AGRO-ECOLOGY

Science and Education for a Sustainable Agriculture

College of Agri
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news and perspectives

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AGRO-ECOLOGY news and perspectives is published bimonthly by the College of Agriculture, University of Illinois at Urbana-Champaign. This issue was edited by Harvey Schweitzer and Tina M. Prow and designed by Nancy Loch. Readers are encouraged to write regarding their concerns and suggestions. Please address all correspondence to: AGRO-ECOLOGY Editors, University of Illinois, 211 Mumford Hall, 1301 West Gregory Drive, Urbana, Illinois 61801.

This newsletter is printed on recycled paper.

W.R. Gomes

College Meets Agro-ecology Challenge

Agro-ecology can provide the needed framework for a systematic and holistic approach to agricultural problem-solving.

Launching another newsletter in the College of Agriculture is not a new experience for faculty at the University of Illinois. But starting a newsletter that attempts to deal with the physical, biological, socio-economic and political aspects of Illinois agriculture within the contexts of ecology and sustainability is an especially challenging task.

The title and subtitle of this newsletter were not chosen lightly. The U of I College of Agriculture has accelerated its research and education efforts in sustainable agriculture. Interest is growing among faculty, students, farmers and the general public in the concept of sustainability. Central to the concept are concerns about the environmental impacts, economic returns and social implications of various agricultural practices and farming systems. We will address these issues in forthcoming newsletters.

We feel, however, that sustainability in agriculture must be addressed within the broader context of ecology, that branch of science concerned with the interrelationships of organisms and their environments. The production of food and fiber is a biological process involving air, water, plants, animals, microorganisms and humans. Agro-ecology can provide the needed framework for a systematic and holistic approach to agricultural problem-solving. Within this framework, sustainable agriculture is a long-term goal. Society will evaluate its long-run success in economic, environmental and ethical terms.

The goals established for this bimonthly newsletter by its steering committee are ambitious. Through it we hope to stimulate faculty and student interest in agro-ecology and the development of research and educational programs in agricultural sustainability. We will keep our readers abreast of relevant research and educational programs carried on through the Agricultural Experiment Station and the Cooperative Extension Service.

Upcoming conferences, workshops, seminars and lectures will be announced. Equally important, we hope to provide a forum for the exchange of perspectives on agro-ecology and sustainability in agriculture. A regular feature will be a guest editorial in each issue designed to stretch our thinking.

Recognizing that research is the driving force behind new knowledge, we intend to emphasize the development of concepts built upon sound scientific studies. Through the newsletter we hope to encourage a dynamic interaction among research, education and the development of public policy in matters relating to agricultural sustainability.

Letters to the editor are welcome as are suggestions for improving the newsletter to meet your needs and interest.

W.R. Gomes, dean, College of Agriculture

John Gerber

Agro-ecology Takes in Whole Ag System

Agro-ecosystems can be judged according to the amount of goods and services produced, the contribution of those goods to human needs or happiness and their relative distribution among the human populations.

Put simply, agro-ecology is a science devoted to the study of agro-ecosystems. An agro-ecosystem is a complex of air, water, soil, microorganisms, plants and animals in a bounded area that humans have modified for agricultural production (Altieri, 1987). Agro-ecosystems exist within a larger environmental, social and knowledge arena which defines the resources available to the system.

The goal of agro-ecology is to provide an understanding of complex agricultural systems and to develop the technologies needed to support those systems.

The science of agro-ecology employs basic ecological principles, such as nutrient cycling, predator and prey interactions, and species competition and cooperation, to provide a better understanding of agricultural systems. Some of the properties of an agro-ecosystem that are useful for scientific measurement are: productivity; stability; sustainability; and equitability (Conway, 1987; Marten, 1988).

Productivity is the output of some valued product per unit of critical input, usually a limiting resource. Outputs include weight of a marketable product, monetary value, energy value, calories and vitamins. Inputs are land and labor, and exploitable resources such as fertilizer, pesticide, fuel, water and other capital expenses.

Stability is consistency of productivity in spite of small disturbing forces and may be measured by the coefficient of variation in productivity. Instability of production may result from minor, random disturbing forces such as uneven rainfall, pest outbreaks or fluctuations in market demand.

Sustainability is maintaining a level of productivity over time in spite of major disturbing influences. Stress conditions, such as soil erosion, salinity, indebtedness and declining market demand, can severely impair the productivity of systems with low sustainability.

Although productivity, stability and sustainability also apply to natural ecosystems, when used to describe an agro-ecosystem, they are defined in terms of desired socio-economic outcomes. That is, they have social value. Agro-ecosystems can be judged according to the amount of goods and services produced, the contribution of those goods to human needs or happiness and their relative distribution among the human populations.

Distribution of goods and services defines the fourth measurable property of an agro-ecosystem, equitability. Equitability implies equal access to inputs (resources) and products of a system. Although natural ecosystems may display high equitability among resident species, this is a result of co-evolution rather than a conscious goal of those species.

When referring to an agro-ecosystem, equitability is clearly a social value that has no counterpart in natural ecological systems.

The traditional criterion for evaluating success of an agricultural system is productivity. Irrigation, for example, is generally considered good because it improves productivity. It also improves stability of a system because farmers are not susceptible to unreliable rainfall.

But the system is sustainable only if it doesn't cause environmental problems like increased soil salinity, erosion or

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Mike Sager

Holistic View Changes Farming Practices

A growing number of agriculturalists are taking a more holistic view of their relationship to the land and examining the total impact of their farming practices.

As pioneers moved westward, they cut and burned the forests and plowed the prairies. They were motivated by the need to survive and their ideas of civilization and democracy. My father, born in 1886, described how as a lad he walked across an 80-acre tract in Jefferson County, Ill., by jumping from log to log without ever setting foot on the ground. Those logs were native hardwoods which were cut and burned to make way for crop production.

That pioneer ethic of going forth to subdue the earth survives in parts of our nation's agriculture. Though suitable for its time decades ago, it must change and it is changing. A growing number of agriculturalists are taking a more holistic view of their relationship to the land and examining the total impact of their farming practices.

For years there was a tendency to look only at the short-term "bottom-line" which was usually expressed as the highest yield or highest return per acre. There is nothing wrong with using that principle as long as it does not negatively impact upon the environment or the well-being of society. Unfortunately, and for too long, some of the negative impacts of this "bottom-line" mentality have been overlooked.

Soil erosion is an example. In Illinois, 40 percent or 9.3 million acres of farmland have excessive soil erosion loss. Soil erosion is an insidious process that is accelerated by traditional tillage practices, usually involving the moldboard plow. Using the moldboard plow typically produces the highest crop yield. It also produces the greatest amount of soil loss.

The "bottom-line" mentality stops with yield. It assumes that the most grain per acre which produces the most income this year is best. The problem is that it ignores the impact of soil loss. The cost to society is sedimentation pollution in the short-term and loss of productivity in the long-term.

The "bottom-line" mentality has been willing to accept excessive soil erosion on 40 percent of Illinois' farmland in order to get a few more bushels per acre in the short run. In many cases, there may have been a 20-ton or greater soil loss per acre per year in return for only five or 10 additional bushels of corn. That is not a good economic or ecologic arrangement.

The agro-ecological perspective is one that takes soil erosion, as well as other factors into account. For example, under the leadership of the University of Illinois Cooperative Extension Service, Soil Conservation Service (SCS) and Agricultural Stabilization and Conservation Service, Woodford County farmers started switching from traditional moldboard plow tillage to conservation tillage methods in the 1960s. They saw this as a way to reduce erosion on a large acreage of cropland in a short time and at low cost.

Although the project is imperfect, it has worked quite well. It has progressed to a point where the major percentage of Woodford County farmers use conservation tillage methods while maintaining adequate crop yields. Recently, a U.S. Department of Agriculture-SCS team suggested that Woodford County is 10 to 20 years ahead of the average in reaching conservation compliance requirements of the 1985 Food Security Act. They made particular note that a strong "conservation

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George H. Kieffer

Environmental Ethics Challenge Agriculture

At one time the farmer was seen as the steward of the environment. More recently, the public's attitude is changing as agriculture's impact on the environment comes under increasing scrutiny.

Society today is fast going through a difficult passage, between one era and another, as it moves from the Age of Industry to the Age of Information. Modern communication and transportation technologies, international economic interdependencies, international economic entities and nuclear arms are causing the painful birth of a supercommunity. What its eventual structure may turn out to be is completely unpredictable at this point.

One thing, though, that can be confidently asserted is that the new era will require of us new duties and present unique challenges. This is especially pertinent to commercial communities, including the agricultural community. How well these communities fare in the years ahead depends on the ability of its managers to respond to the issues and challenges of a world that is fast becoming Marshall McLuhan's "global village." Globalization of the demand for a livable environment must rank as one of the more pressing of these challenges.

Many people feel that time is running out and they do not hold the captains of business entirely blameless for present conditions. The headlines of last year have clarified in the public mind the grim potentials of environmental deterioration. A recent MacNeil-Lehrer News Hour presented a special on the global environmental crisis. Viewers heard about "children from New Guinea playing in toxic wastes from the northeast ... and garbage scows looking for homes in the Third World."

"A Circle of Poison" aired on a local TV channel called consumer attention to supermarket foods coming from foreign lands where last year we sent toxic agricultural chemicals. These same chemicals have returned "full circle" to threaten our health today.

News headline after news headline warns that ozone depletion and global warming can devastate the earth's ecology. Cutting trees for firewood, lumber and other needs, plus the clearing of land for farming and ranching, is steadily reducing the planet's tree cover. As forests disappear, rainfall runoff increases and soil erosion accelerates.

No longer out of sight, such problems can no longer be far out of mind, either. Remote no more are the rain forests of the Amazon, pesticide-tainted food from Central America, nuclear accidents, polluted rivers, or chemical spills wherever on earth they occur.

As the child's song goes, "The whole world is my hometown," and citizens are agitated enough to take action. Burger King is boycotted for buying "rain forest" beef, and Nestle products go unsold because the company markets breast milk substitutes to Third World mothers.

The nation's agricultural system, too, is no longer exempt from public criticism. At one time the farmer was seen as the steward of the environment. More recently, the public's attitude is changing as agriculture's impact on the environment comes under increasing scrutiny.We are told that modern farming practices contribute to soil erosion which not only leads to the loss of productive top soil, but also to increases in air and water pollution.

Pesticides and fertilizers figure prominently in the pollution of both surface water and groundwater. Irrigation leads to the depletion of aquifers and the salinization of soils. Acres of wetlands, one of the richest ecosystems on the continent, are cleared and drained to grow more food.

This may be the right time to forge a "land ethic" that considers both agriculture's responsibility to provide the world with its daily bread, and the public's demand for an improved environment.

Agriculture is being seen more as an industry than a way of life and the public is becoming less sympathetic to its claims for special treatment. The bottom line of this is that agriculture, like other businesses, is being held responsible for its role in environmental degradation. And like any other business, environmental protection is becoming an increasingly important constraint on farm practice and policy.[1]

While these changes can be viewed as threatening to the agricultural community, they can also be viewed as a challenging call for a new set of duties. This may be the right time to forge a "land ethic" that considers both agriculture's responsibility to provide the world with its daily bread, and the public's demand for an improved environment.

I would suggest that the late Aldo Leopold can provide positive guidance for this important task. Leopold, who underwent a dramatic conversion from a management mentality to what he called an ecological consciousness, is universally considered the founding genius of recent environmental ethics. His essay, "The Land Ethic," from his most popular work *A Sand County Almanac*, is the standard against which environmental ethics most commonly is measured; the paradigm case, as it were, of what an environmental ethic should be.

The overarching thematic principle of the land ethic is the community concept – "that land is a community." Leopold's "land" is his shorthand term for the natural environment, encompassing not only humans but plants, animals, water and soil. Each of the myriad components of the community, while pursuing its own interests, performs a function that contributes to the overall flow of materials, services and energy within the system.

To say, as Leopold does, that we are members of the land community, therefore, is to say that there is a reciprocal dependency between phytoplankton, forests, earthworms, honey bees, bacteria, humans and so forth in the same way that people are dependent on other people in the world of conventional economic systems – farmers in Illinois, factory workers in Tokyo, and the like.

The land ethic integrates plants, animals, soil and water into one superorganism; all are working members of the total community. Since personal self-interest cannot override the collective interest of the community, free-for-all competition simply is unthinkable.

The land ethic thus enlarges the boundaries of the community to include soil, water, plants and animals, as well as humans. No longer can we be conquerors, only plain citizens of the land; a state of harmony thus exists between us and the environment.

Aldo Leopold provides a concise working statement of what is called the principal precept of a land ethic: "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."[2] Although a full explication of this proposition cannot be fully addressed here, what is especially noteworthy is the idea that the good of the biotic community is the ultimate measure of the moral value, the rightness or wrongness, of action.

By this measure, it would be wrong for a farmer, in the interests of higher profits, to clear highly erodible, hilly land

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"The goal of sustainable agriculture is based on values of ecological soundness, environmental protection, economic rationality, equity, and humaneness toward people and animals." Patricia Allen and Debra Van Dusen in an article on sustainable agriculture appearing in Volume One, ***Global Perspectives on Agroecology and Sustainable Agricultural Systems,*** *University of California, Santa Cruz.*

"A sustainable agriculture is one that, over the long term, (1) enhances environmental quality and the resource base on which agriculture depends, (2) provides for basic human food and fiber needs, (3) is economically viable, and (4) enhances the quality of life for farmers and society as a whole." American Society of Agronomy.

College Answers Rodale Mail Campaign

Last year, the Rodale Institute launched a major project through several of its publications in support of the Institute's efforts to reduce the amount of pesticides and fertilizers used by farmers and consumers. Appeals were made for donations and readers were urged to contact their state deans of agriculture and experiment station directors. Lists of names and addresses were provided to readers, along with a printed postcard that could be used in contacting these administrators. The card read:

I am concerned about the effects farm chemicals have on our land, water and health. As a taxpayer, I want you to know that I support low-input farm methods. America must begin to reduce the amounts of toxic weed killers, pesticides and fertilizers used by farmers, gardeners and homeowners.

Any steps you can take to achieve this will be greatly appreciated by everyone who supports a healthy environment.

Sincerely, _____

The Illinois Agricultural Experiment Station received over 1000 signed cards from Illinois residents. Each card was acknowledged with a letter from either Director Donald Holt or Assistant Director Harvey Schweitzer. Materials regarding our College's research and education program and asking for support for adaptive research were sent along with the letters.

The last paragraph in our letter stated:

We assure you that given the resources we will strive diligently to help farmers identify those systems that represent the optimum combination of products and practices and that result in profitable, resource-conserving, and environmentally-safe systems. None of us, particularly those of us who work closely with various chemicals, wish to produce unsafe systems.

Scientists Seek LISA Funds for Research

The University of Illinois sent 17 project proposals to the North Central Region LISA program coordinator at the University of Nebraska in the competition for funding under the Federal Low-Input/Sustainable Agriculture (LISA) program. In addition, U of I faculty are involved in six proposals submitted by other North Central states. Congress authorized $4.45 million for the FY '89 program.

The next issue of this newsletter will contain a brief description of each U of I proposal submitted, along with the name of a contact person.

"Ecology is a science. It is exceedingly complex; nevertheless, it is a discipline, the problems of which have to be attacked by scientific techniques within the framework of our scientific causality. It is not a Weltschauung or a pantheistic religion." George Claus and Karen Bolander in ***Ecological Sanity****, David McKay Co., Inc., New York, 1977.*

Committee Considers Sustainable Ag Issues

The College of Agriculture has an ad hoc committee to consider issues of sustainable agriculture. Members are:

Darin Eastburn - Plant Pathology
Dan Faulkner - Animal Sciences
Gerald Gast - 4/H and Youth
John Gerber - Horticulture
Don Kuhlman - Environmental Issues
Eli Levine - Ag Entomology
Tim Marty - Forestry
Emerson Nafziger - Agronomy
Robert Reber - SHRFS
Ann Reisner - Ag Communications
Earl Russell - Ag Education
John Siemens - Ag Engineering
Mike Tumbleson - Vet Medicine
John van Es - Ag Economics
Richard Warner - Natural History Survey

Peter Bloome - Cooperative Extension Service
Ben Jones - Ag Experiment Station
Harvey Schweitzer - (coordinator)
Don Meyer and Mike Sager - Extension advisers in McLean and Woodford counties, respectively, have recently been invited to meet with the campus committee.

Three subcommittees have been formed. One is developing this newsletter; another is looking at issues involved in on-farm research; and the third is organizing a series of seminars and lectures dealing with agro-ecology and agricultural sustainability.

New Position Focuses on Environmental Issues

Dr. Donald E. Kuhlman is heading a new effort in the College of Agriculture aimed at environmental issues. In a release distributed at a press conference Wednesday, May 31, in Springfield, Dean W. R. Gomes stated that action creating this position reflects "the College's commitment and concern on environmental issues, especially those pertaining to agricultural pesticides and problems stemming from their use."

The position carries Extension and research responsibilities. Kuhlman, an agricultural entomologist, is uniquely qualified to provide leadership for research and educational programs on environmental issues. A respected authority on pesticides, he has served as the College pesticide coordinator, Extension entomology project leader, and Integrated Pest Management program coordinator.

One of his many new responsibilities will be to serve as the acting coordinator of the College Committee on Sustainable Agriculture.

Kuhlman's new office is 213 Mumford Hall. His telephone number is 217/ 333-6494.

Society Offers Membership, Information

The Illinois Sustainable Agriculture Society is a nonprofit corporation designed to provide its members access to information about environmentally sound, lower cost, profitable farming practices and technologies. ISAS promotes the use of low-input sustainable agricultural systems which help farmers produce sustainable crop yields, reduce adverse impacts on the environment, and maintain or increase farm profitability.

Officers for ISAS are Donn Klor, Buffalo, president; Gayle Goold, Paxton, vice-president; and Bill Becker, Springfield, secretary/treasurer. Other members on the Board of Directors are Tony Chavez, Cobden; Mark Freed, Lexington; Marvin Manges, Yale; Keith Romack, Newton; William Roth, Stonington; Robert Little, Farmer City; Mike Strohm, West Union; and Jeff Thomas, Edinburg.

Individual or family memberships are $10 a year. For further information contact Donn Klor, R.R. #1, Box 58A, Buffalo, Illinois.

Workshop Explores Pest Management Alternatives

A workshop on alternatives in pest management is planned for Nov. 20-21, 1989, at the Continental Regency in Peoria, Ill. The workshop is designed for practitioners (including homeowners), educators, policy makers and any others interested in unbiased information about alternatives in pest management. Plans for the workshop were initiated by Extension specialists in the College of Agriculture Office of Agricultural Entomology. Involved in the planning are faculty from other College departments, representatives of county Cooperative Extension Service, the Illinois Sustainable Agriculture Society and the Illinois Department of Energy and Natural Resources. For information, call Rick Weinzierl at 217/333-6651.

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Agro-ecology is the study of Aristotle's "composite thing" in an agricultural domain.

water shortages. Further, equitability may suffer because not all producers have access to a source of irrigation water.

Agro-ecology attempts to use these and other properties to evaluate agricultural systems in their totality.

Aldo Leopold's land ethic evolved from the study of ecology and the subsequent understanding of natural ecosystems (Callicott, 1989). It is hoped that agro-ecology will further strengthen a version of the land ethic in which humans perceive value in self-sustained agricultural systems that are less resource-intensive and will enhance environmental quality and human wellness.

Aristotle wrote, "...in natural science it is the composite thing, the thing as a whole which primarily concerns us, not just the materials of it, which are not found apart from the thing itself." Agro-ecology is the study of Aristotle's "composite thing" in an agricultural domain.

M.A. Altieri, *Agroecology: The Scientific Basis of Alternative Agriculture* (Boulder, Colorado: Westview Press, 1987).

J.B. Callicott, *In Defense of the Land Ethic: Essays in Environmental Philosophy* (Albany, New York: State University of New York Press, 1989).

G.R. Conway, "The Properties of Agroecosystems," *Journal of Agricultural Systems*, 24 (1987) pp. 95-117.

G.G. Marten, "Productivity, Stability, Sustainability, Equitability and Autonomy as Properties for Agroecosystem Assessment," *Journal of Agricultural Systems*, 26 (1988), pp. 291-316.

John Gerber, associate professor of horticulture and Extension vegetable crop specialist.

of its trees for cultivation or turn livestock into the clearing, causing the land to dump its rainfall, rocks and soil into the community creek. Instead, more effort will be directed toward reducing the uses of chemicals, utilizing less energy and controlling soil erosion.

Conforming to a land ethic, at least for a start, requires that our activities have a minimum impact on the environment. It's as simple as that. The doctrine of the stewardship of the earth has developed dramatically in the past two decades. Before that, we tended to think that we had almost unlimited dominion over the earth and license to exploit it for our own ends. Now, we are coming to see ourselves as caretakers, and we are holding ourselves responsible for the way we use our resources.

Agriculture can play a leadership role in the increasingly interrelated and increasingly threatened world. In the spirit of openness and cooperation, an effective land ethic can be forged between the several interests who have a crucial stake in the outcome.

1. Sandra S. Batie, "Environmental Limits: the New Constraints," *Issues in Science and Technology* (Fall 1985), p. 134.

2. Aldo Leopold, "A Land Ethic," *A Sand County Almanac* (New York: Oxford University Press, 1949), p. 224.

George H. Kieffer is an associate professor in the Department of Ecology, Ethology and Evolution, School of Life Sciences. His professional interests include biological education, ethical issues in the life sciences and molecular biology.

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ethic" is well established in the minds of Woodford County farmers.

This is just one example of using knowledge to modify traditional agricultural practices and to help the development of a holistic agro-ecological ethic.

U of I Extension advisers have great opportunities as practicing agro-ecologists. The number of Illinois farmers who are using reduced tillage methods and integrated pest management (IPM) strategies is growing. An agro-ecological perspective is emerging on the Illinois agricultural scene. By helping farmers consider the long-term as well as the short-term implications of their farming practices and by helping them put knowledge to work, Extension advisers can help lead agriculture toward a more sustainable future.

An agro-ecological perspective is emerging on the Illinois agricultural scene.

Mike Sager, Woodford County agricultural Extension adviser, Cooperative Extension Service.

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agro-ecology

Science and Education for a Sustainable Agriculture

Sustainable Ag Initiative Gains New Leader — John M. Gerber assumes responsibility for coordinating the sustainable agriculture initiative of the U of I College of Agriculture.

Priorities Move Ag Toward Sustainability — Peter Bloome explores the attributes of a more sustainable and more sustaining agriculture and the conflicts that complicate the process of setting priorities necessary for change.

On-farm Research Spreads Research Base — Emerson Nafziger explains how on-farm research can help growers find solutions to specific problems.

LISA Funds Research, Education — Harvey J. Schweitzer provides insight on the intended purpose of LISA, "one of the most debated and perhaps misunderstood terms currently in vogue in agricultural and environmental circles."

An Illinois Farmer Looks At LISA — A guest editorial by Donn S. Klor, farmer and president of the Illinois Sustainable Agriculture Society, Inc.

College of Agriculture
University of Illinois at Urbana-Champaign

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Sustainable Ag Initiative Gains New Leader

"In the final analysis, there is little doubt that sustainable agricultural practices will lessen agriculture's impact on the natural environment. Only time will tell if it can also address the complex social agenda."
From remarks made by Dennis R. Keeney, director of the Iowa Leopold Center for Sustainable Agriculture at Iowa State University, at the North Central American Society for Agronomy meeting in Columbia, Mo., June 28, 1989.

John M. Gerber was appointed assistant director of the Illinois Agricultural Experiment Station, with primary responsibility as coordinator for the sustainable agriculture initiative of the University of Illinois College of Agriculture, in August.

Gerber will continue work begun by Harvey J. Schweitzer, who retired in July after more than 25 years of service to the U of I. Schweitzer, an assistant director for the Agricultural Experiment Station, was the first coordinator for the college program in sustainable agriculture. He provided leadership for the first issue of this newsletter and helped make plans for a seminar and lecture series on sustainable agriculture.

Making the announcement of Gerber's appointment, W.R. "Reg" Gomes, dean of the U of I College of Agriculture, said, "We expect Gerber to provide aggressive leadership and visibility to our research and educational programs in sustainable agriculture. We need to consider sustainability along with productivity in this era of increased environmental and social concerns."

Gerber has served on the College's ad hoc Committee on Sustainable Agriculture since it was formed last November.

"We felt from the start that sustainability of agricultural productivity was the goal and that ecology is the scientific perspective that will allow us to achieve that goal," Gerber said. "I expect the program to develop a broad base of support from throughout the University community.

"I'd like to see production agronomists working closely with economists, sociologists, biologists, ecologists and others. We need to cross perceived departmental barriers if we expect to work effectively with farmers and consumers."

Gerber has been with the U of I since 1979, serving as a vegetable crops specialist with the U of I Cooperative Extension Service.

Peter Bloome, Cooperative Extension Service

Priorities Move Ag Toward Sustainability

Setting priorities will be difficult at best. Attempts to do so without an overall holistic perspective will have us chasing rabbits as we pursue first one, then another of these objectives. What has been lacking is an overarching, consistent philosophy.

The agricultural production systems that have evolved over the past 40 years are not sustainable into the future. Agriculture is at a point of departure.

We cannot tolerate the loss of soil to erosion, the rate at which we are mining groundwater resources, the rate of fossil energy use, or the abysmal energy conversion of present systems and expect to sustain agricultural production.

Weeds, plant diseases and insects possess the biological capacity to defeat the short-term pest control strategies we are employing against them. Agricultural chemicals, properly applied in recommended amounts, are finding their way into water supplies. In addition, our farming systems are not sustaining many farm families or the rural communities from which they come.

If we are to pursue a more sustainable and more sustaining agriculture, what will be its attributes? A sustainable agriculture must be profitable. It must conserve soil and protect water resources. A sustainable agriculture must deliver a plentiful and wholesome food supply while providing for the health and safety of farmers, their families and their neighbors.

In order to be sustaining, agriculture must contribute fully to the economy and to the quality of life in rural areas. It must strive to protect the stability, integrity and beauty of the natural environment as argued so forcefully by Aldo Leopold.

Agriculture is a natural resource-based industry. Those same resources must provide abundant and high-quality forest products, as well as recreation, fish, wildlife, grassland, wetland and range resources.

The list is long. If we are to provide for all of these needs, we must have priorities and be willing to determine which are of the greatest importance.

However, there appear to be conflicts that complicate the process of setting priorities. For example, one approach to wholesome food is to ban all pesticides. But this would certainly constrain profitability and competitiveness, and perhaps wholesomeness as well. There are conflicts between some approaches to soil conservation and water quality. And, there appears to be a basic conflict between natural resource use and conservation.

Priority setting depends on individual perspective. The highest priority may differ for: an environmentalist; a farmer; a soil conservationist; a consumer; an agricultural input supplier; a non-farm rural resident; and a mayor of a small rural town. And what of the interests of future generations?

Setting priorities will be difficult at best. Attempts to do so without an overall holistic perspective will have us chasing rabbits as we pursue first one, then another of these objectives. What has been lacking is an overarching, consistent philosophy.

There is a hierarchy – a proper order – to these matters. If we focus on a long-term perspective, some of the conflicts disappear. If we look for connections between long-term

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An interview with Emerson Nafziger, agronomist

On-farm Research Spreads Research Base

Q: *Considering the variety and number of agricultural research projects being conducted by University of Illinois scientists, why should Illinois farmers consider conducting research on their own farms?*

Nafziger: The science of crop production has matured to some extent; researchers have answered many of the big questions that limited agriculture in the past. On many farms now, the next 5 bushels is hard to get and often requires "fine-tuning" of inputs and operations. Although the U of I has many research projects at stations around the state, the kind of research being conducted cannot always answer some of the very specific questions farmers have about their own operations. One reason for this is the rapid change in technology; there are so many options available that it is impossible to investigate all the combinations.

It seems logical for a group of farmers interested in a common problem – say nitrogen rates with reduced tillage or hybrid performance in a certain soil type – to put in small trials on their farms and see what happens. If it's done very carefully, on-farm research can help farmers better predict how some specific treatment or hybrid is going to do on their farms.

Obviously, on-farm research isn't for everyone. If a farmer is not committed to keeping records and doesn't have an observing attitude and a curiosity to learn, the research isn't likely to be good. But I think many farmers are capable and willing to do on-farm research. They've done hybrid strip trials for years and know what it takes to keep records.

Q: *What kind of research is appropriate for farmers to consider doing on their farms?*

Nafziger: We have some ideas about what types of research can be conducted by farmers, but we will have to learn what works best by experience. It will certainly be necessary to keep things fairly simple, with a small number of treatments. It will probably not work to try to test too many interactions – multiplying, say, a number of hybrids by several plant populations quickly gets to be too large. Such a limitation on number of treatments is a real drawback to on-farm research, since testing interactions is often necessary.

Nonetheless, variety trials; simple weed control studies, perhaps including cultivated versus not cultivated; insect trials that might involve turning off or turning on application boxes on a planter; and simple tillage trials, perhaps comparing some tillage with no tillage – these are some examples of on-farm research that farmers can probably do.

We will probably want to avoid experiments that require sophisticated or unfamiliar equipment. And, on-farm research should not require the farmer to undertake substantial risk due to loss of yield or quality due to treatments.

Regardless of what type of research is actually conducted, it will be absolutely necessary that the results be analyzed and interpreted properly. This will require the services of someone trained in research methods.

Q: *Will the results of on-farm research be meaningful to anyone other than the farmer conducting the research?*

Nafziger: While the involved farmer would certainly have the quickest access, we would hope such research could be more widely applicable. Being able to make some statistical sense of on-farm research data is critical. Ideally, a number of farmers in an area should all conduct the same on-farm research, and then average the results in order to make their findings meaningful.

Averaging data across locations and years can greatly strengthen the predictive power of such research by helping to assess uncontrolled variability, thus

continued on page 9

Donn S. Klor, Illinois Sustainable Agriculture Society, Inc.

Guest Editorial

An Illinois Farmer Looks at LISA

LISA should not be controversial – it is an applied research approach to sustainability and mandates nothing. One could say there is something in LISA for everyone.

To those of us close to the farm, LISA (low input sustainable agriculture) is probably one of the least understood topics we read about. It seems to look either good or bad depending on the author's viewpoint.

A narrow and concise definition of LISA does not exist, and this is a benefit. There is a greater advantage in having a consensus, rather than a definition, on what LISA is all about. All farmers want to reduce costs and risks, protect the environment and maintain a positive net income – this is the consensus.

In Illinois, sustainable agriculture does not mean organic farming. Sustainable may use conventional products, while the organic farmer shuns these products. However, organic may be sustainable.

The Illinois Sustainable Agriculture Society has several organic farmers as members – and other members are intrigued by organic farming. There is still much to be learned and documented about organic systems by institutions of higher learning and much which appears to be transferable to conventional and sustainable farming.

It is likely that a very large part of the farm community would openly embrace LISA concepts if the questions were asked properly.

For example, what farmer would not want to keep current yields while lowering input costs; reduce use of herbicides and insecticides; or improve soil tilth and water-holding capacity? Don't most farmers want to spread risks with a promising new enterprise and reduce risk of product contamination?

Just about everyone would be happy with these results. But label them LISA projects and the questions start. LISA should not be controversial – it is an applied research approach to sustainability and mandates nothing. One could say there is something in LISA for everyone.

The "LI" in LISA stands for low input to lower out-of-pocket input costs. It could be complex, depending on how the concept is presented. Integrated Pest Management (IPM), Best Management Practices (BMP) and Maximum Economic Yield (MEY) are all management oriented, as is LISA. But LISA goes one step further because BMP and MEY systems are capital intensive.

The risk is increased when the weather is considered in these capital-intensive systems, and input costs are high. One way to look at it is to ask: "Do farmers need a $100 net after $300 expenses, or are they ahead with the same $100 net after a much lower input expense?" Obviously, by lowering input costs with management and substitution of conventional products, a farmer's position for variable risk (poor weather) is improved.

The questions those concerned with the "SA" of LISA, or sustainable agriculture, are asking include: Can farmers continue to use tons of chemicals that, in part, have been shown to be not in their best interest? Can farmers let the soil with its attached fertilizers move into water supplies? Should farmers continue to use products that have a finite supply of base materials?

Most would answer no to these questions. We cannot wait until another *Silent Spring* is written. Researchers must develop more environmentally acceptable products and practices that minimize risks. And when these gains are made, Extension must promote adoption in a way that is embraced by the users, so that it will not be considered strange to farm environmentally. Farming environmentally needs to be the accepted norm.

Simple practices that can be quickly adopted – and adapted to local conditions – would go a long way toward our common goal of providing food for the future. A few of these practices are: banding versus broadcast spray; better fertilizer application methods; cultivation plus new practices, such as precise pre-application soil testing to reflect usable nitrogen in the soil profile; more biological controls; greater use of IPM; and more research into various cover crops that provide fertility and improve soil structure.

In conclusion, the LISA movement can be thought of as an umbrella that covers a broad range of topics. It is not "no-input" farming at all.

Just like the meeting of the Cheshire cat and Alice in *Alice in Wonderland*, we might ask, "Where do we go from here?" The answer is the same as in the story – "wherever we want." Our country wants farmers to become better stewards of the land. We will be, and we will do it through experimentation and research driven by the need to work with the farm and urban populations to develop products the public wants.

New and major sustainable agriculture programs are under way, the closest example being those of the Leopold Center for Sustainable Agriculture in Iowa.

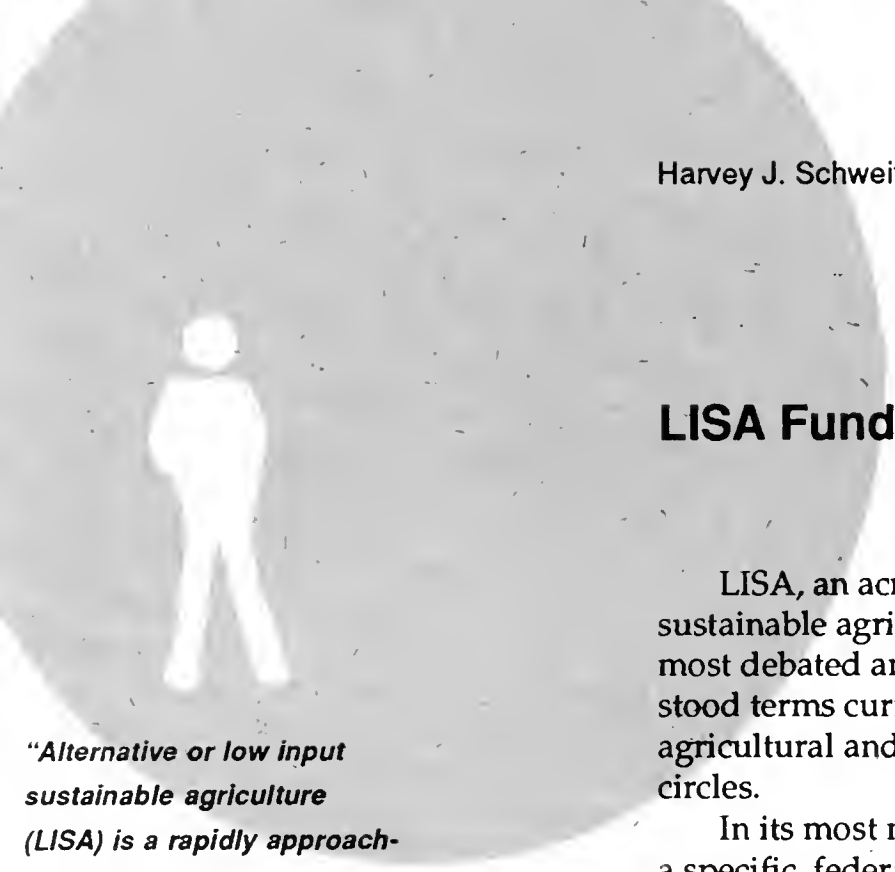
Organic farming – and the products that support it – will continue to grow. I think there will be a shift by some major suppliers to fill that market in the future. As more sales develop, the costs for these products will more than likely decline and that is good news for consumers.

Also, tillage will continue to decline overall, a trend farmers have already seen.

All this will come about because agriculture's LISA has another name – "Evolution."

Donn Klor is a farmer and president of the Illinois Sustainable Agriculture Society, Inc.

Our country wants farmers to become better stewards of the land. We will be, and we will do it through experimentation and research driven by the need to work with the farm and urban populations to develop products the public wants.



"Alternative or low input sustainable agriculture (LISA) is a rapidly approaching national policy issue. It is now acknowledged to be one among many potentially important sets of policy ideas that may be worked into law or further accommodated in existing policy." From "The Quest for Sustainable Agriculture," the 3/20/89 Food Policy Insight column written by Harold Guither, U of I Extension economist.

Harvey J. Schweitzer, Agricultural Experiment Station

LISA Funds Research, Education

LISA, an acronym for "low input sustainable agriculture," is one of the most debated and perhaps misunderstood terms currently in vogue in agricultural and environmental circles.

In its most narrow sense, LISA is a specific, federally funded and nationally and regionally administered program of agricultural research and education. It focuses on developing and promoting low-input, sustainable farming systems.

The Agricultural Productivity Act, passed by Congress in 1985 as part of the Food Security Act, P.L. 99-198, provided the authority to conduct research and education programs in alternative farming systems – often referred to as low-input or sustainable agriculture. It mandates scientific investigations to:

- enhance agricultural productivity,
- maintain land productivity,
- reduce soil erosion and loss of water and nutrients and,
- conserve energy and natural resources.

In December 1987, Congress appropriated $3.9 million for the fiscal year 1988 to begin work under this act. Forty-nine projects were funded the first year. Congress authorized $4.45 million for the fiscal year 1989 program.

Federal LISA funds are administered through four regional offices. Illinois falls into the North Central Region. The North Central Region received 127 proposals this spring and funded 17 projects. Thirteen of these were extensions of ongoing research and four were new projects.

The USDA's LISA program is a relatively small, though significant, initiative dealing with agricultural sustainability. A driving force of greater significance, perhaps, is the growing public concern about environmental issues in agriculture, water quality, soil erosion, food safety and the use of certain chemicals for weed and insect control.

Farmers share these concerns and are seeking ways to effectively reduce costs of purchased inputs while still maintaining acceptable levels of productivity. Thus, low-input, sustainable agriculture is an emerging public issue.

Farmers in several states have formed organizations, such as the Illinois Sustainable Agriculture Society and the Practical Farmers of Iowa. Their purpose is to share ideas about lower-input, resource-conserving practices and to conduct their own field trials and experiments.

Sustainable agriculture is also getting significant attention and support from some state governments.

The Iowa Leopold Center for Sustainable Agriculture was established at Iowa State University by the state legislature. During its first year of operation, the Center was awarded $800,000 in oil-overcharge funds for research and education. Now funded by taxes on fertilizers and pesticides, the Center will have $150,000 this year for additional studies.

Minnesota is using oil-company refunds to finance extensive research on low-input practices. Furthermore, the Minnesota State Legislature has

continued on page 9

Write for These Publications

"We know now, however, that some agro-chemicals have harmed the environment." From "Effects of Agrochemicals in Conservation Tillage on the Environment" by Allan S. Felsot, Louis F. Welch, William S. Curran, Ellery L. Knake and William G. Ruesink in *Illinois Research,* ***Volume 30, No. 3/4.***

". . . good management in a no-till system can keep weed-control costs comparable to those for conventional tillage systems without increasing herbicide expenditures." From "Effects of Agrochemicals in Conservation Tillage on the Environment" by Allan S. Felsot, Louis F. Welch, William S. Curran, Ellery L. Knake and William G. Ruesink in *Illinois Research,* ***Volume 30, No. 3/4.***

"In short, attention to the interrelationships and interactions among the crop and livestock agroecosystems offers significant opportunities for enhanced viability of the total food and agricultural system." From CAST Report 114.

Illinois Research *–Fall/Winter 1989*
This issue will focus on sustainable agriculture, according to Donald Holt, director of the Illinois Agricultural Experiment Station. Because a limited number of extra copies will be printed, anyone interested in this issue should send a request as soon as possible to the Office of Agricultural Communications and Education, 47 Mumford Hall, 1301 W. Gregory Drive, Urbana, IL 61801. Individual copies are provided free of charge to Illinois residents.

Illinois Research *–Fall/Winter 1988*
This issue focuses on land stewardship and agricultural sustainability. Writers explore aspects of conservation of natural resources, giving special attention to conservation tillage. The first words of the opening article are: "The first principle of ecology holds that all things are interconnected." The issue also reviews the relationships among agricultural practices, the environment and people. Write to the address above.

International Agriculture Update
The Volume 4, Number 3 issue deals with stewardship of our natural resources and the environment. The cause of general global warming due to "greenhouse gases" is explained, along with its potential impact on agriculture. Predictions of a "hotter and drier" Midwest will be of interest to the agricultural community. Individual copies of *International Agriculture Update* are available upon request from Bonnie J. Irwin, Editor, Office of International Agriculture, 113 Mumford Hall, 1301 W. Gregory Drive, Urbana, IL 61801, 217/333-6420.

Long-Term Viability of U.S. Agriculture
A task force of science, industry and community leaders prepared this document which explores long-term viability of U.S. agriculture. The following statement is taken from the opening remarks of this report.

"A long-term viable agriculture is defined as one providing safe, abundant, and nutritious food supplies at a reasonable cost while preserving the environment and the beauty and wholesomeness of our rural heritage. Long-term viability has economic (including technology and productivity), environmental (including the natural resource base), and social (family farm, rural community) dimensions."

The 48-page report is available from the Council for Agricultural Science and Technology, 137 Lynn Avenue, Ames, IA 50010-7120; telephone 515/292-2125. Request Report No. 114, June 1988. The report is free to CAST members and is $4 for the general public.

Sustainable Ag Seminar Series Set

A subcommittee of the College of Agriculture Sustainable Agriculture Committee is planning a series of seminars for the 1989-90 school year. The purpose of the series is to stimulate discussion on sustainability issues and encourage interaction among faculty and students interested in agro-ecology.

Don Kuhlman, chairman of the subcommittee, already has scheduled a number of speakers for the fall semester. However, he is interested in suggestions for spring. Please send names, addresses and brief background statements on possible speakers to Kuhlman at 213 Mumford Hall, 1301 W. Gregory Drive, Urbana, IL 61801.

Or, contact any subcommittee member you know with suggestions. Members and the departments they represent are: Eli Levine, Agricultural Entomology; John Masiunas, Horticulture; Bob Reber, Foods and Nutrition; Earl Russell, Agricultural Communications and Education; John van Es, Agricultural Economics; Dick Warner, Illinois Natural History Survey; Emerson Nafziger, Agronomy; and John M. Gerber, Illinois Agricultural Experiment Station.

Seminar speakers and topics are scheduled for 3 p.m. on the following dates through December:

September 28

Dennis Keeney, director of the Leopold Center for Sustainable Agriculture. Issues relating to sustainability. 108 Bevier Hall

October 23

W.R. Gomes, dean, College of Agriculture. The College commitment to sustainable agriculture. 103 Mumford Hall

November 16

George Bird, North Central Region coordinator for the LISA Program. A systems response approach to sustainable agriculture. 108 Bevier Hall

December 6

Gerald Paulsen, McHenry County Defenders. Groundwater problems and how they relate to sustainable agriculture. 103 Mumford Hall

Mark Your Calendars

November 20-21, 1989

Alternatives in Pest Management: A Workshop Examining the Options

Continental Regency Hotel, Peoria, Illinois. The workshop will cover chemical and non-chemical products and strategies for pest management. Attending will help homeowners and farmers understand important issues and make sound, informed decisions on pest management practices and policies. A $90 fee is required to cover printed materials, workshop proceedings and two lunches. To register, please call 217/244-7659. For more information on the workshop, contact: Rick Weinzierl, conference coordinator, at the Office of Agricultural Entomology, U of I, 172 Natural Resources Building, 607 E. Peabody Drive, Champaign, IL 61820; telephone 217/333-6651.

November 29, 1989

An Evening With Wes Jackson, director of the Land Institute in Salina, Kansas

Location and time to be announced. Jackson is a philosopher, ecologist and author of *New Roots for Agriculture* and *Altars of Unhewn Stone: Science and the Earth*. For more information, contact: John Gerber, 217/244-4232.

January 15-18, 1990

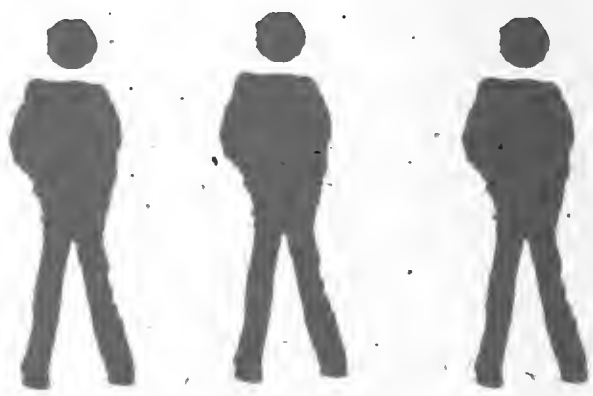
Illinois Specialty Growers Convention and Trade Show

Prairie Capital Convention Center, Springfield, Illinois. The convention will cover such topics as organic food production, marketing and certification. For information, contact: J.W. Bill Courter, program chairman, Dixon Springs Agricultural Center, Simpson, IL 62985; telephone 618/695-2444.

January 24-25, 1990

Moving Toward Sustainability – The First Steps

State Fairgrounds, Springfield, Illinois. This conference is sponsored by the Illinois Sustainable Agriculture Society. Forinformation, contact: ISAS secretary/treasurer, 1229 W. Edwards, Springfield, IL 62704; telephone 217/787-6823.



***Bloome** continued*

economics, ecology and ethics, still other conflicts disappear.

Environmental stability, integrity and beauty ought to be at the center of our philosophy. This places soil conservation, water quality, genetic diversity, endangered species and similar topics at the center of our concern. Surrounding this center is the circle of profitability, health, safety, wholesome and abundant food, recreation and a dozen other desirable attributes.

Sustainable agricultural systems will be more complex than those they replace. They will rely less on chemistry and more on biology and ecology. Greater management skill will be required.

Conservation involves the values of stewardship and enlightened use of natural resources. Sustainability reaches more deeply into the roots of our values. We ought to reject the idea that we can conquer nature – the land community – and reinforce our status as mere members of, and cooperators within that community. Such a durable scale of values will help us avoid mistakes in pursuing goals that are too narrow.

Peter Bloome is the assistant director of the University of Illinois Cooperative Extension Service.

***Nafziger** continued*

allowing us to judge whether differences are due to treatments or to random chance. Even then, farmers should be cautions about extending their research results far outside the area covered in that coordinated effort.

Misuse of on-farm research data comes when decisions are based on single trials without regard to the variability that is always present, even in the most uniform field. There is also variability among years; performance in one year does not always predict performance the next year. We have to recognize these sources of variability and resist the temptation to make important decisions with inadequate data.

Q: ***How can the U of I help farmers interested in conducting research?***

Nafziger: I think there is some potential for U of I Extension specialists, other researchers and county Extension advisers to help coordinate and oversee on-farm research in a region. The U of I is seeking LISA (low input sustainable agriculture) research funding for additional on-farm research projects.

In the future, farmers may hire consultants to help direct on-farm research efforts. That is happening in some European countries already and is getting started in the United States. While this may have resulted partly from decreased access to traditional Extension channels, at least in other countries, it shows that farmers view such research results as valuable.

Emerson Nafziger, an agronomist, holds a joint appointment with the University of Illinois Cooperative Extension Service and Illinois Agricultural Experiment Station.

***Schweitzer** continued*

established a chair for sustainable agriculture at the University of Minnesota.

Wisconsin has committed nearly $1.7 million to a three-year program of on-farm research and demonstration of low-input techniques.

Programs are being developed in a number of other states, including California, Michigan and Texas.

The USDA-LISA program and other low-input, sustainable agriculture initiatives have critics who claim that the benefits are overrated; inefficient production methods are being promoted; the food supply will be reduced; and conventional farming systems are safe and sustainable.

However, supporters of LISA are quick to point out that low-input sustainable agriculture does not mean going back to old labor-intensive, inefficient practices; that production can be maintained; and that the highest level of management is required along with use of the most modern technology.

Critics and supporters alike agree that agriculture must somehow deal with environmental and food safety issues raised by the public.

Harvey J. Schweitzer retired from the Illinois Agricultural Experiment Station in July. An assistant director, his primary responsibility in the later years of service was to coordinate the sustainable agriculture initiative of the College of Agriculture.

Bills Support Sustainable Ag

Two bills passed during the last session of the 1989 Illinois Legislature pertain to sustainable agriculture. The bills have yet to be signed by Governor Jim Thompson.

House Bill 2594, the Sustainable Agriculture Act, will provide funding for a "developmental research program that serves production agriculture in Illinois."

Specifically, the bill establishes a sustainable agriculture program within the Illinois Department of Agriculture. The IDA is charged with reviewing current agricultural systems and encouraging continued research and information delivery on technologies which maintain productivity while minimizing environmental degradation.

In addition, the bill establishes a Sustainable Agriculture Committee. One representative each from the Governor's office, the IDA and higher education and four people actively involved in production agriculture will serve on the committee. The committee is charged with seeking sources of funding for projects pertaining to sustainable agricultural systems.

House Bill 2052, the Illinois Organic Food Labeling Act, relates to organic agriculture. This bill defines what is meant by organic food and prohibits advertising or labeling a commodity as "organic" unless the food meets certain requirements.

For copies of these two bills, contact your state Representative.

University of Illinois at Urbana-Champaign
AGRO-ECOLOGY news and perspectives
College of Agriculture
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news and perspectives

agro-ecology

Science and Education for a Sustainable Agriculture

Sustainable Ag Initiative Gains Momentum — Notes from John M. Gerber's desk.

Pest Control Options Grow Through Research — W.G. Ruesink highlights U of I research to develop innovative pest control tactics.

Disease Control Requires Many Tactics — R.E. Ford discusses limitations of disease control tactics and research to expand control options.

Agro-Ecology Balances Agriculture, Heritage — A guest editorial by Lorin I. Nevling, chief, Illinois Natural History Survey.

LISA Systems Include Weed Control — Ellery L. Knake explores changes in weed control strategies for the 1990s.

Insects Reject The Plants That Don't Measure Up — Jack Juvik's research on disrupting insect behavior by altering host plants may lead to an alternative pest control option.

College of Agriculture
University of Illinois at Urbana-Champaign

AGRO-ECOLOGY news and perspectives is published bimonthly by the College of Agriculture, University of Illinois at Urbana-Champaign. This issue was edited by John Gerber and Tina M. Prow and designed by Nancy Loch. Readers are encouraged to write regarding their concerns and suggestions. Please address all correspondence to: AGRO-ECOLOGY Editors, University of Illinois, 211 Mumford Hall, 1301 West Gregory Drive, Urbana, Illinois 61801.

This newsletter is printed on recycled paper.

Sustainable Ag Initiative Gains Momentum

"Clearly, the broad picture for the College of Agriculture relates to the role of the future of modern agriculture and food and fiber production, and human services. Not only from the historic perspective of feeding the world – providing good, safe, inexpensive food for the world – but in the context of the relationship of that entire process to the sustained preservation of the environment."

W.R. Gomes, ***IlliniWeek,***
Sept. 21, 1989.

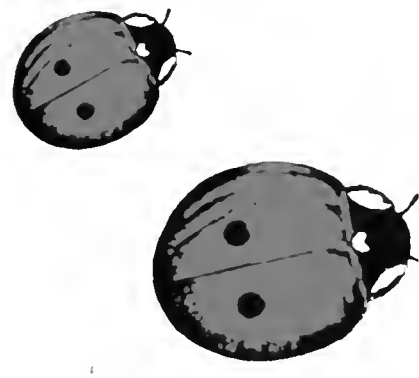
This issue of *Agro-Ecology News and Perspectives* reviews on-going research and education programs in integrated pest management (IPM) at the University of Illinois. The IPM program offers an excellent example of how the U of I College of Agriculture has been involved in sustainable agriculture for some time. But IPM is not enough, and the agro-ecology initiative at the U of I must be developed further.

A recent National Research Council report, "Alternative Agriculture," highlighted a need to evaluate the impact of agricultural production on environmental and social systems. There are scientists at the U of I who are committed to doing that kind of research. The science of agro-ecology will show us how to go beyond IPM to ensure sustainability, equitability and profitability of agricultural systems for years to come.

If the agro-ecology initiative at the U of I seems to be developing too slowly, it may be because it is driven more by commitment and dedication than new funding. The U of I has a number of faculty, students and staff with sincere, deep-rooted interests in agricultural as well as societal sustainability issues. The College of Agriculture ad hoc Committee on Sustainable Agriculture, which began as a small group of 16 just over a year ago, has grown to almost 100 members.

The group already can count some accomplishments. The new sustainable agriculture seminar series is well-attended. There is more interaction and improved communication with other state agencies and farmer and environmental groups throughout Illinois. Special projects, such as a notebook of reference materials and a slide set on LISA, are being developed to help Cooperative Extension Service field staff better serve their communities.

While we are not quite "up and running," we are walking with purpose. Anyone in the university community who is interested in agro-ecology and related issues has a standing invitation to join the College of Agriculture ad hoc Committee on Sustainable Agriculture. *JMG*



W.G. Ruesink, Head, Agricultural Entomology

Pest Control Options Grow Through Research

"Research at the U of I has contributed significantly to improved knowledge of the major pests of our principal agricultural crops. It is the basic knowledge of the ecology of pests and of their interactions with the crop that provide the foundation for long-term solutions. This knowledge has led to better sampling procedures, improved assessment of the role of natural enemies, better timing of pesticide applications and an increased capability to forecast pest outbreaks.

"While integrated pest management (IPM) programs can be improved by making better use of our current control methods, any major reduction in the use of chemical pesticides probably depends on new research developments."

W.G. Ruesink

Research scientists nationwide are vigorously seeking new methods of pest control, as well as better ways to use methods already available. Scientists in the College of Agriculture, University of Illinois, participate fully in this search.

Some of our most promising studies focus on biological control, host-plant resistance and the novel use of chemicals. Listed below are highlights of research with innovative pest control tactics.

• James B. Sinclair and his students in the Department of Plant Pathology discovered that certain microbes will take up residency on soybean roots and thereby reduce the damage caused by pathogenic organisms. For example, *Bacillus ssp.* can protect soybean from Rhizoctonia root rot and *Trichothecin roseum* produces a chemical which suppresses Phytophthora root rot. Both are naturally occurring microbes that have not been genetically engineered in any way.

Before the microbes can be used commercially, however, scientists must learn how to produce them economically and how to insert them into the soil properly.

• Both the potato leafhopper and alfalfa weevil are affected by diseases caused by fungi in the genus *Zoophtora*. Joseph V. Maddox and Edward J. Armbrust, along with Stephen J. Roberts, all of the Office of Agricultural Entomology, are seeking ways to use these fungi in pest management programs.

While one possibility is large-scale production followed by spray application (much like a conventional insecticide), a more promising possibility would be to apply a small amount of fungus early in the season, causing an early disease outbreak in the pest insect population and thus preventing it from reaching economically significant levels. The leafhopper portion of this study is being conducted in collaboration with scientists from Boyce Thompson Institute and the U.S. Department of Agriculture.

• Of all pest control methods, host-plant resistance is probably the safest, both in terms of environmental concerns and human health. Through collaborative efforts, the U of I, Illinois Foundation Seeds and the USDA developed and released four new soybean cultivars with resistance to soybean cyst nematode in recent years. These are Fayette, Cartter, CN210 and CN290. In addition, five germplasm lines with increased levels of resistance to leaf-feeding insects were released for further breeding, and new lines are being screened for release in the future. These lines have good agronomic characteristics coupled with high levels of resistance.

While host-plant resistance offers an excellent solution to some pest problems, there are other pests, such as corn rootworms, for which scientists have been unable to discover any significant levels of resistance in any useable breeding material.

• Even in IPM, chemicals remain one of the main methods of control. Constantine A. Rebeiz, Department of Horticulture, discovered naturally

continued on page 9

R.E. Ford, Head, Department of Plant Pathology

Disease Control Requires Many Tactics

Decades of research and observation show that rotating crops, clean plow-down, incorporation of genetic resistance into crops, use of chemicals and the manipulation of plant density, seeding date and irrigation are effective in reducing the probability of plant disease epidemics.

History has shown that no single tactic is a "sure cure" for plant disease problems. Microorganisms, with their annual multigeneration reproductive capabilities, quickly adapt and thus are capable of circumventing genetic-based tactics. In addition, a tactic may become inappropriate if it poses unacceptable risk to the environment or human health.

Clean plow-down is an example of a classical tactic used for decades, but now losing favor. Although plow-down is an effective and economical treatment for reducing inocula of many microorganisms which cause disease, it can contribute to soil erosion and water and air quality problems.

Also, the recent voluntary withdrawal and probable eventual ban of the EBDC (ethylenebisdithiocarbamate) fungicides from use on fruit and vegetables, along with the removal of soil fumigants several years ago, has reduced markedly the arsenal of chemicals available as an alternative tactic.

Plant pathologists generally recommend chemical control as a tactic of last resort. But for many microorganisms, chemical control is the only known effective control tactic at this time. This makes the use of the host genetic resistance tactic invaluable and, nearly without exception, the lowest cost tactic available.

The soybean cyst nematode is a classic example of the need for multiple tactics. The cost of soil fumigants is prohibitive for many farmers. Research is under way to develop methods for inducing hatching by artificial means during non-host growing cycles, an ideal tactic if it works. But the most promising tactic appears to be host gene resistance.

Biotechnology is proving to be an invaluable tool for first identifying nematode races and host genes for resistance and finally, splicing those resistance genes into high yielding soybean varieties. The new genetically resistant varieties may have slightly different yield and quality characteristics from standard varieties, something growers and consumers must learn to accept.

In other disease research, plant virologists discovered that the coat protein of virus particles holds the key for cross protection. Cross protection results when infection by a mild virus strain protects the plant from excessive damage and yield losses for subsequent infection by severe strains of a virus. Inserting the viral coat protein gene directly into the plant genome can be as effective in disease control as breeding host resistance genes.

Plant pathologists and biotechnology scientists are seeking ways to learn more about the location, structure and function of virulence genes in bacteria and fungi. That will

continued on page 9

"Synthetic chemical insecticides provide many benefits to food production and human health, but they also pose some hazards. In many instances, alternative methods of insect management offer adequate levels of pest control and pose fewer hazards."

*From **Circular 1295,** the first in a series of U of I publications exploring alternatives in insect management. Authors analyze strengths; weakness and most promising uses for microbial insecticides (Circular 1295), botanical insecticides and insecticidal soaps (Circular 1296), insect attractants and traps (Circular 1297), and beneficial insects (Circular 1298). The publications are available from county Cooperative Extension Service offices or the Office of Agricultural Communications and Education, U of I, 69F Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801.*

Lorin I. Nevling, Chief, Illinois Natural History Survey

Guest Editorial

Agro-Ecology Balances Agriculture, Heritage

"It is no doubt impossible to live without thought of the future; hope and vision can live nowhere else. The only possible guarantee of the future is responsible behavior in the present."

Wendell Berry, poet, teacher, farmer and philosopher.

"I believe a re-examination of our inherited philosophic and biological interpretations of human nature – as well as greater trust in our own experience – will lead to one conclusion: individual well-being is impossible outside of the well-being of others."

Francis Moore Lappe, author of ***Diet for a Small Planet,*** *and* ***Food First.***

Most judgments are colored by individual perspectives based on information and experience. Differences in perspective, of course, lead to differences of opinion and sometimes to conflict. To a neutral observer, such conflict is often seen as a collision of "opposing goods." It seems to me that the current state of agriculture fits the conundrum of "opposing goods."

Simply put, the purpose of agriculture is to provide us with food and fiber. Yet the basic needs of a burgeoning world population are accelerating rapidly, and agriculture is sometimes hard pressed to keep pace.

Although the population of Illinois is relatively stable at present, the marketplace for Illinois commodities is no longer defined by state or national boundaries. The world has become our agricultural market. It would be difficult not to judge this expanded agricultural activity a "good."

Since European settlement in the Midwest, agriculture has been the force that changed the face of Illinois. The prairie was fatally suited to farming. To some, however, this transformation has meant the destruction of the natural heritage of the state.

Skeptics would do well to reflect on the nature of this altered landscape. Slightly less than 0.5 percent of the natural areas of Illinois remain. Forest acreage has decreased 73 percent in the last century and the forests of today are generally not of the quality of those a century ago. The original tall-grass prairie, the ecosystem largely responsible for the incredible fertility of Illinois soil, has been diminished by over 99 percent, and only a few scattered remnants remain.

Within a decade after the conversion to intensive row cropping in the 1960s, populations of six native bird species dropped more than 90 percent. No precise data are available on the quantitative loss of wetlands in Illinois, but 80 percent of the loss of the nation's wetlands over the past two decades has been attributed to agricultural activities. The destruction of these native habitats has been accompanied by a corresponding decline in both terrestrial and aquatic biodiversity.

While scientists are only beginning to comprehend the magnitude of these losses, the realization of what has been lost has already begun to concern the general populace. Their anxiety is being reinforced by media-generated discussions of tropical deforestation, the extinction of species, global warming trends, the depletion of the ozone layer, agrochemical contamination of groundwater, air quality and the effects of acid rain.

Like the response of agriculture to global needs for food, efforts to preserve, maintain and restore our natural heritage are a "good." A common ground must be found if the requirements of these two opposing "goods" are to be resolved: enter the concept of agro-ecology.

Historically, other cultures have experimented with these same issues – the Mayan manipulation of Yucatan forests, the slash-and-burn techniques practiced by a variety of

peoples and the Asian polyculture of mulberry, silkworms, ducks and fish, come to mind.

In retrospect, we have been moving toward the concept of agro-ecology for some time with such notions as organic gardening, low-input agriculture and sustainable agriculture. Agro-ecology, however, moves a step beyond any of these and may be precisely the approach needed to deal with current environmental issues while maintaining a balance between the requirements of agriculture and preservation of our natural heritage.

The urban majority is becoming increasingly conservation-minded, and the agriculture community needs to acknowledge and act upon the growing importance of that point of view. While most urban residents have little, if any, direct exposure to agriculture and indirect contact only through the supermarket, romanticized television advertisements and news items on the plight of the family farm or debates over commodity supports, they have become sensitized to air and water pollution, the shortage of landfills and a host of other environmental issues.

This growing awareness on the part of urban dwellers will ultimately affect agricultural practices. Surprising as this statement may seem at first reading, consider only a few of the recent pieces of legislation that directly impinge on agricultural practices: the protection of threatened and endangered species of plants and animals, the increasingly stringent regulation of pesticides, the pending federal biodiversity legislation.

Recall that when household wells went dry during the 1988 drought, water withdrawals by high-volume agricultural wells were blamed. In addition, some of our smaller streams had water withdrawn from them for agricultural purposes until they ran dry. Events like these will spur legislative responses in the future.

Soil erosion is among the most pressing of agricultural problems in Illinois. In spite of the trend toward reduced tillage in the 1980s, the most recent (1987) information indicates that about 8.5 million acres of cropland are not adequately protected from sheet and rill erosion after spring planting. Further, soil erosion remains a major problem of national scope.

Wind erosion has resurfaced as a major problem largely because of the removal of windbreaks and the destruction of fencerows. During 1988, Kansas was estimated to have lost one inch of soil due to erosion.

Short-term and local control measures no longer suffice. For example, efforts to stabilize stream banks by planting narrow filter strips are proving to be mostly, but not entirely cosmetic. Some drainage districts persist in channelizing streams, a practice that only exacerbates the problem and shifts it downstream. Impoundments created for water supplies have proved to be relatively short-lived because of siltation due to soil erosion. Indeed, entire waterways would become virtually useless for river traffic were it not for ongoing and costly dredging activities.

Agricultural practices that take into account the conservation of soil and water and are designed to preserve the remarkable biodiversity of Illinois must be initiated as soon as possible or regulation similar to that found in urban areas (zoning, for example) will result.

The next generation of agriculturalists must farm from an ecological perspective, but we can no longer wait for a gradual bridging between agriculture and ecology.

Current agricultural practices are best modified through education, and the Cooperative Extension Service is ideally suited to assume this challenging task. This group has the experience and the network to provide continuing education and must seize the opportunity to unite the "good" of the agricultural enterprise with the preservation of the natural heritage that belongs to all Illinoisans.

The time has come when farmer and city dweller alike must adopt a renewed conservation ethic. *LIN*

Ellery L. Knake, Extension Weed Scientist, Department of Agronomy

LISA Systems Include Weed Control

One of the greatest challenges of low input, sustainable agriculture (LISA) is for industry, dealers, applicators and farmers to become less product oriented and develop more comprehensive weed control systems. Such systems should consider weed control for the agro-ecosystem of the entire farm, using both chemical and non-chemical controls in a complementary manner at optimum levels to assure efficiency and sustainability.

These are facets of integrated pest management (IPM), which includes programs for control of weeds, diseases and insects. The Cooperative Extension Service is geared to help farmers implement and adopt some of the bold, new IPM approaches that will add greater precision to weed control practices, help reduce inputs and assure sustainability.

One of the most obvious aspects of LISA in Illinois is reduced tillage. While it is commonly thought that reduced tillage requires more herbicides and higher weed control costs, U of I research indicates this is not always the case.

In Illinois, many farmers leave soybean stubble over winter and use little or no tillage in the spring to help meet conservation goals. U of I researchers have achieved excellent weed control and yields of more than 200 bushels per acre with an economical spray-plant-harvest program that involves no increase in herbicide use.

Developing a weed control system to fit whatever tillage option a farmer decides to use is a key objective of U of I weed scientists. For example, a system with only one herbicide application has been developed for no-till soybeans. The application gives both burndown and residual activity for an economical spray-plant-harvest program.

A tillage rotation with modest tillage for soybeans after corn, but little or no tillage for corn after soybeans is already in vogue for many innovators and early adopters of LISA. Rotating crops and herbicides, as well as tillage, helps prevent weeds from developing resistance to herbicides. This may become increasingly important as more products are developed with similar modes of action.

In addition to reduced tillage and rotations, some early adopters of LISA also are taking advantage of cover crops on set-aside, fencerows, ditch banks, filter strips and other non-crop areas. Properly managed, these cover crops can help provide weed control through competition, mulch effect and allelopathy. Economical no-till systems have been developed for corn and soybeans following alfalfa, clover, wheat or rye cover crops.

For example, in U of I research trials, scientists have successfully grown no-till corn after clover with little or no increase in herbicide use. In addition to improving soil physical condition and adding nitrogen, the legume mulch aids in weed control.

While development of good management systems can broaden weed control options, herbicides are not likely to disappear from the farm. But they are likely to be used more judiciously and efficiently in the 1990s. Proper use of certain adjuvants can enhance herbicide activity and allow reduced product rates. Attention to such details as stage of weed growth, weather conditions, method of application and even time of day for application may allow farmers to reduce rates.

In addition, a new generation of herbicides holds great promise for LISA goals. Some of these new herbicides are effective at fractions of an ounce. This can mean savings in production, transportation, storage and application costs. It can also reduce containment expenses at storage sites and help alleviate the problem of container disposal.

Although the term LISA may be new, the objectives and much of the technology for achieving the objectives of LISA are not all that new. Weed scientists with the Illinois Agricultural Experiment Station have been laying the foundation for LISA for several decades and have expressed enthusiastic interest in LISA-oriented research. However, they have little choice but to direct primary research efforts toward those areas for which funds are available.

Recent episodes of aggressive promotion by industry and rapid acceptance by farmers of some new herbicides with concomitant residual problems reaffirm the need for an expanded research base and development of systems designed to help assure long-term productivity and sustainability. The time for adjusting our priorities is now, with greater emphasis on reducing physical inputs and conserving resources – we have to take good care of "mother" because "good planets are hard to find." *ELK*

Insects Reject The Plants That Don't Measure Up

Insects are creatures of habit, and that may prove deadly for them.

A female insect that is sufficiently confused by a plant's odor or put off by its leaf color will die without laying eggs on that plant, according to Jack Juvik, a geneticist at the University of Illinois. By exploiting behavioral processes that limit insects to certain host plants, Juvik hopes to develop alternatives to chemical pest control. He is among a growing number of U of I scientists who are looking at pest control from a non-chemical perspective.

"Toxic compounds are tremendous at putting selection pressure on insects; we couldn't have devised a better way to develop insect resistance than insecticides," he said. "Pesticides are, in effect, creating super insects. We've got to develop some alternatives that allow for more rational choices."

One focus of Juvik's research is on disrupting the female insect at the point where the female is looking for a place to lay eggs (oviposition). Behavioral research shows that females choose host plants for a number of reasons, including plant flavors and other chemical cues, odors, and leaf surface characteristics. The plants must be acceptable for egg laying and more importantly, provide food for crop-damaging larvae that will hatch out later.

"In many insects, host-plant selection by females for egg laying is a precisely controlled behavioral process. If the female experiences the appropriate sensory stimuli from the host plant, oviposition occurs; if not, the process of host-plant selection starts over," Juvik said. "The female won't lay eggs unless the plant provides the correct set of signals."

Once a disruptive characteristic is identified, "hostile" host plants can be created through breeding and genetic engineering technologies. Juvik is screening about 150 species of cultivated and wild plants for compounds which could be used to alter the attractiveness of host plants to insect pest feeding or oviposition.

The studies of plant and insect interaction also are yielding information which eventually may improve pest management decision-making in the field.

According to Juvik, some plants exude compounds that attract certain female insects and stimulate them to lay more eggs than normal. There is potential to extract those compounds in order to create baits used in monitoring programs.

"The advantage of these baits over pheromone traps that capture males is that they would attract the ovipositing female pest, which is what growers have to be concerned with since the female pest lays the eggs that hatch into the larvae that damage the crop," Juvik said.

"We anticipate these baits would improve monitoring accuracy and also allow scouts to predict problems earlier than with other baits. That would give producers time to consider biological control agents and other alternatives to chemicals."

Interfering with an insect's environment may sound like a simple approach to pest control, but each insect species is different and must be dealt with on an individual basis. For each important pest species, scientists must identify host plants and the physical and chemical factors that repel or attract the pest. Only then can work to incorporate the features into the host plant begin.

Once that is accomplished, scientists also must research the effects that changes in host plants might have on other insects in the field.

"One problem with this approach is that although some natural genetic material may be toxic and repel some insects, it may actually attract some other insect," Juvik said.

"Still, it is an alternative to chemical pesticides and an opportunity to get out of the loop we've gotten into with pesticides and resistance." *TMP*

Convention Promises Insight Into Organic Farming

Sessions on organic food production will bring together organic growers and marketers from around the state to the Illinois Specialty Growers Convention and Trade Show on January 15-18, 1990, in Springfield, Ill.

Topics to be discussed during three days of educational sessions include organic production methods, marketing opportunities, organic laws and certification programs.

The organic sessions are co-sponsored by the Illinois Specialty Growers Association and the Illinois Sustainable Agriculture Society. They will begin on Tuesday evening, January 16, with a discussion session planned for organic producers.

Two concurrent Wednesday morning sessions will feature production of organic fruit and grain. In addition, Kathy Rittenhouse, chairperson of the California Certified Organic Farmers Beef Certification Program, will provide insights on feedstock requirements of organic beef producers.

The afternoon sessions on Wednesday will highlight organic vegetable production on the Earthborne Farms and Lady Bug Farms, both in Illinois. Also, Reiny Juengling, area manager of the Kroger Company, will present information on marketing organic foods through major wholesale outlets.

The final day will offer farmers a forum for developing an organic growers' organization in Illinois. The morning will feature comments from Kate Duesterberg of Illinois South on how to get an organization started. Representative John (Phil) Novak will discuss his efforts to pass the Organic Food Labeling Act in the Illinois legislature.

The organic sessions will conclude with discussion on the future of organic farmers organizations and certification programs in Illinois.

For more information, contact J.W. "Bill" Courter, Dixon Springs Agricultural Center, Simpson, IL 62985 or call 618/695-2444.

Mark Your Calendars

December 6, 1989

Gerald Paulson, McHenry County Defenders

Groundwater problems and how they relate to sustainable agriculture. 3 p.m. 103 Mumford Hall, U of I campus.

January 3-5, 1990

Illinois Agricultural Pesticides Conference

Illini Union, U of I campus. The focus of this annual conference is on pesticide problems, crop growth problems and public concern about agricultural pesticides. For information, contact Kevin Steffey at 217/333-6652. To register, call 217/333-2888.

January 15-18, 1990

Illinois Specialty Growers Convention and Trade Show

Prairie Capital Convention Center, Springfield, Illinois. This convention will cover such topics as organic food production, marketing and certification. For information, contact Bill Courter, program chairman, Dixon Springs Agricultural Center, Simpson, IL 62985; telephone 618/695-2444.

January 24-25, 1990

Moving Toward Sustainability: The First Steps

State Fairgrounds, Springfield, Illinois. This conference is sponsored by the Illinois Sustainable Agriculture Society. For information, contact ISAS secretary/treasurer, 1229 W. Edwards, Springfield, IL 62704; telephone 217/787-6823.

March 8-9, 1990

Sustainability: Agriculture and Society Symposium.

Chancellor Inn, Champaign, Illinois. For information, contact John Gerber at 217/244-4232.

March 13-15, 1990

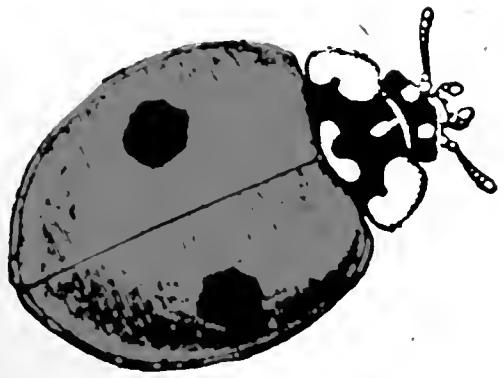
Crop Protection Workshop

A workshop for farmers, Extension advisers and industry representatives. For information, contact Mike Gray at 217/333-6651.

March 19-21, 1990

Pest Management Shortcourse

An educational opportunity for crop consultants, crop scouts and Extension advisers. For information, contact Mike Gray at 217/333-6651.



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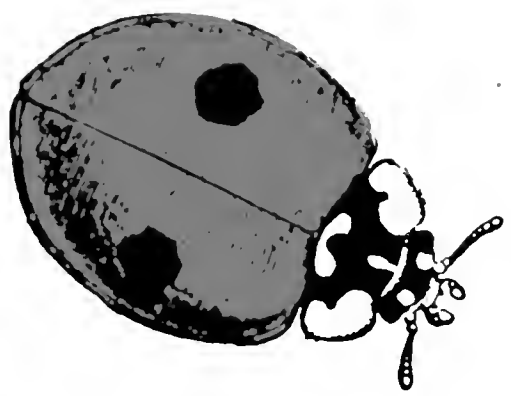
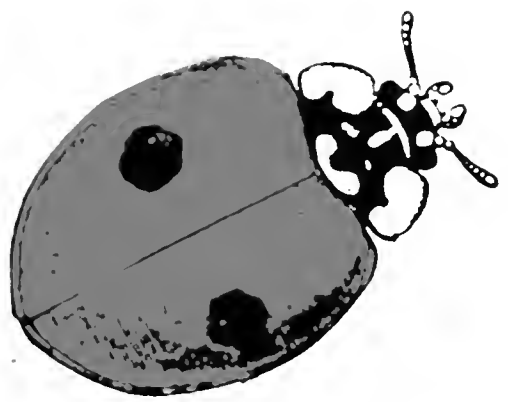


Ford continued



occurring amino acids in plants. When applied as a spray together with modulators of the chlorophyll biosynthetic pathway, these amino acids can interfere with the normal chlorophyll biosynthetic process and cause plant death.

More recently, his studies of the biochemistry of insects led to the discovery of amino acids and heme-porphyrin modulators which have insecticidal properties. Although much developmental work remains, it is possible that this work will result in an entirely new class of pesticides based on natural products.

- Many insects are attracted to volatile chemicals and sometimes this attraction is highly specific. For example, Robert L. Metcalf and his students in the Department of Entomology discovered that corn rootworm beetles can be attracted to plant volatiles in large numbers.

Eli Levine of the Office of Agricultural Entomology is working with Metcalf's group to evaluate baits made of these attractants, a feeding stimulant and small amounts of insecticides. This approach may result in superior control of rootworm beetles using extremely small amounts of insecticide.

These studies illustrate that scientists in the College of Agriculture are seeking answers on many fronts. While progress sometimes seems painfully slow, results are beginning to accumulate and the future does, indeed, seem promising. *WGR*

enable them to devise ways to disarm microorganisms. Once done, these microorganisms might be used to displace the virulent ones from their ecological niche in soil or in crop debris.

Great research effort is being expended to develop tactics for biological control. Most involve encouraging the growth of microorganisms in nature which have the capability to out-compete pathogenic microorganisms for space and food or can produce toxic metabolites that prevent normal growth and reproduction of a pathogen.

For instance, plant pathogenic microorganisms can be selected for virulence and sprayed on weeds. The result is severe disease that reduces weed growth, thus reducing weed competition with crop plants.

Research also is focused on quicker, more accurate diagnosis of plant disease problems so that producers can select the ideal or preferred tactic for control. The ELISA (enzyme linked immunosorbent assay) serological tests discovered a decade ago now are commonly used to identify microorganisms.

Also, computer forecasting with disease models holds great promise for helping scientists understand factors contributing to epidemic growth of a pathogen. This, ultimately, will improve our ability to select the most appropriate tactics for repression or control of diseases. *REF*

- *"Water pollution is probably the most damaging and widespread environmental effect of agricultural production."*

- *"Because ecological interactions are extremely complicated and have generally not been studied by the EPA, the effect of pesticides on the environment is not well understood."*

- *"A central principle of IPM is the economic threshold concept, which holds that the mere presence of a pest population does not necessarily indicate an economically damaging situation where benefits will exceed the cost of control."*

- *From **"Alternative Agriculture,"** a report of the National Research Council of the National Academy of Sciences 1989.*

Research Council Reviews Alternative Systems

The report, "Alternative Agriculture," by the National Research Council of the National Academy of Sciences provides a boost to the respectability of sustainable agriculture within traditional academic circles. In spite of some headlines to the contrary, the report is a fairly balanced compendium, reviewing the relationships among agricultural production, the economy, science, trade, government and people.

Part One of the report includes the chapters: 1) Agriculture and the Economy; 2) Problems in U.S. Agriculture; 3) Research and Science; and 4) Economic Evaluation of Alternative Farming Systems. Part Two presents 11 case studies of farming enterprises as examples of successful nontraditional agricultural systems.

The report presents a well-referenced case for increased research and education on alternative farming practices. One of the conclusions in the Executive Summary reads, "There is inadequate scientific knowledge of economic, environmental and social costs and thresholds for pest damage, soil erosion, water contamination, and other environmental consequences of agricultural practices. Such knowledge is needed to inform farm managers of the tradeoffs between on-farm practices and off-farm consequences."

This report is a valuable compilation of information from many sources and will provide a good review of the current thinking on alternative agriculture. It will very likely impact policy decisions during the next decade.

The 448-page report is available from the National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418; or call 202/334-3313. The single-copy price is $19.95. *JMG*

University of Illinois at Urbana-Champaign
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College of Agriculture
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news and perspectives

agro-ecology

Science and Education for a Sustainable Agriculture

Who Pays for Agriculture? — John Gerber poses some questions for readers to consider as they think about "economics as if the Earth really matters."

Sustainable Systems Balance Ecology, Economics — A guest editorial by John E. Ikerd, project leader for LISA-Farm Decision Support System at the University of Missouri.

College Seeks Alternatives Through Research — W.R. "Reg" Gomes shares some thoughts on the College's commitment to agriculture.

Reduced Inputs + Efficiency = Profits — Robert H. Hornbaker looks at grain farm records to find out how inputs affect profits.

Regulations Unlikely To Affect Exports — Theory suggests environmental regulations will reduce the ability of the United States to export, but Laurian Unnevehr disagrees and explains why.

Economic Decisions Drive Farming Changes — Sarahelen Thompson discusses changes that could result from sustainable agriculture systems.

Iowa Program Focuses On Sustainable Ag — Dennis R. Keeney outlines goals of the Leopold Center for Sustainable Agriculture.

College of Agriculture
University of Illinois at Urbana-Champaign

The editors invite letters from readers who wish to share their experiences and opinions on topics discussed in this newsletter. The following excerpts are from letters received this fall.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification. **agro-ecology** *reserves the right to reject any letter. Address letters to:*

agro-ecology *Editors*
University of Illinois
211 Mumford Hall
301 West Gregory Drive
Urbana, IL 61801

. . . Having been an owner of Illinois farm land and rather close to Corn Belt farming for a period of some 70 years, I have observed many changes of farming philosophy, techniques, ideas and bottom line results. Our prevailing mode of farming with high cash inputs, dependence on governmental subsidies, soil erosion, etc. surely calls out for a shift to a more biotic and ecological emphasis.

Dudley C. Smith
P.O. Box 1201
Tryon, NC 28782

. . . I recently read a colleague's copy of the first edition of agro-ecology. To say the least, I was delighted to see such insightful and "cutting edge" ideas coming from the University of Illinois. Our organization has worked in sustainable agriculture since 1976, and the feedback I've traditionally received is that your institution has fought the concept of sustainable agriculture. You as editors are to be commended, and I would urge your deans and directors to support your pioneering efforts.

Larry Krcil
Research Associate
Center for Rural Affairs
P.O. Box 736
Hartington, NE 68739

. . . The newsletter is on the "cutting edge" of the type of information dissemination we need for our land-grant universities in the area of sustainable agriculture.

Phil Rzewnicki
Assistant to the Dean
University of Nebraska – Lincoln
Lincoln, NE 68583

. . . My husband and I own 600 acres of prime Illinois farm land and actively farm half. We are very much interested in preserving the environment as well as increasing profits. Since chemicals have become so expensive and farm prices are very low, we would be wise to look at a management system which does not use chemicals as extensively and is also environmentally safe.

Mrs. Charles Riebe
RR 1
Box 90
Cullom, IL 60929

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This newsletter is printed on recycled paper.

Who Pays for Agriculture?

"Such 'commons' as the atmosphere, the seas, fisheries and goods in public ownership are particularly vulnerable to being overspent in this way, treated as either inexhaustible resources or bottomless sinks."

*William D. Ruckelshaus in "Toward a Sustainable World," **Scientific American**, Sept. 1989.*

"It seems that we have forever talked about land stewardship and the need for a land ethic, and all the while soil destruction continues, in many places at an accelerated pace. Is it possible that we simply lack enough stretch in our ethical potential to evolve a set of values capable of promoting a sustainable agriculture?"

*Wes Jackson, author of **Alters of Unhewn Stone** and **New Roots for Agriculture.***

The question of economic viability is at the very heart of debate about the sustainable agriculture movement. Some skeptics claim that agricultural sustainability means higher food prices. Others say that sustainability is not compatible with global competition. Still others criticized the so-called "bottom-line" mentality which addresses short-term profits at the expense of long-term viability.

These are not considerations to be lightly dismissed. They are real concerns which we attempt to address in this issue of agro-ecology.

As a society, we must decide if short-term profits justify continued resource depletion and environmental degradation, and if not, what can be done? At issue is the basic question of personal rights and public rights. In this case, the definition for "the public" must include future generations as well as citizens of today.

We must ask whether it is acceptable for individuals to exploit soil or pollute water in order to remain competitive. What limits can or should the public impose on individuals to protect the common good?

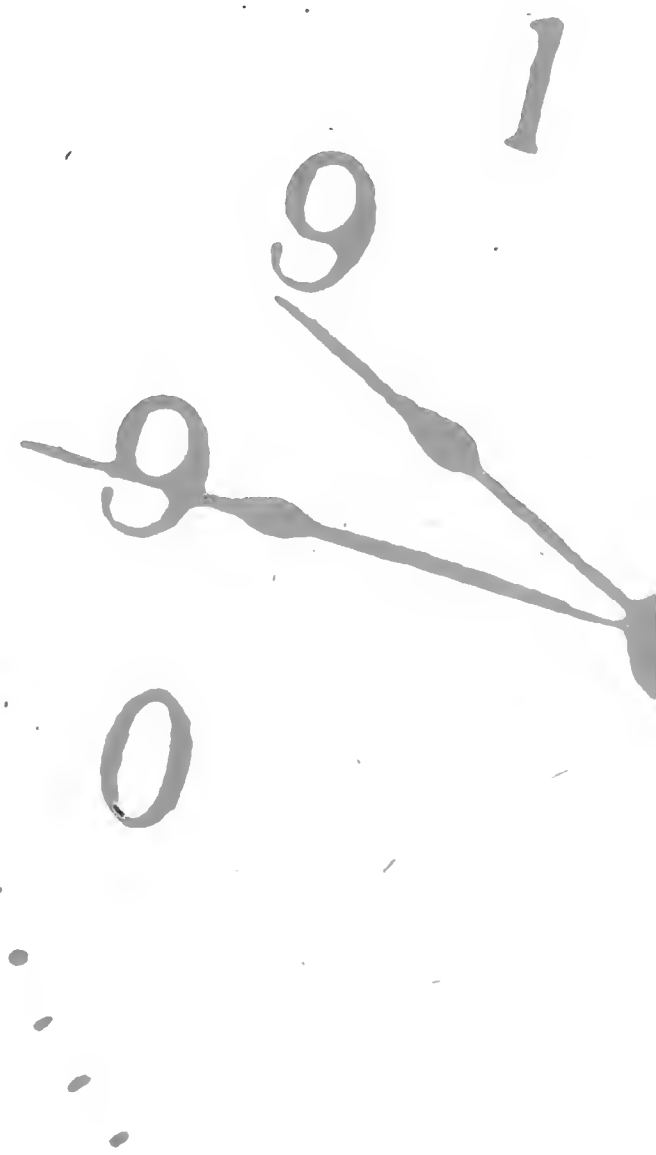
Does any individual have the right to ask society to pay for the so-called external costs of agricultural production, such as river and lake dredging necessitated by continued soil erosion from croplands? Should the citizens of Iowa be expected to pay for the $3.2 million nitrate-removal system in Des Moines necessitated by use of fertilizers?

How can government programs be restructured to encourage farmers to be better stewards of the land?

These are difficult questions that we can no longer ignore. Economics may help us state the questions and provide information upon which to make better decisions. Solutions, however, will likely require debate and compromise in the political arena.

This offers an opportunity for involvement by university faculty, environmentalists, government officials, farmers, representatives of agribusiness — and you.

John Gerber



John E. Ikerd, Project Leader, LISA-Farm Decision Support System
University of Missouri

Guest Editorial

Sustainable Systems Balance Ecology, Economics

"The first requirement is to make the information on which individuals and institutions base their decisions more supportive of sustainable-development objectives."

*William C. Clark in "Strategies for Agriculture," **Scientific American**, Sept. 1989.*

"The most important condition for sustainable development is that environment and economics be merged in decision making. Our economic and ecological systems have become totally interlocked in the real world, but they remain almost totally divorced in our institutions."

*Jim MacNeill in "Strategies for Sustainable Economic Development," **Scientific American**, Sept. 1989.*

A definition of sustainable agriculture is still evolving as a product of public debate concerning agriculture and the environment. However, there seems to be a growing consensus that a sustainable agriculture must be made up of farming systems that are capable of maintaining their productivity and usefulness to society indefinitely.

Sustainable systems must be resource conserving, socially supportive and commercially competitive as well as environmentally sound. Systems which fail to conserve their resource base eventually will lose their ability to produce. Thus, they are not sustainable.

Systems which fail to protect their environment may do more harm than good, may lose their usefulness and even destroy their reason for existence. Such systems are not sustainable.

Farming systems which fail to provide adequate supplies of safe and healthful food at reasonable costs will not support social progress and ultimately will be rejected by the society they serve. Agricultural systems of communist Europe and China are prime examples of systems that were not politically sustainable.

Systems that are not commercially competitive will not generate the profits necessary for financial survival of producers and thus cannot be sustained.

In the long run, there is no conflict between ecologic and economic requirements for sustainability. In the long run, farming systems must be productive and profitable or they cannot be sustained economically no matter how ecologically sound they might be.

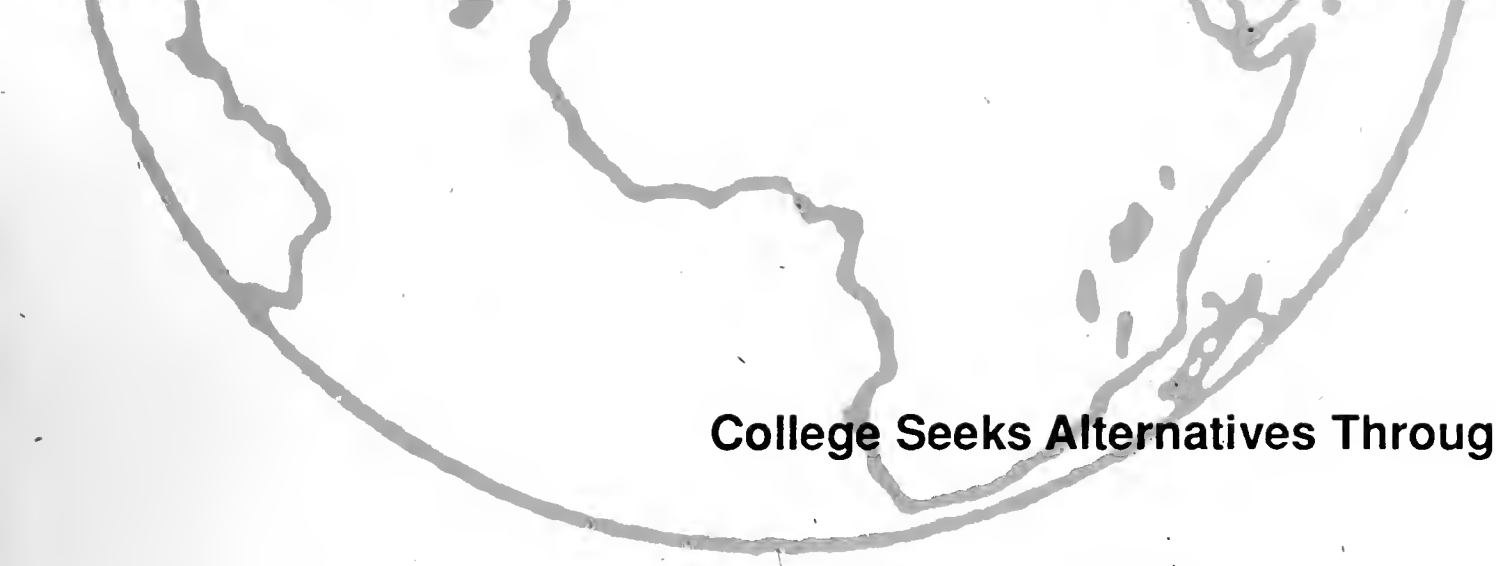
In the long run, systems must be resource conserving and environmentally compatible or they cannot survive ecologically no matter how profitable they might be.

Even in the short run, there is no conflict between ecology and economics from the standpoint of society as a whole. When all costs and benefits to society over time are considered, the benefits exceed social costs only from those systems that are also ecologically sustainable.

The potential conflict concerning sustainability arises between individual producers and society in the short run. In the short run, systems that are most profitable for individual, farmers may or may not be sustainable. Also, sustainable individual farming systems may not be profitable in the short run.

Some farmers may be able to improve the overall sustainability of their operations through adoption of alternative systems using existing technologies. In other cases, research will be needed to develop new technologies to support farming systems that are both more ecologically sound and economically viable.

However, in some cases agricultural sustainability may require changes in farm policies. In these cases, government programs may be used to reconcile differences between private and social costs and benefits so that farmers will find it in their self-interest to farm in ways that also are in the best interest of society in general. *JEI*



College Seeks Alternatives Through Research

"Let us not deceive ourselves. If our lands do produce more than formerly it shows only that our methods are good and that the original stock of fertility was high. It does not show it to be inexhaustible."

Eugene Davenport, dean of the U of I College of Agriculture, 1900-1919.

"The farmer is a steward of the soil, and it is his duty to pass on to his descendants land that is richer, than when he took over its management."

The concept behind the "Illinois System of Permanent Soil Fertility" developed in 1901 by Cyril G. Hopkins, U of I soil scientist and author of ***Soil Fertility and Permanent Agriculture (1910).***

There is a need for knowledge-based, research-based information to address issues of agro-ecology, according to the dean of the University of Illinois College of Agriculture.

Speaking on "Sustainable Agriculture: The Role of the College of Agriculture" at the October Agro-Ecology Seminar, Dean W.R. "Reg" Gomes said, "We are committed to asking questions; to presenting issues; to the dispassionate evaluation of information; to identifying areas where we need better information; to achieving a higher level of knowledge regarding agro-ecology issues.

"We must make sure we don't hold onto what we're doing simply because we know how to do it, or change it simply because someone says it's bad."

The form of intensive agriculture in place on most farms is due in part to production pressure from population growth and change in post-war society, and it was right for the times, he observed. But, the public today is increasingly critical of agricultural production methods that may lead to such problems as soil erosion, runoff of agricultural chemicals to surface water, over-irrigation, reduction of water tables and aquifers, increased salination, reduced water quality and contamination of groundwater by agricultural chemicals.

Society appears to have a "chemophobia" about agrichemicals, so much so that there is an outcry for a return to "the good old days" without regard for the realities of providing healthful, economical food for a hungry world, Gomes said.

The federal low-input sustainable agriculture research and education funding program (LISA), the Iowa Leopold Center for Sustainable Agriculture, the National Academy of Sciences' "Alternative Agriculture" report, and the U of I agro-ecology initiative are examples of responses to this concern. The public must realize there is a cost associated with the responses, he cautioned.

"We generally agree that sustainable agriculture must be profitable; conserve and protect soil; deliver an abundant and healthful food supply; contribute fully to the economy and quality of life in rural areas; and sustain beauty of the environment," Gomes said. "At some point we have to ask: 'If we cannot accomplish all of that, what compromises must be made? What do we get for what we give? What do we give for what we wish to attain?'"

There are no data to support the idea that full productivity and full protection of the environment are both attainable, he said, although he added that he believes there can be productivity and protection of the environment "at some cost."

"We can't do it with what we have today or with yesterday's methods, but we can make strides toward it," Gomes said. "There must be alternatives and we have to find them."

Agriculture has changed greatly in the past century and will continue to change as technology and society change. But change should come from science-based information, not fear, he stressed. *TMP*

Robert H. Hornbaker, Assistant Professor, Department of Agricultural Economics

Reduced Inputs + Efficiency = Profit

For the study, U of I economists examined per-acre costs and returns of 161 grain farms.

Because information was not available on crop rotations, tillage and fertility practices, they used 11 continuous years of records to compute the average costs and returns. This approach allowed them to average out rotational fluctuations and reduced the chance that the low-input farms were simply those which were depleting soil fertility or allowing pest problems to proliferate above economic thresholds.

The farms in the sample were stratified by level of expenditures on variable inputs to determine if low-cost operations were more profitable or less profitable than high-cost operations. The stratification was based on expenditures for fertilizers, herbicides, pesticides, seed, fuel, oil, hired labor and drying and storage of grain.

This research is funded by the Illinois Agricultural Experiment Station, the USDA Agricultural Extension Service and the Illinois Department of Energy and Natural Resources.

Concerns about the high cost and possible adverse environmental effects of modern production agriculture have come together to heighten interest in alternative, sustainable and low-input agriculture systems. The attraction of these alternative systems is their promise of reduced environmental impact through lower inputs — without a loss of net returns.

A preliminary study of 11 years of records from 161 Illinois grain farms indicates lower levels of input can be profitable under some farm circumstances. Among the conclusions:

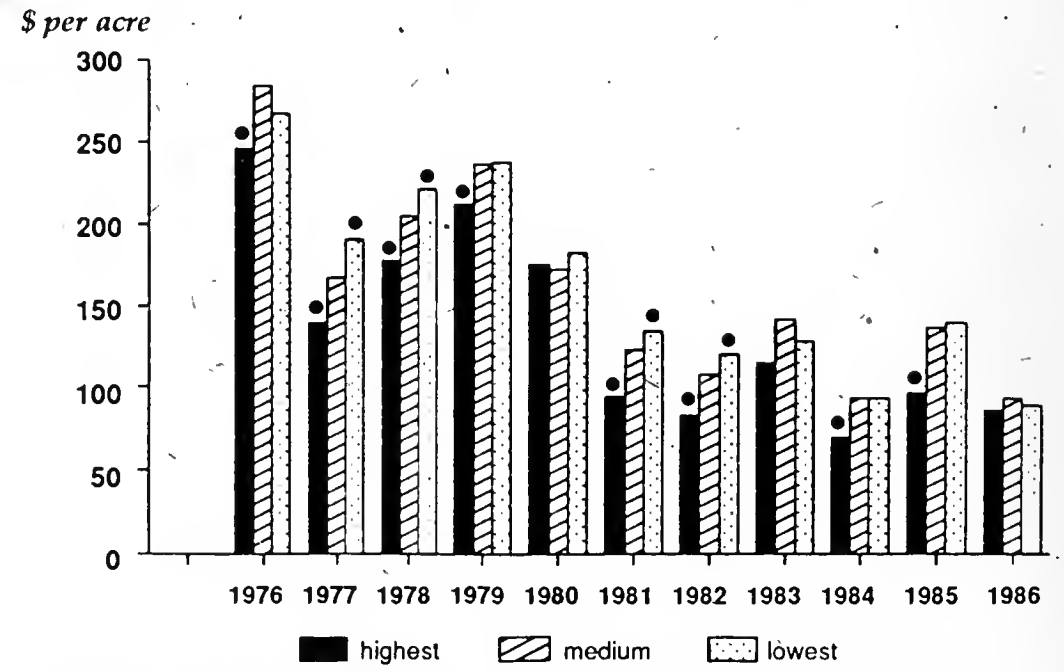
• Adjusted for inflation, the 40 lowest-cost farms averaged net returns of $165 per acre. In comparison, the 40 farms with the highest costs averaged net returns of $136 per acre.

The remaining 81 middle-cost farms averaged net returns of $160 per year.

• Producers on low-cost farms spent 17 percent less money on fertilizers per acre per year ($32) than those on average-cost farms and 27 percent less than those on high-cost farms.

These levels of fertilizer expenditures were statistically significantly lower (at the 5 percent level) for both the average of all 11 years and in each of the 11 individual years.

• Returns for the low-cost farms were higher than the high-cost farms every year and higher than the middle-cost 81 farms in 8 of the 11 years. (One of the years in which the middle-cost 81 farms averaged higher returns than the low-cost farms was 1983, which was unique because it



Average per-acre net farm returns for farms categorized by per-acre cash expenditures.

● *Significant difference, at the 5% level, between this group of farms and the rest of the sample.*

was the only year during which soybean acreage exceeded corn acreage on the sample farms.)

• In four of the 11 years, the net returns of the low-cost farms were significantly higher than all of the other 121 farms.

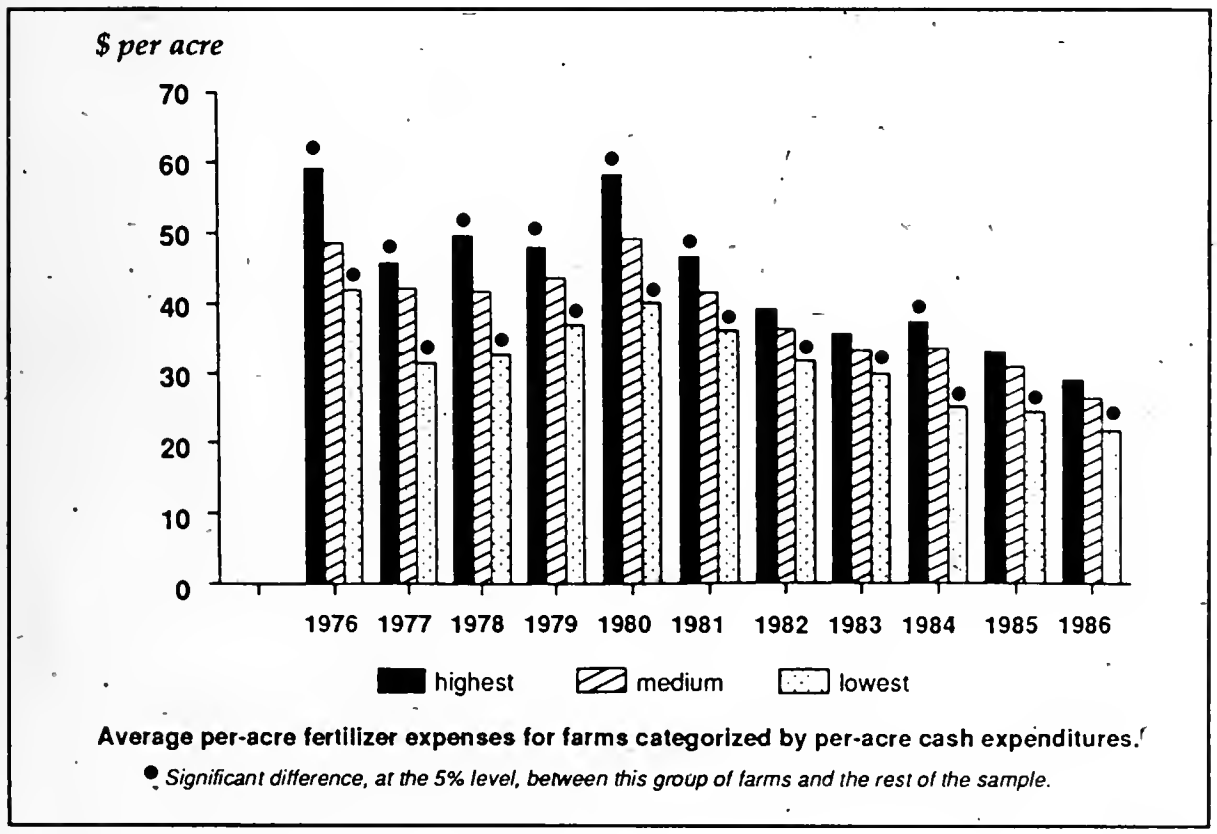
The simple stratification approach taken in this study certainly does not provide a rigorous statistical analysis of low-input farm systems. Furthermore, since the data did not include information on physical quantities of inputs, these results are not meant to imply that these are "low-input, sustainable" farms.

However, this evidence does suggest that improvements in efficiency on conventional farms can increase profits and reduce input use, thereby reducing potential environmental damage. Alternative production systems could lower input use and environmental threats even more.

Moreover, if the social costs associated with potential environmental hazards were considered, the disadvantage of the high-input, high-cost farms would become even more pronounced.

Ongoing research will examine cost and returns for a much larger sample of both grain and livestock farms in Illinois. Other research will evaluate detailed enterprise information, including physical input quantities and specific farm tillage, rotation, fertility and pest management practices from a sample of these farms.

Another related study will extend the research by searching out and evaluating alternative "sustainable" farm systems. *RHH*



Average per-acre fertilizer expenses for farms categorized by per-acre cash expenditures.

● *Significant difference, at the 5% level, between this group of farms and the rest of the sample.*

Laurian Unnevehr, Assistant Professor, Department of Agricultural Economics

Regulations Unlikely to Affect Exports

"If market-like mechanisms rooted in economics cannot be created, then regulations become a necessary tool of social policy."

*P.R. Crosson and N.J. Rosenberg in "Strategies for Agriculture," **Scientific American,** Sept. 1989.*

"Modifying the market to reflect environmental costs is necessarily a function of government...The economic problem is the familiar one of externalities: the environmental cost of producing a good or service is not accounted for in the price paid for it."

*William D. Ruckelshaus in "Toward a Sustainable World," **Scientific American,** Sept. 1989.*

The U.S. agricultural community relies on export markets for one-fifth of total sales. When changes in agricultural practices are proposed, their potential impact on exports is a concern. If sustainable agricultural practices can be developed that do not increase costs, then environmental damage can be reduced while U.S. producers remain competitive.

If such practices cannot be developed and environmental damage remains a public concern, then environmental regulations might be imposed on agriculture. The 1985 farm bill took a big step in this direction with the implementation of conservation compliance provisions. Would further regulation reduce agriculture's ability to compete?

In theory, environmental regulation will raise the costs of U.S. production relative to other countries, if the United States is alone in implementing regulation. This would reduce the ability of the United States to export. In practice, however, it is unlikely that regulation would have a noticeable impact on U.S. exports for two reasons.

First, many countries are concerned about the environmental impacts of agriculture and already are implementing strong regulatory control. The Netherlands limits the total quantity of manure that can be produced on individual farms, for example. This is an effort to reduce the potential for nitrate pollution of groundwater.

Even less-developed countries have become more interested in conserving their natural resources. Thus, the United States is unlikely to implement environmental regulation unilaterally.

Furthermore, negotiations to establish a legal framework for agricultural trade under the GATT (General Agreement on Trade and Tariffs) could provide a means for harmonizing environmental regulations so that they do not restrict trade.

Second and more importantly, many factors determine the level of U.S. exports. Consequently, environmental regulations alone are likely to be relatively unimportant. Changes in agriculture and the export market over the past decade illustrate this.

During the early 1980s, an increase in the U.S. dollar exchange rate and a worldwide recession caused a decline in U.S. exports. After 1985, planted U.S. crop acreage declined by about one-third as more producers put land in set-aside and participated in the Conservation Reserve Program. This reduction in available land should have raised average production costs. Instead, U.S. agricultural exports rose sharply after 1986, probably because the U.S. dollar exchange rate fell and worldwide economic recovery created stronger demand overseas.

Perhaps the fundamental issue is whether export competitiveness should be a consideration in debates about environmental policy. Do we want to base a comparative advantage in trade on a willingness to deplete our natural resources faster than other countries? Or, do we want to base our comparative advantage on abundant and lasting natural resources and cost-effective and sustainable technologies? *LU*

Sarahelen Thompson, Assistant Professor, Department of Agricultural Economics

5

Economic Decisions Drive Farming Changes

The movement toward sustainable agriculture will affect farming practices and the mix, quantity and quality of agricultural inputs and outputs. Each of these areas will be more or less affected depending on the decisions farmers make in response to information and policies that pertain to farming.

It is not clear how much and what types of adjustments in farming practices will be necessary to attain a more sustainable agriculture. Further information on alternative farming methods, such as reduced tillage, crop rotation and diversity, and reduced chemical application, is necessary to determine whether these methods are themselves sustainable.

There are also compelling economic reasons which encourage current farming practices. These include economies of scale, comparative advantage in specialized production, and well-developed input and output marketing systems.

But, it is clear that aspects of government policy encourage the production of certain crops and crop rotations at the expense of ones that might be more environmentally benign. These policies may need to be changed in order to promote a greater diversity in crop production.

Moreover, farmers are generally not penalized for any damage they may cause to the surrounding environment or to the long run productivity of their land. Changes in government policy may be needed to alter the incentive structure for farmers.

Farmers will adjust their farming practices as information becomes available on alternative farming methods and as changes occur in agricultural policies that affect crop choice and farming methods. The adjustments, small or large, made by farmers will be based on economic decisions. That is, farmers will consider the information and policy environment, and then choose a farming system that they perceive will come closest to achieving their personal and financial goals.

This does not necessarily mean that all farmers will adopt a system that maximizes profits. Some farmers may choose to minimize farm labor. Others may choose to minimize income risk. Still others may choose to maximize personal environmental and resource objectives subject to some minimum income conditions.

If sustainable agriculture as interpreted by most farmers implies reduced chemical inputs, the agricultural chemical and farm supply industries may be significantly transformed and perhaps experience high rates of attrition. The agricultural chemical industry may respond by offering new products that are environmentally "safe" or that are designed specifically for sustainable systems.

The marketing system for outputs produced under sustainable systems will probably need to accommodate more variety in the quantity and quality of agricultural production. With increased local diversity in agricultural production, there may be less inter-regional trade in agricultural products and greater local self-sufficiency in food supplies.

ST

Economics: *A science that analyzes problems involving the attainment of goals with finite, or scarce, resources.*

Agricultural Inputs: *Both purchased inputs, such as fertilizers, seed and farm machinery, as well as inputs supplied by the farmer, such as time, expertise and management skills.*

Agricultural Outputs: *The products produced on farms.*

Information: *The body of knowledge available to decision makers.*

Policies: *Government programs that constrain or influence decisions, usually through legal penalties or financial incentives.*

Expense: *A cost that may be incurred either financially or indirectly through reduced productivity or through reduced attainment of goals.*

Economic Decisions: *Decisions that lead to attaining a goal or goals efficiently — that is, with least expense.*

Income Risk: *Variation in income that occurs due to variation in prices, yields or inflation.*

1.4

Iowa Program Focuses on Sustainable Ag

". . . you hope that as you go along you're making wise decisions based on science and not poor decisions based on emotion."

Dennis R. Keeney, director, Leopold Center for Sustainable Agriculture.

"Health (of the land) is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity."

Aldo Leopold, author of ***The Land Ethic.***

"Everyone knows what sustainable agriculture is, but if any two of you agree, I would be surprised," said Dennis R. Keeney in opening remarks at the September University of Illinois Agro-Ecology Seminar.

Keeney, who had just completed his first year as director of the Leopold Center for Sustainable Agriculture in Ames, Iowa, quoted enacting legislation for the Leopold Center to define sustainable agriculture as: " . . . the appropriate use of crop and livestock systems and agricultural inputs supporting those activities which maintain economic and social value."

The Leopold Center, named for conservationist, educator, game management expert and author Aldo Leopold (1888-1948), is part of Iowa's response to highly-publicized problems related to agricultural production, including pesticides in groundwater, soil erosion and rural community problems, he said.

Through the Iowa Groundwater Protection Act of 1987, the Legislature created the Leopold Center to:

- Identify and reduce negative impacts of agricultural practices.
- Develop alternative practices that promote sustainable agriculture and maintain and enhance environmental quality.
- Study the feasibility and impact of these practices.
- Integrate these practices into rural landscapes and communities.
- Disseminate information.

The 1990 budget for the Leopold Center is $1.4 million. Fees on nitrogen fertilizer and pesticides make up more than half the budget.

The Leopold Center is a program, not a building, Keeney noted. Much of the budget is used for competitive grants to fund research around the state.

"Every effort is made to keep money flowing throughout Iowa," Keeney said.

The competitive grants fund such projects as tile drainage, timber utilization and forest management, pesticide management, beef grazing, nitrogen research, tillage, cropping systems and weed control.

These are the kinds of projects that "fill in the gaps not being funded in conventional programs," Keeney said.

In addition to tackling new initiatives, the Leopold Center encourages an interdisciplinary team approach to research, he said. A landscape ecology team, for example, submitted a proposal to study surface and groundwater movement of nitrogen and pesticides from farm fields into wetlands. A cropping systems team is looking at the need for chemicals, rotation and diversity in narrow strip intercropping.

Sustainable agriculture research involves a change in attitude that may make some scientists uneasy, Keeney said. It requires that researchers listen more to farmers and take a more active role in seeing that farmers understand the results of their research.

It also means more collaborative research that extends beyond the "academic world" of a single university, involving scientists at many institutions and agencies and, in some cases, farmers, he added. *TMP*

Ag College Invites Visitors to Campus

The University of Illinois College of Agriculture is hosting an **Open House** on March 2-3 to show the scope of research, teaching and Extension programs of faculty at the Champaign-Urbana campus.

There will be demonstrations and displays in various buildings from 9 a.m. to 4 p.m. each day. John Gerber, a horticulturist who also serves as coordinator for the College's sustainable agriculture effort and is an editor of this newsletter, is on the program to discuss current state, national and world views of agro-ecology.

Researchers will be on hand to discuss a number of projects related to agro-ecology, including: pesticides and water quality; pest control; acid rain; biodegradable plastics; nitrogen management; global warming; and animal welfare.

Video presentations will focus on an Illinois farm family forced out of farming during the 1980s and resource management from the perspectives of six farm families.

Other presentations throughout the two-day event will range from the Asian tiger mosquito, to no-cholesterol milk, to zinc deficiency in dogs.

Displays and demonstrations will take place in the Stock Pavilion, Ag Engineering Sciences Building, Agriculture Bioprocess Lab, Wood Engineering Laboratory, Bevier Hall, Mumford Hall, Turner Hall and the greenhouse complex.

Headquarters for information and hospitality will be in the Stock Pavilion at 1402 W. Pennsylvania, Urbana. For more information, contact Sandra R. Casserly at 217/333-9441.

Mark Your Calendars

Spring 1990 Seminar Series

Sustainable Agriculture in Eastern North America: Lessons from Natural and Human History, Prospects for the Future

All seminars will be at 7:30 p.m. in Room K2, University YMCA, 1001 S. Wright St., Champaign, Ill.

February 28

Soil Formation, Erosion and Crop Productivity

Ken Olsen, U of I Department of Agronomy.

March 14

Farmers' Attitudes Toward the Future

Sonya Salamon, U of I Division of Human Development and Family Studies.

March 28

Pests and Pest Management: The Impacts of Human, Pest, Crop and Technological Dynamics

Rick Weinzierl, U of I Agricultural Entomology.

April 12

Technology, Social Change and Indigenous Knowledge

Mike Warren, Iowa State University.

April 18

A Prospect for Sustainable Agriculture: Energy Farming

Folke Dovring, professor emeritus, U of I Department of Agricultural Economics.

March 8-9

Sustainability: Agriculture and Society

The feature speaker will be Mr. Denis Hayes, founder of Earth Day and chair of the Earth Day 1990 Committee. Chancellor Inn, Champaign, Ill. For information, contact John Gerber at 217/244-4232.

March 13-15

Crop Protection Workshop

A workshop for farmers, Extension advisers and industry representatives. For information, contact Mike Gray at 217/333-6651.

March 19-21

Pest Management Short Course

An educational opportunity for crop consultants, crop scouts and Extension advisers. For information, contact Mike Gray at 217/333-6651.

Book Review

Agro-ecology: A Science of Four Disciplines

A comprehensive book on agro-ecology is hot off the press. In *Agroecology,* ecologists, biologists and agriculturists deal with agro-ecology as a developing science.

An excerpt from the book jacket reads: "Agroecology, a science emerging from four distinctly different disciplines — agriculture, ecology, anthropology and rural sociology — has evolved out of a world-wide increase in farm production juxtaposed against a growing concern for our environment. Scientists have come to recognize that much lauded (and necessary) improvements in agricultural technology are not without environmental costs.

"The study of agroecology will help not only ecologists and agronomists, but also horticulturists, botanists, and agricultural economists seek a balance between the need for improved food production and preservation of the world's already damaged land and water resources."

C. Ronald Carrol, associate director of the Institute of Ecology at the University of Georgia, John H. Vandermeer, professor of biology at the University of Michigan, and Peter M. Rosset, an ecologist in Costa Rica, collaborated on *Agroecology.* The book also includes contributions from world-renowned agriculturists and ecologists.

Agroecology, a 641-page book, is available for $89.95 from McGraw Hill Publishing Company, 1221 Avenue of the Americas, N.Y., NY 10020; telephone 800/2-MCGRAW.

JMG

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College of Agriculture
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1301 West Gregory Drive
Urbana, Illinois 61801

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news and perspectives

agro-ecology

Science and Education for a Sustainable Agriculture

Agro-ecology Science Fuses Agriculture, Ecology — John Gerber explores the relationships among ecology, agro-ecology and agricultural sustainability.

Biomass: Sustainable Energy Crop Of the Future — A guest editorial by Folke Dovring, Department of Agricultural Economics and Robert Herendeen, Illinois Natural History Survey.

Conservation Tactics Reduce Energy Use — Gregory McIsaac and John Siemens discuss strategies for reducing use of liquid fossil fuels for crop production.

Energy Needs Increasing; Outlook Unpredictable — B.A. Stout makes some observations about energy and warns against a "false sense of complacency."

Management Reduces Energy Use in Beef Systems — Dan B. Faulkner highlights energy conservation techniques used in profitable beef systems.

College of Agriculture
University of Illinois at Urbana-Champaign

The editors invite letters from readers who wish to share their experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification. **agro-ecology** *reserves the right to reject any letter. Address letters to:*

agro-ecology *Editors*
University of Illinois
211 Mumford Hall
301 West Gregory Drive
Urbana, IL 61801

". . . I believe that our conventional systems are sustainable. I also believe that they must continue to evolve — as they have in the past — to incorporate new technology, to adjust for economic changes, and to alleviate environmental problems. We don't need a new system as LISA suggests; we need to 'stay the course' and maintain a strong research and extension network.

"The key to Sustainable Agriculture is to strengthen the university-industry-farmer network of development, testing, and implementation of best management practices that are agronomically sound, economically viable, and environmentally responsible. This system is the envy of the world; a major strength of U.S. Agriculture. That is the real ***Sustainable Agriculture.*** *Many components of LISA should be and will be incorporated into the conventional systems — as they meet these criteria. But the decision should be made on the basis of science — not emotion.*

"My main concern is that we give a clear message to the public that science is not bad, and that it is only through good science that we can sort out the practices that are sustainable from the agronomic, economic, and environmental standpoint."

Dr. Harold F. Reetz, Jr.
Westcentral Director
Potash & Phosphate Institute
R.R. 2, Box 13
Monticello, IL 61856-9504

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Agro-ecology Science Fuses Agriculture, Ecology

Agro-ecology is a young, evolving science. Some recognized techniques for study based on systems science and the viewpoint that a farm should be considered an ecosystem already exist. Like other evolving disciplines, however, tools and techniques for the study of agro-ecology await development.

John M. Gerber, U of I coordinator for Sustainable Agriculture.

"Implicit in some agroecological work is the idea that by understanding these processes and relations, agroecosystems can be manipulated to produce better, with fewer negative environmental or social impacts, more sustainably, and with fewer external inputs."

Miguel Altieri, in ***Agroecology: The Scientific Basis of Alternative Agriculture.***

Reader response to the first four issues of **agro-ecology** has been overwhelmingly positive. The newsletter seems to have hit upon common ground that can draw together environmentalists, farmers, agribusinessmen and academicians. Nevertheless, some confusion appears to exist regarding the relationships among ecology, agro-ecology and agricultural sustainability.

Ecology is a science, just as geology and biology are sciences. Although a sincere concern for the environment is a principle reason for studying ecology, the science of ecology should not be confused with environmentalism. Ecology is the study of the complex biological, physical, chemical and social relationships within an ecosystem. As the first principle of ecology is that all things are interconnected, the study of ecology requires the use of systems thinking.

Agro-ecology applies ecological principles and understanding to agricultural systems, or agroecosystems. An agroecosystem can be thought of as a complex of air, water, soil, plants and animals (human and non-human) in a bounded area that humans have modified for the purpose of agricultural production. The agroecosystem concept is a significant departure from our traditional understanding of agricultural science.

An agroecologist, for example, would consider the use of non-renewable energy resources as non-sustainable. Nitrogen fertilizer manufactured from fossil fuels would be less desirable than a renewable source of nitrogen that might be substituted for applied fertilizer. Therefore, research conducted by an agroecologist might focus on cropping systems which employ nitrogen-producing legume cover crops or intercrops. Also, scavenger crops, such as grasses, might be incorporated into the system to prevent leaching losses to groundwater and to keep nitrogen cycling in the agroecosystem.

Although sustainability is one of the measures of success of an agro-ecosystem, agro-ecology is not low-input sustainable agriculture. We believe agro-ecology is the science that can provide the knowledge required to achieve agricultural sustainability.

An agroecologist would recognize that sustainability cannot be achieved with continued environmental degradation and non-renewable resource depletion. They would also recognize that profitability of farms cannot can be maintained simply by lowering inputs.

Agro-ecology may be thought of as a fusion of agricultural science and ecology. Because agricultural science is already an outgrowth of biology, physics and chemistry, this union represents further growth of the science.

Importantly, agro-ecology offers us a way to deal with the tradeoffs that may be required in the future. Farmers who must have short-term profitability and environmentalists who demand long-term sustainability can find common ground in the science of agro-ecology.

John Gerber

Folke Dovring, Department of Agricultural Economics
Robert Herendeen, Illinois Natural History Survey

Guest Editorial

Biomass: Sustainable Energy Crop of the Future

"The United States now uses about a third of the world's energy for all purposes. U.S. agricultural production alone requires about 1/40th of this amount, which is equivalent to 1/120th of the world's energy. To feed the world at its current level would require about six times as much energy as U.S. agriculture uses. Thus, using American agricultural methods, the world's food theoretically could be produced using 6/120ths of the world's energy, or about 5 percent."

F.C. Stickler, W.C. Burrows and L.F. Nelson, in "Energy: From Sun, to Plant, to Man," John Deere & Co., 1975.

"The cost of a gallon of gas in the U.S. has reached its lowest level ever. It does not reflect the cost of defense for the Middle East, smog, global warming or the trade imbalance caused by oil imports."

John H. Gibbons, Peter D. Blair and Holly L. Gwin, in "Strategies for Energy Use," Scientific American, Sept. 1989.

Is energy use in agriculture a burden on the economy? Is energy use in the economy as a whole a threat to the environment and hence to production? Can the farm sector become self-supplying, or even a net supplier of biomass-based energy? How do these questions relate to whether agriculture can become indefinitely sustainable — ecologically, economically and socially?

The oil price crisis of 1973 prompted many studies of agriculture's use of fossil energy — directly through tractor fuel and indirectly through fertilizers and other chemicals. How much fossil fuel was needed to produce a bushel of corn, a hundredweight of potatoes, or a pound of beef? This dependence implied a vulnerability to reduced availability.

Today, on the other hand, we hear about threats to agriculture's and silviculture's productivity from too much rather than too little energy use: acid rain and global warming from increasing atmospheric concentration of "greenhouse gases," among them carbon dioxide from fossil fuel combustion.

At the farm gate, agriculture uses about 4.5 percent of all energy in the United States. In comparison, the whole food complex takes about 12 percent, including agriculture's share, to get food to the American consumer. These fractions could be reduced if agricultural practices were made less energy-demanding or if society ate lower down on the food chain (less meat), or used food produced closer to home, or reduced food product packaging.

During the late 1970s ethanol-from-grain boom, it was touted that for an Illinois corn field, the liquid fuel for tractor power could be produced from about 6 percent of the area. Indirect effects, such as the energy needed to build, run and maintain an ethanol plant and the energy used in the economy to produce agricultural chemicals, equipment and other inputs, magnify this number. With proper accounting, the 6 percent becomes about 30 percent. While Illinois corn production is still a net energy producer (and thus to some extent a solar technology), this is not true for corn in areas requiring irrigation.

A decade ago, it was made clear that biomass energy could become a significant part of the national energy budget through production of methanol (methyl alcohol) from cellulose (The Report of the Alcohol Fuels Policy Review, June 1979).

In 1988, Congress enacted the Alternative Motor Fuels Act which recommends methanol as the choice propulsion fuel of the future in this country. Methanol is now widely hailed as the best alternative to gasoline. The consensus is that methanol delivers much less atmospheric pollution than any other liquid fuel. The main, but minor, difficulty is formaldehyde in the exhaust, for which technical solutions exist.

Many researchers, however, still bypass the biomass option and assume that the methanol would be produced mainly from natural gas (in out-of-the-way deposits which are hard to exploit otherwise), with coal as a possible backup feedstock,

despite the latter's much larger environmental hazards.

A strong argument for biomass energy is that steady production in principle has a net zero effect on atmospheric carbon dioxide: photosynthesis is the reverse of oxidation. There is, however, a transient effect associated with changing standing biomass. Permanent deforestation can release net carbon to the atmosphere, while establishing a forest where there previously was none sequesters atmospheric carbon.

The potential of afforestation is illustrated by noting that today terrestrial biomass contains about three-fourths as much carbon as the atmosphere, the latter having increased 27 percent since the beginning of industrialization. Thus, increasing standing terrestrial biomass by one-third would absorb all of that atmospheric carbon dioxide increase.

This dual potential of biomass does involve a partial trade-off. A mature forest has maximum standing biomass but produces no net biomass energy, or no net growth, while a short-rotation biomass plantation has high net growth but relatively little standing stock. A further complication is the fact that short-rotation production requires relatively more indirect energy inputs per unit of output, so that net energy production is reduced and carbon emissions increased.

Given these constraints, methanol from biomass can become a major energy source in this country. Energy yield per area unit is much larger than with ethanol from grain. Average corn yield of 120 bushels per acre yields 300 gallons per acre of ethanol, but suitable hay crops produce 6 tons per acre, yielding 800 gallons per acre of methanol.

Several research reports agree that once the biomass-to-methanol path is chosen for aggressive agronomic, technological and industrial research and development, yields of biomass crops and the power yield of alcohol fuel will increase. Biomass-based methanol can become fully competitive with gasoline within the next 10 to 20 years. This is especially likely as the cost of petroleum fuels is certain to go up within that time frame.

Such development would center on two agronomic concepts: permanent grasses on moderately erodible farmland, and medium-rotation (8 to 15 years) trees on the more sloping lands. Intensive silviculture (short, 2- to 5-year rotation), is more problematic as it is essentially another intensive row-crop system.

With large-scale use of farmland to grow biomass crops, the long-standing problem of surplus production in U.S. agriculture could disappear in a few years. With no more need to subsidize conventional agricultural production, the U.S. government could easily shoulder the rather much lighter burden of initially subsidizing the biomass enterprise. Agriculture could become more sustainable, with much less chemical inputs in the total. It would be ecologically more stable than at present because the erodible lands would, on the whole, be withdrawn from intensive use of annual tillage.

The potential of biomass would be diminished by economically competitive artificial chlorophyll to synthesize carbohydrate. Short of such a development, which is not yet in sight, biomass-based fuel appears to us the most advantageous future solution to fuel and pollution problems, and also problems of sustainable agriculture.

Even the social situation of rural America might be stabilized in this way because, unlike the petroleum refineries with their high degree of industrial concentration, plants to process cellulose into methanol would be small, numerous and widely scattered. They are likely to supplement the employment of family-scale farmers, whether their current livestock enterprises are maintained or curtailed by continued development of crop-based human food to replace animal products.

The use of cropland for production of biomass feedstocks can become as paying as most conventional food crops. Use of chemicals would be less, on the whole, and could be tempered by direct recycling of the ashes from nearby methanol plants. *FD/RH*

Gregory McIsaac, Senior Research Specialist
John Siemens, Professor and Extension Specialist
Department of Agricultural Engineering

Conservation Tactics Reduce Energy Use

". . . slightly more than two calories of energy are invested per calorie of food obtained for all agricultural production in the U.S.

. . . When the energy costs for processing, distribution, and preparation are added. . . , the total energy cost is about 9.8 calories of energy per calorie of food consumed in the U.S."

*A.B. Lovins, L.H. Lovins and M. Bender, in "Energy and Agriculture," **Meeting the Expectations of the Land.***

Table 1. Estimated Energy Requirements for Corn

Inorganic Fertilizer	30.0
Drying	19.4
Machinery	11.2
Transportation	6.0
Pesticides	2.0

Energy Input Gallons per Acre
Diesel Fuel Equivalent

Current methods of crop production in the corn belt depend upon liquid fossil fuels. In the future, the cost of fossil fuels is likely to increase as reserves are depleted, as political instability interrupts imported supplies, or as governments tax its use to cover the costs of environmental impacts.

Energy for crop production is consumed directly as fuel for machinery and drying, or indirectly in the form of manufactured machinery and chemicals. Inorganic nitrogen fertilizer constitutes approximately 40 percent of the energy input for typical corn production (table 1). Anhydrous ammonia is manufactured from natural gas. Since other forms of inorganic nitrogen fertilizer are made from anhydrous ammonia, they require more energy per pound of nitrogen applied.

Nitrogen fertilizers should be applied based upon a realistic yield goal for the soil and climate, and adjusted for applications of manure and nitrogen supplied by previously grown legumes. Replacing manufactured nitrogen fertilizers with biologically fixed nitrogen has a potential to reduce the fossil energy used in corn production. Soybeans fix atmospheric nitrogen and, therefore, require much less purchased energy input per acre than corn.

In addition, research has shown that soybeans can enrich the soil with approximately 40 pounds of nitrogen per acre that can be utilized by a following corn crop. Alfalfa or clover can supply up to 100 pounds of nitrogen per acre to a corn crop, however, this is not economically viable unless there is a market or use for the forage. Additional research, markets and policy changes are needed before forage legumes, such as clover and vetch, can be economically competitive with manufactured nitrogen fertilizers for corn.

A second major category of energy use in corn production is drying the grain to prevent spoilage. With present technology, one-quarter to one-half of the energy in this category can be supplied by solar grain dryers. Corn cobs also can be burned to supply heat for drying.

Fuel for field operations, tillage, planting and harvesting constitute a third major category of energy use. This energy requirement can be minimized by eliminating unnecessary tillage operations, selecting optimum machinery sizes and operating equipment at peak efficiency. Eliminating unnecessary tillage operations also conserves soil in many fields.

In the future, fuel for farm equipment may be derived from biological sources, such as crop oils, ethanol from corn and methanol from forages.

Both technologies and policies will have to be developed in order to have an agriculture and a society which are based upon sustainable sources of energy. *GM/JS*

The authors thank Carroll Goering, Robert Hoeft and William Peterson for information and suggestions. Information also was obtained from the "Illinois Agronomy Handbook" and "On-Farm Solar Drying of Crops and Grains Demonstration Project," available from the U of I Cooperative Extension Service.

B.A. Stout, Professor, Agricultural Engineering Department
Texas A&M University

Energy Needs Increasing; Outlook Unpredictable

"Humankind expends in one year an amount of fossil fuel that it took nature roughly a million years to produce."

*John H. Gibbons, Peter D. Blair and Holly L. Gwin, in "Strategies for Energy Use," **Scientific American**, Sept. 1989.*

"Without efficiency improvements, global demand for energy could double by the year 2025. Two additional Saudi Arabias would be needed to supply oil. Several hundred nuclear plants would have to be built. At least four times as many rivers would have to be impounded for hydropower. The world's coal production would have to be more than tripled. Expansion of world energy supply of this magnitude will require decades to accomplish. Thus, increased competition among nations is likely."

William Chandler, in "Energy Productivity: Key to Environmental Protection and Economic Progress," Worldwatch Institute study.

Current low oil prices have lulled the public and many politicians into a false sense of complacency.

World oil consumption is rising and is now estimated at about 50 million barrels per day.

Many experts in the utility business acknowledge that there is surplus generating capacity in the United States today, but little new capacity is being planned. Consequently, even with a modest 2.7 percent annual growth in demand, there could be danger of brownouts by the mid-1990s. Much of the electric industry's problems center on nuclear power. Numerous U.S. nuclear power plants under construction have been abandoned because of financial constraints or public protest.

Even though the technical feasibility of renewable energy has been demonstrated, most forms are unable to compete with imported oil costing $15 to $20 per barrel. Therefore, renewable energy technologies have not received high priority. But higher oil prices in the future could renew interest in biomass fuels, solar heating, wind power and other forms of renewable energy.

Farm energy use is less than 3 percent of the nation's total energy consumption. Total use of direct energy on U.S. farms declined 29 percent and use of energy-intensive fertilizers increased 15 percent from 1974 to 1985. Meanwhile, gasoline use declined nearly 50 percent, fuel oil use dropped nearly 75 percent and LP gas consumption dropped 31 percent.

Energy efficiency in U.S. agriculture increased 55 percent between 1974 and 1985. Output per unit of direct energy rose 90 percent, while output per unit of invested energy rose 17 percent. Farmers increased their energy efficiency through a number of conservation measures, such as reduced tillage; more controlled and timely applications of fertilizer, pesticides and irrigation water; and heat recovery systems.

Since 1977, U.S. energy consumption per constant dollar (1982) of gross national product has declined about 25 percent. Farm expenditures for fuel, lubricants and electricity have declined at a rate close to or exceeding the national average.

If we have learned anything about energy since the early 1970s, it is that predictions have been inaccurate. Few experts foresaw the oil embargo of 1973 and the sharp oil price increases that followed. Virtually no one predicted the Iranian hostage crisis of 1979, which again resulted in a doubling of world oil prices. And some experts were predicting $50 to $100 per barrel when the oil price collapse of the early 1980s occurred.,

We can say with some confidence that agriculture's energy needs will continue at levels experienced in recent years and will still comprise a small percentage of national energy use.

But energy shortfalls, should they occur at a crucial time in the production cycle, could have a devastating effect on the U.S. farm economy. And, rising reliance on imported oil and other uncertainties of world oil politics make an energy crisis in the 1990s highly probable. *BAS*

Dan B. Faulkner, Extension Specialist, Beef

Management Reduces Energy Use in Beef Systems

"Agricultural production consumes only 2.5% of the total nonsolar energy used in this country. Food processing and related industries use an estimated 5 to 7% of the total U.S. energy budget."

From "Energy Use and Production in Agriculture," ***Cast Report No. 99.***

Profitable beef producers have year-round systems of production that maximize grazed forage and minimize fertilization, grain feeding and purchased supplemental feeds. These reduce most expenses associated with energy by limiting the use of hydrocarbon-based fuels for harvesting and nitrogen fertilization.

It is important to minimize the use of harvested forages in beef systems because forage harvesting methods are energy intensive. Using stored forages may result in energy waste of up to 40 percent during harvest, storage and feeding. Producers can reduce the need for harvested forage by accumulating forage, growing winter crops and using crop residues for late fall or winter grazing.

Another way to save in beef production systems is to reduce energy requirements for fertilization. Allowing cattle to graze forages recycles nutrients through the decomposition of manure. Rotational grazing of grass and legume pastures, sequential grazing of cool- and warm-season grasses, and supplemental feeding of ruminants grazing crop residues are management techniques for controlling animal movement to further enhance the fertility contribution of manure.

Even with manure, additional nitrogen fertilizer may be needed. Split applications of nitrogen fertilizer can improve the yield distribution of cool-season grasses to a limited degree, but labor costs, energy costs and the threat of water contamination may increase.

Legumes may be an alternative in some forage systems. Legumes produce nitrogen symbiotically with the proper Rhizobium bacteria. Symbiotically-produce nitrogen has little risk of contaminating surface or groundwater. The nitrogen is produced, stored and released from nodules on the legume root. The release rate is relatively slow, so grasses or the legume plants themselves use the released nitrogen for growth.

Consequently, planting legumes with cool-season grasses or in grass pastures with no-till seeding can eliminate the need for nitrogen fertilizer. The energy savings could be substantial in light of the fact that 33 percent of the energy expended in U.S. agriculture is used to produce nitrogen fertilizer.

In addition, legumes improve the feed nutrient value of forages. They have higher concentrations of crude protein, total nonstructural carbohydrates and digestible dry matter with lower concentrations of cell wall constituents (fiber) compared to grasses. Therefore, they can be effective for supplementing lower quality forages when added to the diet at a rate of 15 to 30 percent. Legumes used in a crop rotation as a source of nitrogen or legume pastures hayed to initiate a grazing rotation could be used for this type of supplemental cattle feeding.

Additional energy savings in cattle production can result from using woods or other natural protection for cattle, instead of using barns or other structures. *DBF*

Papers Offer Opinions, Advice, Challenges

The College of Agriculture is publishing a new series of papers on agro-ecology and sustainability issues. These papers are intended to encourage dialogue among people interested in the economic, social and environmental impact of production agriculture. The manuscripts represent the viewpoints of authors with diverse interests. They are not subject to formal peer review.

These manuscripts are available from the Agro-ecology Program, University of Illinois College of Agriculture, 211 Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801. Payment in advance of $2 per manuscript, or $10 for papers one through six, is required to cover handling and postage. Please request papers by number and title, and make checks payable to the University of Illinois.

Illinois' Annual Billion Dollar Soil Erosion Problem: A Challenge for Research and Education *AE 90-1*

Mike Sager, Woodford County Extension adviser, examines the College's role in providing information to farmers who wish to reduce soil erosion. He challenges the College to take a leadership position in this important area of agricultural sustainability.

Agro-ecology, Innovation and the Cooperative Extension Service *AE 90-2*

This is the text of a speech made by John M. Gerber, U of I coordinator for Sustainable Agriculture, at the Illinois Cooperative Extension Service Annual Conference. He suggests ways for Extension to approach the challenges of the future with creativity and renewed vigor.

Nutritional Recommendations Should Promote Sustainability *AE 90-3*

Robert J. Reber, U of I Extension specialist in nutrition, offers some insights into how diet and food consumption patterns can impact agricultural and societal sustainability. He reminds his colleagues in human nutrition that the recommendations they make can influence the food-dollar votes made by consumers in the marketplace.

Agricultural Sustainability and the University of Illinois: An Introduction to Agro-ecology *AE 90-4*

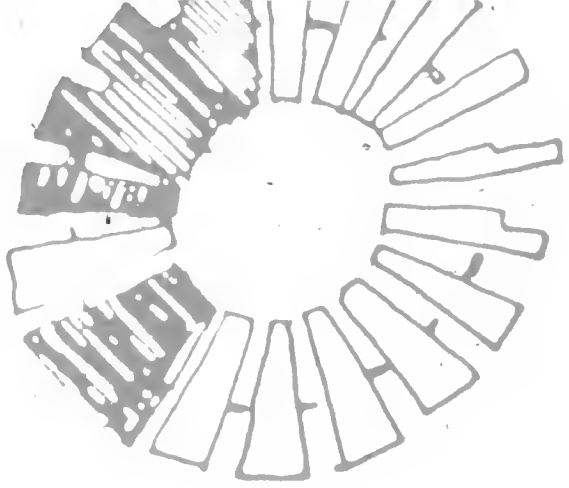
John M. Gerber, U of I coordinator for Sustainable Agriculture, discusses current ideas about the new science of agro-ecology.

New Student Conservation Attitudes and Beliefs: Implications For Curriculum Development in the U of I College of Agriculture *AE 90-5*

Because the students of today are the leaders of tomorrow, the question must continually be raised: Does the education offered at the U of I prepare people for the complex world in which they will live and work? Ann Reisner and Gerry Walter, faculty members in the Office of Agricultural Communications and Education, examine freshman views on soil conservation and the role of government in farming policies.

Sustainability: Agriculture and Society *AE 90-6*

Three papers from speakers at a symposium honoring Harvey J. Schweitzer, first coordinator for the College's Sustainable Agriculture initiative, are presented in this package. Denis Hayes, chairman of the Earth Day 1990 Committee and organizer or the original Earth Day in April 1970, offers strategies for a "greener" and better future. Vernon W. Ruttan, regents professor of Agricultural and Applied Economics at the University of Minnesota, presents his views in "Sustainability Is Not Enough." Chuck Hassebrook, leader of the Stewardship Technology and World Agriculture Program at the Center for Rural Affairs in Walthill, Neb., challenges the research community to set goals that are consistent with social, as well as economic, benefits.



Robert J. Reber, Associate Professor, Nutrition Extension

"Earth Day 1990": Challenges and Responsibilities

Many are beginning to view the Earth as a living organism possessing internal controls that tend to stabilize and sustain the global environment, much as metabolic regulation stabilizes an individual. The concept of a living Earth is not new. Originating in paleolithic mythology, this view has been supported in recent times by modern poets, naturalists, philosophers, and ecologists including Emerson, Thoreau, Muir, Ouspensky, and Leopold. Over two decades ago, the British scientist James Lovelock proposed the "Gaia Hypothesis," which further expands the concept of a self-controlling, living Earth.

It is now becoming apparent that human activities can exert destabilizing influences on the global environment. Soil erosion, massive deforestation, increasing atmospheric concentrations of greenhouse gases, and depletion of the ozone layer are prime examples.

The greatest challenge for human beings may be to modify our own activities in order to protect the integrity, stability, and beauty of this global environment to preserve its health—that is, its capacity for self-renewal. Out of this challenge arises the concept of sustainability that will require all of us to make basic changes in the way we live, work, and play.

On April 22, "Earth Day 1990" gives us a splendid opportunity to honor our vital connections with the Earth. Many activities and events are planned by groups and organizations. It will be a time for reflection, introspection, and personal commitment as we individually and collectively search for a more durable scale of values.

Global sustainability is impossible without agricultural sustainability. Society depends on a continuous flow of nutrients and energy from the sun, soil, water, and air up through the pyramid of living organisms. Sustainable agriculture strives to maintain this flow of sustenance over the long term. Achieving this goal, however, depends upon maintaining the health of the Earth. Sustainable agriculture depends upon the stability and integrity that biodiversity brings to ecosystems. It depends upon the sheer beauty of Nature's patterns that stabilize global climates. The overall goals of global and agricultural sustainability are one.

What will motivate us to modify our activities to be compatible with and not compromise Nature's patterns—the patterns that foster self-renewal? What will spur us to renew a covenant with the Earth on her own terms? Thinking that we can meet this challenge by appealing only to economic self-interest is terribly shortsighted. Likewise, appealing to survival instincts may fall short of the mark.

But let us not forget the power of love. Love motivates. It has and will continue to motivate us to tackle and accomplish Herculean tasks. To extend love to "Gaia—the Living Earth," we will have to expand our concept of community to embrace all members of the global village, including every component of the land organism—soil, water, air, and all biologic species.

Experiencing and appreciating the beauty of individual species, as well as the patterns of life that comprise the whole, can help inspire this love. "Earth Day 1990" gives us an opportunity to pause, reflect, love, and extend our limits of community.

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Public lectures, demonstrations and other activities are planned throughout April to commemorate ***Earth Day 1990.***

For information, please contact the following people:

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217/328-5991

Virginia Scott
Illinois Environmental Council
217/544-5954

Linda Devocelle
Earth Day Illinois
217/785-2800

Illinois Earth Day Organizer's Network
1/800-252-8955

Mark Your Calendars for Earth Day 1990

MILLERCOM 90

March 27
Global Sustainability: Our Common Responsibility

Peter H. Raven, Director, Missouri Botanical Garden. 8 p.m., Follinger Auditorium.

April 3
Extinction in the Fossil Record: The Lessons of the Past

David Jablonski, University of Chicago. 8 p.m., Follinger Auditorium.

April 10
The Future of New Guinea: A Biological Treasurehouse

Jared Diamond, UCLA School of Medicine. 8 p.m., Follinger Auditorium.

April 17
Conserving Biological Diversity in the Tropical Rainforest: The Challenge of the 90's

Russell Mittermeier, President, Conservation International. 8 p.m., 112 Gregory Hall.

April 24
Genetics and Conservation Biology

Alan Templeton, Washington University, St. Louis. 8 p.m., 112 Gregory Hall.

The U of I College of Agriculture is a cosponsor of the spring MILLERCOM 90 lecture series on biodiversity. This is one of many campus activities planned to commemorate ***Earth Day 1990.*** *For more information on any of the lectures, contact the Institute for Environmental Studies at 217/244-3399.*

The Spring 1990 Seminar Series

Sustainable Agriculture in Eastern North America: Lessons from Natural and Human History, Prospects for the Future, continues through April. Lectures will be at 7:30 p.m. in Room K2, University YMCA, 1001 South Wright St., Champaign, Ill.

April 12
Technology, Social Change and Indigenous Knowledge

Mike Warren, Iowa State University.

April 18
A Prospect for Sustainable Agriculture: Energy Farming

Folke Dovring, U of I.

April 6

NEPA (National Environmental Policy Act) 20 Years Later: An Examination of the Social, Economic, Biophysical and Legal Components of Environmental Impact Statements

Panel: Rabel Burdge, U of I, moderating; Larry Leispritz, University of North Dakota; Maurice Voland, North Carolina State; Thomas W. Mason, Rose-Hulman Institute, Terre Haute; and Roy E. Roper, U of I. 3:30 p.m. in Room 365, new offices of the Institute for Environmental Studies, 1101 W. Peabody Drive, U of I campus.

April 25
MILLERCOM 90 Lecture
A Century of Resource Use: Can the Next Century Feast Be As Rich?

Brian J. Skinner, Yale University. 4 p.m., Lincoln Hall Theater, U of I campus.

Book Review

Book Integrates Viewpoints

A new textbook on ecological approaches to agricultural productivity integrates the production-oriented focus of the agronomist with the systems-oriented viewpoint of the ecologist.

Agroecology: Researching the Ecological Basis for Sustainable Agriculture, edited by Dr. Stephen R. Gliessman, director of the Agroecology Program at the University of California at Santa Cruz, is part of the Ecological Studies Series of Springer-Verlag New York, Inc.

Drawing on international case studies, Gliessman analyzes different methodologies for quantifying and evaluating agroecosystem sustainability. Leading researchers from around the globe examine the design and management of agroecosystems from the humid tropics to temperate regions. This text is an important contribution to the growing body of knowledge becoming known as agro-ecology.

In the introduction, Gliessman writes: "The challenge for agroecology is to find a research approach that consciously reflects the nature of agriculture as the coevolution between culture and environment, both in the past and the present. The concept of the agroecosystem can (and should) be expanded, restricted, or altered, as a response to the dynamic relationship of human cultures and their physical, biological, and social environments. An understanding of this relationship provides a framework in which inputs, outputs, and sustainable production processes can be maintained."

The 512-page book is available for $98 from Springer-Verlag New York, Inc., P.O. Box 2485, Secaucus, NJ 07096-2491; phone 800-SPRINGER. *JMG*

University of Illinois at Urbana-Champaign
agro-ecology news and perspectives
College of Agriculture
211 Mumford Hall
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Urbana, Illinois 61801

Summer 1990
Volume 2, Number 3

news and perspectives

agro-ecology

Science and Education for a Sustainable Agriculture

Sustainability Is a Challenge For Society — A spring symposium honoring Harvey J. Schweitzer began with the premise that "sustainable agriculture and agro-ecology are everyone's business."

Reflections on Sustainability: Agriculture and Society — Now retired and managing the family farm he left more than two decades ago, Harvey J. Schweitzer offers a perspective on the dynamic nature of agriculture.

We Have the Power To Choose Our Future — Denis Hayes urges individuals to pursue environmental goals and values.

Farmland Owners Face Increasing Legal Restrictions — A guest editorial by Harold W. Hannah, a lawyer from Texico, Ill.

Set Research Priorities To Advance Social Goals — Congress could use funding to focus research on social and environmental goals, Chuck Hassebrook suggests.

Sustainable Ag Must Feed A Growing Population — Vernon W. Ruttan expresses concern that sustainable agricultural technology is not developed sufficiently to allow farmers to feed the world.

College of Agriculture
University of Illinois at Urbana-Champaign

The editors invite letters from readers who wish to share their experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification. **agro-ecology** *reserves the right to reject any letter. Address letters to:*

agro-ecology *Editors*
University of Illinois
211 Mumford Hall
1301 West Gregory Drive
Urbana, IL 61801

agro-ecology is published bimonthly by the College of Agriculture, University of Illinois at Urbana-Champaign. This issue was edited by John M. Gerber and Tina M. Prow and designed by Nancy Loch.

This newsletter is printed on recycled paper.

. . . Please continue to present information that points up paths of action that seem more likely to increase our knowledge of sustainable agriculture. Without such publications as yours, farmers are left to continually experiment at ground level, no pun intended. Your articles give us some idea of which experiments are seeming dead ends, which experiments may give rise to successful methods — an overview of those techniques that are economically and environmentally sustaining.

Though it is my personal belief that our environment must not be sacrificed at any cost, still we cannot justify a system's viability simply because we judge the effort as being noble. Environmental sustainability must walk hand in hand with economic sustainability or LISA is a dead end.

Rich Witowski
531 S. 2nd Street
West Dundee, IL 60118

. . . Thanks for the magazine, it's very interesting to see the development of the idea. You're a great leaven to the inertia of the establishment.

Harriet L. Mueller
612 N. Arlington Hts. Rd.
Arlington Hts., IL 60004

. . . I think we have to take a middle of the road approach until we have enough data and conclusive facts to go on. We must remember there is a good and bad side to most everything, so, full speed ahead with caution.

Duane R. May
R.R. 2, Box 175
Princeton, IL 61356

. . . I think it is imperative that we find ways to again work with nature and not against it.

If it kills the bugs and weeds, it is just a matter of time that humans will be victims of their own folly. I have a relative with DDT in his systems since 1963, and he has not worked since.

Allan Youngquist
Box 215
Oneida, IL 61467

. . . As an organic gardener, I am interested in the control of the chemicals that enter the groundwater in our towns and cities. There are no controls on the residential applier of chemicals. The local government and school officials should be informed. The farmer is not the only one at fault.

Earl Frank
137 Robinson St.
Genoa, IL 60135

. . . As an urban organic gardener, this is a subject dear to our hearts. My mother has a farm 40 miles from Champaign; have been passing on the newsletter to her farmer, in hopes of a change of mind-set. We need to let the government know how we feel. Short-term, chemical-pesticide farming is no longer financially feasible. It's a real challenge to us all!

Joe and Sandra Baldwin
24651 E. Pleasant Ct.
Plainfield, IL 60544

. . . While I am not a farmer, I am a gardener. I read your newsletter with interest because as farming technology changes it carries the changes throughout the agriculture industry down to gardeners. This year I received several seed orders with letters of apology from my suppliers. They were unable to locate sources of untreated seed for several of my varietal selections. Captan, the fungicide used to treat many of these seeds is allegedly highly toxic and a potential hazard. My range of choice has been narrowed and in some cases I will be forced to work with treated seed if I choose to grow this variety. Research such as yours gives me hope that situations like this will be averted in the future. Thank you for keeping me informed.

Pam L. Lindstrom
941 N. Loomis
Naperville, IL 60563

Sustainability Is a Challenge for Society

"Global sustainability is impossible without agricultural sustainability. Society depends on a continuous flow of nutrients and energy from the sun, soil, water, and air up through the pyramid of living organisms. Sustainable agriculture strives to maintain this flow of sustenance over the long term."

Robert Reber in "Earth Day 1990: Challenges and Responsibilities," ***agro-ecology,*** *Vol. 2, No. 2.*

"Sustainable agriculture and agro-ecology are everyone's business. The issues affecting the quality of water, food, the environment and life concern us all." From the program for ***A Symposium on Sustainability: Agriculture and Society****, honoring Dr. Harvey J. Schweitzer.*

Nearly 200 people gathered in Champaign this spring to attend a symposium on sustainable agriculture and society. Sponsored by the Illinois Agricultural Experiment Station and University of Illinois College of Agriculture, the symposium recognized Dr. Harvey J. Schweitzer's leadership for research and Extension programs in rural sociology, rural development and agro-ecology issues.

Dr. Schweitzer retired last year. During his 27-year career at the U of I, he was at times a professor of Agricultural Economics, an Extension specialist, and an assistant director for the Cooperative Extension Service and the Illinois Agricultural Experiment Station. An Illinois native, he continues to live in Champaign and manage the family farm in DeKalb.

Drawing on the diversity of his experience and interests, Dr. Schweitzer brings a unique perspective to "Reflections on Sustainability: Agriculture and Society" on page 2.

His concerns about maintaining productivity, profitability and competitiveness of agriculture; protecting the environment, natural resources, water and food; and improving the quality of rural life were also concerns of speakers at the symposium.

The divergent views of these speakers, some of the nation's most outspoken leaders in the areas of research, agricultural policy and the environment, are represented in **agro-ecology.**

The issues of agriculture, sustainability and society are complex, and we expect to come back to this theme again. At that time, we would like to include some of your views. We encourage you to answer the survey beginning on page 9 and to continue sending us letters. After all, every individual is a representative of "society."

Linda M. Prow

Harvey J. Schweitzer, Professor Emeritus
Department of Agricultural Economics

Reflections on Sustainability: Agriculture and Society

I want to express my appreciation to all who planned and participated in the symposium, "Sustainability: Agriculture and Society," held recently in my honor. I am particularly pleased that the symposium provided the opportunity for speakers and participants to exchange divergent views on some of the most urgent topics in agriculture today.

Agriculture in our state and nation is one of the most dynamic and rapidly changing sectors of our economic and social fabric. Throughout the history of agriculture — whether new developments have been in the form of the steel plow, gasoline-powered tractors, hybrid corn, improved crops and livestock, founding of colleges of agriculture, biotechnology or importation of Chinese pigs—the pattern has been that of innovation, adoption and adjustment.

The process of change continues and with it, social and economic ferment.

When I first came to the University of Illinois in 1962, I became involved in the College of Agriculture's rural development programs. While the idea of rural community development was not new, some of the approaches at the national level were.

There were spirited and sometimes heated debates among faculty and our clientele about our involvement in federal and state rural development programs. The Extension Service struggled to define its educational mission in this endeavor, trying to balance the demands for its services to production agriculture with newer public demands for community economic development, rural leadership and public policy education.

Now, 28 years later, the U of I College of Agriculture is struggling to define its mission in another area of considerable debate and public concern — namely the environmental and ecological aspects of production agriculture.

Today the issues include water quality, food safety, soil conservation, production practices and farm profitability, with much attention being given to the use of farm chemicals, fertilizers and tillage practices.

As was the case of rural development in the 1960s, there is spirited and often heated debate among university faculty, farmers, agribusiness people, government officials and environmentalists over objectives, methods, roles and responsibilities, and needed research and education.

Broad environmental and ecological issues will remain high on the public's agenda for a long time and agriculture will continue to receive much attention as these issues are debated. The current skirmishes over the merits of low-input sustainable agriculture, definitions of low-input or sustainable agriculture, organic versus more conventional farm practices and debates over the provisions of the 1990 farm bill are necessarily capturing a great deal of attention today.

Differences of opinion, however, should not detract us from the broad objective of preserving the integrity of our environment.

There are many encouraging signs of progress. Despite differences of opinions about methods and philosophies, there is a growing consensus regarding agriculture and the environment.

There is agreement, I believe, that agriculture must remain productive, profitable and competitive; production cost must be curtailed whenever possible; adverse environmental impacts from the use of agricultural technologies must be reduced; our natural resources, water quality and food safety must be protected; and the quality of rural life must be sustained or improved.

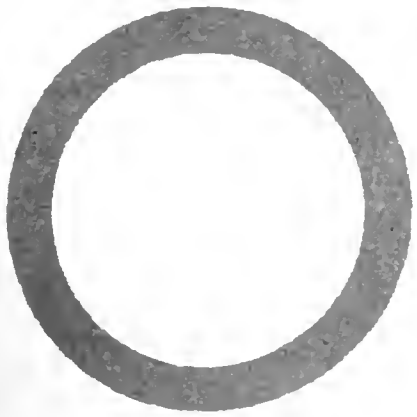
All of these themes are currently being discussed not only in the general media but also in the farm press and in agribusiness trade journals. General farm organizations and commodity groups are attempting to deal with the public's concern.

Individual farmers are making adjustments in their practices because of economics and a sense of responsibility towards the environment. Farmers are organizing themselves around the issue of sustainability to share information about their experiences.

And, increasingly, farmers and farm groups are meeting face-to-face with environmental groups to share their concerns, debate their differences and arrive at mutually acceptable solutions whenever possible.

Colleges of agriculture are focusing more and more attention on the environmental aspects of agriculture in research and education.

continued on page 8



Following is a excerpt from a speech made by Denis Hayes at the spring Harvey J. Schweitzer symposium in Champaign. Hayes, a San Francisco lawyer, is chairman of the Earth Day 1990 Committee.

We Have the Power to Choose Our Future

During the last eight years, the U.S. national debt has nearly tripled. The United States has shifted from being the world's greatest creditor nation to being the world's largest debtor. Hostile takeovers, leveraged buy-outs, and greenmail have left our businesses mortgaged to the hilt in unstable junk bonds. The Federal Savings and Loan Insurance Corporation has collapsed under $300 billion of prospective liability. It is not a promising time to look to the federal government for salvation.

Instead, we must look to ourselves. . .

First, we need to make our own lives congruent with our values. For most of us, there is room for improvement in virtually all spheres.

We should conserve energy with easy things, such as replacing incandescent light bulbs with folded fluorescents which are five times as efficient, insulating our water heater, and doing laundry in cold water. Then we should do the more expensive and difficult things, such as superinsulating our dwellings and buying a more efficient furnace and more efficient appliances.

We should pledge not to purchase another new car until we can buy one that meets our needs while getting at least 50 miles per gallon. We should install flow restricters in our faucets and showers, and dams in our toilets. We should plant indigenous vegetation.

We should search out environmentally sensible soaps and cosmetics, and look for recycled paper and other products.

We should eat lower on the food chain, and develop a preference for fresh organic products grown nearby. We should carry our own, reusable string bags to the supermarket, and search out ways to eliminate other unnecessary packaging. We should recycle our metals, glass, paper, and plastics, and compost all organic waste.

There are many reasons why such lifestyle changes make sense. In the aggregate, they make a huge difference. If everyone used the most efficient refrigerators available, we could save the equivalent of 12 large nuclear power plants.

Using the most efficient cars having the same internal dimensions as our current vehicles would cut gasoline consumption in half.

Every year, we send more iron and steel to our dumps than we use in the entire automobile industry. The aluminum we throw away every three months could replace the nation's entire fleet of airplanes.

Leading lives that are congruent with your values is a necessary and important first step, but it does not discharge your responsibility.

Next you need to explore what you can do as an employee, an investor, a parent, and a member of your church and civic clubs.

You should be alert to ways you can lessen the environmental impact of your job from avoiding styrofoam coffee cups to suggesting modifications in industrial processes. You should ask your pension fund trustees to adhere to Valdez Principles in choosing investments.

You should set a good example for your children.

Integrating your values into your job and your other activities is another important step, but it still does not discharge your responsibilities.

Next, join local and national organizations that share your goals and your philosophy, and proselytize on their behalf. Give gift memberships for Christmas; display their publications on your coffee table; support their campaigns financially and with your volunteer efforts.

Working on behalf of environmental groups that represent your views is vitally important, but this still does not fully discharge your responsibilities.

The next step is to become actively involved in politics. Support candidates who share your visions; vigorously oppose those who do not.

Invest the time, energy, and financial support needed to win elections. Play the sort of role that causes political friends and foes alike to view you as a person of substance, a person to be reckoned with.

Communicate your environmental goals and values to your candidate, and make clear that there are narrow limits on how much compromise is acceptable. *DH*

Harold W. Hannah, Lawyer
Texico, Illinois

Guest Editorial

Farmland Owners Face Increasing Legal Restrictions

"The greatest challenge for human beings may be to modify our own activities in order to protect the integrity, stability, and beauty of this global environment to preserve its health — that is, its capacity for self-renewal."

Robert Reber in "Earth Day 1990: Challenges and Responsibilities," ***agro-ecology,*** *Vol. 2, No. 2.*

"In short, a land ethic changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such."

Aldo Leopold in ***A Sand County Almanac and Sketches Here and There.***

The right to own and freely use property is a keystone in the structure of our federal and state law — and the judiciary has gone to great lengths to protect that freedom.

But this right has never been an undiluted freedom. Under common law nuisance theory, one may be prevented from making uses of land if the uses are offensive to others.

The law also applies certain restrictions to landowners whose actions might affect the neighbors or community. For instance, abandoned wells must be covered. Noxious weeds must be destroyed. Infected plants which could spread disease to other property must be removed or the disease controlled. Water and drainage law condition one's rights in the water that flows from one property to the next.

Increasingly, farmland owners are confronted with land-use questions that were unthought of a century ago. Does an owner have a duty to prevent soil from eroding and washing onto nearby land? Is there a duty to prevent chemicals from moving with runoff?

Do farmers have a duty to the public to see that chemicals determined to be harmful to man and animals do not leave the farm in the products produced there?

Is there a duty to know what chemical residues are in the soil and to inform incoming tenants or new owners? Could failure to notify them of chemical residues affect a contract for sale or rental of the land? If a new tenant or new owner discovers harmful chemical residues, can this be the basis for a civil suit? If so, what would be the extent of damages and how might they be determined?

These are some of the legal questions with us today. Legal responses, both legislative and judicial, are multiplying.

For example, water-use laws are being expanded to better protect the water table. More and more restrictions are being placed on farm chemicals and on the expertise of those who use them — including farmers themselves.

Soil loss limits are established in many counties throughout the country. In Woodbury County Soil Conservation District v. Ortner, (279 N.W.2d 276, 1979), the Iowa Supreme Court held that the county had a right to impose its limits on a farm owner. The court said, "Its provisions are reasonably related to carrying out the announced legislative purpose of soil control, admittedly a proper exercise of police power."

To reduce the health hazard to consumers, laws and regulations require a withdrawal period for antibiotics used in meat animals. There is no reason laws and regulations could not be constructed to establish levels of chemical toxicity in soils. This could help ensure that levels remain low enough for safe production of food and feed crops, vegetables and fruits.

In **Agricultural Law Update**, July 1989, a newsletter of the American Agricultural Law Association,

James B. Wadley and Anita Settle discuss the statutory regulation of hazardous chemicals on the farm. They make the following comment:

"Farmers have been, and for the most part continue to be, only minimally regulated as primary sources of water pollution. For the most part, regulation has been left to the states, even under the federal acts. Where direct regulation occurs, it tends to focus on the acceptability of particular farm management practices. This appears to stem from a deep-seated perception that the use of chemicals in the course of farming operations is not only necessary to the economic well-being of the farm but is socially desirable because it has resulted in the production of abundant crops. Recent concerns over the increasing presence of hazardous chemicals in groundwater supplies and in farm products, however, may call for a different balancing of public interests and may suggest that elimination of health threatening contamination is more important than relatively cheap and abundant food supplies. This of course could signal greater efforts to regulate farmers as 'sources' of that pollution or to eliminate the offending chemicals."

Illinois has two laws which make the above statement sound prophetic. Though these laws were not aimed at agricultural land, such lands are not immune. As time goes on and amendments are made, they could very well apply fully to the transfer of agricultural land.

One of these laws is the Responsible Property Transfer Act for transactions originating after Oct. 31, 1989, and closing on or after Jan. 1, 1990. It applies to property subject to reporting under the Federal Emergency Response and Community Right to Know Act of 1986, and to property containing storage tanks subject to registration with the state fire marshall.

The other Illinois law is in the Environmental Protection Act and supports the Federal Comprehensive Environmental Response Compensation and Liability Act, or "Super Fund."

Both laws are discussed at length in ILLINOIS BAR JOURNAL, September 1989. The Institute on Continuing Legal Education of the Illinois State Bar offered a short course on the application of these laws in Urbana last fall. Discussion brought out some alarming points.

In an agricultural context, it appears that in some situations federal and state sanctions might apply against sellers who fail to conduct a proper "audit" and do not supply the purchaser with information about concentrations of chemical residues in soil. It also appears that civil suits by purchasers could be instigated against these sellers.

The relative liability of owners and farm tenants poses several complex questions. How far back in ownership or in the rental history of the farm might liability extend? Could liability reach applicators, suppliers and manufacturers of agricultural chemicals?

If the duty to supply an audit should some day apply to transfers of farmland, a new breed of environmental scientists may develop. These scientists could supply the facts which could make a case in court.

But making a case in court would not be easy. Soil and vegetation contain naturally-occurring chemicals. It may be difficult to distinguish what and how much was added and by whom, and how much of what was added remains in the soil.

Perhaps the right to unpolluted soil is only one step from the recognition of the right of public and private parties to have unpolluted water.

Although holding the soil in place and ensuring the safety of products which come from it should be attainable objectives, ensuring the continued viability of the soil as a producer of human needs is more difficult. How far can the law go in saying that a land user must sustain the productivity of the land?

Science and education for a sustainable agriculture are one thing; ensuring that it will, in fact, be done before irreparable damage is done to the farm is another.

We are in a time when scientists, educators, farmers, lawmakers and courts need to understand each other in working toward the overriding objective of providing an adequate and safe food and feed supply for man and animals, while at the same time preserving the quality of the land. *HWH*

Set Research Priorities to Advance Social Goals

"Much of the current public research program pursues an industrial approach to agriculture, which is inimical to rural social well-being and environmental quality. These systems seek efficiency through reducing the role of people in agriculture, both quantitatively and quality, to make it possible for fewer people to farm the Nation's land and produce its food and fiber. . .

"Sustainable systems seek efficiency by enhancing the role of people in agriculture and making it possible to reduce capital expenditures and input use through more intensive application of skilled labor and hands-on management. Whereas industrial systems seek to reduce costs by replacing $2 worth of time with $1 worth of inputs, sustainable family farm systems seek to improve efficiency by replacing $2 worth of inputs with $1 worth of time."

Comments made by Chuck Hassebrook at the Harvey J. Schweitzer symposium.

The public must gain control of research to ensure that it is directed toward achieving broad social and environmental goals, according to the leader of the Stewardship, Technology and World Agriculture Program at the Center for Rural Affairs in Walthill, Neb.

Speaking at the spring Harvey J. Schweitzer symposium on sustainability in Champaign, Chuck Hassebrook said, "Agricultural research is a form of social planning.

"Choices made by Congress, research institutions and researchers about what research is undertaken in part determine what farming systems, varieties and technologies are developed, become cost effective and are put to use."

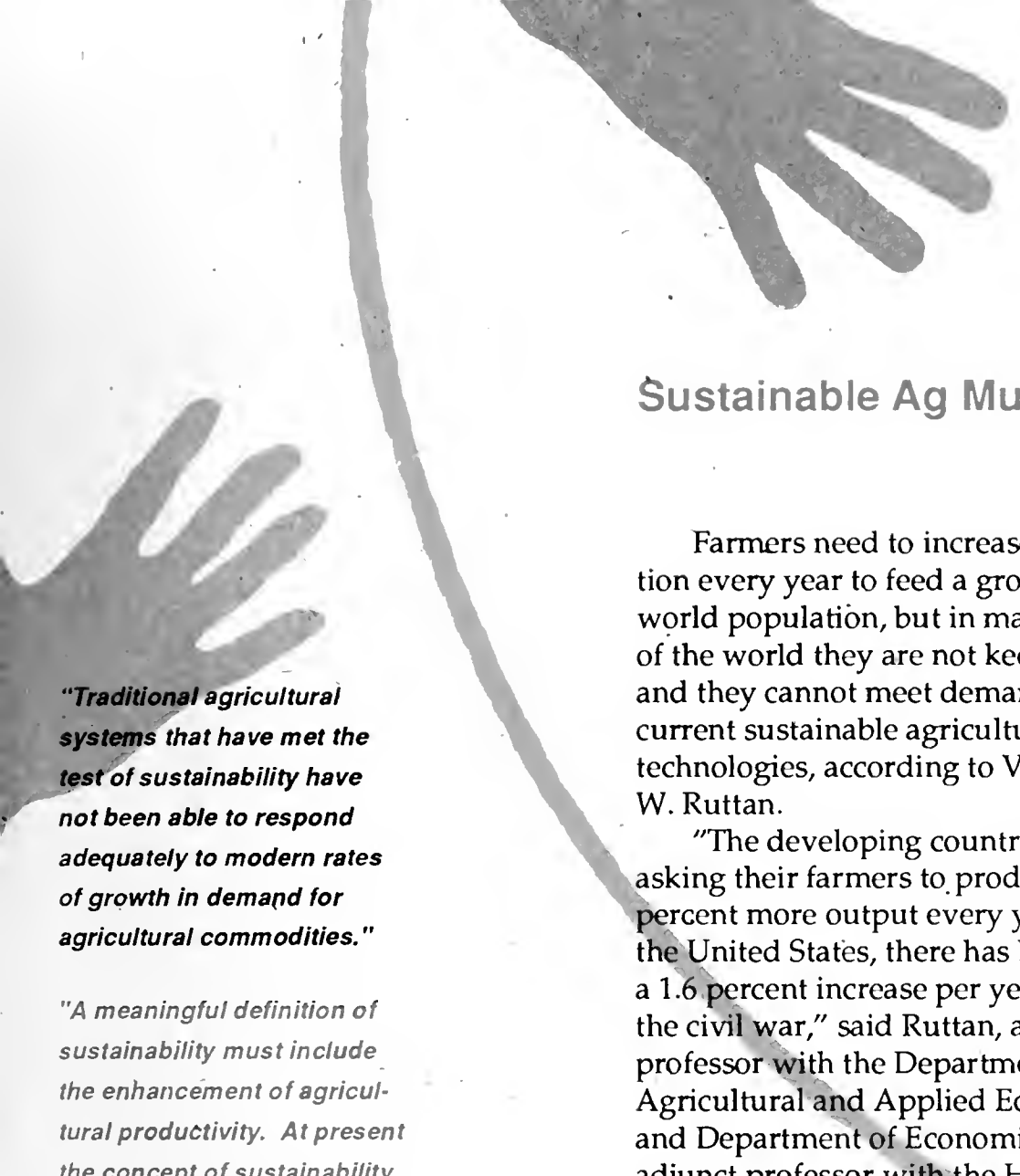
These choices affect agriculture, human health, farm resiliency and environment, he said, and are too important to be left to individual scientists and product development interests.

He suggested Congress take the lead by developing goals and purposes for public sector research and through funding, set an agenda that reflects social priorities. According to Hassebrook, new funds for agricultural research should include:

- Funds to the low-input sustainable agriculture research program (LISA).
- Funds for a strong agroecology research program.
- Funds for genetics research on problems which cannot be controlled by changes in farming practices.
- Funds for research on farming in an uncertain climate.
- Allocations for assessment of the social and environmental impacts of alternative research directions.
- Allocations for competitive grants for innovative Extension programs to reach small- and moderate-sized farmers, beginning farmers and minority farmers who might otherwise be left behind by rapidly changing technology.
- Competitive grant funds for innovative programs that get the public involved in debate over the future of the food and agricultural system and involved in setting agricultural research priorities.
- Development of new crops and new uses for crops and production systems suitable for growing them on small- and moderate-sized family farms.
- Development of new crops suitable to small- and moderate-scale processing techniques appropriate for farms and rural communities.
- A directive that calls for proposals and evaluation criteria which reflect social goals and purposes for agricultural research.

"If we want agricultural research to advance each of the goals set forth, I believe it can do so," he said, "but only if we take a fundamentally different approach to agriculture and technology.

"That approach is sustainable family farm agriculture—in many respects a more sophisticated and more knowledge- and management-intensive system than industrial systems." *TMP*



Sustainable Ag Must Feed a Growing Population

"Traditional agricultural systems that have met the test of sustainability have not been able to respond adequately to modern rates of growth in demand for agricultural commodities."

"A meaningful definition of sustainability must include the enhancement of agricultural productivity. At present the concept of sustainability is more adequate as a guide to research than to farming."

"If the concept of sustainability is to serve as a guide to practice, it must include the use of technology and practices that both sustain and enhance productivity."

"The research agenda on sustainable agriculture needs to define what is biologically feasible without being excessively limited by present economic constraints."

Comments made by Vernon W. Ruttan at the Harvey J. Schweitzer symposium.

Farmers need to increase production every year to feed a growing world population, but in many parts of the world they are not keeping up and they cannot meet demand with current sustainable agricultural technologies, according to Vernon W. Ruttan.

"The developing countries are asking their farmers to produce 3 to 6 percent more output every year. In the United States, there has been only a 1.6 percent increase per year since the civil war," said Ruttan, a regents professor with the Department of Agricultural and Applied Economics and Department of Economics and an adjunct professor with the Hubert H. Humphrey Institute of Public Affairs at the University of Minnesota.

"Farmers in developing countries, then, are being asked to do what western and European farmers have never had to do," he said.

Ruttan discussed problems of productivity and sustainable agriculture at the spring Harvey J. Schweitzer symposium on sustainability in Champaign.

He expressed concern for a lack of commitment to research for achieving productivity in sustainable agricultural systems.

"And I am also concerned that the sustainability movement is pressing for adoption of agricultural practices under the banner of sustainability before either the science has been done or the technology is available," he said.

Integrated crop-animal husbandry in Western Europe, traditional wet rice cultivation in East Asia and cultivation systems that used forest and bush fallow in Africa are examples of sustainable systems from history. But these systems were sustainable only while populations and demand remained low, he said.

While some sustainable agriculture advocates call for a back to basics approach to farming, the significant advances in productivity have resulted from a "remarkable fusion of science, technology and practice," Ruttan said.

That fusion is needed to develop technical knowledge for sustainable agricultural practices that meet productivity needs of the world population, he added.

For this reason, sustainability should be thought of as a guide to research rather than as an immediate guide to practice, he said. Research goals might include development of technology and practices that maintain and enhance the quality of land and water resources.

Other goals might be to make improvements in plants, animals and production practices that lead to substitution of biological technology for chemical technology.

"The sustainable agricultural movement must define its goals sufficiently broadly to meet the challenge of enhancing both productivity and sustainability in both the developed and developing world," Ruttan said. *TMP*

Agro-ecology Series Adds New Titles

The College of Agriculture's new series on agro-ecology and sustainable agriculture issues continues to grow. This series gives authors an opportunity to present their views on the economic, social and environmental impact of production agriculture. The papers are not subject to peer review.

These papers are available from the Agro-ecology Program, University of Illinois College of Agriculture, 211 Mumford Hall, 1301 W. Gregory Drive, Urbana, IL 61801. Advance payment of $2 per manuscript is required to cover handling and postage. Please request papers by number and title and make checks payable to the University of Illinois.

New titles are:

An Executive Summary of: Alternative Agriculture, by the National Research Council, Washington, D.C., 1989, with two reviews by Bruce Hannon and Emerson Nafziger ..... ***AE 90-7***

University of Illinois faculty members critique the report. Excerpts from the report are included.

Why America Needs a Commitment to Organic - Sustainable Agriculture: A Consumer's Perspective ..... ***AE 90-8***

Rosalie Ziomek, executive director of the Illinois Coalition for Safe Food, describes her concern about food safety.

Other titles in the Agro-ecology series are:

Illinois' Annual Billion Dollar Soil Erosion Problem: A Challenge for Research and Education ..... ***AE 90-1***

Agro-ecology, Innovation and the Cooperative Extension Service ..... ***AE 90-2***

Nutritional Recommendations Should Promote Sustainability ..... ***AE 90-3***

Agricultural Sustainability and the University of Illinois: An Introduction to Agro-ecology ..... ***AE 90-4***

New Student Conservation Attitudes and Beliefs: Implications for Curriculum Development in the U of I College of Agriculture ..... ***AE 90-5***

Sustainability: Agriculture and Society ..... ***AE 90-6***

Reflections on Sustainability continued from page 2

It is imperative, I believe, that our land-grant universities become aggressively involved in the environmental and ecological aspects of modern agricultural production. They need to be at the cutting edge of related research and education, maintaining research vigor and dedication to providing unbiased information to the public.

It is gratifying to see the response of the U of I College of Agriculture to this area of concern. The dedication of many faculty members, the sponsorship of seminars and symposia, development of a newsletter and press releases, new research on and off-campus, consideration of an agro-ecology curriculum, and off-campus education programs are very encouraging signs.

However, as we all know full well, our College can only progress in these and other efforts as it receives public support, not only in terms of encouragement and guidance, but also in funding for new programs for research and education. *HJS*

Share Your Views

The College of Agriculture's Sustainable Agriculture Program is interested in knowing what you think about a variety of issues related to agriculture and society.

Please circle a number from one *(strongly disagree)* to five *(strongly agree)* for each question and mail the clip-out portion of this page to:

agro-ecology Editors
University of Illinois
211 Mumford Hall
1301 West Gregory Drive
Urbana, IL 61801

A summary of responses will be given in a future issue of **agro-ecology.**

1. I am willing to spend more time and effort to learn about environmental matters.

strongly disagree	1	2	3	4	5	*strongly agree*

2. Given the opportunity, I would recycle 100 percent of my garbage.

1	2	3	4	5

3. I am willing to pay more for food produced in an ecologically sound manner.

1	2	3	4	5

4. I am willing to donate time to ecological restoration projects in my home community.

1	2	3	4	5

5. I am willing to reduce my standard of living for the sake of the environment.

1	2	3	4	5

6. I am willing to boycott food items produced in an ecologically unsound manner (beef produced at the sacrifice of rain forests, or tuna caught without regard for the safety of porpoises).

1	2	3	4	5

7. I am willing to become politically involved for the sake of the environment.

1	2	3	4	5

continued on page 10

Please clip and mail

Mark Your Calendars

1990 Sustainable Agriculture Field Tours

August 1
Mike Strohm Farm, West Union, Illinois

August 8
Shelby County, Illinois

August 9
Tom Hortin Farm, Albion, Illinois

For more information, call John Gerber at 217/244-4232.

National Sustainable Agriculture Conference

August 15-18

For information, contact the University of Nebraska Cooperative Extension Service at 402/472-2966.

Tour an Agricultural Research Farm this Summer

Research fields are near towns listed. For information, call Les Boone at 217/333-9452.

August 23
Brownstown Agronomy Research Center
Brownstown, Illinois

August 27
Illinois River Valley Sand Farm
Kilbourne, Illinois

August 28
Northwestern Illinois Agricultural Research and Demonstration Center
Monmouth, Illinois

August 29
Orr Agricultural Research and Demonstration Center
Perry, Illinois

September 12
Ewing Demonstration Field
Ewing, Illinois

September 13
U of I Agronomy Day
Champaign, Illinois

Survey continued from page 9

8. Maintaining a healthy environment should be given primary consideration when molding economic policy.

strongly disagree	1	2	3	4	5	*strongly agree*

9. At some point, national and global economics must abandon the dream of an ever-expanding economy and strive to reach a steady state that is consistent with the carrying capacity of the planet.

1	2	3	4	5

10. Nations have environmental responsibilities beyond their own borders.

1	2	3	4	5

11. Developed nations of the world should de-emphasize materialism.

1	2	3	4	5

12. The ultimate question humankind will have to answer is how many people and at what level of materialism the planet will be able to support.

1	2	3	4	5

13. Research and development for alternative energy sources should proceed as rapidly as possible.

1	2	3	4	5

14. What I do as an individual really isn't going to make that much difference.

1	2	3	4	5

Please clip and mail

University of Illinois at Urbana-Champaign
agro-ecology news and perspectives
College of Agriculture
211 Mumford Hall
1301 West Gregory Drive
Urbana, Illinois 61801

Volume 2, Number 4
Fall 1990

news and perspectives

agro-ecology

Science and Education for a Sustainable Agriculture

Raise Cattle, Not Crops On Fragile Soils — A.L. Neumann suggests beef production is one way to get a return from cropland after it is converted to pastures and hay meadows.

IRM Balances Production, Environmental Goals — Douglas F. Parrett reports that a growing number of farmers are adopting a holistic approach to cattle management.

Sustainable Farming Systems Can Integrate Animals — A guest editorial by Charles F. Parker, chairman of the Department of Animal Science at The Ohio State University.

Cattle Turn Pasture Grasses Into Steaks — Dan B. Faulkner examines cattle diets in terms of energy use.

Focus on Efficiency Sustains Industry — Sam Ridlin traces development of the poultry industry from colonial times when settlers kept small flocks.

Meat as Human Food: Sustainability May Be the Key — Robert J. Reber and David H. Baker weigh the positive and negative aspects of meat as a source of nutrients for humankind.

The editors invite letters from readers who wish to share their experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification. **agro-ecology** *reserves the right to reject any letter. Address letters to:*

agro-ecology *Editors*
University of Illinois
211 Mumford Hall
1301 West Gregory Drive
Urbana, IL 61801

agro-ecology is published bimonthly by the College of Agriculture, University of Illinois at Urbana-Champaign. This issue was edited by John M. Gerber and Tina M. Prow and designed by Nancy Loch.

This newsletter is printed on recycled paper.

✍ *Folke Dovring and Robert Herendeen's "Biomass: Sustainable Energy Crop of the Future" (* **agro-ecology***Vol. 2, No. 2) contained many constructive suggestions, however, there is much public confusion concerning the use of ethanol and methanol as renewable fuels. Methanol is poisonous — breathing the fumes or drinking it is detrimental to human health. Corrosiveness and lower energy content limit methanol use in internal combustion engines. Being cheap appears to be an advantage, but when health costs and ecological concerns are considered, methanol becomes more expensive.*

There are several promising solutions that will allow the use of biomass for energy. More effort must be directed to selecting a "regional fuel of choice." We should use natural gas, wood products, coal and grain where they are abundant.

Lyle G. Reeser
Global Energy Systems, Inc.
1605 Highview Road
East Peoria, IL 61611

✍ *It appears to be unfortunate that this publication has to date only reflected the political response to the issues at hand. As an Illinois taxpayer, I recognize the need to initially put in place certain committees and programs to address the issues, but I would expect, and hope to see soon, the beginning of definitions for solutions and some well-defined plans for implementation via some type of legislative action.*

The appearance of technical details for solutions, in lieu of political statements, is what I would like to see in this publication.

Thomas L. Keiser
17925 John Ave.
Country Club Hills, IL 60478

☞ ***Mark Your Calendars***

College of Agriculture Open House
Discover Our Diversity
March 1-2, 1991
For more information,
call 217/244-2285

✍ *In my life span I've observed many changes — from the horse and "bangboard" to the tractor — emergence of soybeans as a cash crop — the corn picker — hybrid seed corn — the combine harvester — the current heavy use of inorganic fertilizers and chemicals.*

Your efforts are helping me try to visualize the next agricultural "plateau." May those efforts culminate in a more biotic agriculture.

Dudley C. Smith
P.O. Box 1201
Tryon, NC 28782

✍ *I am concerned about the sluggish progress made so far in our country. Dean Gomes (W.R. "Reg" Gomes, dean, University of Illinois College of Agriculture) seems so consumer cost oriented, and other writers seem so dependent on the chemicals that we know are dangerous and obviously not all that cost effective. The general public responds to advertisements for "larger plants" and larger specimens, though the productivity isn't necessarily proportionate to plant size.*

I just wonder how much research is shared beyond our state or country. "Green politics" in Australia seem to have yielded more solid results (and questions) than Illinois has.

Lenore Neu
2071 Sapphire Lane
Aurora, IL 60506-1629

Diet Affects Soil, Environmental Conservation

- *Number of human beings who could be fed by the grain and soybeans eaten by U.S. livestock: 1,300,000,000*
- *Number of people who could be adequately fed by the grain saved if Americans reduced their intake of meat by 10 percent: 60,000,000*
- *User of more than half of all water used for all purposes in the United States: livestock production*
- *Quantity of water used in the production of the average cow is sufficient to: float a destroyer*

From ***Realities: 1989,*** *EarthSave, Santa Cruz, Calif.*

Q. If we didn't raise cattle, wouldn't we have a lot more land on which to grow food crops?

A. At least 85 percent of the nation's grazing land is not suitable for farming or growing cultivated crops.

Q. If we didn't feed grain to livestock, wouldn't we have more grain to feed to hungry people overseas and in this country?

A. Grain fed to livestock is feed grain, which is not generally suitable for human consumption.

Q. Doesn't beef production require a great deal of water?

A. Cattle's drinking water use ranges from 3 to 18 gallons per pound of retail beef, much less than the 2,500 gallons claimed by critics of meat and meat production.

From Kendal Frazier, National Cattlemen's Association, in "How To Respond To Myths About Cattle Production," ***Beef Business Bulletin,*** *Vol. 13, No. 28.*

Approximately one-third of the U.S. cropland, and more than half of the land used to grow grain crops, is used to produce corn, soybeans, sorghum and other animal feed grains. Tillage practices used to grow grains often expose the soil to the erosive forces of wind and water.

One-quarter of the U.S. cropland, and one-third of the cropland in the Corn Belt, is eroding at rates believed to be damaging to the long-term productive capacity of the soil. The annual cost of non-point source pollution from agriculture is estimated to be as high as $12 billion.

The extent and use of cultivated cropland is affected by the diet society chooses. Several writers have encouraged consumers to help alleviate the problems of soil erosion, environmental degradation and world hunger by changing the foods they consume.

Proponents of this idea argue that meat production uses much more energy and cultivated cropland per calorie and gram of protein produced than do food grains. Thus, by eating more grains and vegetable protein and less meat, people make fewer demands on the environment and food supply.

Health issues concerning fat and cholesterol also have discouraged people from eating meat, particularly beef. Beef consumption per capita is decreasing, while chicken consumption per capita is increasing. However, meat appears to remain a food staple, even though information and recipes for vegetarian cooking are widely available.

In these pages of **agro-ecology,** writers explore some of the health and environmental issues related to animal agriculture.

To my knowledge, the idea of soil and environmental conservation through reduced meat consumption has barely been addressed in academic literature.

Think about the following questions as you read this issue of **agro-ecology:**

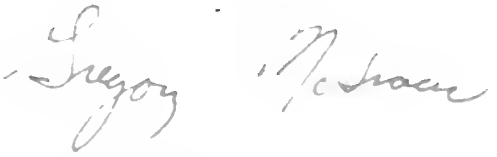
What effect would reduced meat consumption have on cropland use, soil erosion, non-point pollution, farm income and rural communities?

With reduced domestic demand for feed grains, to what extent would farmers till fewer acres or increase exports?

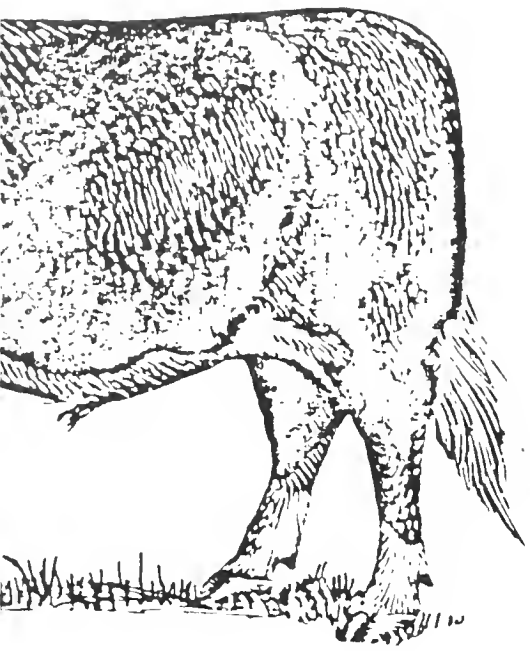
If fewer acres are tilled, which acres would likely go out of production? What would be appropriate alternative uses for the land?

If there are social, environmental and conservation benefits from reduced meat consumption, then to what extent should environmental, conservation and social service agencies promote or provide information on reduced meat diets?

To what extent could meat consumption be reduced by increased consumer awareness and confidence in vegetarian alternatives?



Gregory McIsaac
Department of Agricultural Engineering



The fear that shifting to forage crops, and hence beef production, will reduce the demand for corn appears to be unfounded. For the foreseeable future, most consumers will continue to prefer beef from finished or fed cattle grading at least low-choice.That will still require 25 to 50 bushels of corn per head.

A.L. Neumann

Concern for . . . the endangered habitat of the human race, will increasingly have to be built into economic policy . . . and will transcend national boundaries.

Peter Drucker in ***The New Realities****, 1989.*

A.L. Neumann, Professor Emeritus
Department of Animal Sciences

Raise Cattle, Not Crops on Fragile Soils

As acceptance of concepts promoted by "sustainable agriculture" advocates increases, a somewhat different combination of crops will be grown in the Corn Belt. Instead of the typical corn to soybean rotation now used, fields subject to excessive erosion because of slope or soil type will likely be seeded to combinations of grasses and legumes.

This raises the question of how to use the resulting pastures and hay meadows at a profit. Lowered costs for fertilizers, herbicides and other inputs should offset some of the lowered returns from these displaced cash crop fields — and herein lie the challenges.

Ruminant animals that graze these forage crops provide one answer. As to whether the animals should be beef or dairy cattle, or sheep or exotic game species, is debatable, but beef cattle will surely be one of the favorite choices. Several beef production programs are well-suited to the Corn Belt.

The cow-calf program, which has a goal of producing a weaned calf by each cow every year, will be popular and the best choice in most instances. It requires the best management, but the least cash and labor inputs. Also, it carries the least financial risk.

The goal of a 600-pound weaned calf at 8 months of age is obtainable, but crossbred mother cows with high and persistent milk yield are necessary. Mature cows should be medium-size for reduced feed requirements. Each sire, of a third breed, should have proven growth rate combined with low birth weight. Such breed combinations are available, and more will be developed through ongoing research.

Net income of a cow-calf program can be maximized with a rotational grazing management system. For best results, use legumes such as alfalfa or clovers combined with cool-season grasses in some fields and warm-season grasses in other fields. This pasture management strategy should extend the grazing season in spring and fall.

Also, grazing cash crop residues in the fall can considerably shorten the winter feeding period of dry cows and reduce the need for costly harvested forages. Minimum tillage, especially elimination of traditional fall plowing of corn and soybean fields, can further reduce input costs.

In most years, selling the calves directly off the cows is more profitable than feeding them. Feeding often increases weaning weight, but usually does not pay, especially if cows milk well and long. Holding the calves over for summer grazing generally means wintering them on harvested feed, which lowers the per-pound sale price for the resulting yearlings.

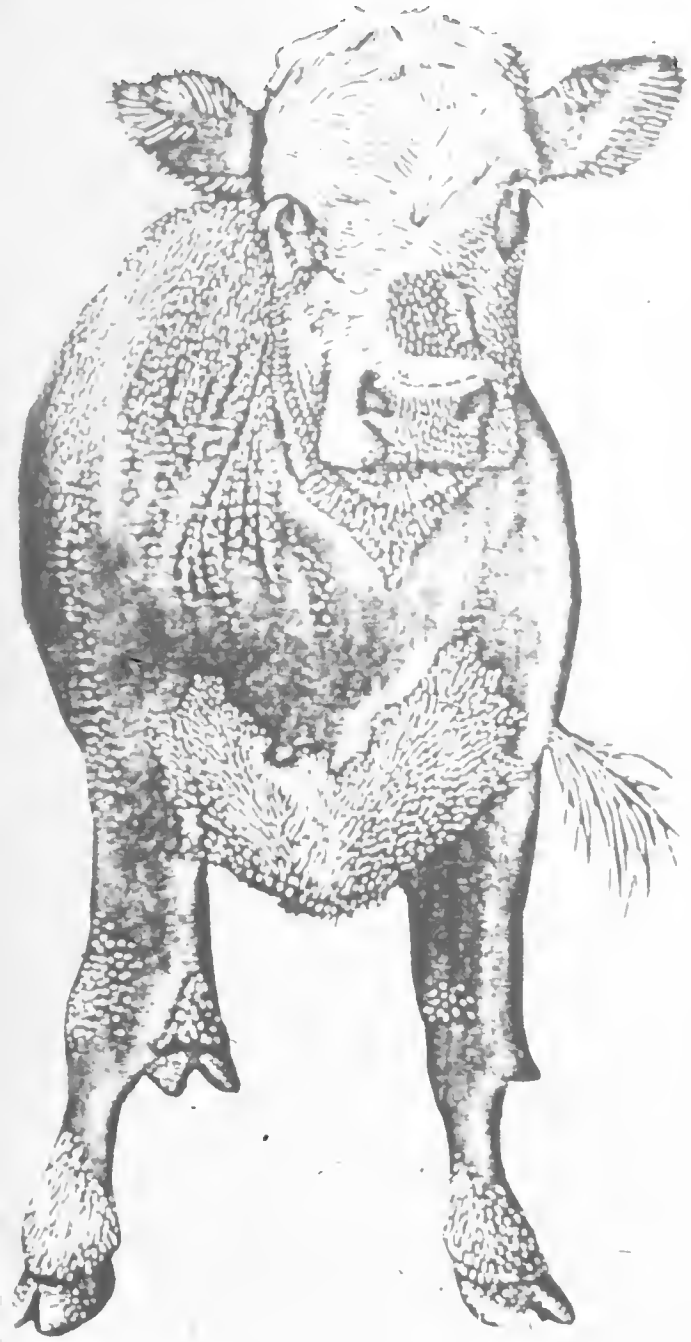
Enlarging the cow herd — to use the extra pasture and increase the size of the enterprise — seems a better plan. In some years, retaining ownership and feeding the calves out at home or in a custom-feeding lot yields an advantage. It is advisable to use a computerized program to conduct a feasibility evaluation.
ALN

Douglas F. Parrett, Associate Professor, Extension Beef Specialist
Department of Animal Sciences

IRM Balances Production, Environmental Goals

The abundance of immediately consumable, obviously desirable or utterly essential resources has been sufficient until now to allow us to carry on despite our ignorance.

R. Buckminster Fuller in ***Operating Manual for Spaceship Earth****, 1963.*



The beef cattle industry is a mature agricultural industry. Consumption levels of beef are fairly constant and most beef producers maintain beef cow-calf operations as a secondary farm enterprise to use forages grown on erodible or low-fertility soils.

According to the National Cattlemen's Association Task Force Report on Beef in a Competitive World: "Industry structure will be shaped by individual decisions in response to economic forces in the free enterprise system. Low-cost producers will survive in this system of competitive marketing; others will eventually be unable to compete and will exit the business."

To reduce costs, many producers are adopting an Integrated Resource Management (IRM) approach for operating their beef enterprise. IRM offers a holistic management approach which encompasses nutritional, reproductive, environmental, marketing, genetic selection, financial planning and other subject matter areas. A producer and a team of experts work to identify interrelationships in the beef production chain with a goal to reduce production cost.

More specifically, a beef producer's IRM goal is not to raise more pounds of beef, rather it is to lower the production cost in order to market the beef product at a more competitive level.

This interdisciplinary approach enhances a producer's ability to identify cost factors in a production enterprise. The cost and benefits of all inputs to the farm should be analyzed and the trade-offs measured. For example, an increase in growth rates in cattle means more pounds of beef to sell, but larger cows require greater feed resources to stay reproductively sound.

Another example would be that harvesting hay from pastures results in greater feed yield per acre, but the equipment and harvesting costs may be much greater than the value of the extra feed harvested. A producer using the IRM approach tries to determine optimum levels of inputs as compared to benefits (income) derived.

Equally important to cost reduction are the environmental benefits to the IRM approach. By analyzing production from a broad perspective, producers learn to balance production goals with beneficial environmental practices. This generally results in improved soil fertility, reduced soil erosion and improved water quality.

Illinois and many other states are adopting IRM programs. The National Cattlemen's Association is working with the Cooperative Extension Service in these states to help identify and verify beef production practices that will keep beef producers competitive for years to come.
DFP

Charles F. Parker, Chairman
Department of Animal Science at The Ohio State University

Guest Editorial

Sustainable Farming Systems Can Integrate Animals

Plant and animal resource integration to maximize output efficiency within a given ecological and socio-economic setting should be the ultimate goal for developing a complete farming system.

Charles F. Parker

Exploiting the ability of animals to use noncompetitive and renewable resources for the production of quality food and fiber remains of paramount importance to human prosperity throughout the world. Animal manure is more commonly thought of when the subject of sustainable agriculture comes up than is the animal itself. Such cursory recognition of the role of animals in sustainable agriculture deserves a more prudent evaluation.

Enterprise integration and selection of production practices congruent with optimum use of resources is a complex function. Sustainable aspects of whole farming systems focus on profitability, the resource input and output ratio and preservation of environmental integrity.

Consideration of the source of energy and its flow through the farming system is fundamental for achieving maximum use of renewable resources. A greater reliance on the solar energy system will be required to reduce dependence on external and non-renewable inputs.

Plant and animal resource integration to maximize output efficiency within a given ecological and socio-economic setting should be the ultimate goal for developing a complete farming system. The integration of diverse biological entities generally creates complex interactions that yield positive complementarity and synergistic responses. These favorable interrelationships contribute to greater economic and ecological stability and therefore become an important aspect of integrated agriculture systems.

An example of improved economic viability through enterprise diversification with animals is the price buffer or value-added effect livestock provide to corn crop production. At present, 50 percent of the U.S. corn crop is marketed through high-value livestock products.

One of the most important biological relationships in the world is that between herbivores and forages. Solar energy derived ligno-cellulosic material (such as pasture plants, forages and crop residues) assimilated by animals into products for human use generates approximately 30 percent of the total economic value created by U.S. agriculture. Because ligno-cellulosic material is the most abundant renewable source of nutrients, it seems appropriate that integrated animal and plant farming systems should be well-adopted for many ecosystems.

Animals are positioned higher in the biological order or pyramid and directly rely on plant nutrients derived from solar energy and soil. Plants, therefore, function as the primary component of an integrated animal and plant system. Animals are opportunistic, yet highly synergistic, in their role to assimilate food, recycle nutrients and enhance the environment for improved plant production.

An important animal variable is the variation in nutrient requirements among animal species and classes within species. Matching nutrient availability of plants with animal nutrient needs results in production sub-systems that range from extensively managed animals fed near

maintenance for fiber production to higher input-intensive management for meat and milk production from rapid-growing and lactating animals.

Multispecies grazing of livestock, including wildlife for certain diverse agroecosystems, has improved yield of animal products by as much as 90 percent. The concept of multiple animal cropping offers an opportunity to intensively exploit animal variation to more efficiently use feedstuffs that vary according to location, kind, quality and quantity.

Seasonality of forage production is a major effect and important influence on choice of methods for harvesting and using forages throughout the year in an animal and forage production system. Seasonal grazing of market animal groups, such as stocker animals, and sequential intensively controlled grazing of animals with varying nutritional requirements are examples of multiple-animal cropping groups.

One of the major technological advances in animal and forage farming during the past 20 years has been the development of electric fencing technology. Controlled grazing is now feasible through the economical and labor-saving aspects of electrified fences. This grazing method has multiple uses as a low-input practice for controlling weeds and noxious plants, biological seeding, silviculture and renovating and restoring marginal land areas.

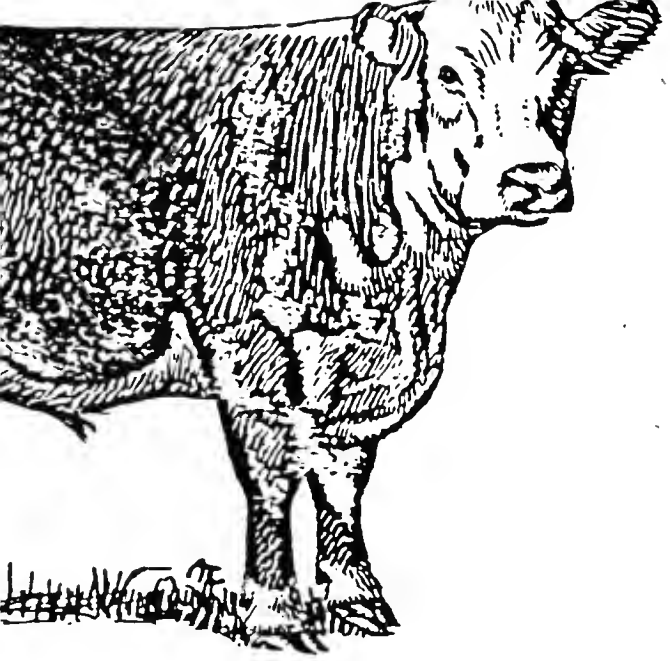
Solar energizers are commonly used in electric fencing systems. This method of fencing also has reduced animal losses due to predation, especially among small ruminants.

An increase in integration of plant and animal cropping systems seems likely. The value of nitrogen-fixing leguminous forages in crop rotation systems is well-recognized as an important agronomic practice for reducing supplementation of crops with high nitrogen requirements.

Redirected land use and renewed cropping systems to conserve the resource base and stabilize production capacity is expected to increase the availability of higher quality forages, especially legumes. These anticipated agronomic changes should enhance the overall importance of the animal enterprise in sustainable farming systems.

Animal utilization of crop residues, low-quality cereal grains and by-product materials is an important aspect of mixed crop and livestock systems. Crop residues provide a major source of feedstuffs for ruminants and create additional potential for livestock production in areas where grain production is a primary enterprise.

Animals should be recognized along with the sun, soil, water and plants as a major natural resource that can lengthen the food chain for human sustenance. Many whole sustainable farming systems are biologically and economically dependent upon the integration of an animal enterprise. *CFP*



The beef cattle industry uses such feeds as pastures, crop residues, byproducts and damaged grains. These feeds are not suitable for human consumption, but cattle convert them into a product that is — beef. If economics and consumer preferences change, cattle could be produced totally on non-competitive feeds.

Dan B. Faulkner

Dan B. Faulkner, Associate Professor, Extension Beef Specialist
Department of Animal Sciences

Cattle Turn Pasture Grasses Into Steaks

There is considerable debate about the energy cost of beef cattle production systems. Often overlooked, but key to any discussion of energy cost for animal protein, is the fact that much of the energy used in beef production is non-competitive, or not likely to be used directly by humans.

In a typical beef production system, more than 75 percent of the energy used comes from ligno-cellulosic feeds such as pastures, forages and crop residues. These feeds are renewable resources, deriving their energy from the sun, and can be used only minimally by humans.

It is true that ligno-cellulosic feeds can require energy for nitrogen fertilization, but legumes can be used to supply nitrogen to other plants and reduce the need for nitrogen fertilizer. Harvesting of ligno-cellulosic feeds can also be a major energy cost. This cost can be greatly reduced by allowing cattle to graze forage or crop residue. A benefit of grazing is that nutrients are recycled back to the soil through manure.

When considering energy requirements for beef cattle, it is important to recognize that a typical beef production system uses less than 25 percent grains and other nonligno-cellulosic feeds. And much of that feed comes from byproducts of various industries.

For example, many cattle in the Northwest are finished on waste from potato processing plants. In California, many cattle are finished on vegetable waste and cull vegetables.

In Illinois, beef cattle feed may include such byproducts as brewers grains, distillers grains, distillers solubles, corn gluten feed, soybean hulls, vegetables, seeds, spent tea leaves and other processing wastes. Cattle producers also make use of dog food, candy, cookies, chips and other products that do not meet industry specifications.

Even much of the grain used in beef production is not intended for human consumption or export. This includes grain screenings, sprouted grain, damaged grain and wet grain from sunken barges.

The cattle industry is responsive to grain prices and consumer preferences. Already, consumer demand for lean beef has reduced the amount of time cattle spend on a finishing diet.

If grain prices rise dramatically and consumer preference for finished beef changes, forage-fed cattle could be slaughtered to produce beef. This is the way beef is produced in much of the world and the way it was produced in the United States at one time. This system would require almost no energy that could be directly used by humans.

While beef cattle production is not practical on every farm, there is potential for more cattle production in Illinois.

Many farms have land that is not suitable for row crop production. Also, about 1 million acres farmed today must eventually go into permanent sod and 9 million acres must go into a sod rotation. Beef cattle could convert the ligno-cellulosic feeds produced on these lands into food for human consumption. *DBF*

Sam Ridlin, Professor Emeritus, Poultry Extension Specialist
Department of Animal Sciences

Focus on Efficiency Sustains Industry

At this time, there appears to be little likelihood that modern poultry units with their integrated linkages and efficiencies will be dissolved.

Sam Ridlin

Some of the toughest problems we face are those created by the successes of the past . . . . Some of the greatest impediments to effectiveness are the slogans, the commitments, the issues of yesterday . . . .

Peter Drucker in ***The New Realities,*** *1989.*

America's poultry industry began with the coming of the colonists, many of whom kept a few chickens. As settlers spread across the land, small flocks of chickens could be found on most farms and in many villages and towns. Those early flocks provided quite small, though important, contributions to the people's food fare.

Limited gains in productivity of chickens were made until the late 1800s, when academic institutions began teaching poultry courses and conducting research on poultry. Those early instructional and investigatory efforts centered on small farm flocks, for those flocks made up the poultry industry until the late 1940s.

Up to that time, most flocks were improperly fed and housed. Flock health care also was seriously inadequate.

Following World War II, however, the industry began to change. Universities greatly accelerated research, teaching and Extension activities in poultry. The stepped-up efforts of scientists and extensive inputs by commercial firms quickly propelled the poultry industry to a high level of efficiency.

Technological advances led to balanced feeds designed for different phases and kinds of production.

Breakthroughs in environmentally controlled housing enabled producers to concentrate chickens in greater numbers, significantly reduced housing costs. The new housing protected poultry from weather extremes and predators. Under optimum environmental temperatures and air movement, poultry made highly efficient use of specialized feeds. Importantly, controlled conditions and improved profits from poultry made flock health care practical.

Present-day large confinement poultry units are not without problems and challenges. They require substantial financial investments, skilled management, constant monitoring, effective fly and odor control, large-volume manure disposal and sound marketing.

Changing to a different system of production, however, will likely result in significantly higher costs to consumers and could potentially lower the quality of poultry products. Some estimates indicate that free-range systems can increase the cost of poultry products to consumers as much as 100 to 150 percent. Those estimates might be on the low side when reductions or losses of production efficiencies and marketing are taken into account.

All things considered, the modern poultry industry is an incredible success story. It has effectively offset increasing costs of feed, labor, transportation and other inputs by operating on economies of scale, increasing production and responding to research advancements that improved feed-to-yield ratio and other economic measurements.

Consumers are the real benefactors. Through today's poultry industry, they have a plentiful, relatively cheap supply of high quality poultry meat and eggs. *SR*

John M. Gerber, Professor
Coordinator, Agro-ecology Program

Universities Must Address Societal Needs

Universities have an obligation to serve society by making the contributions they are uniquely able to provide.

A few rough guidelines can also help to prevent an institution from encumbering itself with programs and projects of doubtful merit. To begin with, research universities should avoid undertaking tasks that other organizations can discharge equally well.

A second guideline in considering new ventures is that every additional program should enhance the institution's teaching and research activities.

A third, and closely related, principle is that new projects should not normally be approved unless they can first be shown to command the enthusiasm and active support of existing members of the faculty.

Dr. Derek Bok, president of Harvard University, in ***Beyond the Ivory Tower; Social Responsibilities of the Modern University.***

In a "Know Your University" speech given a little over a year ago, University of Illinois Board of Trustees President Charles Wolff said that some members of the legislature and public want "greater accountability" from higher education.

They use accountability in two ways, he said. "One sense is negative; it is a criticism. The call for accountability claims that the public university has somehow gone into business for itself: 'It is insulated. . . remote. . . out of touch. It marches only to its own drummer. It speaks its own language: a combination of academic jargon and bureaucratic gobbledygook. Its only link to the outer world is a one-way street. . . that brings our tax dollars through the campus gate.'

"The other sense is positive. It is a mixture of challenge and affirmation. In this sense, the call for accountability addresses the public university as a remarkable resource: 'You have so much talent, so much energy, so much to offer. We want to work with you. So help us to get a better sense of how you can help to define the public interest. Help us by showing how you are pursuing the public interest. . . how you are raising the level of public trust in state government.'"

About a month before Wolff made those remarks, the U of I College of Agriculture launched the Agro-ecology Program. Within the U of I academic community, this fledgling program was received with enthusiasm by some, antagonism by others and ambivalence by many.

Nevertheless, it strikes me that our initiative to improve communication and dialogue on the environmental and social impact of production agriculture is an appropriate response to President Wolff's call for more emphasis on programs which benefit the public in Illinois.

As we confront social issues and plan new programs to deal with our societal responsibilities, we must consider whether the form of service we propose is appropriate for a public university to provide.

It is my belief that the U of I Agro-ecology Program can provide a framework within which the College of Agriculture can address the needs of society, while employing the tools of scholarly research and teaching for which we are best equipped.

Continued activity of the program, however, will depend largely on the personal commitment of individual members of the faculty, students and staff. *JMG*

Robert J. Reber, Associate Professor, Nutrition Extension
School of Human Resources and Family Studies
David H. Baker, Professor of Nutrition, Department of Animal Sciences
Division of Nutritional Sciences

Meat as Human Food: Sustainability May Be the Key

There are no perfect foods. Meat is no exception. It has both positive and negative nutritional attributes. While its shortcomings (total fat, saturated fat, cholesterol content) have received much recent attention, its nutritional advantages should not be forgotten. The nutritional value that meat and meat products can contribute as a part of a varied, diverse diet can be substantial.

Two key points must be considered when evaluating the nutritional worth of a food. Obviously, the nutrient content is important. Additionally, the bioavailability of those nutrients is key. That is, how well the nutrients are digested, absorbed and used by the body is paramount. Meat scores high on both counts.

Meat products from beef, pork, lamb, poultry and fish are important contributors to satisfying daily nutrient requirements of the human population. Meat consumption in the United States furnishes from 35 to 50 percent of daily needs for protein, iron, zinc, niacin, vitamin B_6 and vitamin B_{12}.

In addition, meat products are the only food sources of taurine, carnosine and carnitine. While these three compounds are important metabolically, whether ***dietary*** requirements exist for them is a subject of much debate. Nonetheless, many infant formulae are now being fortified with taurine and carnitine so as to augment the supply of these compounds provided by biosynthesis in the body.

The protein supplied by meat is highly digestible (over 95 percent) and its content of amino acids is in a pattern close to that needed by humans for effective growth, reproduction and lactation.

Meat products are particularly rich in the amino acid, lysine. This is important because lysine is limiting in most plant sources of protein. Legume and cereal proteins tend to be low in both lysine and methionine. Meat, therefore, not only is high in protein quality itself, but when combined with cereal and legume foods, the high lysine and methionine content of meat serves to improve the quality of the mixed protein.

An increasing body of evidence is accumulating to show that meat products are important, perhaps even critically important, sources of iron and zinc. Moreover, the iron and zinc in meat are highly available in a form that can be absorbed from the intestinal tract into the body proper.

Most of the iron in meat is present in the form of heme iron, which is more easily assimilated by humans than the nonheme iron found in plant-source foods. Plant-source foods contain a compound known as phytate, and this compound binds trace elements such as iron and zinc in the intestinal tract, thereby reducing their absorption into the body.

Bioavailability studies conducted with laboratory animals, and also humans, have confirmed that the iron and zinc present in meat are absorbed from the bowel as well as or better than the most highly available inorganic salts of iron (iron sulfate) or zinc (zinc sulfate). With plant-source foods, iron and zinc absorption efficiency is two- to four-fold less than is the case for meat.

Iron and zinc are frequently consumed in inadequate quantity by humans, particularly by those who eat meat only infrequently. Sound evidence has been produced showing that the elderly absorb zinc much less efficiently than younger individuals. In addition, a zinc deficiency problem has been linked to skin disorders and loss of taste perception in the elderly population.

Even though the nutritional pluses of meat and meat products are many, the negative aspects must be addressed. Meat and meat products can be potentially high in total fat, saturated fat and cholesterol. And many citizens of the developed world may need to limit their intake (of meat products) to reduce the risk of chronic diseases such as heart disease and cancer.

However, we must remember that meat is a highly modifiable food.

Through various breeding, feeding and fabricating strategies, meat and meat products can be modified to alter their overall fat, fatty acid and cholesterol content as suggested by the National Research Council's Committee on Technological Options to Improve the Nutritional Attributes of Animal Products.

For example, feeding livestock the highly desirable omega-3 fatty acids increases their content in the animals' fat. Also, growth modifiers and selective breeding strategies will

continued on back

Meat as Human Food *(continued from page 9)*

continue to lower the fat content of meats. Nonetheless, the cholesterol problem will not go away by reducing the fat content of meats. There is more cholesterol in the lean than in the fat portion of meat cuts. Still, great potential exists for modifying meat and meat products to better supply human nutritional needs.

Many of the strategies suggested to improve meat nutritionally are in concert with the strategies to improve the sustainability of agricultural production.

For example, the leaner, grass-fed beef are, for the most part, harvesting contemporary energy — sunlight — with less calories of fossil fuel invested per calorie of beef produced. In contrast, feedlot, grain-fattened beef are more dependent on fossil fuels.

Of course, where and how those cattle are grazed and what impacts they have on the agroecosystem must be considered. Obviously there are both environmentally sound and destructive ways to graze beef.

Meat is a viable source of nutrients for humankind. The long-term future of meat as human food may depend on how well animals can be integrated into sustainable agroecosystems. Such integration will be limited only by our imagination and ingenuity. *RJR/DHB*

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agro-ecology

Science and Education for a Sustainable Agriculture

"Organic" Challenges The Way We Think — John Masiunas opens this issue by exploring some of the reasons he is interested in organic farming ideas and principles.

"Vote With the Dollar" To Support Organic Ag — Rosalie Ziomek urges consumers to use their buying power to help bring about change.

Certification Protects Farmers, Consumers — K. Casey Drury examines the benefits and requirements of certification programs to ensure that produce labeled "organic" is produced organically.

It's a Matter of Opinion . . . — Farmers write about why they've chosen to farm organically and why consumers buy organic products.

Farmer Shuns Pesticides, Farms Organically — Gary McDonald explains why pesticides have no place on his farm.

Work Toward Organic Bill Builds Coalition — Kate Duesterberg gives a behind-the-scenes account of work on the two failed organic labeling bills.

University of Illinois at Urbana-Champaign
College of Agriculture

The editors invite letters from readers who wish to share experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification.

agro-ecology reserves the right to reject any letter. Address letters to:
agro-ecology Editors
University of Illinois
211 Mumford Hall
1301 W. Gregory Drive
Urbana, IL 61801

Your Fall 1990 newsletter was a considerable disappointment. Rather than truly addressing the agroecological implications of a meat-based diet (and thus agricultural system), it was a shabby defense of the status quo. I do believe that animals are an integral part of a sustainable agriculture system, but this newsletter failed to make that case very convincingly.

On the environmental side, there was no honest analysis of all the environmental impacts of a meat-based agriculture: manure and methane in the environment; the amount of energy consumed to raise grain fed to livestock; and the pounds of protein fed to livestock to get one pound of meat protein.

The essays glossed over other important issues. This was especially true in your failure to examine the socioeconomic implications of livestock production and the direction it is going in the United States.

Nothing about the fact that the beef and hog packing industry is concentrated in the hands of three companies; that this trend is undercutting small farmers' ability to compete; that more cattle are being raised on huge (and environmentally disastrous) feedlots; and that as the packing industry gets more concentrated, the more hostile they become toward labor unions and decent wages and working conditions for packing plant workers.

Nothing about the abuses suffered by growers working under contract to the three huge poultry growers who dominate the industry; nothing about the increased incidence of salmonella from increased resistance by such bacteria to antibiotics after decades of subtherapeutic antibiotics fed to chickens (necessary for them to survive in chicken factories); nothing about the loss of an important income generator and diversifier for farm families.

I found this support for livestock and animal agriculture interesting and quite ironic, coming from the University of Illinois. There you are in a state that's basically given up on livestock production and all the advantages you tout for the environment and farmers. Instead, Illinois has put its farming eggs in the basket of highly erosive, chemically dependent cash grain agriculture. I have no idea what the numbers are, but my guess is that fewer than one in 10 Illinois farmers have livestock. Most of them are raising cheap grains to ship west to feed livestock in feedlots, where the big grain and packing companies are capturing the value of running grain through animals. It seems highly unlikely that the Illinois farmers are willing to give up their corn bases and turn that acreage into forage or hay ground for livestock.

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"Organic" Challenges the Way We Think

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.

Aldo Leopold in ***A Sand County Almanac and Sketches Here and There****, 1949.*

Get down to the farm and see what's going on. We need some of you guys with research backgrounds to see what we're doing and assess the results.

We need research results now, not five or six years from now.

Researchers need to look at the system as a whole, not only at individual components, but as a whole — that's how we farm.

Comments from Terry Holsapple, an organic grain and vegetable farmer from Cumberland County, at a December Agro-Ecology seminar, Research and Educational Needs of the Illinois Organic Foods Industry. Holsapple served on a panel along with Kate Duesterberg, Illinois Stewardship Alliance; Julie Elder, produce manager for Jerry's IGA, Urbana; Roy Petersen, organic grain and vegetable farmer, McLean County; and Kathlene Vinehout, organic poultry producer, Sangamon County.

I had mixed feelings when asked to write an introduction for this issue of **agro-ecology**. Organic farming invokes strong emotions and challenges many commonly held assumptions.

As a faculty member of the Department of Horticulture, I'm interested in how pests, particularly weeds, are managed in vegetable cropping systems. But organic farming challenges much of what I was taught at universities, including the critical need for pesticides in vegetable production.

Unlike my own research, organic farming focuses on agricultural systems based on nature with a living soil, and everything in the system is balanced and mutually reinforcing.

My interest in organic agriculture also has a personal side. I remember Art Knuttel and Larry Riddel, both farmers and dear friends, who died of cancer. I can't help but wonder if their cancers were tied in some way to exposure to farm chemicals. This seems to be a concern of many farmers today.

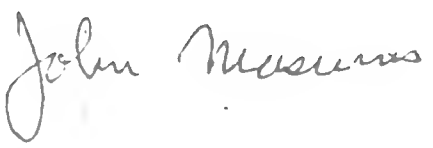
I also wonder about the future of agriculture. Must future generations rely on intensive use of agricultural chemicals in a never-ending battle with nature? Are pesticides vaccines, a necessary part of a healthy agriculture, or are they opiates, drugs to which our present agricultural systems are hopelessly addicted? I don't have the answers, but we must face these questions if we are to shape a sustainable society for our children and grandchildren.

Organic farming is much more than pesticide-free agriculture. It predates post-World War II synthetic chemical based agriculture. Organic farming emphasizes the importance of nature in agricultural systems. It is humus farming with its cycle of carbon and nutrients, its reliance on beneficial soil organisms and soil health.

Organic agriculture defines farming as living systems — at its best, it is Aldo Leopold's land ethic in practice.

This issue of **agro-ecology** presents many perspectives on organic agriculture. Organic farmers have a deep love of agriculture and the land, their rural communities and their families. Rosalie Ziomek and K. Casey Drury value organic products and are willing to pay a premium for them. Kate Duesterberg strives to provide rural communities and farmers with options.

Their beliefs may differ from your own, but they describe the respect and consideration for the environment that we must all have as we shape the future of agriculture.



John Masiunas
Assistant Professor of Horticulture

Rosalie Ziomek, Illinois Consumers for Safe Food

"Vote With the Dollar" to Support Organic Ag

(Organic agriculture) is both a philosophy and a method of farming. Its philosophy is first and fundamentally holistic. It sees all life, all creation as being inextricably interrelated, such that something done or not done to one member, part or facet will have an effect on everything else.

Margaret C. Merrill in ***Eco-Agriculture: A Review of Its History and Philosophy****, Biol. Agric. and Hort., 1983, Vol. 1, 181-210.*

Science in agriculture is good when the approach of the scientific specialists to the subject is controlled by an ecologist, or by an ecological point of view; when it is biological rather than mechanical; when the scientist's respect for husbandry is profound; his education humane and philosophical; his methods controlled by empirical trials.

E. Hyams in ***Soil and Civilization****, 1976.*

Illinois Consumers for Safe Food is a group of consumers, mostly housewives and mothers, who became concerned about pesticides in our food when the Alar scare occurred in March of 1989.

We felt betrayed by a regulatory system that would allow a suspected cancer-causing chemical to remain on the market for years while we trustingly fed our babies apple products.

In the past year or so, we have been hearing more and more about "the green consumer." What this means is that consumers are beginning to see that we have contributed to the slow destruction of the environment by demanding and buying products that are attractive or tasty or convenient, but which in some way are harmful to the earth.

Consumers have encouraged the use of pesticides in food by insisting on having all kinds of produce available during the year. Housewives in every area of the country now expect to buy, for example, tomatoes in January.

We do so in spite of the fact that the very taste and texture have been bred out so that the tomatoes may be shipped long distances.

We do so in spite of the fact that many summer fruits must be imported from foreign countries that may use banned and other unregistered chemicals.

We are learning that by eating locally available, in-season, organically-grown produce, we will be less dependent on imported fruits and vegetables that may be treated with unregistered chemicals.

Another way that consumers have encouraged the use of pesticides in food is by demanding produce that looks perfect. We have learned that there are a host of post-harvest fungicides and waxes that are used to keep our produce cosmetically attractive. We are beginning to see that the price paid for this "perfection" may be cancer, neurotoxic disorders and birth defects.

We started out being protective of ourselves and our children. But, we have learned that the price to be paid for consumer demand for year-round availability and perfect produce is not just paid by us as individuals. It is also paid by farmers and farm workers who are routinely exposed to pesticides.

It is paid by the earth itself through the loss of fertile soil and the contamination of water from pesticide residues.

Identifying the contribution that consumers have made to the pesticide problem is the first step. The next step is to see how we can contribute to the solution.

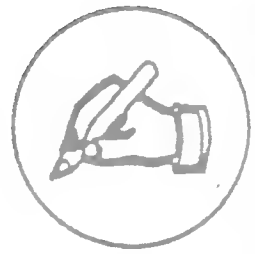
The most direct and effective way to help bring about change is to "vote with the dollar" by simply buying organic food whenever it is available. We tell our members: "If you don't see it, ask for it. If you see it, buy it."

Consumers must also change expectations about year-round availability and cosmetic perfection in the produce aisles of the grocery store.

In these small ways, the consumer can help to decrease the amount of harmful pesticides in the family, in the farmer and in the earth. *RZ*

K. Casey Drury, Graduate Student, Department of Horticulture

Certification Protects Farmers, Consumers



Organic food production systems are based on farm management practices that: replenish and maintain soil fertility by providing optimal conditions for soil biological activity; and reduce the use of off-farm inputs, environmental and health hazards associated with agricultural chemicals, and reliance on non-renewable resources.

*From "What is Organic?" **Organic Farmer**, Winter 1990.*

The American public is expressing growing concern over agricultural chemicals in water and pesticide residues on food. Legislators have responded by restricting the use of many agricultural chemicals and by proposing to limit the use of others, as in the "Big Green" initiative in California.

Organic farmers are committed to ecologically sound production practices; they value renewable resources, soil organic matter and biological control of pests. If environmentally concerned consumers value a reduction in the use of agricultural chemicals, they must support those farmers working to improve the quality of the environment.

As consumers adopt new standards and send a clear message that they are concerned about the environmental cost of food production, they will demand accurate information about organic foods. This can be accomplished through certification.

Certification of organic farmers by private organizations or government agencies is a formal recognition of individual farmers who adhere to established guidelines for organic production. For certification:

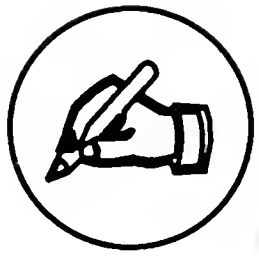
- Farms should be inspected. Documentation and records become part of a system that assures the consumer that "organic" foods are, in fact, produced in accordance with certification standards.
- A skilled retail manager should audit documentation and deal directly with local growers.
- Basic information, including the name of the certifying organization, the farm name, location and state, should be displayed as a product label or sign for bulk foods.
- Signs and labels should provide information that enables customers to recognize and support organic growers who provide consistent quality and to track documentation for certified organic products.

Consumers can choose to reinforce current production standards: low-cost, abundant supply, year-round availability, and cosmetically-perfect appearance. Or, they can choose to make a statement in support of organic farming by purchasing certified organic foods.

Consumer acceptance of organically grown food will be influenced by the availability of quality organic foods offered by reliable retail sources and the availability of accurate certification documentation.

As organic farming gains acceptance, research and educational programs will likely develop to encourage farmers to make the transition to farming without agricultural chemicals. As a larger proportion of the food supply is organically produced, organic food will be available to a wide spectrum of retail customers.

Consumers can choose to support organic farming by selecting certified organic food as it becomes available. This will help encourage the development of organic markets and create a demand for a more consistent supply.
KCD



It's a Matter of Opinion . . .

If I were asked to sum up in a few words the basis of this movement and the general results that are being obtained, I should reply that a fertile soil is the foundation of healthy crops, healthy livestock, and last but not least healthy human beings.

Sir Albert Howard in ***Introduction to Pay Dirt,*** *J.I. Rodale, 1945.*

The farmer's role is to be nature's partner in the creation and recreation of abundant life. Agriculture, therefore, must be an art at least as much as it is a technology.

Margaret C. Merrill in ***Eco-Agriculture: A Review of Its History and Philosophy,*** *Biol. Agric. and Hort., 1983, Vol. 1, 181-210.*

Why do people farm organically?
Why do people buy organic produce?

These are questions John Gerber, coordinator for Sustainable Agriculture Initiatives at the University of Illinois, asked participants of the organic farming sessions at the 1990 Illinois Specialty Growers Convention. Following are excerpts from some of the letters he received.

Organic farming is important to us at Academy Gardens because 50 percent of our customers are requesting organic food. They are having trouble with allergies and believe that chemicals are the trouble.

Also, we do not like handling chemicals to be applied on the field.

Our sales increase every year because of the interest we have in organic produce.

Don Thiry, Academy Gardens, Elburn, Ill.

Although few people are familiar with the complexities of organic production, the general thinking is that organic advocates are "far out" or fanatics.

This perception of organic may be partially justified, but experienced organic producers could well be the greatest resource for developing more sustainable systems for mainstream agriculture. I don't visualize organic grain farms popping up all over the countryside, but some organic concepts are being adopted. Organic practices likely to see widespread use include more diverse crop rotations and planting of legume cover crops primarily for nitrogen production and soil improvement.

Certain crop sequences will be recognized for their ability to control insects, weeds and diseases while improving the soil. There is growing realization that maintaining good soil structure and tilth requires the return of sufficient organic matter to the soil and adequate erosion control.

A soil well-supplied with organic matter is a basic tenet of organic production practice. It is considered essential to improve the health of the crops produced and the animals that consume them.

Lester Johnson, Jo Daviess County Soil and Water Conservation District

Why I farm organically:

- *Why be the same as everybody else when you can be different and righteous about it?*
- *I like to work hard and have nothing but calluses to show for it.*
- *Caring for the land is a sacred business not to be confused with the toxic technology of chemical pesticides.*
- *All of the above.*

Why people buy organic produce:

- *It's a modern day quest for immortality.*
- *The hidden message (to the consumer) in organic produce is eat organically and you will live forever.*

Stephan J. Smith, Anna, Ill.

My feelings toward organic vegetables will be considered "negative" by the starry-eyed prognosticators. After six years of experience, we find consumer (and, therefore, food retailer) interest to be very low.

I completely disbelieve the surveys that show 52 percent of the respondents would buy organic produce even if it cost more. I suspect such response is more the way the respondent would like to be perceived rather than what he or she does when making a purchase decision.

This year, for instance, one of our most organically-conscious food retailers dropped most "organic" produce due to lack of demand. He continued ours because of our label which, over four years, has established a modest franchise.

Though I hate to say it, organic produce on the average is often inferior in appearance, and presumably, quality. It does have a shorter shelf life and food shoppers have been trained to respond to visual rather than taste as a primary determining influence for buying.

Our Ladybug Farms experience is somewhat unique. Because we do our own delivering, restaurants are our primary outlets. Should volume justify, we'll make deliveries every other day throughout the week. Shelf life is no problem because we will renew the supply every other day, or every third day.

We operate in the same fashion with independent retail food stores. There obviously are many individual exceptions wherein the consumer truly feels there is a taste or health difference between "organic" and "regular" produce. In relation to the entire market, however, these individuals comprise a tiny percentage of the whole. It seems strange, for instance, that relatively few outlets for "organic" or "natural" foods have a well-defined fresh produce section.

Our opinion is that the "organic movement" must somehow put together a mass marketing program that includes a distribution system to enable frequent deliveries to take full advantage of fresh-picked vegetables.

There is no question in our minds that the "organic way" truly does improve the soil, that it and crop rotation will make long-lasting contributions to soil fertility and that the grower who chooses this course has an excellent opportunity.

Mike Michael, Ladybug Farms, Spring Grove, Ill.

I sell at a farmer's market in Chicago and one in Evanston. A tiny percentage of people buy exclusively organic. Most people "support" organic with words, but they shop appearance or price. Note I use the word "appearance" and not "quality."

Many consumers think they are buying quality, when really they are buying a look. They're buying a "chemicalized" vegetable that looks good, instead of a "pure" vegetable with bug damage.

Another thing about organic (we use no synthetic pesticides or fertilizers) is that I feel farming organically warrants about as much praise as cleaning up after oneself. Many people "oh" and "ah" about organic, but organic farming is not going to correct the evils of the world.

John Peterson, Peterson Farm, Caledonia, Ill.

I have farmed over 40 years. When I farmed chemically, I almost died.

Anhydrous drift causes me to lose sense of smell and taste and causes a severe sinus condition — even today.

Bills dropped by over 50 percent when I switched to organic farming 20 years ago. Soil life has been restored — as evidenced by tilth, earthworms, microorganisms, less weeds, less insect problems, more natural insect predators — and the soil holds more rainwater.

Grain, hay and forage quality is more palatable and digestible, for better animal production at less cost per acre.

My soil stewardship includes green manure, crop rotation, natural soil conditioners and soil erosion control — with concern for future generations.

Norman Witt, Hampshire, Ill.

more letters on page 6

It's a Matter of Opinion . . .

I just wanted to let you know *my son definitely has a taste for good, wholesome food. He is 3 years old and has not been bombarded with organic food advertising. Granted, I do try to feed him fresh, pesticide-free fruits and vegetables and organic-fed meat.*

But, the other day I ran out of our normal egg supply. I tried feeding him store-bought eggs three days in a row. Each day, he told me the same thing, "Mom, they do not taste at all. Why do you feed me these?"

The fourth day, I had my regular egg supply from non-caged and organic-fed chickens. He ate the entire egg.

My young son has taught me a lesson. Don't waste your health, time and money on food that "does not taste" and is loaded with chemicals.

Chris Katkus, St. Charles, Ill.

It does not take much *acreage to fill the need for fresh organic broccoli (or other crops) as a marketable fresh vegetable. What is needed is the development of a small-scale processing program to handle specialty vegetables or fruit that cannot be marketed as fresh, but could be sold to the same community clientele during the rest of the year as frozen or canned.*

These small processing plants could be equipped to clean, prepare, blanch and freeze or can variable quantities. These plants could use part-time seasonal labor, including senior citizens.

Without the availability of small local processing plants, a lot of very good specialty crops go to waste, causing financial hardship upon the families that have diversified. Many will then consider the specialty organic plant rather risky. The community is denied the benefit of this nutritional food.

I have been researching this subject and intend to write a proposed plan to initiate thinking in this area.

Ed Heine, Hampshire, Ill.

Why do I farm organically? *It's a very simple question for me to answer: Because it makes me feel good inside! It makes everything just seem right. I feel a closeness to the soil that I've never felt before!*

I farm our old family homestead that we have had since 1863. My father and I farmed conventionally until 1986, the year he passed away. It was at that time that I came to the realization how different the farm was from when it was first tilled by my great-grandfather.

I began to realize the great difference in the basic feel of the soil as compared to virgin timber soil. Our soil was so lifeless. It seemed so hard that then I knew I was going to start treating the ***soil****, not the* ***plant****, and begin using our soil as a life-giving medium, not just plant potting soil!*

Now, I've got the farm in a one- to four-year crop rotation. I've started raising small fruits and vegetables. The one-year rotation of vining plants is essential. What I do is plant pumpkins on an acre one year, then fall-seed with rye — either plow it down in spring or leave it to seed for combining. I definitely believe in plowing down of green manure crops.

I've seen tremendous differences in the ease of plowing and the moisture retention of the soil. Even with all this rain we've had up here this year, I had very little standing water, and as a kid I remember water standing in the fields after a hard rain.

Also, the beneficial insects are back. When I go out to the raspberries or the pumpkins, the land just comes alive with life.

Gene Dennhardt, East Moline, Ill.

I farm organically *to have a truly healthy job; to leave the land better for future generations; because it makes sense not to spray poison on our food; because organic approaches tend to blend with nature rather than try to dominate; because people really appreciate fresh, good-tasting organic produce; and because it works.*

People buy organic produce to avoid pesticide residues; to support ecologically-based farming; and because the food tastes better.

Patrick Sweeney, Greenridge Farm, Carbondale, Ill.

Farmer Shuns Pesticides, Farms Organically

Gary McDonald doesn't use pesticides and wouldn't use them even if scientists developed new products and labeled them "safe."

There have already been too many pesticides labeled "safe" and later found in groundwater and linked to human health problems, he said.

A decade ago, McDonald farmed 750 acres organically. Last year, he farmed an 80-acre organic demonstration plot and served as president of the Illinois Chapter of Organic Crop Improvement Association. He maintains that he's farming safer than growers who use pesticides and that his corn, beans, oats, wheat and alfalfa are healthier than crops treated with pesticides.

"Man is not able to know and understand the side effects of using pesticides. Our polluted streams and eroded soils have been caused partly by chemicals," McDonald said.

McDonald said his greatest concern with pesticides is that they are designed to kill. And reassurances that they kill weeds, insects and plant diseases are no consolation.

"Anything that kills throws the ecosystem out of line, whether it's classified as natural or not. And everything in the ecosystem is there for a reason," he said. "Man does not have the knowledge or infinite wisdom to know when something needs to be killed; it concerns me that man can so easily tamper with the natural order of things.

"Pesticides are poisons, and in the long haul, all of society will pay a high price for them."

A good farmer can get good yields without resorting to the "artificial crutch" that pesticide are, he said, noting his yields compare favorably to those from neighboring, chemical-treated fields.

McDonald said farmers are becoming more interested in organic practices as they learn more about the health and environmental problems associated with pesticides. But turning a majority of farmers to organic production hinges on finding markets for organically-grown crops.

"I'm optimistic about markets changing to our favor. I think the demand is there, particularly for oats and soybeans, less so right now for corn and wheat. For some crops, it's just a matter of getting buyers to sellers," he said, "and I'm looking forward to the day when that will be the case for all organically-grown crops."

TMP

Why People Farm Organically:

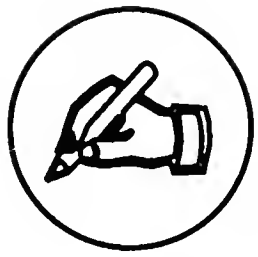
- *"A new peace of mind" is probably the number one reason.*
- *To decrease the cost of production.*
- *Concern for increased pesticide resistance in weeds and insects.*
- *To decrease erosion and pollution.*
- *Has a positive effect on wildlife, birds, bees, beneficial insect populations, soil systems and plants.*
- *Direct contact with chemical mixing and application is hazardous to human health.*
- *Concern for demise of family farms.*
- *Increase in net profit.*
- *Less risk when less dollars are invested in growing a crop.*

Why People Buy Organic Produce:

- *Because they are hungry.*
- *Chemical sensitivity.*
- *Basic holistic health care.*

Gary E. McDonald, farmer, Mason City, Ill.

Kate Duesterberg, Agriculture Program Coordinator, Illinois Stewardship Alliance



Work Toward Organic Bill Builds Coalition

Society can no longer afford agricultural leadership that encourages individual farmers to fall in line with all the rest like proverbial lemmings on their seaward march. Leadership in both the private and public sector should encourage the farmer to use practices that are biologically sound and that are best for his or her individual operation.

*Bob Reber in "What Is Real Farm Progress?" **The New Farm**, July/August 1983.*

This is a good, straightforward bill. It helps organic farmers gain credibility for their product. And, it will give assurance to consumers that products labeled organic have been grown according to strict standards developed by recognized organizations.

Terry Holsapple, a Cumberland County farmer, describing the vetoed Organic Labeling Act (HB 3952).

More and more Illinois farmers are making a commitment to organic farming, both to respond to a growing market niche and to protect the viability of on-farm resources.

However, those who produce organically quickly realize that there is no mechanism in place in Illinois to protect them from unfair competition of those who falsely label their conventionally-grown products as "organic" for the prices organic products command. Consumers also want assurances that when they pay premium prices for organic produce they are truly getting organically-grown products.

Thus was born a farmer/consumer coalition in 1989. It was led by the Illinois Stewardship Alliance, a farmer advocacy organization, and also included a core group of organic farmers and the Chicago-based Illinois Consumers for Safe Food.

That first year, the group worked for passage of the Illinois Organic Definition Act. It passed in the House and Senate, but was vetoed by former Gov. Jim Thompson.

Still, interest in organic production was growing and other producers and safe food advocates joined in the campaign. Representatives of the farmer/consumer coalition started fresh in 1990, to write a new bill.

The Organic Labeling Act of 1990 (HB 3952), a bill sponsored by Rep. Phil Novak and Sen. Jerome Joyce, defined how products must be grown in order to be labeled organic. It called for any product using the "organic" label to be certified by an experienced, recognized certification organization. These organizations would be accredited to certify farms in Illinois by a board established under the proposed Act.

The group also responded to the Illinois Department of Agriculture's growing interest in organic legislation, recognizing that the program would likely be housed within the IDOA. The coalition met with the IDOA several times to negotiate changes acceptable to all. This process was an exercise in diplomacy and compromise for both the coalition and the IDOA.

The bill passed the House and Senate with strong bipartisan support. It was endorsed by the Illinois Farmers Union, Illinois Farm Bureau, Illinois Environmental Council, Illinois Conference of Churches, Illinois Catholic Conference, Midwest Chapter of the Sierra Club and the Illinois Chapter of the Organic Crop Improvement Association.

Despite the strong support, the governor vetoed the legislation, and it did not pass in November's veto override session. Farmers and consumers must now consider making another attempt next year. *KD*

Editor's Note: The Food, Agriculture, Conservation and Trade Act of 1990 (farm bill) includes a national standard for organic food. According to Kate Duesterberg, the Illinois coalition continued to work on a state bill that would be in compliance with the federal bill because: "We felt we needed a program in Illinois to give control and establish parameters for a board made up of farmers and other groups so that there would be grassroots control rather than 'imposed' federal regulation over Illinois farmers."

John B. Masiunas, Assistant Professor, Horticulture Department
John M. Gerber, Professor, Horticulture Department and Assistant Director, Agricultural Experiment Station

Organically Grown Produce Finding Market Niche

*Marketing Organics in Illinois**

A traditional source of organic fruits and vegetables has been natural food stores and cooperatives. Natural food stores are generally found in larger Illinois cities, and some have handled organic produce for more than twenty years. This long-term commitment has allowed them to establish extensive networks of sources within the organic food industry. Many natural food stores and co-ops now stock a wide variety of quality fruits and vegetables. Gone are the early days of organics, when farmers could offer food stores only a narrow selection of poor-quality fruits and vegetables.

Green Earth in Evansville offers an innovative approach to natural-food retailing. Co-owned by Kyra Walsh and Karin Dittmar, Green Earth is not only a large food store but also a mail-order business carrying a full line of organic fruits and vegetables. During the summer, the business partners buy directly from local growers. At other times, they buy produce flown in from California. Walsh and Dittmar research their Illinois growers carefully, using questionnaires and visits to get to know them and their operations better.

Terminal markets and produce wholesalers also have been an important source of conventionally grown fruits and vegetables. An increasing number of wholesalers in Illinois specialize in organics. One example is Midwest Organic Produce, owned by Maurice Dayan. Since 1988 the company has operated out of the South Water Market, the terminal fruit and vegetable market in Chicago.

Much of Midwest Organic Produce's business is done with health food stores and co-ops, Chicago's more progressive and cosmopolitan niche grocery stores, local wholesalers, and trendy restaurants. To ensure a year-round supply of organic fruits and vegetables, they buy produce from the West Coast, Texas, and Florida.

Most consumers shop for produce in retail grocery stores and supermarkets. Some grocery stores in Illinois have attempted to stock organic items, but their efforts have not always been successful. It has been difficult for supermarket chains to find consistent quantities of organic products or to encourage customer recognition of organics. Thus supermarkets generally have lagged behind smaller retail outlets in stocking such items.

**This excerpt is reprinted by permission from Illinois Research, Fall/Winter 1990.*

Robert David Rodale, 1930-1990

Everywhere he looked — from the American Great Plains to Africa, Latin America and the steppes of the Soviet Union — Bob saw the promise of abundance and health through working in harmony with nature.
*George DeVault, writing of Robert Rodale, in "The Vision Lives On . . ." **The New Farm**, Nov./Dec. 1990.*

This issue of agro-ecology is dedicated to the memory of Robert David Rodale, a man with visionary ideas for regenerative agriculture, health, nutrition and community.

Mr. Rodale died Sept. 20, 1990, in an automobile accident in Moscow. He was in the Soviet Union to finalize details for jointly publishing a Russian language magazine on regenerative farming.

In a tribute published in Rodale Institute's magazine, ***The New Farm***, editor George DeVault wrote, "Many of Bob's ideas truly were revolutionary: plowless farming with perennial grains, fish farming, making drought tolerant grain amaranth a commercial crop, famine prevention, community regeneration and a whole lot more.

"But, Bob was not one to criticize. Instead of pointing out problems, he focused on solutions and ways of preventing problems."

Mr. Rodale joined Rodale Press, founded by his father, in 1949. John Haberern, president of the Rodale Institute, and Ardath Rodale, his wife, will carry on his work.

"We can do nothing less than follow in the footsteps of a man who walked the earth planting hope," said Haberern in ***Partnership Report***, Rodale Institute, Fall 1990.

University of Illinois at Urbana-Champaign
agro-ecology news and perspectives
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agro-ecology

Science and Education for a Sustainable Agriculture

Take Agro-ecology Home — Anton G. Endress explains why agro-ecology is everybody's business.

"Perfect" Lawns Carry Environmental Cost — The best-looking lawn on the block isn't always the best-managed lawn, Tom Voigt suggests.

Use Ecological Approach In Home Gardens — A little planning before planting can help gardeners reduce pesticide use, according to Philip L. Nixon.

The Society of Nature — Bruce Hannon calls for communication, education and action.

Student Environmentalists Carry Hope for Future — David Casteel shares observations from a high school classroom.

Recycling Supports Sustainable Society — Kathleen Brown describes how reuse completes the recycling loop.

University of Illinois at Urbana-Champaign
College of Agriculture

The editors invite letters from readers who wish to share experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification.

agro-ecology reserves the right to reject any letter. Address letters to:
agro-ecology Editors
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This newsletter is printed on recycled paper.

*I have read with interest and often concern the **agro-ecology** newsletter. The Winter 1991 issue finally motivated me to express my concern about a philosophical difference in educational policy.*

I have long held the philosophy that I would only use research information generated by "unbiased" individuals in my Extension programs. Basically, I have limited my information sources to university and U.S. Department of Agriculture scientists. Even then, I have been selective. I will listen to and read information generated by other individuals and by companies, but I personally will not use that information in presentations or publications.

*Several of the **agro-ecology** issues have contained statements or entire articles of opinions — unsubstantiated by data or references to known sources of scientifically conducted research. Glaring examples of this are in the Winter 1991 issue on organic agriculture.*

For several years, many of us have dealt with unsubstantiated claims by sales forces of both conventional and non-conventional products. We have stuck to our reliable data base to refute such claims and we have resisted allowing any of their material to be printed in University of Illinois publications. The user public continues to express their appreciation for such service, and I plan to continue that approach.

Robert G. Hoeft
Professor of Agronomy
University of Illinois

Surely, one role of a university is to present facts and recommendations in an unbiased manner, as you suggest. The University of Illinois has many fine publications solely devoted to reporting the results of scientific research, but **agro-ecology news and perspectives** was designed to serve a different, unique function.

When the agro-ecology program subcommittee initiated the **agro-ecology** newsletter in 1989, it was with the express goal of creating a publication to deal with difficult issues of public as well as scientific concern. The newsletter was to stimulate faculty to think about opposing viewpoints. Dean W. R. Gomes wrote in the first issue that "we hope to provide a forum for the exchange of perspectives."

In fact, authors are encouraged to write what they think, to speculate, to wonder, to dream.

The understanding and appreciation for alternative viewpoints that can come from an "exchange of perspectives" can help keep the lines of communication open to all groups — and ensure that there is a path for research-based information.

John M. Gerber
Coordinator, Agro-Ecology Program
University of Illinois

*The Winter 1991 issue of **agro-ecology** tackled the difficult topic of organic food and farming in a clear-sighted and effectual manner.*

Liberty Hyde Bailey wrote a century ago that "the real and permanent prosperity of a country begins when the agriculture has evolved so far as to be self-sustaining and to leave the soil in constantly better condition for the growing of plants."

Many farmers, consumers and researchers view organic farming today as a legitimate agricultural production system designed to improve the soil while maintaining or improving farm profits and satisfying very real consumer demands.

*I am sending a copy of Winter 1991 **agro-ecology** to each of the 100 county Extension offices in Iowa.*

Greg Welsh
Iowa State University
Cooperative Extension Service
2517 Park Ave.
Muscatine, Iowa 52761

The 1990's are bringing, I think, a new sense of awareness that institutions alone can never solve the problems that cumulate from the seemingly inconsequential actions of millions of individuals. My trash, your use of inefficient cars, someone else's water use — all make the planet less livable for the children of today and tomorrow. But remember: as much as we are the root of the problem, we are also the genesis of its solution.

*From **50 Simple Things You Can Do to Save the Earth**, Earthworks Press, 1989.*

Take Agro-ecology Home

Recently an acquaintance asked me why anyone should read **agro-ecology.** Certainly there are many newsletters, magazines and newspapers to read, probably too many. Why then should this particular one be included among the most important?

I read **agro-ecology** because it is instructive, informative and concise. More importantly, however, it is controversial, appealing to my belief of what education is all about.

The objective of education is to prepare the young-of-mind to self-education throughout their lives for both living and making a living. Knowledge about facts is of lesser importance than the knowledge about values. Values are the bases for our behaviors.

The essential process of education is to challenge the assumptions that we individually and collectively hold and on which we act.

Therein lies the essential importance of **agro-ecology**; it is a forum for news and perspectives about agriculture that prompts us to re-examine the assumptions and beliefs we have about ourselves and how we interact with each other and our world. It prompts us to remain vigorous, renewing ourselves by illuminating old facts with new insights, acquiring new information and affirming the interconnection of knowledge about facts and values to living and making a living.

So what assumptions are challenged in this particular issue?

The first challenged assumption is that sustainable agriculture is solely directed to producers of fruit, vegetable, grain and livestock products. The second is that the rest of us, who mostly live in urban and suburban areas, shouldn't be concerned about sustainable agriculture because it neither affects us nor we it.

All of us are consumers of agricultural products, acting on assumptions about the world around us. Our behaviors significantly influence the kinds of crops grown, animals raised and the types of processes used to produce the various products offered.

Agro-ecology is everybody's business and this issue focuses on ways we can take ecology home. Through the suggestions, observations and insights offered in the articles, the authors clarify our impact on agriculture and its effect on us. As city-dwellers, there are many things we can do that will enhance the environmental stability and integrity of our world.

This issue, then, is about living and making a living. It is about some of the many things we can all do in our homes, at our workplaces, in classrooms, or in parks and other recreation areas. It is about education, the importance of garnering facts, the courage to re-examine beliefs that could change values and alter behaviors, and the opportunity to take ecology into your home and make it part of your life.

Anton G. Endress

Anton G. Endress
Head, Department of Horticulture

Illinois is fast running out of landfill space. Yard waste not only uses up this valuable space, but contributes to methane gas and leachate problems, as well. Yard waste also makes incinerators less efficient because of its high moisture content. So, keeping your yard waste out of the garbage truck saves money and protects the environment.

From ***A Homeowners Guide to Recycling Yard Wastes,*** *University of Illinois Cooperative Extension Service and Illinois Department of Energy and Natural Resources publication ILENR/RR-89/03, Revised 6-90.*

Home, Yard and Garden Today. *A tabloid with timely articles on handling yard waste, recycling, alternative pest control practices, low-maintenance lawns, prairie plantings and other gardening topics. Available from county Extension offices.*

Reports on Plant Diseases. *A series covering management of more than 200 plant diseases. For a complete listing, please write to:*
Extension Plant Pathology
N 533 Turner Hall
1102 S. Goodwin Avenue
Urbana, IL 61801

Land and Water Series. *The newest publication in this series covering water quality and soil conservation issues is* ***Safe Drinking Water: Testing and Treating Home Drinking Water****. For an order brochure, please write or call:*
305 Mumford Hall
1301 W. Gregory Drive
Urbana, IL 61801
217/ 244-2807

Tom Voigt, Extension Specialist, Turfgrass

"Perfect" Lawns Carry Environmental Cost

Many of us have emotional feelings about the appearance of our home lawn. We feel pride when the lawn looks good, anger when it is damaged by pests or disease and concern when a neighbor's lawn is neglected.

Home lawns do more than elicit emotions, they also improve property value. As part of a well-designed and maintained landscape, a home lawn can increase property value by 15 percent. In addition, lawns improve the physical environment by converting carbon dioxide to oxygen, cooling the atmosphere on summer days, reducing soil loss, eliminating mud and trapping much of the dust and dirt that would otherwise be released into the atmosphere. We have both emotional and financial reasons for maintaining a good quality lawn.

Frequently, however, we place too much value on appearance. The unrealistic pursuit of a "perfect" lawn causes some of us to use large quantities of pesticides and waste natural resources. Excessive home lawn management is not in concert with today's environmental concerns, nor is it sustainable for the future.

Quite commonly, we mismanage the home lawn. Mowing too short or underfertilizing leads to weed invasions, increasing the need for herbicides. Overfertilizing wastes energy, increases mowing frequency and can increase turfgrass diseases. Overirrigation wastes water, produces excessive turf growth and can encourage turf disease infestations.

Well-managed lawns in northern states can recover from temporary summer dormancy. Is supplying the 3,000 to 4,000 gallons of water per week required to keep the average 5,000 square-foot lawn green really necessary? Or, is it a luxury we can no longer afford?

Lawn care pesticides are sometimes required to maintain a quality lawn, but pesticide overuse is common. According to the U.S. Environmental Protection Agency, almost 4 million pounds of the herbicide 2,4-D is applied to residential lawns. This could be reduced dramatically if spot sprays, rather than broadcast sprays, were used. Even less would be used if we spot-sprayed only publicly visible areas and tolerated a few weeds elsewhere.

Other lawn care pesticides are sometimes unnecessarily applied — for preventative reasons. An example is the insecticide diazinon, the most widely used pesticide on residential lawns. Approximately 6 million pounds is used annually on residential lawns, much of it to prevent insect problems that don't exist.

Applying pesticides only when pest populations are large enough to cause damage would reduce the amount of total pesticides put into the home environment.

While lawns are important for our emotional, financial and physical health, we should not place an inordinate value on pursuing the "perfect" lawn. We need to evaluate and change our current lawn-management practices to bring them in line with what is environmentally safe. When this is accomplished, we can have quality lawns that are sustainable for the future. *TV*

The University of Illinois Office of Agricultural Communications and Education distributes free and for-sale publications on a variety of gardening and pest management topics.

One of the newest series by Extension specialists explains the latest research on control methods that use less toxic insecticides, insect attractants and traps, and natural enemies of insect pests to manage injurious insect problems.

***Alternatives in Insect Management** titles include: Botanical Insecticides and Insecticidal Soaps (C1296, $2); Microbial Insecticides (C1295, $1); Insect Attractant and Traps (C1297, $2); Beneficial Insects and Mites (C1298, $2); Field and Forage Crops (C1307, $2); Insect Traps for Home Fruit Insect Control (NCR359, $1.25); and Insect Pest Management for the Home, Yard, and Garden (J17-91, $1).*

*The circulars are also part of the **1991 Illinois Pest Control Handbook** (IPC-91), a 532-page book filled with updated, timely guidelines for insect, weed and disease management, as well as pesticide application and equipment. IPC-91 is available for $14.*

To order these publications, or for a free Resources Catalog of other publications, videotapes and slide sets, please call or write:

Communications Services
Office of Agricultural Communications and Education
69-AC Mumford Hall
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217/ 333-2007

Philip L. Nixon, Extension Specialist, Entomology

Use Ecological Approach in Home Gardens

Diseases, insect pests, weeds and poor fertility can reduce productivity of a vegetable garden. However, most home gardeners can avoid or manage these problems in an ecologically-sound manner by learning more about garden pests, planning before planting and using hand labor, mulches and other alternatives to reduce chemical pesticide use.

One of the first steps toward improving productivity of home gardens is to improve general soil tilth, or lightness and workability of the soil, as well as fertility by adding composted organic matter.

Mulches can reduce much of the hand-weeding in a garden. Straw or other organic matter added between rows and between plants are effective at smothering weeds. They have the added benefit that they can be turned into the soil where they will decompose and add tilth and nutrients. Mulches, however, can lead to an increase in slugs. Consequently, use mulches only where they are needed most.

Many garden diseases live in the soil and attack closely-related groups of vegetables. These diseases can be avoided by rotating the location of related vegetables in the garden from year to year. For instance, potato, tomato, pepper and eggplant are closely related. Cabbage, collards, kale, brussels sprouts, broccoli and cauliflower are also closely related. Beans and peas are close relatives. So are squash, pumpkin and watermelon.

Disease-resistant tomato varieties, identified by VFN after the variety name, should be selected for home gardens. If other vegetables have recurring disease problems, look for resistant varieties.

Insects are more of a problem on some vegetables than on others. Many vegetables can be grown without major insect problems. These include carrots, lettuce, beans, peas, sweet potatoes, peppers, beets, okra and onions.

Other vegetables draw enough insects that it may be easier to simply not plant them than to try to control the insects. Following are some treatments to consider for garden vegetables that routinely have damaging insect pests:

- Cabbage, collards, kale, brussels sprouts, broccoli and cauliflower are all attacked by the same caterpillars. The caterpillars can be controlled with an insecticide that originates from the bacteria Bacillus thuringiensis (Bt).
- Plant squash early. Insects will eventually ruin late-harvested squash in most areas.
- Place spun polyester screening over cucumbers to protect them until they start to bloom. Then, remove the screening so that pollination can occur.
- Use screening to protect radishes from root maggots in northern Illinois.
- Be prepared to hand-pick Colorado potato beetles off potatoes, or to spray the beetles with Bt or other insecticides.
- Hand-picking or Bt can be used to control hornworms on tomato.
- Eggplant is often attacked by flea beetles. Botanical and chemical insecticides are available for managing this pest. *PLN*

Bruce Hannon, Professor, Department of Geography

The Society of Nature

A Lakota chief once remarked that a rule existed for their Indian children: Never pick the first flower that you find in spring, it may be the only one. The modern American rule, inherited from Adam Smith, would be something like: Don't pick the last flower, it may be the last one.

The problem lies in knowing whether or not the flower you see is the last flower. Our tendency is to assume that this flower is not the last one, a process which can lead to resource extinction.

From Bruce Hannon's collection of stories and myths.

When thoughtful citizens trace the origins of environmental destruction which is everywhere about them, they frequently give up and turn their thoughts to more immediate and personal matters. We might wonder why this is so.

Why is it that otherwise responsible and capable individuals so often fail to execute responsibility to their living fellow man, to those who have gone before and whose gifts are in use today, and to those of the future, who give meaning to the struggles of the present?

The reason is fundamental: Each of us easily recognizes that environmental problems can be ultimately traced back to our own consumption. Sometimes, our consumption causes someone else's pollution — and sometimes their consumption causes our pollution.

We can quickly come to the mistaken conclusion that there is no way for us as individuals to significantly contribute to reduction of resource consumption, to reduction of pollution, to saving our resources and to preserving our heritage. Individual efforts will only result in the increase in consumption by some other (equally silent) irresponsible person.

Our saving would, it may seem, be in vain. We may mistakenly conclude that the future will take care of itself because it always has. The trees will regrow, the atmosphere will clear and the ocean will heal itself.

But our problem is in our hearts, not the woods; in our perceptions, not the air; in our souls, not the sea. In our deception, we destroy our most fundamental values.

We struggle to survive, yet we are unwilling to give our descendants the tools for their survival. We did not respect our natural and cultural heritage and, by example, our children will not respect theirs.

Our attempt to avoid the situation either leaves us alone and impotent with shame and guilt, or we seek consumption as a curative, as an alternative to facing the reality of the environmental problem.

There is, however, an alternative behavior which promotes happiness based on consistent accomplishment. It requires a gradual withdrawal from material consumption. It requires a continuing education — learning the significance of our natural and cultural heritage and learning how to preserve, enhance, create and pass on these gifts to an infinite future.

It means, most of all, learning that all life and all the means to life are sacred; nature is not to be protected only because of its potential direct or indirect value to mankind, but also because it has an intrinsic value beyond the reach of man, a sacredness, fulfilling a need beyond his understanding.

We need help in making a transition to this new behavior. What I am proposing is the formation of the Society of Nature: a group of well-educated and trained organizers, dedicated to resolving our deepest dilemmas.

The Society is based on respect for all life and for inanimate nature as well — from all time perspectives: past, present and future.

The Society strives to overcome natural and cultivated tendencies of most people to highly discount

undesirable events or consequences which are remote from the present; to discount harm or benefit to people who are not genetically or socially connected to them; to discount the adverse effects of the location of undesirable physical elements provided they are sufficiently far away; to discount the likelihood of an adverse result; and finally, to discount that which cannot be detected by the five senses.

The Society is based on the concept of fairness: among members of the current generation and between members of the present and future generations.

Fairness to the present compels us to include environmental costs in the cost of production processes which produce environmental damage. Fairness in the public sector requires an accurate coupling, in time and place, of cost-sharing in proportion to benefits.

Fairness between generations requires that we preserve options for future generations by conserving natural and cultural resources to an ever-increasing degree, even beyond the levels dictated by the current economic practice.

To be perfectly fair to all future life, we must give the future all the necessary technology, population and remaining resources so that the next generation can have the same options as we had at the beginning of ours.

Nature's problem is that there are too few environmentalists. There should be more of them. We, who claim to be among them, need to create more of them from the great mass of consumers.

We must cease being content to believe that a movie on forest destruction, a newsletter on the effects of the latest chemical pesticide, an editorial in the *New York Times* or mention on the evening news will change people's behavior in any permanent way. That sort of self-assurance is kin to belief in leprechauns.

We must cease to allow "members" to relieve their guilt by paying to join our groups and having our newsletter and telephone tree serve as their only connection to environmental action.

We should believe that we are causing net reduction in the environmental war only when we can look someone in the eye, hold onto their hand and hear them tell us that we have changed their life — nothing else is real enough reward to support us through a lifetime of true environmentalism. This is how the Society of Nature must work.

For the past 23 years, a group that takes this hands-on approach to environmentalism has existed in the Midwest. Although the name of the group has changed over the years, from the Committee on Allerton Park, to the Coalition on American Rivers, to the innocuous-sounding Central States Resource Center, it has maintained its focus on making environmentalists out of otherwise innocent citizens. The past and present leaders of this group are the beginning of the Society of Nature.

The group began when army engineers proposed a dam just large enough to flood the last bit of forest in the vast expanse of corn and soybeans in east-central Illinois. It grew to include nearly a hundred experts in engineering, ecology, economics, recreation, journalism and art. Members wrote, testified, lobbied, protested and petitioned for eight years against the project. They became the most formidable force the corps had ever dealt with. Finally, the dam proposal was abandoned and most of the corps' district office was closed or transferred.

For 15 years, this group helped others in the Midwest stop dam proposals by visiting sites, living in communities until local citizens could master dam-stopping techniques, and then moving on. Nearly 200 proposed federal and state dams were abandoned. But most important, thousands of environmentalists were created.

Gradually, the focus of the Central States Resource Center changed from dams to highway proposals and, over the past 10 years, to solid waste problems. Calls for help are still handled the same way — personal visits, protracted stays and revisits until the local group is on its feet, the leaders are established and the project is stopped.

Over the life of a typical project, the Center tries to expand the vision of the local group by asking: Why is the dam, highway, landfill or incinerator being proposed? Don't we all contribute to the demand for such things?

The Center tries to intercept the despair which is bound to occur when local people recognize their connection to the thing they are trying to stop. They try to intercept this despair and convert it into useful

continued on page 6

The Organizers

What we need are organizers, individuals who are dedicated to communication, education and action. The goal of a good environmental organizer is to make all people "combatants" in the struggle for a desirable environment. The good organizer seeks to frame environmental problems in a way that reflects our ethics and values.

The training and education of such individuals requires broad schooling in the professional and social arts. The technical detail of biology and ecology cannot be overlooked. History, sociology, political science and psychology are necessary tools of the organizer.

The educational process of the organizer must be interspersed with community action projects to bring realism into the classroom.

To begin, we must establish a formal training program that attracts students in the late high school years and probably no later than the second year of college. The program should be free of the usual departmental requirements in order to allow for the broad range of courses required by the Society of Nature. The program must also be designed to bond the students to each other.

Graduates would be assigned to various communities to form local community groups dedicated to communication, education and action. As the Society matures, these communities would become the main source of candidates for the formal training process. BH

local action which could remain the group's focus for the future.

The Center's organizers talk to those in the local groups about source reduction and recycling alternatives, and lately about the need for a Model Community.

The Model Community concept is as simple as it is effective. The basic idea is to establish a set of minimum standards for a particular local business, school or church. The standards require the local enterprise to reduce energy use or solid waste or water use by some specified amount in order to be publicly designated as a Model enterprise.

For example, the Center created a Model Supermarket out of a local store by getting the manager to label shelf items which were the least harmfully packaged (refillable, recyclable container, least packaging or least harmful in a landfill). It is a small step, a tiny white flag in the war on nature, but it is a step in the right direction. And it helps deter despair and forgetting; it helps build real and lasting environmentalists.

The people who are helped by the Center are NIMBYs (not in my backyard). But all environmentalists were NIMBYs at one time. None of us began fully wound. Something had to give us the courage — to spark our anger enough to goad us into that first action from which we have generalized our position.

Most often that initiating action was an affront to the place we revered, that place we called home. The action offended our sense of place. A NIMBY can be redefined as one whose sense of place is strong enough to be offended and who has taken the first step in defense of that place. To the Center, the NIMBY is an opportunity, a means to enter local consciousness and to create new environmentalists.

But the Central States Resource Center does not impress its agenda on local groups. It responds to calls for help and uses its considerable experience to bring about a successful solution. The Center is a kind of ecological "Peace Corps" that can be sustained by the Society of Nature.

We share the planet with many other forms of life. We need and sustain each other and yet the behavior by humans appears to disrespect other life-forms. We consider ourselves so much more important than other life-forms that in controlling them, we harm ourselves.

Our survival depends on the respect we give to all life. That respect is shown by our efforts to control both the size and the consumption per capita of the human population and by our efforts to use environmentally-sound means of provisioning the human population.

Through a Society of Nature, we can accomplish all three forms of control. Only then will we have respect for all life and only then can ecological justice and peace prevail. *BH*

Editor's Note: This editorial contains excerpts from a paper Bruce Hannon began writing in April 1985. The draft is revised periodically to reflect discussions with fellow environmentalists, including Clark Bullard, Paul Craig, Ernst Habicht, John Hackmann, Denis Hayes, Ed Hessler, Robert McKim, Tina Prow and John Thompson.

David Casteel, Environmental Science Teacher, Centennial High School, Champaign

Student Environmentalists Carry Hope for Future

The times are a big part of adolescent troubles. Born in 1975, they don't know about hippies or flower children; they haven't heard of DDT, Three Mile Island or Kent State. An adolescent's life today is filled with contradictions, and the environmental problems they're confronted with add to their frustration.

During the 1980s, government estranged environmental organizations, abandoned environmental agencies and labeled most environmentalists radicals. Despite administrative persecution, seeds planted at the first Earth Day survived and sprouted during the oil crisis of the seventies.

David Casteel

** Precycle to reduce waste at the source. That is, think before you buy. Look for products packaged in recyclable containers and choose biodegradable products, for example.*

If teachers and society have failed to convince today's public school children that the environment is legitimately in trouble, it is because we have underestimated how very perceptive they are.

From primary school on, they see right through our phony lip service. They learn what is really important to us from what we do — not from what we say. They perceive our insincerity about the environment — seeing too often the old double standard that we adults do so well.

My secondary school ecology class lesson plans reflect my lifestyle, and that may account for my success as a teacher — students can see that I "put my money where my mouth is" every day. I bicycle, precycle*, recycle, compost and read. I don't air-condition or waste water or heat.

Although there is nothing momentous in that list, my students wonder aloud what I have against convenience. I ask them what they think convenience costs and who they think pays the bill. After all, the total cost of a gallon of gasoline is not included in the selling price.

Economic externalities are not always easy to see and seldom part of the calculated cost. I attempt to help them weigh the benefits of burning a gallon of gasoline against the environmental costs of producing it and disposing of its wastes.

That, in turn, opens the door for seeking alternatives that might solve problems, as opposed to merely treating symptoms. When we defer problems with short-term, expedient responses, they are neither diminished nor do they go away; they just become more intractable.

Some of my students just don't get it. There may be as many reasons why they don't as there are students in that category. Some don't see school as being related to real life.

For others, the timing stinks. Just as they are about to enter the adult world of driving, we tell them the automobile is the nation's leading polluter. The mobile future they anticipated — that prestigious symbol of freedom and opportunity — is threatened and they rebel. As you might expect, they aren't eager to hear such practical driving tips as share rides, keep engines tuned, dispose of used oil properly, inflate tires, plan trips, slow down on the highway and walk, bike or use the bus.

But some students have caught on. Many are extremely capable, perceptive, sensitive, enthusiastic, communicative and involved. These students are incredulous that we have had no rational federal energy policy for more than a decade.

From ecosystem studies and discussions of Aldo Leopold's ideas, they understand that all parts of a system are necessary for maintaining the stability and integrity of the system.

One of my brighter students once corrected me when I suggested that considering certain global trends, the earth might not be capable of supporting human beings. She informed me that, instead, maybe we are unable to sustain the earth.

The idea of stewardship had not occurred to her classmates. But in that one thoughtful and caring student, lies our hope. *DC*

Kathleen Brown, Extension Specialist, Solid Waste Management

Recycling Supports Sustainable Society

The human species is part of nature. Its existence depends on its ability to draw sustenance from a finite natural world; its continuance depends on its ability to abstain from destroying the natural systems that generate this world.

William D. Ruckelshaus in ***Toward a Sustainable World,*** *Scientific American, September 1989.*

Recycling is perhaps the most widely recognized concept in solid waste management.

Recycling is more than the separation and collection of materials. These are only the first steps; post-consumer materials must also be reprocessed or remanufactured. Only when the materials are reused is the recycling loop complete.

By recycling, we are taking one small step along the long road toward becoming a sustainable society. Sustainability has two primary components: the use of natural resources and the rate of pollution loading.

In terms of natural resources, a sustainable technology or policy would not allow use of natural resources to exceed the rate at which the resources could be replenished. In terms of waste, a sustainable technology or policy would not allow generation of wastes to exceed the rate at which the wastes could be cleansed from or metabolized into the natural environment.

Recycling contributes toward sustainability in both of these primary ways. It conserves natural resources, and it reduces pollution.

Natural resources are conserved in two ways. A portion of the virgin feedstock materials is replaced with recycled materials. Also, recycling saves energy resources that are necessary for the extraction of raw materials through mining, drilling or timber cutting.

For instance, little material loss occurs during the recycling process for some materials, including aluminum, glass, steel and plastics. Thus, there is potential for significant benefits in terms of the longevity of natural resource supplies and reduced impacts on the natural environment.

Recycling reduces pollution in several ways. Land pollution is reduced through the reduction of materials that otherwise must be placed in landfills. Air pollution is lessened through reduced emission during product manufacture, according to Worldwatch Institute Paper. These benefits are of fundamental and widespread significance.

Each material that is recycled into a new product has its own energy savings profile, or energy savings associated with recycling. A Worldwatch Institute source sets energy savings for commonly recycled materials at: 90 to 97 percent, aluminum; 47 to 74 percent, steel; 23 to 74 percent, paper; and 4 to 32 percent, glass.

If the market is functioning properly, the recycled material will go to its highest value use. This is usually the use with the greatest energy savings. For example, recycled plastic bottles can be used for production of new bottles or as fiberfill insulation material for garments. The higher value use is the production of new bottles.

Programs to reduce waste volume and recover recyclable materials are developing at a remarkable rate in Illinois. It is clear that recycling will make an ongoing and significant contribution to energy and resource conservation.

It is also clear that recycling is a fundamental support of our necessary journey toward becoming a sustainable society. *KB*

Clark W. Bullard, Professor, Department of Mechanical Engineering
Director, Committee for River and Stream Protection

Appeal Made to Protect Illinois Rivers, Streams

Most conflicts between agriculture and environmental quality have their roots in Washington, in laws and regulations that make it economically infeasible to farm in a more environmentally sensitive manner.

Clark Bullard, speaking at the Illinois Farm Bureau meeting in Chenoa, Illinois, Sept. 4, 1990.

Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has.

Margaret Mead

***For more information** on this proposal to protect rivers and streams in Illinois, please write:*
Committee for River and Stream Protection
509 W. Washington Street
Urbana, IL 61801

By thy rivers gently flowing,
Illinois, Illinois
O'er thy prairies verdant growing,
Illinois, Illinois

From "Illinois,"
the official state song

I am saddened that our "prairies verdant growing" have been lost. We must prevent the same thing from happening to our "rivers gently flowing." I want us to be more visionary than our forefathers, more sensitive to our grandchildren's heritage, more willing to give back to our country a small fraction of what it has given to us.

While it *is* too late to take a child for a long walk through an Illinois prairie, it is ***not*** too late to canoe or walk for an entire day along one of its prairie rivers.

Illinois is blessed with more than 33,000 miles of rivers and streams. But the once beautiful Illinois River has been transformed into a superhighway for barges. Its floodplain lakes fill with silt from upstream farms, but the river is not allowed to flood and scour new channels to create new floodplain lakes.

In fact, the vast majority of Illinois' rivers and streams have been transformed into barge canals or drainage ditches. In economic terms, they have been developed. In ecological terms, they have been obliterated, in most cases by agriculture.

What I propose is permanently protecting the best 5 or 10 percent of these rivers and streams that remain. This could be accomplished through a mandatory program such as zoning.

But a better approach would be to create a voluntary program for landowners to sell or give conservation easements or conservation rights to the State. Owners of ecologically valuable riparian habitat who agree not to cultivate or develop the land could retain some rights to the land, including the rights to use it for hunting and fishing, and even the right to prohibit public access.

The potential impacts of a river protection program include:

- *About 100 miles of river protected each year.*
- *Improved water quality and wildlife habitat; preserved scenic areas, biodiversity; improved fishing, boating, recreational opportunities.*
- *Average cost of $25 million annually, about $2 per person per year. Possible revenue sources: a bond issue retired by general revenues; a tax on items other than property, such as soft drink containers, water and air pollution, waste disposal.*
- *Improved farm economy. Cash from program funding distributed to participating farmers. Opportunity to sell conservation rights could reduce property taxes, estate taxes; could make existing farm programs (intended to protect the environment) more attractive to landowners.*

I believe that great things could come from a partnership of farmers and environmentalists. We must convince our leaders that it is in our interest to work together. By focusing on an issue that can be resolved in Springfield, we can show ourselves and the nation that environmentalists and farmers can work together to save the land we love. *CWB*

An Environmentalist's Code

Governments alone cannot secure the environment. As citizens of the world, we accept responsibility in our personal, occupational and community lives, to protect the integrity of the Earth.

From ***Earth Covenant: A Citizens' Treaty for Common Ecological Security, Global Education Assoc.****, 475 Riverside Dr., Suite 456, N.Y., N.Y. 10115.*

Following is Bruce Hannon's* beginning list of guidelines for the serious environmentalist. The list is meant to be suggestive; the reader is encouraged to add to it.

- Do not drink from throwaway containers.
- Increasingly travel by the most resource-efficient mode. Trade time for resources.
- Spend at least one hour per week in a natural area, park or similar area (not a golf course) for the purpose of focusing on ecology as it relates to human values. Take a younger person along.
- Do a public action for the betterment of the environment at least once a month.
- Plant a tree seed from an indigenous species in a secure place at least once a year.
- Regularly recalculate the direct and indirect environmental cost of your lifestyle.
- Spend at least one hour per week restoring part of the cultural heritage.

Bruce Hannon explores the need for environmentalism more fully in* ***The Society of Nature* *beginning on page 4.*

University of Illinois at Urbana-Champaign
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news and perspectives

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Science and Education for a Sustainable Agriculture

Volume 3, Number 3 Fall/Winter 1991

On-farm Participatory Research:

A Land-grant Vision — Charles W. Laughlin shares a personal viewpoint on moving some land-grant research to farms.

An Industry Perspective — Colin J. Peel explores the role on-farm research can play in product development.

An Agronomist's Experiences — The relationship between farmers and researchers is an element to consider, Don Bullock suggests.

A Facilitator's Expectations — John M. Gerber describes a partnership for action and an opportunity for sharing.

A View From the Field — Charles Koenig outlines an approach for initiating on-farm research.

An Agency Response — A grant program that brings researchers and farmers together is getting results, according to Deborah Cavanaugh-Grant.

An International Viewpoint — Yoseph O. Elkana examines basic elements necessary for developing on-farm trials.

A Communicator's Analysis — Divergent views on knowledge keep scientists and farmers apart, Ann Reisner observes.

University of Illinois at Urbana-Champaign
College of Agriculture

The editors invite letters from readers who wish to share experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification.

Letters are printed as space permits. Address letters to:
agro-ecology Editors
University of Illinois
211 Mumford Hall
1301 W. Gregory Drive
Urbana, IL 61801

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*I wish to express my joy at the "Society of Nature" by Bruce Hannon (**agro-ecology news and perspectives**, Volume 3, Number 2). This article touched upon several points which I feel strongly about. There are people in the world who see Nature as more than a forest preserve or city park. There are those who view Nature with an awe which surpasses a casual aesthetic. There are those who wish to live as a part of Nature, participating in the process of Nature, and not separately, as some failed stewards.*

The point is so well-made that "nature is not to be protected only because of its potential direct or indirect value. . . but also because it has an intrinsic value beyond the reach of man, a sacredness." I believe that this attitude of sacredness is characteristic of a new awe that is being felt by many, including myself.

Jon Pagano '79
334 Westbrook Circle
Naperville, Illinois 60565

"Agro" is not "ecology" in the natural (or non-industrial/technological, man-influenced) sense, and differentiations must be made between agro-ideas/solutions and political ideas/solutions.

Briefly, natural ecology (defined as nature-in-flux without human intervention) is a state almost non-existent anywhere. Even the purported "observation-without-intrusion" can be seen as intrusive, in the sense that what is observed functions within the context of that awareness, and few observers operate objectively without looking for something, not to mention entertaining foregone conclusions.

Of all the ecological upsets, agriculture is the most pervasive. Presented as the "cradle of civilization," farming and ranching commence with the deforestation that is most inimical to ecology and ultimately most destructive to civilization itself.

What we fail to realize is that the very concept of government, concentrating power in the hands of few (even though purporting to promote the common good), legitimizes coercion and the involuntary servitude coercively imposed to pay for the political process, and is thus inimical to these very ideas that represent the highest potential of our species. More specific to agro-ecology, as here considered, it is this coercive function of the state that is continually resorted to in order to "preserve" the ecology.

Ultimately, this method will fail, for it carries the notion that "might makes right" rather than promoting the concept of knowledgeable voluntary agreement for an enlightened self-interest that is evermore beneficial to the common good than the coercive imposition of even the best intentions through government.

Erik Erikson
40 East Sumner Avenue
Roselle Park, New Jersey 07204

Participatory On-farm Research: A Land-grant Vision

In agriculture, until very recently, . . . it was the responsibility of the professionals to determine what worked best for farmers, on farms large and small, and then to persuade the farmers to accept the information and ideas of the professionals.

W.F. Whyte in ***Participatory Action Research****, Sage Publications Inc., 1991.*

It is long past time that farmers were active participants in agricultural research, rather than passive recipients. There are two persuasive arguments for land-grant colleges and universities to be more involved with farmers: the success of sustainable agriculture programs, and history.

In the recent past, land-grant colleges and universities moved away from on-farm research because it seemed more convenient and more scientifically accurate to buy our own land and run trials under rigorous conditions. One problem with this is that the bounty we enjoyed in buying land is coming to an end.

But even more, we desperately need to re-establish a linkage with the farmer—and not just with our own ideas about farming.

Working directly with farmers means that we have a much smaller margin for research failure. It also, however, empowers farmers to be part of the decision-making process for research, which is essential if we are to enjoy support of the people in the future.

I also cited history as a reason. In Georgia, as in many other states, the land-grant university began agricultural research a century ago with a list of participating farmers in whose fields we worked. We have lost that tie along the way, and farmers and researchers are the poorer for it.

In fact, we need a system that involves everyone to make it greater than the sum of its parts. This synergy will allow a flow of information that will be increasingly vital in years ahead as we begin once more to learn from farmers.

The problems might be seen as differing "filters" for information. Farmers have certain filters, as do researchers, but they seldom seem to be the same. We must work so that each understands the other and profits by successes and failures.

If we in land-grant institutions are to meet farmers' needs, we clearly must use the farmers' filters. Thus, participatory research is vital to the future of agricultural science at colleges of agriculture—we travel alone at our peril.

Charles W. Laughlin
Associate Director
Georgia Agricultural Experiment Station

Colin J. Peel, Monsanto Agricultural Company

Participatory On-farm Research: An Industry Perspective

On-farm, participatory research is useful in bringing people together to seek solutions to common problems, and in stimulating greater communication among those who develop and use new information in farming.

From ***Closing the information cycle: participatory methods for on-farm research,*** *a conference paper co-authored by C.A. Francis, P.E. Rzewnicki, A. Franzluebbers, A.J. Jones, E.C. Dickey, and J.W. King for Farmer Participation in Research for Sustainable Agriculture, Oct. 8, 1989, in Fayetteville, Arkansas.*

Industry has a responsibility to be financially sound so that shareowners, employees, suppliers, customers and the community all can share in its well-being. This can only be achieved if products that are needed and provide customer satisfaction are produced.

One way to ensure customer satisfaction is to have the customer involved in the research and development of a product at the earliest practical stage. A cycle of continuous customer feedback and improvement in the product can then be established.

That is the ideal. The reality of industrial research is that new products are often developed in highly regulated environments created by such agencies as the Environmental Protection Agency, the Food and Drug Administration, and the U.S. Department of Agriculture. Guidelines for product evaluation are rigorous and require highly qualified investigators, either from within industry or hired from universities.

Often, it is not until the final phase—field evaluation—that "participatory research" can be realistically implemented. At this stage, great progress can be made in identifying customer needs and having continuous feedback on the positioning of products for end markets.

Trials must be well designed, use established statistical methods, be simple and establish a clear understanding of the roles and time commitment of farmers and investigators. A good team spirit can evolve. Almost inevitably, the time required by all parties is greater than first anticipated.

The discovery of major products generally occurs in industry or universities. Although there are exceptions whereby the farmer makes the discovery, more often than not the discoveries are either serendipitous or at least not obvious. Or, a need is established by the farmer, and industry and universities search for ways to fill that need. Opportunities exist for much greater participation of farmers and farm organizations working with industry in establishing directions and targeting areas for new products.

Farmer involvement in the implementation of participatory research in early phases of product development entails uncertainties. Firstly, risk may not have been minimized. Besides obvious concerns for liability, potentially good products may be prematurely perceived as ineffective. First impressions are often difficult to change, no matter what subsequent data indicate.

Secondly, farmers are not trained to undergo long and often tedious experiments involving intensive monitoring and data collection. Nor do they have in place the people, the equipment, the methodologies, nor often the mindset, for this aspect of research. Initial enthusiasm by the farmer may wane, particularly with day-to-day crises which have to be attended to. And their priorities may change before the project ends.

In conclusion, industry values and encourages participatory research—and indeed can be greatly rewarded by it. However, there are potential pitfalls, particularly if it is perceived as a panacea to accelerating product development and gaining more rapid customer satisfaction and acceptance. *CJP*

Don Bullock, Assistant Professor, Agronomy
University of Illinois

Participatory On-farm Research: An Agronomist's Experiences

[If] scientists tilt toward the rigor of normal science that currently dominates . . . American Universities, they risk becoming irrelevant to practitioners' demands for usable knowledge. If they tilt toward the relevance of action research, they risk falling short of prevailing disciplinary standards of rigor.

C. Argyris and D.A. Schon in ***Participatory Action Research and Action Science Compared: A Commentary,*** *1991.*

The vast majority of field research conducted by university agronomists takes place on university-owned experiment farms located near major universities. For many projects experiment farms are, without a doubt, the best locations. They have the necessary laboratory facilities and are generally convenient for frequent data collection and monitoring.

In other cases it is preferable, or even necessary, to conduct field research "on-farm," that is, on production farms in cooperation with the producers who farm the ground. An example would be a requirement for 20 acres of uniformly cropped and fertilized land. Such a request on most, if not all, experiment farms would elicit a response of amused bewilderment—the acreage is simply not available. For such work, the researcher has little choice but to seek ground elsewhere: on-farm.

When research moves on-farm, the resident farmer becomes a component of the project. It has been my experience that a farmer can be either an unavoidable and unmovable obstacle or an invaluable resource. The role the farmer plays will depend, to a certain extent, upon the farmer's personality, but it is much more dependent upon the attitude and approach of the researcher.

I strongly believe it is a mistake to design an experiment and then present it to a farmer as a request for land. Such an introduction usually results in a landowner-tenant type of relationship—not hostile, but not equal. In short, the farmer feels little connection to the project. The farmer needs to be involved with the project at a very early stage.

This is particularly true for applied research. I believe it is preferable to present a farmer with the question to be answered with research, and then request input. Farmers have a wealth of pragmatic information on the art of farming, and if asked to comment they will often serve as invaluable assets in the initial identification of a problem and statement of an appropriate hypothesis. Nobody can contribute more.

Farmer participation also keeps us in touch with the real world. Scientists are excellent problem solvers, but since most of us do not farm, we are not always the best problem identifiers.

It has been my observation that if we fail to seek the counsel of the end users of our research, then the very real risk we take is designing projects which go to great lengths to give detailed answers to questions nobody is asking. And the more applied the research, the greater the potential for such an outcome. Use of the on-farm participatory research method does not prevent such an outcome, but it does reduce the probability. *DB*

John M. Gerber, Agro-Ecology Program Leader
University of Illinois

Participatory On-farm Research: A Facilitator's Expectations

We have some ideas about what types of research can be conducted by farmers, but we will have to learn what works best by experience. It will certainly be necessary to keep things fairly simple, with a small number of treatments. It will probably not work to try to test too many interactions– multiplying, say, a number of hybrids by several plant populations quickly gets to be too large.

Emerson Nafziger in ***agro-ecology news and perspectives,*** *September October 1989.*

New farmer-managed sustainable agriculture organizations are forming throughout the United States to develop and share new ideas on farming practices that are both profitable in the short-term and sustainable in the long-term. The academic community is beginning to increase their efforts to serve these organizations through on-farm research and demonstration programs.

However some farmers, researchers, and educators have expressed dissatisfaction with on-farm research programs initiated and managed by land-grant institutions.

The research and Extension education model in which information on farming practices is "discovered" by university researchers and "transferred" through Extension education is viewed with skepticism by some of the new groups. Many believe there is a need for a new agricultural research and Extension education model based on a vision of partnership that better accommodates the needs of agricultural producers.

The Dilemma

The need for more farmer participation in agricultural research and education has been recognized by the international agricultural community, as evidenced by the emergence of the farming systems research and Extension model as a framework for development. At the same time, the importance of citizen participation in community action programs in the United States has been acknowledged.

However, most agricultural research and Extension education programs in the United States have not actively explored the participatory paradigm. Some agricultural scientists have difficulty accepting their proposed role as partners or co-learners rather than experts. Some farmers question the relevance of a research methodology which demands statistical validity in on-farm experimentation.

Clearly, farmers and scientists tend to use different standards when assessing the validity and relevance of research. The characteristics of a research or educational project that are thought to be important to farmers are:

- Plots are single or multiple machine widths and provide clear visual results.
- Alternative treatments result in only modest investments or minor changes in equipment.
- The focus is on yield, profitability and risk reduction.
- Experimental conditions are representative of their farm and farming operation.

On the other hand, the characteristics of a project that are likely to be important to a scientist are:

- Plots are designed for statistical validity.
- Alternative treatments allow a full range of experimental conditions for comparison.
- The focus is on publishable (peer reviewed) results.
- Experimental conditions are representative of a large, economically important agricultural region.

While scientists are trained to search for global truths, farmers seek local solutions.

A method allowing both is needed for farmers and scientists to work as partners in the research and education process. Participatory research and education may provide a solution.

Participatory Research and Education

Participatory research and education is designed to use the specific skills and knowledge of people with diverse training, experiences and interests. When participatory programs are developed to address agricultural problems, the active involvement of farmers, researchers, Extension educators, community groups and the agricultural supply and support industries all may be important.

Since each group provides the type of input into the research and educational process for which they are best suited, the partnership relationships that develop are likely to be mutually respectful and supportive.

The process encourages farmers to provide leadership by identifying critical research and education objectives. Researchers participate by developing appropriate experimental designs that will result in useful and valid information.

Extension educators may become involved as designers of appropriate learning opportunities for sharing new knowledge and understanding with the broader community.

Agricultural suppliers and support industries can offer products and services which make implementation of new solutions possible.

Community groups may represent the public concern for how agricultural research and education influences environmental integrity and the vitality of rural life.

In all cases, farmers must be full participants in identifying the problem, setting objectives, selecting alternative solutions for testing, and interpreting results. While others must be involved at various stages, only the farmers can finally implement new agricultural practices, procedures and principles.

The Conceptual Foundation

The participatory research and education model is based on social science and adult education theory. Most learning by adults is driven by the needs of the individual. That is, adults actively learn what they perceive they need to know.

Therefore, research findings are more likely to be understood and acted upon by farmers when they are active participants in the research process.

The objective of participatory research and education is not only to seek solutions to a problem through new understanding, but to encourage people to take action based on the new understanding (a traditional role of Extension). Thus, participatory research provides a strategy in which research, education and action are closely linked.

In doing so, participatory research and education change the unidirectional flow of information from researchers to users and modifies current social relationships among farmers, Extension educators, researchers, agricultural industry and farm community organizations. *JMG*

Insiders. . . are expert in the specifics of the setting or situation and know from personal experience how things work and how the elements are connected to each other. . . .

Outsiders (researchers and the external experts) have what's missing: training in systematic inquiry and analysis, in designing and carrying out research. . . .

The insider comes to the inquiry because of a personal interest in a specific practical problem. The outsider, in contrast, comes because of an interest in solving particular kinds of problems (in theory and/or practice), methods, general knowledge, or values.

What is needed is a connection between insiders and outsiders that integrates their different forms of expertise and different initial frameworks to generate a third framework or 'practical theory' of the local situation. We aim at a partnership in which insiders become more theoretical about their practice and outsiders more practical about theory.

M. Elden and M. Levin in ***Cogenerative Learning: Bringing Participation into Action Research****, 1991.*

Charles Koenig, Illinois Cooperative Extension Service Adviser

Participatory On-farm Research: A View From the Field

Obviously, on-farm research isn't for everyone. If a farmer is not committed to keeping records and doesn't have an observing attitude and a curiosity to learn, the research isn't likely to be good. But I think many farmers are capable and willing to do on-farm research. They've done hybrid strip trials for years and know what it takes to keep records.

Emerson Nafziger in ***agroecology news and perspectives,*** *September/October 1989.*

Much of what we know about how to make crop production more sustainable has been passed along by individual farmers who have experimented on their own. Some of these innovators were organic farmers motivated by a desire to reduce exposure to pesticides—for themselves and their customers.

Many were simply trying to reduce their out-of-pocket expenses in order to survive. Land-grant universities, for the most part, were not able to provide assistance to these farmers. What useful research information was (and is) in the agricultural libraries dates back to the 1930s and has not been studied by young researchers and Extension specialists.

These farmers are doing their own on-farm research and are depending on farm magazines, local newspapers and word of mouth to pass information along. From each other, they learn what works and what doesn't work.

A weakness of this kind of "trial and error" research is that results are not always transferable to other farms. Farmers must try each idea to see if it will work on their farm, in their situation and with their equipment.

Even so, on-farm research is the most practical avenue available for getting answers to the questions many farmers are asking. The challenge for cooperating university researchers and Extension advisers is to make it as valid and transferable as possible, while not imposing a burden on the one doing the work.

After much discussion over a long period of time, the idea of participatory research has evolved. This is a voluntary system that starts with the farmer's need for answers to particular questions or problems.

One practical approach would be for local Cooperative Extension Service advisers to serve as the primary contacts for farmers interested in doing participatory on-farm research. The advisers could assemble ideas and questions and then design, often with the assistance of university research staff, an on-farm experiment in a way that fits the farmer's equipment and time resources, while at the same time assuring valid and transferable results.

Importantly, farmers should have an opportunity to review the design and identify areas that seem outside the range of their abilities or equipment.

From this give and take should evolve a plan that is acceptable to all.

The key to the success of participatory research is the mutual involvement of farmers, researchers and Extension workers in each step of the decision-making process. Without the farmer's input, the researcher could lose practicality and with it, credibility. Without the researcher, the farmer might end up with data that has little meaning to anyone.

This venture will be valuable only if the spirit of cooperation is kept alive and well among all involved. *CK*

Koenig is executive secretary for the Southeastern Illinois Sustainable Agriculture Association.

Deborah Cavanaugh-Grant, Resource Planner, Illinois Department of Energy and Natural Resources

Participatory On-farm Research: An Agency Response

Regardless of what type of research is actually conducted, it will be absolutely necessary that the results be analyzed and interpreted properly. This will require the services of someone trained in research methods.

Emerson Nafziger in ***agroecology news and perspectives,*** *September/October 1989.*

In 1990, the Illinois Department of Energy and Natural Resources (ENR) conducted a Sustainable Agriculture Demonstration Grant Program which encouraged farmers to conduct on-farm demonstrations of sustainable agricultural practices.

Although the 1990 program was successful on many fronts, it was apparent that a critical component was missing. The program lacked meaningful cooperation among farmers, researchers and educators.

To remedy that, ENR developed the Sustainable Agriculture Participatory Research and Education Grant Program in 1991. The ENR program was aimed at giving farmers the opportunity to conduct research meaningful to them, and also meaningful to the larger farm community. The request for proposals stated, in part:

"The participatory research and education program is designed to use the specific talents and knowledge of people with diverse training and experience. Each group, farmers, researchers and educators, provides the type of input for which they are best qualified, depending on whether the project is primarily research or primarily educational. . . .

"In all cases, farmers must be full participants in the identification of problems and setting of objectives. . . .

"The participatory research process (1) allows farmers to determine the research questions and set the direction of the program and (2) allows the researchers to assist with design, data collection and analysis."

A requirement of the program was cooperation. This was a new experience for many. Researchers often are criticized for being "out of touch" with those who are impacted by their work. Farmers often have a poor understanding of research principles and methodologies.

In this program, researchers, farmers and Extension educators worked cooperatively. The "traditional" rules for conducting research were changed—researchers asked farmers for input, and farmers worked as active partners. The farmer participants learned how to conduct randomized, replicated trials.

A project which compared effects of various soil insecticide rates is one example of how researchers and farmers worked cooperatively and successfully. The project was conducted by Extension entomologists Mike Gray and Kevin Steffey, along with Extension advisers and farmers in DeKalb, Kane, Kendall, Knox, LaSalle, Marshall, Mercer, Ogle, Warren and Whiteside counties. It resulted in a strengthened partnership among the groups; a heightened credibility for the research; and development of additional research projects. A project with practical applications, it helped farmers understand that research is not "mysterious."

The Sustainable Agriculture Participatory Research and Education Grant Program was a new idea, and with any new idea there are often difficulties and details to work out. But in all cases, researchers and farmers were able to learn from one another.

So for a relatively small sum, the ENR Sustainable Agriculture Participatory Research and Education Program helped university personnel and Illinois farmers rethink how they can deal with each other. ENR provided a funding source that encouraged participatory research and opened new avenues for dialogue and cooperation. *DCG*

Yoseph O. Elkana, Extension Specialist, Minister-Counselor for Agricultural Affairs
Embassy of Israel, Washington, DC

Participatory On-farm Research: An International Viewpoint

Science is not achieved by distancing oneself from the world; as generations of scientists know, the greatest conceptual and methodological challenges come from engagement with the world.

W.F Whyte, D.J. Greenwood and P. Lazes in ***Participatory Action Research: Through Practice to Science in Social Research****, 1991.*

Researchers, educators and Extension have placed much emphasis on the theoretical foundation of participatory on-farm research. The literature abounds with social, psychological and cultural statements that on-farm research must be fully participatory to be effective.

As a farmer turned agronomist, turned Extension educator, I have tried to simplify the complexities and demystify the theories in an effort to isolate basic elements common to as many diverse situations as possible.

One of my assumptions is that farmers are traditional because that is how they have survived—by doing what their forefathers have done. But farmers are changing, and more will change as they develop trust in new ideas and technologies; in the man-made environment of government, organizations, community and market; and in their own ability to determine their own futures.

Thus, in any society, at any given time and at any level of economic and technological development (be it in the United States or in the Sahel), there may prevail conditions of certainty or of uncertainty, of risk or lack of risk. These conditions will inhibit or enhance a farmer's propensity to change.

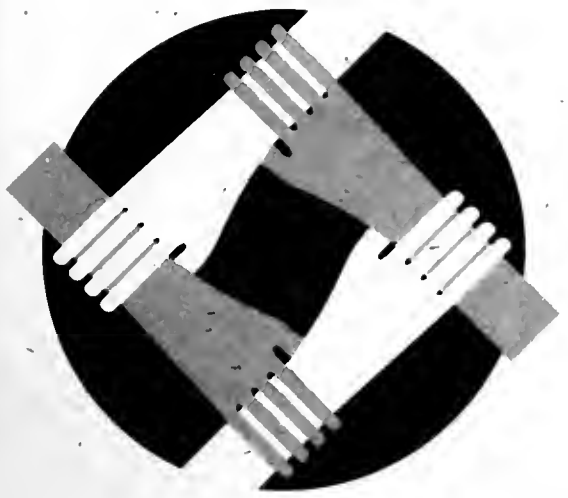
This leads us to on-farm trials. As farmers develop trust toward their peers, community, Extension agents or various authorities, they will be willing to try out new technologies suggested or demonstrated by these groups.

In addition, if the man-made climate is supportive—a stable government, low inflation, new markets—farmers will not only be prepared to try out new ideas, but will even initiate testing of new ideas and technologies.

And if a few farmers are open to and learn how to experiment with new practices at low risk, a sizable proportion of farmers in a given community may become partners in a "research" effort which may lead to effective improvements in agricultural production.

This does not mean that getting complete community involvement in all stages of on-farm research work is not preferable. But I question whether such an approach is feasible in most situations. It requires highly-trained and devoted agents of change with skills in community development and technology—rare "commodities" in many communities.

A main rationale for on-farm research is the lack of locally-adapted, tried, relevant technologies available to recommend to farmers. The farming community, through the aid of an Extension system, can use on-farm trials to bridge the tremendous gap which almost universally exists between elitist science-oriented research and the farm reality. *YOE*



Ann Reisner, Assistant Professor, Agricultural Communications and Education
University of Illinois

Participatory On-farm Research: A Communicator's Analysis

The challenge is to define and meet standards of appropriate rigor without sacrificing relevance.

C. Argyris and D.A. Schon in ***Participatory Action Research and Action Science Compared: A Commentary,*** *1991.*

For the past 50 years, agriculture has been committed to a form of generating information—scientific rationality. The aim of scientists using this particular rationality is to produce general universalistic knowledge.

Such scientists are concerned with an explanation of observations, a generalized understanding of how a process or practice works, and the ability to manipulate a situation in a predictable fashion. The belief in scientific rationality organizes, for scientists, the proper method for viewing the world, including how truth can and should be established.

As a consequence, adherents to this view prefer scientist-generated information over other types of information. In its extreme form, scientists can, and do, claim that information generated by non-scientists is not valid.

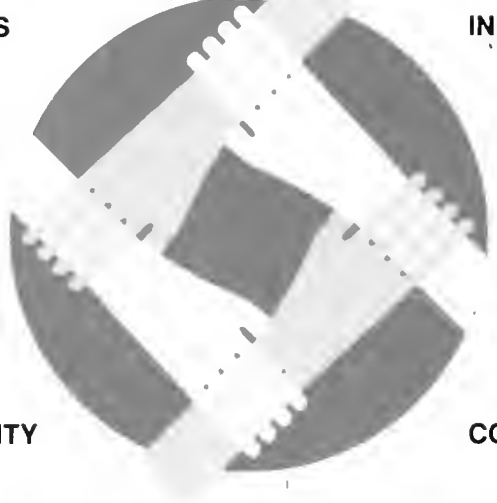
But, in fact, scientific rationality is not the only acceptable means of generating useful agricultural information; farmers, for example, have been producing technical information for centuries.

Farmers' methods of generating knowledge, variously called indigenous knowledge, lived, experiential or everyday knowledge, differs from scientific-generated knowledge. The goal of experiential knowledge-generation is not as much with universal explanations, as with particular, practical solutions.

That is, most farmers are not as concerned with the scientific validity of universal truths, as with the practical utility of practices and products for local situations.

The scientific means of determining valid information, so important to researchers, is less important for the generation of experiential knowledge. Whereas scientists determine validity of knowledge by a process of falsification of hypotheses, farmers include as valid many means of gaining knowledge, such as experience, observation and intuition.

Advocates of experiential knowledge argue that such a system of generating knowledge is, in fact, preferable to scientific rationality, since particular information developed through everyday experience is believed to be more sensitive to local conditions. A better understanding of these distinct sources of knowledge and measures of validity is needed if researchers and farmers are to experience meaningful interaction. *AR*



Participatory Research and Education For Agricultural Sustainability:

A national conference to explore further the issues raised in this newsletter.

The conference will be July 30-August 1, 1992, in Champaign, Illinois.

For information, contact John Gerber at 217 244-4232.

University of Illinois at Urbana-Champaign
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news and perspectives

agro-ecology

Science and Education for a Sustainable Agriculture

Volume 4, Number 1 Spring 1992

Challenges to Agriculture:

Agrichemical dependence	Does our abundant, inexpensive food supply depend on the continued use of agrichemicals?
Pesticide residues	Is our food safe?
Risk	Does agriculture have a right to impose health or environmental risks, however slight, on another segment of society?
Pesticide detections	Should farmers defend pesticide residues in water and food?
Environmentalists	Are environmentalists concerned about their own credibility?
Carcinogens	Do farmers want to use a pesticide that is classified by the U.S. Environmental Protection Agency as a probable or possible carcinogen?
Government ties	How should farmers respond to criticism about polluting water and food with pesticides while receiving government subsidies?

University of Illinois at Urbana-Champaign
College of Agriculture

On the cover: Questions posed by Donald Kuhlman in University of Illinois Agro-Ecology Program Paper AE 91-16, **Reflections About Environmental Issues.**

For a copy, please write:
Agro-Ecology Program
211 Mumford Hall
1301 West Gregory Drive
Urbana, Illinois 61801

The editors invite letters from readers who wish to share experiences and opinions on topics discussed in this newsletter.

Letters should be limited to 200 words. All letters are subject to editing. A name and address will be published with each letter. A daytime telephone number is required for verification.

Letters are printed as space permits. Address letters to:

agro-ecology Editors
University of Illinois
211 Mumford Hall
1301 West Gregory Drive
Urbana, Illinois 61801

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This newsletter is printed on recycled paper.

A view from the farm

It has been said with much fanfare that the 1990s is the environmental decade. Chemical corporations have been busy selling the image that the American farmer is a trustworthy caretaker of our land.

However, what appears to be a commercial for farmers is also directed at the general public, sending the message: Things are fine on the farm, so don't question the status quo.

We are on the verge of something much greater than an environmental decade. Something that is no less than a rebirth in environmental awareness which could span generations. What began with a handful of innovative farmers showing that they could do better than the status quo has blossomed into what is now known as the sustainable agriculture movement.

A new coalition between land-grant universities and farmers is being formed which could have a significant influence on the way agricultural research will be conducted in the future. Agriculture provides a unique arena for merging subjective and objective ways of thinking. Unknowns and variables can be eliminated from the laboratory, but are part of everyday life for farmers.

The sustainable agriculture movement has encouraged farmers to recognize that each piece of ground is unique. By doing on-farm experiments with all the unknowns and variables that naturally exist, we can get results which will help us to be better managers, save money and preserve the environment.

The fact that each piece of ground is unique has made it difficult to define sustainable practices. The primitive holy man said that anything which destroys the earth's ability to regenerate is unsustainable, period. Modern rationality now steps in and says: What can we get away with considering the world's growing population? We need science to help us define our limits, not to allow a few of us to live beyond them.

Through on-farm research conducted with U of I researchers and Cooperative Extension Service advisers, we've found some exciting and unexpected results which make a strong case for sustainable practices in Illinois:

- *3/4 rates of soil insecticide appeared as effective as full-label rates.*
- *60 percent of fields tested did not have economic infestations of corn rootworm.*
- *Hairy vetch and rye provided nitrogen and additional benefits, including improved soil tilth and weed control.*

Farmers from around the state involved in on-farm experiments of their own design have observed other interesting phenomenon. However, their work lacks statistical validity and so is often overlooked by research institutions. Because of this, valuable information which could be useful to both the farmer and researcher may be lost.

In order to build on the coalition which has begun between inquisitive farmers and interested academics, we need others from the farming and research communities to join us. The academics will have to accept farmers with their shortcomings, remembering that we have a unique view of the world. Together, we can help build a truly sustainable agriculture.

Doug Zehr
Gibson City, Illinois
On-farm Research and Education Coordinator
Illinois Stewardship Alliance

editor's note: ***A view from the farm*** *was prompted by a series of articles on on-farm participatory research presented in the previous issue of* ***agro-ecology news and perspectives.***

Participatory Research and Education for Agricultural Sustainability: A national conference to explore the issues.

The conference will be July 30-August 1, 1992, in Champaign, Illinois. For information, contact John Gerber at 217 244-4232.

Paper stimulates discussion, letters

Our world is too complex and our resources too limited to allow any segment, including agriculture, to ignore the ethical consequences of what it does. Everything we do affects others. Agriculture obviously contributes immense good and always ought to get credit for that. But it also must be willing to accept responsibility when its practices have potential negative consequences for the broader society.

*Bob Hays, U of I associate professor of agricultural communications and journalism and campus coordinator of the new AG*SAT course on agricultural ethics.*

In June 1989, I doffed my Extension entomologist hat and donned a new one as Program Leader for Environmental Issues for the University of Illinois College of Agriculture.

So began **Reflections About Environmental Issues**, an Agro-Ecology Paper written by Dr. Donald E. Kuhlman shortly before he retired last September. He continued:

My new assignment included serving as a "spokesperson" on environmental issues and providing leadership for water quality programs in the College. It didn't take very long before I discovered that tackling entomology problems in field crops had a more favorable "comfort zone" than resolving issues of pesticides, water quality, food safety, and perceptions about environmental quality.

For most insect problems, there are science-based solutions. With pesticide issues, there are more questions than answers. And misinformation, twisting of facts to fit perceptions, and personal values muddy the water even more.

In the paper, Dr. Kuhlman raised some questions he had "wrestled with" during his last two years with the U of I. The questions, he said, "must be resolved to calm some of the fears of the public." The articles and letters in this issue of **agro-ecology news and perspectives** are responses to some of those questions and to the paper.

We heard from Lloyd Burling, president of the Illinois Fertilizer and Chemical Association, and John White Jr. president of the Illinois Farm Bureau.

Writing from his 600-acre farm near Cowden, Illinois, Nick Robertson summed up some views of the Illinois Sustainable Agriculture Society. Robertson's crop mix includes corn, soybeans, wheat and hairy vetch. He credits Paul Gebhart, a corn, soybean, wheat and livestock producer near Edinburg, Illinois, with helping him think through some of the responses.

Edward T. Hodel III, a U of I computer science graduate now farming 400 acres of corn, soybeans and wheat near Roanoke, Illinois, also provided insights from a farmer's perspective, as did Louis N. Reuschel, a Golden, Illinois, farmer producing corn, soybeans, wheat, oats and hay on his own 400 acres and another 300 rented acres.

Responses from the U of I were received from Lennie Clement, agricultural education graduate student; Bruce Hannon, professor of geography; Eric Freyfogle, professor of law; and James M. Krejci, area Extension adviser, Resource Conservation and Management. Other faculty viewpoints on questions presented here can be found in past issues of **agro-ecology news and perspectives.**

The perspectives collected for this issue present alternative viewpoints on difficult personal and public policy issues. It is our hope that this issue will encourage public debate and dialogue, the foundation of policy making in a democracy.

John M. Gerber
Program Leader
U of I Agro-Ecology Program

Does our abundant, inexpensive food supply depend on the continued use of agrichemicals?

The debate over pesticides is not only about facts, but also about values. Consequently, some view modern-day pesticides as an evil to our environment and a threat to our health, while others believe those same pesticides are necessary for a profitable business and an abundant, healthy, cheap food supply.

Donald Kuhlman

Some may recall the battle in the early 1970s between the Environmental Protection Agency and Shell Chemical Company over the banning of aldrin, a corn soil insecticide. Some scientists predicted a calamity in corn production without aldrin to control soil insect pests. A headline in the November 1974 Farm Journal raised the question, "Can We Grow 6 Billion Bushel Corn Crop Without Aldrin?"

The answer, as we know now, is "yes," and we're doing it without adding residues of a very persistent insecticide to the environment.

Does our abundant, inexpensive food supply depend on the continued use of agrichemicals?—*Donald Kuhlman*

The College of Agriculture should already have addressed the question, relative to corn and soybean production in Illinois. If this has not been done it would seem an appropriate, if not necessary, task of the College.

We would assume that past research check-plot data could be used to estimate reductions in corn and soybean yields as a result of eliminating herbicides, insecticides and fertilizers as a production input, and thus arrive at an overall economic impact on Illinois agriculture and the overall state's economy.

Lloyd Burling
President
Illinois Fertilizer and Chemical Association

Do we depend on chemicals to produce an abundant, cheap food supply? Who is we or us? Middle- and upper-class North Americans? The notion that food is inexpensive is fostered by the agriculture industry as a means of self-aggrandizement.

The fact is that there are millions of hungry people in the United States. For them, the fact that an American worker spends perhaps half the time an Italian would to buy a loaf of bread is inconsequential. Perhaps food is abundant, but for many it is far from inexpensive.

I presume though that in your question you meant to ask: If we stop using agrichemicals, will food supplies decrease and costs go up? In the short-term, absolutely yes!

We have inherited, for better or worse, a system that uses pesticides to minimize the effects of crop and storage pests. To suddenly turn our backs on those chemicals would place on the public a greater risk of crop and food failure than they currently face now with the use of agrichemicals.

Looking longer term, two further questions have to be asked: Will the American public accept a change in lifestyle as it relates to food? What role will American food play on the international political stage?

I assume that shifting to an organic or chemical-free production system will require some changes in cropping systems. Diversification and "new" crops will be the rule. Corn, wheat and cotton will have to share the limelight with legumes and oilseeds.

Decreased feed grain production will raise feed grain prices, driving the cost of meat production upward. Eventually, a new meat equilibrium price will be reached, but

Imposing some restrictions on pesticides and pesticide users through regulation should bring about more improvement in water quality, but will be expensive and controversial.

Donald Kulhman

I believe it will be at a significantly lower level of consumption and a higher cost. Such a shift would probably be healthier for Americans, but it would be a hard sell.

Lennie Clement
U of I Graduate Student
Agricultural Education

The key words seem to be abundant and inexpensive. If we would discontinue agrichemicals and make the transition to natural food production, I would expect a temporary (transitional) decrease in production, an increase in production cost and an eventual gain in food quality.

As a corn, soybean, wheat, oats and sheep farmer, I am hard pressed to find a profitable market for any of it. So, it's not like there's a shortage of these commodities.

Furthermore, most people could live on considerably less than they eat. Second, they could improve the quality of their diets. Third, there is a waste of good food. I think it's really a question of values.

Edward T. Hodel III
Farmer
Roanoke, Illinois

My first comment is in regard to the term "inexpensive" food supply. I question why food should be inexpensive. At whose expense is this happening?

In this day and age, the farmer who produces our food has to buy his product back at the same price as the highly-paid professional, blue-collar worker or factory worker in this country. The farmer's goal is to produce a quality product with a comfortable margin of profit — the same goal any factory owner or manufacturer has.

Productivity is about three times greater now than in the 1940s, but in my opinion it is more due to the advances in seed productivity than the use of more fertilizer and pesticides.

Louis N. Reuschel
Farmer
Golden, Illinois

First, let us address the question of whether we really have an inexpensive food supply. The cost to the consumer at the supermarket may be low compared to other countries but what about the other costs, due to high-tech agriculture? What about the high price of erosion? Dredging of lakes, streams and river channels, as well as removing turbidity, is costly. Any loss of water supplies due to chemical pollutants that come with the soil sediment, or even those that leach through the soil, must be factored in, too.

What about the cost to society from farm bankruptcy, displaced farmers and farm program subsidies which cost the taxpayer plenty? Yet farmers are still going broke at an alarming rate.

What the question should be is: Does our overproduction of grain (we raise far more corn than our domestic consumption) and livestock and livestock products depend on continued use of agrichemicals?

Our overproduction of food will require heavy and continued use of fertilizer and pesticides. Adequate and healthy food will not require such waste of resources.

Nick Robertson
President
Illinois Sustainable Agriculture Society

If this question is to be answered in a short-term perspective, I would suggest that our current food supply system does depend on agrichemicals.

Having farmed for roughly 40 years, I have seen many benefits come from the adoption of technology. Agrichemicals have been an important part of the development of the productive agriculture we enjoy today.

A recent study by Texas A&M showed that substantial increases in the price of food would result if we banned the use of chemicals, hitting hardest the group of people the least able to pay. I don't think the public would stand for this.

If you are to look at agriculture in a longer term perspective, it is clear that the concerns of farmers and the general public must lead us to a means of controlling pests different than what we have relied upon for the past 20 or so years.

I expect that research and technology will continue to reflect the dynamic needs and desires of farmers and the public to provide us means to continue producing high quality food and fiber at a reasonable cost and in an environmentally responsible manner.

John White Jr.
President
Illinois Farm Bureau

I believe our food supply relative to pesticide residues is safe, but the issue will continue to bother those who value pesticide-free food and who distrust the risk assessors of the USEPA who set legal tolerances for residues in food.

Congress may resolve the issue of pesticide residues in food with the passage of a "negligible risk" standard. But in the final analysis, it's the public's perceptions that largely determine those risks that are acceptable and those that are not.

Donald Kuhlman

Of concern to many is the possibility that pesticide residues make it not only to drinking water, but also to grocery store shelves.

But according to a Food and Drug Administration report published in the September 1991 issue of the Journal of the Association of Official Analytical Chemists, no pesticide residues were found in 60 percent of 8,879 domestic surveillance samples in 1990, and less than 1 percent had residues over U.S. Environmental Protection Agency tolerance. Of the 10,267 import surveillance samples, 64 percent had no residues detected and less than 1 percent had residues that were over tolerance. The findings for 1990 corroborate FDA's results reported in 1987, 1988 and 1989 of generally low levels of pesticide residues in our food supply.

Is our food safe?—*Donald Kuhlman*

In absolute terms no, though I expect food that was absolutely safe would also be positively expensive. My food is relatively safe, compared to food that is in danger of consumption by locusts in the Sahel, Africa, or food that rots in the field because of poor transportation and low farm-worker morale in the Ukraine.

And like it or not, some tradeoffs have been made for me. Though I may be 100 times more likely to die from cancer than my grandfather was, Dr. Jonas Salk saw to it that I would be 10,000 times less likely to suffer from polio. Different ages, different risks.

Lennie Clement
U of I Graduate Student
Agricultural Education

Our food is probably safe in one respect and not so safe in another.

Compared to the way slaughterhouses and various food processing and handling plants were once operated, we are much safer. On the other hand, there are bound to be various amounts of many chemicals in today's food because of manmade additives. Man made them, used them and abused them.

While the average age of an American is increasing, we also see a lot of cancer that cannot be explained. Other health problems may be caused by chemicals in our food. But one thing remains certain, we are what we eat.

Nick Robertson
President
Illinois Sustainable Agriculture Society

By any measurable standard, I think Americans enjoy one of the highest quality, safest food supplies of any nation in the world. While we often debate the relevance of improved detection capabilities, the need for tighter inspections, and the long-term health effects of low-dose exposure to various substances, the overall health of our citizens is vastly improved over that of our forefathers. The number of actual, serious food safety concerns is relatively small.

John White Jr.
President
Illinois Farm Bureau

Does agriculture have a right to impose health or environmental risks, however slight, on another segment of society?

Should farmers defend pesticide residues in water and food?

Environmental groups are raising questions that put agriculture on the defensive. The good news is that agriculture is responding to critical questions raised by environmentalists.

Still, it's difficult to defend pesticide residues in water and food, even though the levels are within the tolerances or health advisories set by the U.S. Environmental Protection Agency. If you defend pesticide residues — no matter how small or insignificant — there's some risk of losing the public's trust.

My advice to farmers is: If you don't want to be portrayed as villains, you must convince the public that you're doing the right things to protect the environment from contamination.

For starters, I suggest you demand the pesticide industry provide environmentally-benign pesticides. Don't hesitate to inquire about the toxicity of a pesticide and its effects on wildlife and leaching and runoff potential. Those questions are just as important in this environmental era as questions about cost and effectiveness.

Don't hesitate to put pressure on the industry and land-grant colleges for answers to those questions. In the final analysis, the farmer is the one who will ultimately bear the responsibility for using the pesticide. Be tough with your environmental demands.

Agriculturists aren't going to be able to dodge issues of pesticides in rainfall, streams and groundwater. While the levels being detected are generally minuscule, the inescapable truth is that residues are present and the public finds this unacceptable.

Does agriculture have a right to impose health or environmental risks, however slight, on another segment of society?—*Donald Kuhlman*

I suppose it begs the question to point out that the auto industry, the power industry and the steel industry impose health and environmental risks on society.

Lennie Clement
U of I Graduate Student
Agricultural Education

The answer for this is very easy. NO.

Nick Robertson
President
Illinois Sustainable Agriculture Society

This is perhaps the easiest question to answer of them all. No, we absolutely do not.

However, to imply, as the question does, that farmers are consciously imposing health or environmental risks on society at large is offensive to farmers. Farmers and the agribusiness community have spent billions of dollars on "pollution control equipment," training and licensing for product use, research on safer chemicals and a host of other investments related to the issues of food safety and the environment.

This obligation to protect the interests of the public is a part of our job that we take very seriously.

John White Jr.
President
Illinois Farm Bureau

NO. The pesticide manufacturers should defend the residues. They invented, designed, researched and directed (wrote the directions for) pesticide use. They even funded extensive university research projects and personnel — the experts farmers put their faith in for farming advice — to promote their pesticides.

What farming magazine is not inundated with pesticide advertisements? What farmer has never witnessed the presto/change-o magic transformation of a weedy field by herbicide sprays? It is no wonder that farmers use pesticides. Who could better defend the pesticide residues than the manufacturers themselves?

Edward T. Hodel III
Farmer
Roanoke, Illinois

NO. If the answer to the previous question is no, then surely, we farmers can't defend residues because we are unable to assume the risks involved.

Nick Robertson

Farmers should not defend pesticide residues in water and food. Yet, we must help others to understand the world does not come in such simple terms that would allow us to deal with this issue as this question presents it.

What we need to do is to focus more of our attention on the effective ways to balance the risks with the benefits posed by the use of various technologies.

John White Jr.

Direct more research, less debate toward environmental questions

The College of Agriculture, as a land-grant college, should have no question as to their mission and obligation to every citizen of Illinois — all clientele — but should not find themselves in the position of attempting to resolve perceived problems, without first confirming the problems as real and then providing recommendations to correct real problems based on scientific evaluations.

Lloyd Burling

We view Dr. Donald E. Kuhlman's "Reflections About Environmental Issues" not unlike those of our industry, and farmers in general, as an expression of the frustrations experienced in attempting to address this very complex subject with any degree of objectivity.

Dr. Kuhlman reflects that the various interest groups — environmental activists, agribusiness and College colleagues — each perceived his alignment or alliance with another group that he worked with separately. Dr. Kuhlman's questions seem to further polarize and divide interest groups into the pesticide industry, farmers, environmentalists and land-grant colleges.

With the advent of **agro-ecology news and perspectives**, we have observed what appears to be a division or polarization of College research and Extension personnel. This public extension of disagreement at the College becomes obvious, with little or no differentiation as to whether the information presented is based on fact or opinion.

This is not a healthy situation and only contributes to increased polarization between groups and College personnel, and in our opinion does nothing toward resolving the issues.

Production agriculture, specifically corn and soybean production, relies on evolving technology. Farmers have adopted those technologies that perform well. Agri-industry has developed marketable technologies and land-grant colleges have recommended technologies based on performance.

Agribusiness and farmers are very concerned about the perceived impact of technologies on the environment and efforts are under way to clearly define those technologies that pose a real threat.

Current information and specific recommendations coming from the College of Agriculture can no longer be clearly interpreted, with opinion and basis of fact no longer discernible. We would encourage the College of Agriculture to more clearly define their position and the basis of the information when addressing the public and making production recommendations. We believe the College of Agriculture should be the vehicle to resolve issues among groups and not one of the individual groups.

The College of Agriculture, at Illinois, should focus on research to determine if the principle crops grown in Illinois — corn and soybeans used for human and livestock food — are safe, and on research to determine the risks imposed on health and the environment in the production of these two specific crops. Perhaps then the College can factually and realistically address the question of risks and benefits relative to the state's most important crops.

More important, this will allow the College research and Extension personnel to concentrate on resolving issues relative to Illinois agriculture, with less concern and lost time discussing broad environmental issues — many of which they can never impact, and many of which do not directly impact Illinois production agriculture.

The College of Agriculture has the opportunity to take a leadership role by directing research efforts to answer the questions posed by Dr. Kuhlman that most significantly impact Illinois agriculture. The College of Agriculture will then fulfill the mission of providing factual and useful information to all clientele — consumers, farmers, agribusiness and environmentalists. *LB*

If you look at the farm bills of 1985 and 1990, it's fairly plain that farmers have to strengthen the alliance—the new alliance—with environmentalists and consumer groups.
—Peter D. Bloome

Agriculture must recognize public policy issues

Peter D. Bloome, assistant director, Illinois Cooperative Extension Service, shared some thoughts on society, agriculture and science during an interview for Illini Farm Report with Kathy Reiser, Information Services, Office of Agricultural Communications and Education. Following are comments excerpted from the interview.

On setting limits:

As an individual, I certainly expect to have something to say about limitations on how the steel industry or the petroleum industry or the auto industry operates. I think society has exactly the same expectations about agriculture.

Society may have an even greater reason to be concerned about agriculture and to think about the limits that it would like to set on how agriculture can be practiced. In reality, the majority of our natural resources are controlled by agriculture as an industry. And those natural resources are absolutely essential to future generations.

On who speaks for agriculture:

Whenever there's an issue raised that could be construed to be criticism of agriculture, the input industries rush to the defense of agriculture. They do something else that's rather interesting too: They presume to speak for agriculture. And they go one step further than that. They even presume to pre-sent the public image for agriculture.

But the interests of agriculture are not the same. The interests of the farmers are not the same as the interests of the input industries. I'm not sure farmers have thought about that, but I think it's terribly important.

I think it may well be that farmers are going to have to choose whether they want to stand very close with the input industries — almost in opposition to environmental and consumer interests — or whether, in fact, they want to shift their alliance. . . .

If agriculture sees all issues that might be construed as placing limits on it or criticizing how it operates as "either/or" — that this is a battle that we have to fight to the end to win — we'll lose most of our battles. And we'll lose most of our battles simply because we're going to be outvoted.

And so the strategy of pressing for an either/or decision on important public issues is probably not in the best interest of agriculture. Much more in its interest would be **compromise:** discover common ground and then come to a solution that meets the needs of the public and agriculture.

On science and public issues:

We've all had impressed upon us many times that, for all of its power and all of its insights, science does not give us definitive answers to important public, political and social issues. Science can provide us with knowledge, but it can't provide wisdom to go along with that knowledge. These are public policy issues, by definition. That means there's no right or wrong answer; people have to make judgments.

In my view, the appropriate role for the University is in public policy education, and that has three steps. The first step is to identify and define the issue itself. Secondly, to identify and discuss the alternative actions that the public has in dealing with that issue. And then finally, to try to identify and discuss the consequences of each of those activities.

And then withdraw.

It's not the University's role to say what the public ought to do about those issues. It is the public's right — and it's appropriate in a democracy — for the public to make those decisions. To say that science should resolve these issues is to misunderstand science.

Science cannot resolve these issues. In a pure sense, science is divorced from values and purpose. Science is just trying to discover truth, just trying to define the nature of things as they are.

Purpose has to be attached somehow to that scientific knowledge. And that's where wisdom, compromise and judgment come to bear.

So the University has a terribly important role to play, but it is not in **resolving** an issue. It is in helping the public **understand** the issue, know what its alternatives are, and understand the consequences of those alternatives.

On production agriculture:

It used to be when we dealt with production agriculture topics, that we could deal with them in a very straightforward economic analysis of what's going on on that farm.

We still deal with production topics that way. But when we talk with farmers now, we also have to supplement those production topics with a discussion of the public policy issues that surround agriculture.

We have to talk about the fact that our agriculture is very much dependent on fossil energy sources. And that's a public policy issue. The public's going to make decisions about how our nonrenewable energy sources are going to be used.

Traces of agricultural chemicals in the environment is a public policy issue, and the public is rightly going to make decisions about that. *PDB*

Are environmentalists concerned about their own credibility?

I would like to see environmentalists continue to question agriculture, but also make a greater effort to avail themselves of opportunities to spend time "down on the farm," interacting with farmers and pesticide dealers to get a better idea of the risks and trials and tribulations of growing crops and livestock.

Have environmentalists taken the time and effort to become more educated on the pesticides, toxicology and farming?

Are environmentalists concerned about their own credibility?

—Donald Kuhlman

The central issue raised by pesticides is the issue of health. For many observers, health means human health, and the main or sole concern is with health problems that arise quickly and clearly.

Environmentalists, by contrast, take a broader view on this issue.

For them, the health of humans is inextricably bound to the health of the planet, which is to say that the inquiry needs to include the health of all life forms. If pesticides kill fish something is wrong, even if the fish don't end up on our dinner plates.

Many discussions of the health issue assume that humans can trace the ill effects of pesticide use.

Environmentalists, by contrast, tend to the opposite assumption.

It is nearly impossible to alter only one part of nature. Once we set a force in motion, its effects spread far and wide, well beyond our ability to follow and calculate. A rootworm insecticide does more than kill rootworms; it interferes with the entire ecosystem of which the rootworm is a part. Some effects might be good; others might be bad.

The point is, we do not know all of the effects, which means that we cannot undertake a complete tally. By using any insecticide, we act at our peril and the peril of the land.

Part of the issue here is one of burden of proof. When a new chemical is introduced, should we assume that it is safe until proven harmful, or should we assume the opposite?

Many of today's farm chemicals are backed by little if any public testing, and the Reagan-Bush administrations have pushed hard for even less testing. By its very nature the testing that is undertaken proves but little. Only by extrapolation can we guess at long-term effects on humans, for the typical testing is not on humans and not long-term.

Even with our expensive testing programs we know little about how various chemicals interact in the environment, and what effects they have on the integrity and stability of ecosystems.

By counseling caution, environmentalists seek to embrace this human ignorance and leave as much room as possible for nature to remedy our inevitable errors.

Dr. Kuhlman expresses commonly held doubts about the credibility of environmentalists. His challenge on this point, however, appears to mix issues of fact with issues of value.

He displays a sense of shock that an environmental paper could assert that "The large amounts of chemical fertilizers in widespread use also pose serious health risks." His concern, I can only assume, is with the word "serious," for the rest of the sentence seems unobjectionable.

The sentence is, first of all, not limited to the question of human health, and it may be unfair to read it that way. Even when focusing narrowly on humans, nitrate contamination does pose risks.

And there are those who view the danger as serious, even if Dr. Kuhlman does not. Whether a risk is serious depends upon the level of risk that the speaker is willing to accept, which in turn might well be relative to the perceived benefits of the use. Even the relatively harmless Alar can be viewed as an unacceptable threat in comparison with the benefits of the chemical, which are somewhere between trifling and negative.

The attacks on environmentalists for not attending more pesticide gatherings carry a strong air of unfairness, however desirable their attendance might be.

The environmental movement in this country is almost entirely made up of volunteers, and they are volunteers who receive no monetary compensation, direct or indirect, from what they do. The paid staff of environmental groups is minuscule in size. (There is a total of one environmental lobbyist in Springfield, for example.)

For the busy environmentalist, library research is often more productive than time spent at conferences, particularly conferences put on by people with products to push.

Finally, it is always worth remembering that no group is fairly judged by the conduct of its least responsible members.

Eric T. Freyfogle
U of I Professor of Law

Although I don't always find their appraisals about pesticides to be factual, environmentalists are articulate, smart, aggressive, sincere, honest, hard-working individuals dedicated to maintaining and improving the quality of our world.

Donald Kuhlman

Bruce Hannon, U of I Professor of Geography

Environmentalists see social, economic costs of agriculture

Hats off to Don Kuhlman for having the courage to bring his thoughts and experiences together after what must have been a difficult time in his professional life.

I, too, believe that within "agriculture" are some of the smartest and most environmentally-oriented people that I have met. I like the idea of posing sets of questions on issues swirling around agriculture today to various "interest" groups. My comments are stimulated by the queries.

The focus of agricultural colleges is still on production, but there are places where nutrition and home design are studied. And there are places in our College of Agriculture where rural sociology is described. These are small places, by comparison, with the production arena, but they are the telltale pieces of the overall concern with the culture of agriculture.

Our College indeed seems large and yet too self-contained, too inward-looking, too self-interested, too narrow. Perhaps this is why the overall university policy has not favored the College in recent times.

The College, it seems, has two general choices: to further turn inward and derive even more of its support from the diminishing rural population and from agribusinesses, or to turn outward and recognize the ecology of agriculture and produce the rational constraints which make it a more useful part of society.

Environmentalists are concerned with culture also, but on a wider scale. They are worried about how the earth is treated by the agriculturalist and by everyone else.

For instance, they see the Amish as part of agriculture and ask why these successful modern farmers are easier on the earth than the neighboring "English" farmer. They see both farmer types as based on religious viewpoints: the English worshiping at the altar of efficiency and profit margin, and the Amish seeking the means to better curatorship of the garden.

Both groups depend heavily on their respective cultures to survive. Both see their landscapes as standards for beauty, and even though the Amish farm more lightly on the earth, they still reduce Nature to crops.

The loss of habitat is nearly the same for both; the Amish simply risk the environment less, mainly because their chemical use is smaller and their methods produce less soil erosion.

Environmentalists see the process of modern agriculture as just another industry, albeit, the hardest one on the earth. The problem as they see it is to be solved by changing the rules under which agriculture proceeds.

Environmentalists have tried to learn the economics of internalizing external costs and to promote generally those constraints which give the farmer the most freedom to choose. They eschew detailed regulation except as a last resort. They dislike and distrust bureaucracy just as much as the farmer, but they will promote bureaucracy as an alternative superior to inaction.

They do not believe in the often-promoted picture of "farmer as environmentalist" as so incorrectly promoted by the Farm Bureau and other farm chemical interests.

In one sense, environmentalists don't need to know the details of farming. They are willing to believe that farmers are people very much like themselves and similarly in need of constraint.

Environmentalists see the issue of food cost as a bit of red herring brought out by those who promote chemically-intensive agriculture. The cost of food for the average American is already low and the farmer's share in the cost of food on the table is very small.

The general public already has said that they would pay more for purer food. I think that the proper questionnaire which connects soil loss and air and water pollution to food costs would find the public willing to pay even more.

Twenty years ago, we thought that we knew an awful lot about the damage to the environment and public health from farm chemicals, habitat loss and soil erosion. We can look back and laugh a bit at how little we knew and we will no doubt look back from the year 2010 with the same sort of humor at today's stance.

Environmentalists are more risk-averse when it comes to protecting nature, and in that sense they are more conservative than conservative farmers.

They also see a difference between voluntary and involuntary risk. They refuse, as apparently does the public, to accept the word of the College, the Farm Bureau or the chemical industry as to the risk of residue pesticides in their food. They especially dislike the idea of such risk being compared to the risk of driving a car.

But to speak only of pesticides versus Nature/Public and not about other impacts from modern agriculture is to ignore vagrant soil, the world's greatest air and water pollutant, and the extensive loss of wildlife habitat, both surely a key result of agriculture. These are enormous social and economic costs. *BH*

Do farmers want to use a pesticide that is classified by the U.S. Environmental Protection Agency as a probable or possible carcinogen?

In 1990, President George Bush recommended a new initiative for enhancing water quality in his budget proposal to Congress. In his statement of principles and policies, he made it clear that farmers are ultimately responsible for avoiding contamination of water resulting from management practices they apply to the landscape.

Donald Kuhlman

Although the public is concerned about pesticides and their effects on health, manufacturers are unlikely to cease production. Farmers need and demand pesticides to control weed, insect and disease pests.

Do farmers want to use a pesticide that is classified by the U.S. Environmental Protection Agency as a probable or possible carcinogen?
—Donald Kuhlman

Some farmers would check for an alternative pesticide, then weigh advantages versus disadvantages of the alternative(s); others would not think that the health risk is that significant or justifiable; a few would avoid it entirely. I would tend toward avoiding it entirely.

Edward T. Hodel III
Farmer
Roanoke, Illinois

Farmers want to survive the economic crisis facing agriculture first and foremost. This has led many farmers to ignore the question posed here or else postpone its answer until time has run out. But, if given a choice, most would surely agree the world would be better off if we could eliminate such pesticides.

Nick Robertson
President
Illinois Sustainable Agriculture Society

This question goes back to the issue of risks versus benefits. If we had our druthers, I'm not sure there is a farmer that would want to use a pesticide classified as a probable or possible carcinogen.

Yet, we recognize that life puts many choices before us. I am reminded that a leading source of poisoning in homes is bleach. Yet, we do not see many people frantically foregoing its use.

This need not be the case with agricultural chemicals. Farmers know and are trained to handle chemicals carefully. They recognize the risks posed by using chemicals can be managed.

What farmers want and need is reliable information on how a pesticide which is of proven benefit can be used in a way that absolutely minimizes the potential health or environmental risk for the farmer, the farm family and the rest of society.

John White Jr.
President
Illinois Farm Bureau

The Age of Information

On this page you'll find just a sampling of publications and other information from the University of Illinois. Many of the sources also offer free catalogs or can guide you to other information outlets.

Agronomy Handbook 1991-1992 (C1311) *$5.00*
Addresses such topics as soil management, tillage, moisture management, weed control, corn and soybeans, small grains, cover crops and water quality.

Alternatives in Insect Management: Biological and Biorational Approaches (NCR401) .. *$6.00*
Provides background information and evaluations of the safety and effectiveness of several alternative products and practices.

A Farmer's Guide to Agricultural Credit (AE-4679) *$2.00*
Explains credit options, including variables that figure into the terms and conditions of a loan and how different loans work.

Making Your Views Count on Public Policy Issues (NCR389) *$2.50*
Suggestions and ideas to help you become involved in public policy decisions.

1992 Illinois Pest Control Handbook (IPC-92) *$18.00*
Information on pesticides, biological insecticides, application strategies, regulations and more. Single chapters on field and forage crop pests *(J1-92)* and home, yard and garden pests *(J17-92)* are available for $2 each.

Protecting Water Quality in Illinois
Nutrient and Pesticide Management Strategies (C1315) *$2.00*
Information to help readers make more informed management decisions that will reduce the levels of water pollution caused by agricultural activities.

Sustainable Agriculture *Illinois Research, Fall/Winter 1989*
Ideas, practices and philosophies emerging in agriculture.

Water Quality Today; Food Safety Today; Home, Yard and Garden Today
Practical tips for producers and consumers, research updates and viewpoints on issues.

Weed Control Systems for Lo-Till and No-Till (C1306) *$1.50*
Suggests general weed control methods for various conservation tillage systems.

For the publications listed above, or a free catalog of other publications, slide shows and video tapes, write to: Information Services, University of Illinois, 69 Mumford Hall, 1301 West Gregory Drive, Urbana, Illinois 61801, 217/ 333-4780.

Land and Water Series:
A Plan for the Land: Erosion-Control Alternatives

Maximum Control in Minimum Till: Economical Weed, Insect and Disease Control in Reduced Tillage

Pesticides and Groundwater: Pesticides as Potential Pollutants

Planning Your Well: Guidelines for Safe, Dependable Drinking Water

Ridging: The Pros and Cons of Ridge Till

No-Till: Successful No-Till Management

Safe Drinking Water: Testing and Treating Home Drinking Water

A Land and Water Series brochure and one free copy of each publication are available from: Land and Water Publications, University of Illinois, 305 Mumford Hall, 1301 West Gregory Drive, Urbana, Illinois 61801.

The Pest Management and Crop Development Bulletin
($20 for 25 issues weekly during the growing season)
Extension specialists report on the insect, weed, plant disease and crop situation and offer advice on management strategies and pesticide application techniques.

Other newsletters deal with farm economics; market outlooks; dairy, poultry and horse management; forestry; vegetable production; and weed, disease and insect pests found in the home, yard and garden. Prices range from $4 to $30 per subscription. Descriptions and subscription forms are available from: U of I Ag Newsletter Service, 116 Mumford Hall, 1301 West Gregory Drive, Urbana, Illinois 61801.

Ag Events Calendar
The Illinois Cooperative Extension Service, along with the College of Agriculture, agribusiness and government agencies, sponsors meetings, field days and conferences on a range of topics and issues.
Contact your nearest Extension office for a monthly schedule.

Louis N. Reuschel, Farmer, Golden, Illinois

Sustainable agriculture offers alternatives

Dr. Donald Kuhlman made some interesting comments and asked some important questions. The paper is timely and speaks to the issues quite honestly. It is time for the University of Illinois to take these issues seriously. I believe that prior to 1980, they did not know the meaning of the word sustainability, let alone address it.

I don't agree with the idea expressed in the paper that farming systems in the 1950s weren't sustainable for economic reasons. Most farmers were in better shape financially in the 1950s than they were in the 1980s. Just because some farmers raised over 200 bushels of corn last year doesn't mean that they are better off financially.

The paper also asks why farmers have evolved to the current corn-soybean rotation. The main reasons are government programs, bigger machinery and trying to stay in business.

Previously, cultivation and rotation of small grain crops and legumes were good methods of weed management. Now, with the chemical industry's advertising, we are "conned" into thinking chemicals are better and cheaper. But what is forgotten is that rotations were more beneficial than we realized.

I would suggest that corn-soybean rotations with anhydrous ammonia and chemical farming could be compared to people who are hooked on drugs. They start out small, using a small amount. It makes them feel good for awhile, but then they think they need a little more to get the same effect, and pretty soon they have doubled, or tripled, their drug (chemical) use.

Then they notice that things aren't quite the same as they were before. Getting back to a healthy state is slow and can be very painful!

Finally, I would like to ask: What has happened to stewardship? To ***not*** think of tomorrow and beyond is very shallow. America's greatest resource is our productive farmland. I, for one, want to try and preserve it for our future generations.

I am genuinely interested in and work sincerely for the practice of sustainable agriculture. To my knowledge, sustainable agriculture is the only group that is addressing production agribusiness concerns for the future generations!

Sustainable agriculture doesn't have all the answers; we are asking questions too. But, we are suggesting that there are some alternatives out there. Sustainable agriculture has something to offer everyone. *LNR*

A Guide to Sustainable Agriculture Practices

Due out soon, this guide lists farmers using sustainable agriculture practices and sustainable agriculture organizations. It includes government and university contacts for information on alternative energy, conservation, pesticide restrictions, pollution, soil erosion and water quality.

Write to: Illinois Sustainable Agriculture Society
P.O. Box 500
Rochester, Illinois 62563

Farm Program Options Guide To Sustainable Agriculture, Conservation and Water Quality Incentive Programs In the 1990 Farm Bill ($3.00)

Prepared by the Sustainable Agriculture Working Group.

Write to: Farm Guide
Center for Rural Affairs
P.O. Box 405
Walthill, Nebraska 68067

How should farmers respond to criticism about polluting water and food with pesticides while receiving government subsidies?

Will Congress tighten the purse strings and mandate growers to do "X" to receive government payments? We may be getting closer to prescription agriculture, whereby a "certified crop doctor" tells a farmer what and how much of an agrichemical to apply.

Donald Kuhlman

The "window of opportunity," or the time for farmers and the U.S. Department of Agriculture to show evidence of change and improvement in water quality, is probably about five years, or until the next farm bill is written. If improvements in water quality don't come about in five years, government may take more regulatory action.

Many question whether Congress (and taxpayers) should continue to subsidize farmers who are polluting water resources.

How should farmers respond to criticism about polluting water and food with pesticides while receiving government subsidies?
—Donald Kuhlman

This question mixes apples with oranges. I don't really see that the two are connected.

Government subsidies are put in place primarily to act as a stabilizing factor on the production of agricultural commodities. It is the result of a conscious public policy decision which has been made to maintain an adequate supply of reasonably-priced food and fiber.

I do not see how one can reconcile the issues of government farm program payments to farmers with criticism about alleged pollution of water and food.

John White Jr.
President
Illinois Farm Bureau

Remove pesticides from the market and discontinue all government subsidies. I would consider it a refreshing challenge for farmers to farm without both of them.

Edward T. Hodel III
Farmer
Roanoke, Illinois

How else but to say the two go hand in hand. Farm programs dictate what crops to grow. To increase yields and cover more acres, farmers will use agrichemicals that are bound to pollute. Beyond that, farmers could say they must do what they can to survive economically — yet many do not survive.

Nick Robertson
President
Illinois Sustainable Agriculture Society

James M. Krejci, U of I Area Extension Adviser, Resource Conservation and Management

Education is key to resolving environmental questions

Facts can be found in scientific literature to prove just about any personal view or bias on just about any issue.

Donald Kuhlman

The questions raised in the paper are more than science can answer — most, if not all, cannot be solved scientifically. They transcend science. The questions involve values, ethics, morals, politics and perceptions (societal influences) which are all rolled up together with science to make a highly complex situation — that is called an issue.

Dr. Alvin M. Weinberg in **Science and Trans-Science** discussed the relationship between scientific knowledge and societal decisions. He wrote:

"Many of the issues which arise in the course of the interaction between science or technology and society. . . hang on the answers to questions which can be asked of science and yet which cannot be answered by science." Dr. Weinberg goes on to state that science is inadequate to provide answers to these questions because:

- To get good answers would be too expensive.
- The subject matter is too variable to allow use of strict scientific procedures accepted by the natural sciences.
- The issues involve moral and aesthetic judgments that deal with what is valuable, rather than with what is true.

Most of the questions raised by Dr. Donald Kuhlman fit this dilemma and therein lies the challenge. The challenge is to use good fundamental public policy education to provide the factual alternatives and consequences to society and then let the public apply the values, ethics and politics to the facts to make a decision (policy). *JMK*

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On-farm nitrogen research — Emerson D. Nafziger describes a nitrogen rate study carried out by farmers.

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On-farm weed control trial — Gary Bickmeier and Cletus Arnold report the results of a trial comparing herbicide use and cultivation for weed control.

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Fertilizer investment — Doug Zehr describes how a farmer followed up on concerns about the returns on his fertilizer investment.

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One topic of particular interest to the Illinois Stewardship Alliance and others involved in on-farm research is validity versus relevancy. Farmers and researchers have different goals when they set out to do research, and this becomes evident when they come together and try to plan a project.

Researchers want universally valid information which can be published and used throughout the state or nation.

Farmers want locally relevant information which will help in their own farming operations.

Are these two goals mutually exclusive? Can there be compromise?

Perhaps part of the dilemma can be explained by Webster's New World Dictionary. The first definition of research is "scientific or scholarly investigation." Land-grant institutions traditionally have clung to this definition and have considered this part of their contract with the rest of society. Most of the latest advancements in agricultural production can be attributed to science. Society, as a result, has held this first definition of research in high esteem.

But a second definition of research, according to Webster's, is "close, careful study." For thousands of years, agricultural societies have used this definition of research to improve their way of life and in the process, have given us the domestic species commonly used in agriculture. Today's farmers are heirs to this tradition and still possess many of the same skills as their predecessors. However, society has placed less value on this second definition of research, and many farmers have lost confidence in their own perceptions.

On-farm research has provided a way to encourage farmers to rely on their own innate capacity for keen observation. These farmers don't question the validity or need for small-scale randomized, replicated plots found on research farms. However, they have found that their own observations, too, are important for making everyday management decisions.

Doug Zehr
On-Farm Research Coordinator
Illinois Stewardship Alliance

editor's note: *Zehr describes one farmer's "close, careful study" of fertilizers on the back cover.*

Agronomy Day

September 10, 7 a.m. to 1 p.m.
Agronomy-Plant Pathology South Farm, Urbana

Field tours to University of Illinois research plots highlighting new ideas for efficient agricultural production which conserves resources and protects the environment. For information, contact Sharon Conatser at 217/333-4424.

Coming: *Agro-Ecology Technical Notes*

Where there is much desire to learn, there of necessity will be much arguing, much writing, many opinions; for opinion in good men is but knowledge in the making.

John Milton, ***Tractate of Education,*** *1644.*

Through *agro-ecology news and perspectives,* ***we expressed our ideologies and vented our frustrations. Now we need to focus on specific things that people can do to make our agriculture more ecologically sound, while at the same time meeting the basic needs and desires of consumers for high quality, safe, affordable agricultural products and services, conserving natural resources and improving the quality of life of all who work in the industry of agriculture.***

Donald A. Holt

My grandfather told of times in his youth when the infestations of wild sweet potato, known by some as manvine, were so bad that when you stepped in one end of the field, the other end would shake.

While probably somewhat exaggerated, this little story symbolizes the agroecology perspective. When you intervene in and change some part of a complex agroecological system, an effect, possibly an unexpected and undesirable one, is manifested somewhere else or at some other time.

Agro-ecology news and perspectives was created to inform its readers of the agroecological complexities and controversies associated with modern agriculture. The publication was unique among our publications, because we solicited articles from people who were outspoken critics of various farming systems and of other agricultural groups.

Not surprisingly, some readers were offended by some articles. Surprisingly, at least to me, some of those most offended were University of Illinois faculty and staff. One of our most dedicated and conscientious people said to me, "I feel like my whole career has been rejected."

We like to think of the University as the marketplace of ideas, a place where controversial ideas can surface, where free-thinkers can think the unthinkable, where issues are vigorously debated and everybody goes home happy, having honed their intellectual skills.

But we learned that agroecology issues run deep. People on both sides of these issues regard the criticisms of present and proposed systems as threats not only to their technical knowledge and experience, but to their values and motives. People do not like to have their values and motives questioned.

I would just like to tell people on all sides of these issues that, in general, everything is OK. I don't mean that all agroecology issues are resolved, not by any means. I don't mean that the University will provide answers that will satisfy everyone's concerns. I can't even promise that University people will speak with one voice on these issues; that is very unlikely.

I don't mean to suggest that agriculture will move back to a more benign, less intensive, less stressful enterprise. The trend toward capital intensity is driven by the logistical needs of feeding large urban populations, using a small work force drawn from a population that is definitely not inclined toward the agricultural drudgery of the past. I doubt if that trend will change. The need is simply too great.

We're OK because we are talking to each other and working together, in part because of **agro-ecology news and perspectives.** We are working together, through our participatory research programs and in other ways, to attack specific agroecology problems. That is a very positive development.

But it's time to move to another stage in our ongoing discussion of agroecology. So, **agro-ecology news and perspectives** will evolve to *Agro-Ecology Technical Notes*. There will still be a few articles in which authors describe their particular agroecological value system, but more articles will relate to the results of specific agroecological research efforts. We will try hard to make it a useful, practical publication.

Donald A. Holt
Director
Illinois Agricultural Experiment Station

John Masiunas and Michael Crotser, Department of Horticulture, University of Illinois
Catherine Eastman, Center for Economic Entomology, Illinois Natural History Survey and Office of Agriculture Entomology, University of Illinois

Vegetable intercropping

The debate over alternative and conventional agriculture will continue; only research and practical applications will answer the many questions. However, we must all work together to achieve the common goals "of improved protection of the environment, sustainability of agriculture, human health, and profitability of farms."

Lowell S. Jordan and James L. Jordan quoting Richard S. Fawcett in ***Alternative Agriculture: Scientists' Review,*** *Special Publication 16 from the Council for Agricultural Science and Technology.*

Intercropping is growing two or more crops at the same time in a field. Common methods of intercropping in the Midwest are growing strip crops or cover crops.

Some possible advantages include: greater yields than monocultures, reduced risks, lower pest populations, better use of resources (such as water or nitrogen), and more uniform labor demands.

Nitrogen use in an intercrop system may be more efficient because a legume (soybeans, alfalfa, green beans or peas) in the intercrop fixes atmospheric nitrogen while a nonlegume (corn, wheat, cabbage or tomatoes) uses nitrogen present in the soil.

Intercropping may reduce pest populations by increasing the difficulty with which the insect pest locates a host crop; releasing plant-produced chemicals which discourage pests; providing less favorable habitats; or increasing parasites and predators of pests.

The objectives of this research were to determine if tomatoes intercropped with cabbage reduced pests or increased yields compared to monocultures of the two crops. Transplants of *Sunny* tomato and *Hancock Hybrid* cabbage were spaced 18 inches within the row and 3 feet between rows at the Irrigated Vegetable Research Farm in Champaign. Integrated pest management was used.

Cabbage and tomatoes were planted in four-row strips within 16-row plots. The proportion of cabbage and tomatoes in the intercropped plots was varied from 0 to 100 percent of each plot.

Each intercropping treatment was replicated three times. Two treatments were 100 percent tomato plants. Tomato plants in one of these treatments were staked; those in the other treatment were grown on the ground. All other tomato plants in other treatments were staked.

Crop quality, cabbage head weight and tomato fruit weight, number and size were determined.

The predominate weed early in the season was velvetleaf. Later, it was morningglory. Intercropped plots with 75 percent tomato had significantly fewer morningglories than the other intercropped plots.

Due to unusually high populations of cabbage worms (cabbage looper, diamondback moth, and imported cabbageworm) in all plots, none of the intercropping treatments had an effect on insect pests.

The two crops intercropped well together, and there were no effects of intercropping on tomato or cabbage growth. Tomato fruit matured earlier in the 25 percent tomato intercrop plots. The 75 percent tomato and 25 percent cabbage intercrop was the most productive system when yield was expressed in pounds of marketed crop per acre.

Staking caused the tomato fruit to mature earlier. Tomatoes grown on the ground (not staked) had higher yields than staked tomatoes. However, most of the increase consisted of late-maturing fruit.

This research indicated that under conditions of high caterpillar pest populations, intercropping cabbage with tomato may have no significant effect in reducing pest numbers in cabbage. Also, tomato plants produced more fruit when grown on the ground, but staking resulted in earlier-maturing fruit. One final observation was that, in terms of total yield in this intercropped system, it may be advantageous to plant 25 percent cabbage.

This research is being continued for the 1992 field season. *JM, MC, CE*

Vasey Mwaja and John Masiunas, Department of Horticulture, University of Illinois

Cover crops: Vegetable crop systems

Production systems using reduced tillage and maintaining plant residues on the soil surface are very effective in reducing weed problems, conserving soil moisture and reducing soil erosion.

The plant residues suppress weeds by shading the soil and producing chemical compounds that are toxic to weeds. Residues of small grains, such as rye, wheat and barley, are the most suppressive. For example, rye residues inhibit up to 90 percent of annual broadleaf weeds for six weeks after planting.

Previous research indicates cover crop management is critical for establishing vegetable crops into residues. The objective of this research was to develop reduced-tillage vegetable production systems which use rye and hairy vetch residues.

In fall 1990, *Wheeler* rye and hairy vetch were interseeded in Champaign plots at 100 and 30 pounds per acre, respectively. The following spring, the cover crop was either disked or killed with Roundup. Disking maintained greater than 70 percent soil coverage. Cover crops killed with Roundup were not tilled (no-till).

Bravo cabbage, *Market Pride* tomato and *Mustang* green beans were planted during the third week of May. The cover crop systems were compared to a conventional clean-tillage production system. In the conventional system, Treflan was used for weed control.

The residues persisted longer when the cover crop was killed with Roundup than when it was killed by disking. At the end of the growing season (12 weeks after planting), 1 pound of residues per square yard remained in the Roundup-killed plots.

Giant foxtail and large crabgrass were the most troublesome weeds. The no-till system, where Roundup was used, was similar to the conventional system in grass suppression. There were greater numbers of grasses, redroot pigweed and dandelion when the cover crop was disked than in the other production systems.

Growth and yields of cabbage, tomatoes and green beans did not differ between the production systems. Tomato fruit ripened earlier in the no-till cover crop system, possibly because of cooler soil temperatures and more uniform moisture. Also, the no-till cover crop system had less cabbage worm (species was not identified) feeding on cabbage heads compared to other systems.

In summary, cover crop residues may be important for integrated pest management in vegetables. Cover crops suppressed weeds and reduced injury from insects without affecting yields.

The maximum benefits were obtained by killing the cover crop with Roundup and leaving the residue on the soil surface. *VM, JM*

A portion of this joint project with Purdue University was funded by the North Central LISA Program. The use of trade names does not constitute a guarantee or warranty of the products by the authors, the University of Illinois, nor the NC-LISA Program and does not imply its approval to the exclusion of other products that might also be suitable.

Sonya Solamon, a University of Illinois professor of family studies, has a LISA grant from the North Central Region Sustainable Agriculture Research and Education Program to examine social, cultural, environmental and production factors of farming systems. She will coordinate the efforts of U of I researchers from the fields of family studies, resource economics and crop production. The researchers will work with 60 farm families.

Stephen A. Ebelhar, University of Illinois Dixon Springs Agricultural Center

Cover crops: Hairy vetch kill dates

Hairy vetch grows rapidly after the last spring killing frost in southern Illinois. It nearly doubles in size during each two-week period from mid-April to late May and, correspondingly, nearly doubles in nitrogen content.

The quandary of no-till farmers in the area is: Should they chemically kill the vetch at normal corn planting time or extend the growing period for the vetch cover?

Research on cover crop killing dates and corn planting dates conducted at the University of Illinois Dixon Springs Agricultural Center since 1989, would suggest that delaying corn planting solely for nitrogen production by a vetch cover is less than economical.

In 1989, the hairy vetch cover crop grew rapidly and accumulated much higher levels of nitrogen than in 1990 and 1991 (TABLE 1). Dry matter production nearly doubled every two weeks from April 20 through May 17.

However, the rapidly growing vetch removed much of the soil-stored moisture during this growing period, and the moisture deficit was not renewed during the growing season. For this reason, yields were greatly reduced when the vetch was allowed to grow past April 20 (TABLE 2).

The highest corn grain yield, 159 bushels per acre (bu/A), was obtained when the vetch was killed on April 20 and corn was planted on May 3. Yield where the vetch was allowed to grow until May 17 was 133 bu/A. This amounted to a 26 bu/A yield loss in 1989, worth $65 per acre at $2.50 per bushel.

A nitrogen production gain of 114 pounds per acre occurred between April 20 and May 17, worth $22.80 at $.20 per pound of nitrogen fertilizer equivalence. Thus, in 1989, there was a loss of $42.20 per acre when vetch was allowed to grow until May 17.

In May 1990, the Dixon Springs Ag Center received more than 10 inches of rain. Because of excess rainfall, it was actually beneficial to allow the vetch to continue growing. The vetch removed excess water from the soil through evapotranspiration.

For this reason, the highest grain yields were obtained by planting on May 23 in 1990 (TABLE 2). After this date, yields declined with lateness of planting.

In May 1991, rainfall conditions returned to near-normal and results were similar to those in 1989. Again, the economics of nitrogen fertilizer equivalence indicated that allowing vetch to grow longer in May was not economical.

There are several reasons the corn yields were higher when herbicide application preceded planting by at least one week:

- Soil moisture was retained where vetch was not allowed to grow into May during the normal-May rainfall years of 1989 and 1991.
- Spraying before planting caused the hairy vetch to wilt down, making for better planter operation and seed to soil contact.

Hairy vetch is still an excellent choice for erosion control on highly erodible land. Also, the organic material released during hairy vetch decomposition generally makes the soil more tillable and productive in the short-term.

Even when killed in early May, the vetch is worth 30 to 60 pounds of nitrogen fertilizer equivalence; when grown after soybeans, vetch can give farmers a 60- to 100-pound nitrogen credit for corn. *SAE*

TABLE 1. Hairy vetch dry matter yield and nitrogen content at time of herbicide application

Herbicide application date			Hairy vetch dry matter production			Nitrogen content		
1989	1990	1991	1989	1990	1991	1989	1990	1991
date			lb/acre			lb/acre		
4/20	4/25	5/01	1244	1048	1608	53	45	68
5/03	5/09	5/08	2594	2282	2650	90	73	93
5/17	5/23	5/15	4827	2576	3101	167	70	109

TABLE 2. Planting date effects on corn grain yields

Planting date			= Corn grain yields [1]			Corn grain yields [2]		
1989	1990	1991	1989	1990	1991	1989	1990	1991
date			bu/acre			bu/acre		
5/03	5/09	5/08	146	94	101	159	80	110
5/17	5/23	5/15	133	143	98	150	137	101
5/31	6/06	—	—	—	—	73	125	—

[1] *Herbicide applied day of planting.*

[2] *Herbicide applied two weeks prior to planting in 1989 and 1990; one week prior to planting in 1991.*

Bill Simmons and Scott Norman Stein, Department of Agronomy, University of Illinois

Cover crops: Nitrogen from irrigated hairy vetch

Hairy vetch may provide a source of slow-release nitrogen for corn grown on irrigated sands. Studies under way by University of Illinois agronomists show that hairy vetch can be incorporated into a corn-soybean rotation.

The work is part of the Illinois River Sands Water Quality project, a federally funded, multi-agency effort to protect groundwater quality in Mason County, Illinois. Nitrogen leaching is a major concern on irrigated sands, so strategies that spread out application or availability of nitrogen should be of benefit.

Cover crop use on sands also can help suppress weeds and surface evaporation, as well as cut down on wind erosion. Hairy vetch is at the top of the candidate list for meeting these environmental needs.

Avoiding large preplant nitrogen applications on irrigated sand is critical since early-season rains are the most likely to cause leaching. At that time of year, the soils are wetter and the growing crop is using little nitrogen or water. Nitrogen supplied from decomposing hairy vetch may help corn through early growth, delaying the need for nitrogen input through center pivot systems until later in the year when leaching vulnerability is lower.

Irrigation also adds an important element for moving adaptation of cover crops further north into the Corn Belt.

Following soybean harvest, vetch is immediately drilled through existing residue and can be "watered up" if soil conditions are dry. Quick emergence and growth are critical to winter survival. Hairy vetch has come through the winter quite nicely in Mason County, while similar plantings that lay in dry soil in Champaign County did not survive.

In the spring, soil profile drying is of less concern under irrigation since soil water can be replenished as needed. As an added benefit, the hairy vetch provides a protective cover to negate the effects of blowing sand.

How important is hairy vetch derived nitrogen released to a subsequent corn crop? Does nitrogen from vetch get into the corn in time to do any good?

To address these questions, labeled nitrogen called ^{15}N was used to grow the hairy vetch. The movement of vetch-derived nitrogen was traced through samples of growing corn, soil and vetch residue on the soil surface. The samples were taken throughout the year.

Results from the first year showed that about 30 percent of the original vetch nitrogen was taken up by the corn; 40 percent entered the soil nitrogen pool; and 10 percent was left in the form of plant residue.

The fate of the additional 20 percent is unknown but may have been lost due to volatilization. Continuing research may reveal how much of the vetch-derived nitrogen is cycled through subsequent crops.

A companion study examines the corn yield response to nitrogen fertilizer rates superimposed on a hairy vetch cover crop.

In the first year, only a small response to nitrogen was seen above the rates of 100 pounds per acre. Vetch treatments outyielded fertilizer-only treatments at each nitrogen level applied from 0 to 250 pounds per acre.

The vetch crop treatments produced 110 bushels per acre of corn with no additional nitrogen and 180 bushels per acre with 100 pounds of additional sidedress nitrogen. *BS, SNS*

Working with a LISA grant from the North Central Region Sustainable Agriculture Research and Education Program, Illinois Sustainable Agriculture Society President Nick Robertson is arranging a regional workshop on the use of cover crops in sustainable farming systems. Farmers will share first-hand experiences to help agricultural professionals gain a better understanding of the needs of farmers and to strengthen working relationships between the two groups. For more information, call 217/498-7422.

Emerson D. Nafziger, Department of Agronomy, University of Illinois

On-farm nitrogen research

We thank each cooperator—John Carmichael, Scott Diehl, Paul and Mark Hill, Frank Floto, Allen Berrer, Clark VanBuskirk, Eldon Eigsti, Gary Rote, Randy Kryder, Ritchie Koch, Charles and Mark Nusbaum, Vern Gittleson, Jim and John Burke, Tom Anderson and Ken Beswick—who made land available and did much of the work on this study. We also thank the county Extension field staff—Stan Eden, Jim Endress, Dave Feltes, Bob Lahne, Jim Morrison, Wally Reynolds and Jeff West—who identified and worked with these farmers.

Emerson Nafziger

Determining the best rate of nitrogen use for corn in Illinois is of great financial and environmental importance. In the winter of 1990-91, Extension field staff in the northwestern part of the state were asked if they would like to identify, and work with, farmers interested in doing a nitrogen rate study on their own farms. Seven chose to participate in this study, and they worked with 15 farmers to conduct a total of 22 nitrogen rate studies.

In an attempt to relate available soil nitrogen to crop response to nitrogen, soil samples were taken to a depth of 2 feet, both before planting and at the time of sidedressing of nitrogen (when the corn was 6 to 12 inches tall). The samples were analyzed for nitrate.

The highest nitrogen rate used in each rate trial was the farmer's normal rate. Five additional rates were used: 0, 20, 40, 60 and 80 percent of the highest rate. The nitrogen rates were applied to plots using normal field equipment. Farmers and Extension field staff harvested the plots with regular combines.

Soil nitrate content (pounds of nitrogen per acre = parts per million x 8) before planting (or at sidedress time in some locations) ranged from 17 to 170, with higher values in fields where manure had been applied.

The optimum nitrogen rate, calculated from the response curve from each trial, was zero nitrogen (corn yield did not respond to nitrogen) in 11 of the 22 trials. Soil nitrogen ranged from 42 to 170, with an average of 79, for these "non-responsive" locations.

In the nitrogen-responsive locations, soil nitrogen ranged from 17 to 107, with an average of 50 pounds of nitrogen per acre.

The average optimum nitrogen rate for the responding sites was 109 pounds of nitrogen per acre. There was some indication that the sites with low soil nitrogen responded more to applied nitrogen, but there were exceptions to this, and the correlation between soil nitrogen and nitrogen response was not high.

The average nitrogen rate applied by farmers to the remainder of the field where the trial was conducted was 161 pounds of nitrogen per acre on the non-responsive sites and 162 pounds of nitrogen per acre on the nitrogen-responsive fields. With few exceptions, the farmer-applied rate was higher than the optimum rate as determined in this study.

This project has stimulated a great deal of interest among the farmers and Extension field staff involved, and has for most participants been an excellent introduction to applied research techniques.

While some farmers have indicated that they may cut their nitrogen rates as a result of the 1991 trial, there is still the realization that weather can affect the response to nitrogen rate. Consequently, most of the farmers and Extension field staff are repeating this work. *EDN*

Michael E. Gray and Kevin L. Steffey, Office of Agricultural Entomology, University of Illinois, Center for Economic Entomology, Illinois Natural History Survey

On-farm corn rootworm studies

The use of soil insecticides applied at planting by producers in Illinois and throughout much of the Midwest accounts for the vast majority of insecticide use in the Corn Belt. The western corn rootworm, *Diabrotica virgifera virgifera* LeConte, and the northern corn rootworm, *D. virgifera* Smith and Lawrence, are the primary targets of soil insecticides.

Since the early 1970s, entomologists at several universities in the Midwest have evaluated the root protection afforded by using less than labeled application rates of soil insecticides for corn rootworms. Data collected from university trials across much of the Corn Belt indicate that root protection provided by reduced rates (0.75 pounds of active ingredient per acre) of many soil insecticides is equivalent to that of labeled rates.

If university research data indicate that less than labeled application rates of soil insecticides provide adequate root protection, why hasn't this practice been recommended by Extension entomologists? A pivotal question raised by manufacturers concerns the ability of farmers to use less than labeled rates effectively.

Would farmers accurately calibrate their planters to deliver a soil insecticide at a reduced rate and still maintain satisfactory root protection? Would yields decline if reduced rates were used throughout a producer's field?

In order to address these questions, we coordinated 29 on-farm research experiments across northern Illinois during the summers of 1990 and 1991. Ten Extension field staff were asked to participate in the project and they, in turn, solicited volunteers.

We met with all the producers and Extension field staff each spring. In addition, during summer root digs and harvest we met with producers and Extension field staff at each farm.

Results from these on-farm trials indicated that applying reduced application rates (25 percent reduction) of several commonly used soil insecticides provided equivalent root protection to the labeled rates. In essence, producers who are willing to calibrate their planters to deliver certain soil insecticides at a reduced rate can achieve satisfactory root protection.

Differences in yield between the labeled and 3/4 insecticide application rates were negligible (statistically nonsignificant in most trials) for most experiments in each year of the study.

Perhaps of most surprise was how few of the fields required any insecticide application. If root rating results of both years are combined, only 23 of the 58 experiments (39.7 percent) had damage at or above the "economic injury level" (root damage rating of 3.0) in the untreated checks.

If the new economic injury level of 4.0 (proposed by G.R. Sutter, USDA Northern Grain Insect Research Laboratory, Brookings, South Dakota) is used, then not a single trial (0/29) in 1991 had average damage in the untreated check at the economic level.

In 1990, eight trials (27.6 percent) had average damage in the untreated check at or above a root rating of 4.0. Regardless of the economic injury level that is used, the root rating data suggest that producers in Illinois are using soil insecticides on far more continuous corn acres than necessary.

In Illinois, a significant portion of the corn acreage (2.8 million acres; 26 percent of the total corn acreage) is grown without crop rotation, and these acres receive the largest load of insecticide each year. Approximately 88 percent of the continuous corn grown in Illinois receives a soil insecticide application each spring.

This on-farm research project was initially devoted to determining how efficacious reduced rates (0.75 pounds of active ingredient per acre) of soil insecticides were in protecting root systems from corn rootworm damage. As this research objective was being answered, continued involvement with producers led to another research challenge: identifying those fields in which the practice of applying soil insecticides at planting could be eliminated completely.

Scouting for corn rootworm beetles during the summer and determining the need for a soil insecticide the following year, based upon the number of beetles per plant, has never been accepted by most farmers in the Midwest. However, if this tactic was adopted, many acres of corn could be spared annual insecticide applications.

Currently, we are involved in a participatory on-farm research project that is examining the use of yellow sticky traps (Pherocon AM) to monitor corn rootworm beetle populations. During the summer of 1991, more than 20 producers volunteered to monitor these traps. This summer, roots will be dug in each of the fields that were monitored last year and the predictive value of the traps will be assessed.

If the predictive validity of these traps can be demonstrated on a large scale, this approach may ultimately reduce the number of acres that are needlessly treated each spring with a soil insecticide to prevent root damage.

MEG, KLS

Gary Bickmeier, Crop Systems Educator, University of Illinois Extension Center at Quincy
Cletus Arnold, Farmer, Alsey, Illinois; Scott County Extension Council

On-farm weed control trial

To determine which of five control systems delivered the highest percentage weed control, obtained the highest yields and returned the most net profit, a three-year study was initiated in west-central Illinois.

The site had virden silty clay loam soil with 4 to 6 percent organic matter. The field was in a relatively high state of fertility. Beans and corn were rotated and had been planted on ridges for the past nine years.

Under a randomized complete block trial design, treatments were: cultivate, cultivate and band, solid spray, no treatment, and band only. It should be noted that soybean and corn plot locations were rotated. Consequently, no attempt was made to evaluate the effect of weed buildup on the weed control systems.

The bean herbicide program was 1 quart of Dual and 8 ounces of Preview per acre, broadcast applied. The corn program was 1.5 quarts of Bladex, 1.5 quarts of atrazine and 1 quart of crop oil. Cultivated plots were done twice annually.

Soybean trial results show that the cultivate and band system of weed control was significantly better in percent weed control and yield per acre than all other treatments. It was not significantly better than the cultivation-only system in net income. If yields in the cultivated-only trials had been just 3 bushels lower, the cultivation and band system would have been significantly better.

Soybean farmers interested in cutting or eliminating herbicide use, will appreciate that there was no significant difference between solid-spray, band-only and no-treatment systems, in grass control or net income.

The cultivation-only treatment was as good or better than solid-spray systems in all areas of evaluation.

Corn trial results show the cultivate and band system of weed control was the top performer in all areas of evaluation. All of the systems except the no-treatment system were not significantly different in the net income evaluation.

Cultivation-only was consistently in the top comparison groups, except in the area of percent grass control.

Corn farmers looking to sustainable systems should be encouraged by the lack of significant difference in net income between herbicide-use systems and cultivation-only systems in both the corn and soybean trials.

One conclusion from this data is that on ground of this sort and with similar weather conditions, a farmer could try a cultivation-only weed control system with at least two cultivations and expect (at least in the first year) to maintain corn and soybean yields close to those achieved with solid herbicide spray. *GB, CA*

Soybean Weed Control Systems Study Results 1989-1991

Soybean treatment	% Grass control	% Broadleaf control	Yield bushels/acre	Net income $/acre
Solid spray	61.7 b	71.4 b c	33.9 b	177.30 b c
Cultivation only	68.7 b	78.9 a b	35.2 b	204.20 a b
Band only	47.2 b c	63.1 c	30 b c	158.50 c
No treatment	34.4 c	61.2 c	25.5 c	152.90 c
Cultivate & band	92.9 a	93.3 a	42.7 a	241.30 a
	Lsd = 21.9	Lsd = 15	Lsd = 7.1	Lsd = 42.4

Treatments with same letter are not significantly different.

Corn Weed Control Systems Study Results 1989-1991

Corn treatment	% Grass control	% Broadleaf control	Yield bushels/acre	Net Income $/acre
Cultivate only	50 c	71.4 a b	142.6 a b	348.40 a
Cultivate & band	91.7 a	88.3 a	155.2 a	376.10 a
Solid spray	83.8 a b	86.4 a	152.4 a b	370.00 a
No treatment	19.3 c	49.9 c	103.8 c	259.40 b
Band only	36.9 c	59.1 b c	136.6 b	337.80 a
	Lsd = 26.7	Lsd = 20.3	Lsd = 18.3	Lsd = 54.6

Treatments with same letter are not significantly different.

Terry and Sheila Holsapple, Farmers, Greenup, Illinois

Foliar spray: Midwest Rodale Network Project Report, 1991

Well-planned and well-documented research is a tool for gathering new information on crop production. . . . Research efforts are most productive when experiments are well designed, data is carefully collected, and results are statistically analyzed.

Gary E. Pepper in ***On-Farm Research & Demonstration Plot Summary—1991,*** *University of Illinois Department of Agronomy Special Report 1992-04. For a free copy, call 217/333-4424.*

The foliar spray, CALCIUM-25, is promoted as an inexpensive calcium mineral supplement that will increase corn and soybean yields when sprayed on young plants. This product was tested in two randomized and replicated experiments, one with corn and the other with soybeans, on the Holsapple farm last year.

In both crops, no grain yield differences were found between the CALCIUM-25 treatment and the standard practice. Soybean and corn leaf tissue samples taken July 7 showed that nutrient levels were adequate or better for nitrogen, potassium, phosphorus, sulfur, calcium, magnesium, manganese, iron, sodium, copper and boron.

For the trials, Trislers 5330 corn was planted May 18 and Trislers 221 soybeans were planted May 28. Plots were laid out in a randomized complete block design with four replications for corn and five for soybeans. Each plot was 18 rows wide and 1,230 feet long. Row width for the crops was 30 inches.

The plots were sprayed by a local spray service according to instructions for the product. The service used two different formulations of CALCIUM-25: the field corn formulation for corn, and the vegetable formulation for soybeans.

The dilution for corn was 1/4 pound per 100 gallons of water. For soybeans, it was 1 pound per 100 gallons of water. Spray rate was 20 gallons per acre for corn and 40 gallons per acre for soybeans. Both crops were sprayed around the four-leaf stage of growth.

In each crop, weeds were controlled mechanically by rotary hoeing four days after planting and again four days later. The soybeans were cultivated twice, and at the second cultivation they also were ridged.

Yields were taken by combining the middle six rows in each plot. Yields were measured with an Acu-Grain yield monitor on the combine.

TH, SH

Results:

				LSD = 5.6		AVERAGE
Soybeans (bu/A)	with CALCIUM-25	49.5	44.8	42.5	37.7	43.4
14% moisture	without	44.8	47.2	47.2	42.5	45.3

				LSD = 15.7		AVERAGE
Corn (bu/A)	with CALCIUM-25	97.7	99.1	99.1	99.1	98.5
12% moisture	withouf	110.8	106.1	94.3	103.8	103.8

Conclusion: No yield advantage in these tests for CALCIUM-25.

Doug Zehr, On-farm Research Coordinator, Illinois Stewardship Alliance

Farmer checks fertilizer investment

Several years ago, Tom Anderson began to question whether he was receiving an adequate return from his investment in phosphate and potash fertilizer.

To find out, the Saline County farmer divided a 40-acre field in half in 1989. He applied 46 pounds per acre (lbs/A) of phosphorus and 60 lbs/A of potassium on 20 acres and no fertilizers on the other 20 acres. Soil tests showed the field had a phosphorus level of 60 lbs/A and a potassium level of 200 lbs/A.

That year, soybeans on the fertilized side of the field yielded 61.2 bushels per acre and soybeans on the unfertilized side yielded 61.0 bu/A.

In 1990, Anderson conducted the same fertilizer experiment with phosphorus and potassium on the same two 20-acre plots. However, he rotated to milo and applied 120 lbs/A of nitrogen to both sides of the field. The side that received phosphorus and potassium yielded 6,719 lbs/A, while the side without yielded 6,483 lbs/A.

Still, Anderson calculated that he saved $9.26 per acre on the unfertilized side by not applying the phosphorus and potassium.

In 1991, he conducted the same experiment with soybeans again and applied the same rate of phosphorus and potassium to the fertilized side. This time, the fertilized side yielded 36.4 bu/A and the unfertilized side yielded 35.4 bu/A.

He calculated that he had spent $20.30 per acre for the phosphorus and potassium, but the fertilizers only gave him one more bushel of soybeans.

After harvest in 1991, Anderson pulled soil samples from the two plots and found that the levels of phosphorus and potassium had stayed the same on the fertilized side. But on the unfertilized side, levels had dropped slightly — to 55 lbs/A of phosphorus and 196 lbs/A of potassium.

The methodology of this particular experiment has been criticized for its lack of "scientific validity." However, there is a high degree of local relevance to what has been done. Anderson said that, based on his experience with the 40-acre field, applying maintenance levels of phosphorus and potassium was not a good practice on his farm, environmentally or economically. He said he plans to base future applications of fertilizer on a combination of economic analysis and soil tests. *DZ*

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agro-ecology

Science and Education for a Sustainable Agriculture

Volume 5 Number 1
Spring 1993

Emerging and Ongoing Activities in Agro-Ecology at the College of Agriculture — The Agro-Ecology Program offers a full complement of services in teaching, research, and community outreach.

The Future of **agro-ecology news and perspectives** — Richard E. Warner explains the reemergence of **agro-ecology news and perspectives** and what shape it will take in the future.

ISAN: Linking Farmers with Researchers — Deborah Cavanaugh-Grant describes the Illinois Sustainable Agriculture Network, an innovative participatory research and education effort.

Illinois Sustainable Agriculture Committee — Tina M. Prow chronicles the creation of a legislative committee dedicated to agricultural sustainability.

Funding Sustainable Agriculture — According to Michael Rahe, Illinois must follow Iowa's lead in addressing how to fund sustainable agriculture programs.

Illinois On-Farm Research Program — A growing number of farmers are investigating alternative agriculture practices through a new program coordinated by Dan Anderson of the UI College of Agriculture.

On-Farm Conference Proceedings, Videotape Available — Tina M. Prow summarizes a conference about on-farm research and tells how to get copies of the proceedings and videotape.

University of Illinois at Urbana-Champaign
College of Agriculture

Emerging and Ongoing Activities in Agro-Ecology at the College of Agriculture

Address letters to:
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agro-ecology news and perspectives is published by the College of Agriculture, University of Illinois at Urbana-Champaign. This issue was edited by Nancy Nichols and Tina M. Prow and designed by Nancy Loch, Information Services, Office of Agricultural Communications and Education.

This newsletter is printed on recycled paper.

Teaching activities

- *Integration of principles of agro-ecology in undergraduate curricula*
- *Formation of a graduate program in Natural Resource, Ecology, and Conservation Biology*

Research topics

- *Agro-forestry opportunities in Illinois*
- *Organic vegetable production systems*
- *Fertilizer use efficiency in relation to soil testing, fertilizer application rates and methods, and yields through on-farm experimentation*
- *Impacts of farm policies and programs on the conservation of renewable and non-renewable natural resources*

Community outreach

- *New publications pertaining to water quality, pest management, food safety, economics of sustainability, and other relevant topics*
- *Cooperative efforts with farmer-managed sustainable agriculture organizations for participatory research and education*
- *Demonstrating and describing complex farming systems that meet various environmental and socioeconomic goals*

New graduate curriculum

Dean W.R. "Reg" Gomes has announced the formation of a new program for graduate studies in the College of Agriculture. Called the Natural Resource, Ecology, and Conservation Biology Program, the new curriculum allows graduate students to pursue studies culminating in a master's or doctoral degree.

This emerging graduate program will encourage students and faculty to form the interdisciplinary working relationships that are often necessary for improving our understanding of complex agricultural ecosystems and how to manage them.

The degree programs are offered in seven different tracks:

- *Agro-ecology*
- *Conservation biology*
- *Biodiversity and systematics*
- *Wildlife ecology*
- *Fisheries and aquatic ecology*
- *Environmental biology*
- *Physical systems ecology*

For more information on this new program, contact Richard E. Warner, College of Agriculture, 213 Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801, phone 217·333·0240.

Richard E. Warner, Interim Assistant Director for Natural Resources, Illinois Agricultural Experiment Station, and Leader of the College of Agriculture Agro-Ecology Program

The Future of *agro-ecology news and perspectives*

There is an ongoing need for the College of Agriculture to communicate to its various constituencies regarding such interrelated topics as sustainable agriculture, agro-ecology, and the conservation of natural resources in general — issues that are of growing importance to our society.

In the last issue of **agro-ecology news and perspectives** (Volume 4, Number 2, page 3), Donald A. Holt, director of the Illinois Agricultural Experiment Station, observed:

Through ***agro-ecology news and perspectives****, we have expressed our ideologies and vented our frustrations. Now we need to focus on the specific things that people can do to make our agriculture more ecologically sound, while at the same time meeting the basic needs and desires of consumers for high-quality, safe, affordable agricultural products and services, conserving natural resources, and improving the quality of life for all who work in the industry of agriculture.*

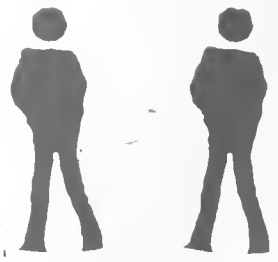
With this observation, Holt announced that the College of Agriculture would be publishing *Agro-Ecology Technical Notes*, a new periodical directed primarily at farm producers who are considering the adoption of various sustainable agriculture practices. There is an ongoing need, however, for the College of Agriculture to communicate to its various constituencies regarding such interrelated topics as sustainable agriculture, agro-ecology, and the conservation of natural resources in general—issues that are of growing importance to our society.

Thus, the College will continue to publish **agro-ecology news and perspectives**, twice in 1993 and quarterly thereafter. The scope of material will be broad, ranging from discussion of farming practices that encompass sustainable agriculture in Illinois, to the agro-ecology movement in general. We hope that this approach will keep you, our readers, well informed about the agro-ecology movement in this state and how issues pertaining to agro-ecology and sustainable agriculture relate to strategies to conserve renewable and non-renewable resources on a global scale.

The future format of **agro-ecology news and perspectives** will include several recurring sections. You will find articles that describe emerging teaching, research, and community-outreach activities of the College of Agriculture that pertain to agro-ecology. You will also find feature articles that address the interface of sustainable agriculture, agro-ecology, and conservation of natural resources in general. Part of each issue will also be directed to acquainting our readers with relevant sources of information and notices of future conferences, seminars, workshops, and other activities.

This issue focuses on the maturation of the sustainable agriculture movement in Illinois. Some key growth areas outlined in this issue include activities and focus of (â) the Illinois Sustainable Agriculture Committee; (b) the Illinois Sustainable Agriculture Network for farmers; (c) the Participatory On-Farm Research Program; and (d) a new opportunity in the College of Agriculture for graduate studies in agro-ecology and related topics. *RW*

Deborah Cavanaugh-Grant, Coordinator, Illinois Sustainable Agriculture Network



ISAN: Linking Farmers with Researchers

The Illinois Sustainable Agriculture Network is a cooperative effort among the following organizations:

- *Illinois Stewardship Alliance*
- *Illinois Sustainable Agriculture Society*
- *Southeastern Illinois Sustainable Agriculture Society*
- *Western Illinois Sustainable Agriculture Society*
- *University of Illinois College of Agriculture*
- *Illinois Department of Agriculture*
- *American Farmland Trust*

The Network's activities are based on a set of sustainable agriculture principles developed by the Illinois Sustainable Agriculture Committee.

The Illinois Sustainable Agriculture Network was formed in January 1992 through a grant from the USDA Sustainable Agriculture Research and Education Program and the Illinois Department of Energy and Natural Resources. The aim was to link farmer-managed, community-based sustainable agriculture groups in Illinois with the UI College of Agriculture in a statewide participatory research and education network.

The goals of the Network are to (1) develop economically competitive and sustainable farming systems through a scientifically valid on-farm participatory research program; (2) facilitate the adoption of sustainable technologies and practices by Illinois farmers through educational projects such as on-farm research, farm tours, workshops, publications, regional meetings, and a farmer-to-farmer communication network; and (3) develop the methodology and institutional capacity to conduct scientifically valid on-farm participatory research and educational projects in Illinois.

A major focus for the Network is its On-Farm Participatory Research Program. Participatory research attempts to accommodate the needs of both farmers and researchers, resulting in a partnership between both groups. In 1992, the Network had 45 on-farm research and demonstration projects. This year, that number will increase to more than 70. With the assistance of Dan Anderson, UI on-farm research coordinator, ISAN held several meetings in January to provide farmer cooperators with information about on-farm research design and methodology. The meetings also gave the farmers an opportunity to meet individually to plan their 1993 projects.

Another important aspect of the Network is the educational component, which includes conferences, workshops, field days, and publications. In January, ISAN held a conference in Springfield titled "Partnerships for Progress: Traditional Knowledge, New Technologies, the Wisdom to Apply Them Profitably." The conference focused on such topics as soil health, rotational grazing, cover crops, residue management, and integrated pest management. In March, the Network held four regional workshops hosted by the participating farmer organizations. These meetings focused on issues of regional concern and provided farmers with the opportunity to share experiential knowledge of sustainable techniques and practices. Field days were held throughout the state last year and will be held again this year. At the field days, farmers get an up-close look at sustainable practices and technologies that are developed in on-farm situations and integrated into current farming systems with minimum economic and environmental risk.

The Network soon will release a publication of the 1992 on-farm research results and is in the process of producing the second annual "Research for Tomorrow" publication that details the research projects for 1993.

The Network has succeeded in assisting farmers with their on-farm research. The various educational activities—conferences, workshops, and field days—have been well attended and have brought farmers and educators together to share ideas and information. The future of the Network is dependent on our ability to continue to strengthen the cooperation among the member organizations and upon our success in securing funding. *DC-G*

Tina M. Prow, Science Writer, Illinois Agricultural Experiment Station

Illinois Sustainable Agriculture Committee

An informal survey of 106 farmers who attended regional workshops sponsored by the Illinois Sustainable Agriculture Committee showed that:

- ***52 percent had livestock on the farm.***
- ***23 percent had children planning to farm in the future. (Average farmer age was 45.)***
- ***Overall, 51 percent considered their farms sustainable. The average was lower in southern Illinois than in northern Illinois.***
- ***64 percent were attempting to reduce herbicide and fertilizer use.***
- ***81 percent supported on-farm participatory research.***

From the Illinois Sustainable Agriculture Committee's ***1992 Report and Summary of Recommendations***

As the 1980s came to a close, Illinois had at least three farmer-driven sustainable agriculture organizations calling for research and education programs to support their concerns for the short-term economics of farming and the long-term health of rural communities and the environment.

The groups gained the support of state Rep. Charles Hartke, whose bill became the Sustainable Agriculture Act. Signed into law on January 9, 1990, it authorized use of state funds "to strengthen the production of agriculture programs in Illinois." It also created the State of Illinois Sustainable Agriculture Committee to "seek sources of funding for projects." *(See story, page 6.)*

Furthermore, then-governor Jim Thompson's cover letter asked the committee to characterize sustainable agriculture and to include a "cross section of interest groups in such decision making."

The seven-member committee includes four farmers and one representative each for the governor, the Board of Higher Education, and the Department of Agriculture.

To get beyond the distracting, polarizing, and sometimes paralyzing debate on what sustainable agriculture is, the committee early on described it as "a set of ever-changing agricultural production and marketing systems that are sustainable forever and for everyone."

They developed working guidelines, the Principles of Agricultural Sustainability, that stated an agricultural system is sustainable if it does all of the following:

- Is based on the prudent use of renewable and/or recyclable resources
- Protects the integrity of natural systems so that natural resources are continually regenerated
- Improves the quality of life of individuals and communities
- Is profitable
- Is guided by a land ethic that considers the long-term good of all members of the land community

The description and principles of sustainable agriculture reflect input from more than 60 business, food, agriculture, consumer, environmental, university, and community organizations. Forums, workshops, and meetings were held to gain the groups' input.

In 1992, the committee reviewed information from the participating groups and developed recommendations for the 88th Illinois General Assembly. Their primary recommendation was that the Legislature set up funds for implementing the Sustainable Agriculture Act and related initiatives.

Other recommendations focused on needed programs:

- A research and education grant program to encourage the long-term sustainability of Illinois agriculture
- A farmer-to-farmer mentoring program for exchange of information
- An in-service education program for professional agriculture field staff
- Long-term cropping system, rotation, and tillage studies that look at farming systems at the whole-farm level

For more information, request the Illinois Sustainable Agriculture Committee's *1992 Report and Summary of Recommendations* from Michael Rahe, Illinois Department of Agriculture, Division of Natural Resources, P.O. Box 19281, Springfield, IL 62794-9281; phone 217·782·6297. *TP*

Michael Rahe, Sustainable Agriculture Coordinator, Illinois Department of Agriculture, and Illinois Sustainable Agriculture Committee Appointee

Funding Sustainable Agriculture

The proposed fee increases in Illinois would boost production costs for farmers approximately 5 cents per acre. But if Illinois farmers reduce nitrogen use, as did Iowa farmers, potential savings on nitrogen alone could range from $3 to $4 per acre. Where else could a farmer make $3 for a 5-cent-per-acre investment?

Recent meetings, forums, and workshops conducted by the Illinois Sustainable Agriculture Committee revealed a need for research, education, and training programs.

But there are two different opinions on who should pay for such programs: Some people feel the public will benefit from better water quality and other improvements, so everyone should pay. The majority opinion, however, is that farmers—those who use the products that are causing problems—should pay.

The committee's funding quest began with a review of federal and state programs in Illinois and other states to see what worked, where funds came from, and how monies were used. Based on what they found, the committee members decided that increasing fees on both fertilizer sales and pesticide registration is the most appropriate way to fund sustainable agriculture programs.

This kind of system is used with success in nearby Iowa. Since Iowa began using the fees, total nitrogen use per acre has dropped by more than 17 percent. Farmers are maintaining yields despite applying less nitrogen. Additional benefits include reduced nitrate in water supplies and an annual savings for farmers in excess of $40 million.

Public perceptions and attitudes toward Iowa farmers also have improved. The threat of regulation is decreasing because the perception is that farmers are addressing the public's concerns.

The proposed fee increases in Illinois would boost production costs for farmers approximately 5 cents per acre. But if Illinois farmers reduce nitrogen use, as did Iowa farmers, potential savings on nitrogen alone could range from $3 to $4 per acre. Where else could a farmer make $3 for a 5-cent-per-acre investment?

On the legislative front, a bill to fund the Sustainable Agriculture Program was introduced into the recent House session on behalf of the committee. Unfortunately, because of many factors, the bill will not come up for a vote, though it did pass through the House agriculture committee. The committee is working to build a coalition of supporters for an appropriation bill that will be introduced in a future legislative session. During coming months, the committee also plans to look into funding sources other than fertilizer and pesticide fees.

The argument that nitrate and chemicals found in water at low levels are safe will not fly with the public. The public wants to see farmers do something about these concerns—real or perceived. Iowa has taken a proactive approach to addressing these concerns, and it is paying big dividends for farmers. Illinois needs to do the same.

Instead of arguing over where the money should come from and who should pay, let's make the decision that something needs to be done, take the lead, and JUST DO IT! *MR*

Dan Anderson, Coordinator, Illinois On-Farm Research Program, College of Agriculture

Illinois On-Farm Research Program

New newsletter addresses on-farm research

The On-Farm Research Program at the University of Illinois College of Agriculture publishes a quarterly newsletter titled ***Agro-Ecology Technical Notes: On-Farm Research****, featuring stories dealing with issues pertaining to sustainable agriculture and on-farm research. The newsletter is circulated to on-farm research cooperators as well as other interested parties. If you would like to be on the* ***Agro-Ecology Technical Notes*** *mailing list, send your request to Dan Anderson, Coordinator, Illinois On-Farm Research Program, 305 Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801.*

A growing number of farmers are investigating alternative agriculture practices, practices that generally reduce inputs while sustaining soil health and productivity. Motivation for this transition stems from increasing concern about environmental issues as well as financial survival.

For the past three years, an Illinois On-Farm Research Program has been in progress, sponsored by the University of Illinois College of Agriculture. In 1992, the position of "on-farm research coordinator" was created to address the needs of farmer-researchers by providing education on the research process and statistical support. Contact with farmer cooperators is made primarily through the Illinois Sustainable Agriculture Network (ISAN), an umbrella organization linking grassroots sustainable agriculture groups from around the state.

Each winter, projects are planned for the following growing season. The on-farm research coordinator meets with each cooperator to discuss the cooperator's project ideas and to help design a replicated, randomized experiment with which to test the idea. This year, there are approximately 70 cooperators.

A wide variety of projects will be carried out in 1993. For the first time, cooperators will conduct livestock research. One southern Illinois cooperator is testing sow guards in his farrowing huts. These guards protect pigs from being crushed. A farmer in northern Illinois who raises rare Dutch Belted cattle is going to test the dry-matter production of different grass-legume mixtures. He would like to extend the grazing season of his rotational grazing system.

Fruit and vegetable growers are also getting into the act. A new cooperator plans to test the yield effect of nitrogen placement on peach trees. One vegetable grower is tackling a fairly complex project focusing on the interaction of two different tillage systems on different rates of calcium nitrate and its effect on tomato yields.

Many cooperators interested in the nitrogen rate question will go about it a little differently this year. They have agreed to collaborate in a statewide N-rate study in which all cooperators will use the same rates. This level of cooperation provides significant benefits:

- More replications overall than could ever be attained by an individual farmer
- Through increased replications, an ability to detect smaller differences among the treatments being tested
- Broad applicability of the test results because of the distribution of cooperators statewide and across a wide variety of environments

Each year, the results of the projects will be reported in a publication distributed by ISAN. *(See story, page 4.)* *DA*

Tina M. Prow, Science Writer, Illinois Agricultural Experiment Station

On-Farm Conference Proceedings, Videotape Available

"The objective of participatory research is not only to seek solutions to a problem through new understanding but also to encourage people to take action based on the new understanding." Donald A. Holt, associate dean for research and director of the Illinois Agricultural Experiment Station, wrote these words in the proceedings for the conference on Participatory On-farm Research and Education for Agricultural Sustainability held last summer in Urbana.

He urged conference participants to "identify new strategies to link research, education, and action and share them with their colleagues."

Sponsored by the Agricultural Research Institute, University of Illinois College of Agriculture, American Society of Agronomy, Illinois Stewardship Alliance, USDA-EPA Sustainable Agriculture Research and Education Program, and NC-157 Regional Research Committee, the conference drew more than 250 participants from around the world.

So that those unable to attend might share in the conference, presenters contributed to a 249-page conference proceedings. The proceedings opens with experiences and perspectives on participatory on-farm research from farmers, the agricultural industry, Cooperative Extension Service specialists, and researchers. It includes material from workshops on strategies for conducting on-farm research and working with statistics. Overviews from 35 programs and projects illustrate how participatory on-farm research is being carried out in the United States and other countries.

Some conference participants appear in a companion video that explores why farmers are conducting research, the benefits of participatory research, and the drawbacks of on-farm research. To obtain a copy of the proceedings or companion video, please complete the order forms included in this issue. *TP*

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Results of Cover Crop Study

UI agronomist Donald Bullock wraps up a three-year study of hairy vetch and rye as winter cover crops in corn-to-soybean rotations.

Second Environmentally Sound Agriculture Conference

At an April meeting in Florida, the aim will be to get farmers and environmentalists communicating on the same wave length.

Expanding the Definition of Sustainable Agriculture

The agroecology team at the University of Santa Cruz wants to broaden our outlook.

Envisioning the Future: The 2050 Project

The 2050 Project is a major collaborative effort with a very big goal—to define conditions under which global society could be sustainable in 2050 and to develop strategies for achieving those conditions.

The Agrarian Librarian

Resident expert Dick Warner recommends these resources for the serious agroecologist.

First Annual Bioethics Institute

Faculty members sit down with some well-known moral philosophers and environmental ethicists to improve the faculty's teaching and advance their thinking about conservation of the Earth.

University of Illinois at Urbana-Champaign
College of Agriculture

Tina M. Prow, Science Writer, Illinois Agricultural Experiment Station

Results of Cover Crops Study

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This newsletter is printed on recycled paper.

Hairy vetch looks promising as a cover crop in southern Illinois but not as good in central Illinois, and farmers in northern Illinois might as well "bury their money" as plant hairy vetch after soybeans, according to a University of Illinois agronomist.

"For the central part of the state, the only way to get vetch to survive and produce is to plant it after wheat or very early soybeans," Donald Bullock said. "The winter is just too severe."

Bullock is wrapping up a three-year study of hairy vetch and rye used as winter cover crops in corn to soybean rotations on farms in Fisher, Greenup, and Albion.

"Cover crops are not a panacea but can be used to improve certain situations, particularly in southern Illinois where erosion is more severe and soils are not as rich," he said. "No-till into vetch and rye could be a wonderful system for keeping the soil where it belongs."

For hairy vetch, region appears to be a limitation. When hairy vetch survived the winter, the crop could be measured in inches in Fisher, compared to knee-high in Greenup and hip-high in Albion. The nitrogen contribution from hairy vetch tended to be lowest in Fisher and highest in Albion.

"Does the 75-mile difference in the locations represent a true difference in latitude or just differences among three different farms? We don't have enough samples to say," Bullock said, "but farmers' experiences with hairy vetch suggest that there indeed are the regional differences that we saw in this study."

Data also showed the nitrogen contribution from hairy vetch could support grain sorghum but was not enough for corn. Hairy vetch used solely for nitrogen purposes is expensive, Bullock noted. The costs for seed and for herbicides to kill the crop can offset any economic advantage from the nitrogen contribution.

But if erosion control and compliance goals are taken into account, hairy vetch can be a good investment, he added.

According to the data, rye lacks the nitrogen-fixing ability of hairy vetch but offers more flexibility in terms of geography. Rye provided good cover protection through all winters of the study. Bullock used herbicides to kill the crop before no-tilling soybeans or corn.

The rye showed allelopathy, or naturally occurring chemical protection, against some weeds. That, combined with the dense plant coverage, suggests certain weed populations might be reduced over time where rye is planted, he noted. The allelopathic action occurred not just against weeds but also against corn and grain sorghum. Data showed response even when rye plants were small.

This study was conducted with input from the cooperating farmers: Mark Cender of Fisher, Terry Holsapple of Greenup, and Tom Hortin of Albion. They provided 10 to 12 acres each, a larger acreage than UIUC agricultural research farms could commit. In addition, the farmers asked questions and offered insights that helped shape the study.

"The benefit that I get from working with farmers is that they tell us what's important and help us relate the data to their systems—the value is in their experience and intellectual input, rather than their physical work," Bullock said. *TMP*

Cheryl Frank, Publications Editor, Information Services, Office of Agricultural Communications and Education

Sustainable agriculture "will come on stronger" at the Second Environmentally Sound Agriculture Conference, set for April 20–22 in Orlando, Florida. Agricultural people and environmentally oriented people will dialogue. Farmers can learn how to reduce or manage chemical inputs better and still have high enough yields to sustain a healthy profit—the bottom line in business. A variety of overall farm-management systems and specific farming practices are on the agenda—all designed to help growers and the environment.

3

Second Environmentally Sound Agriculture Conference

The aim of an upcoming national agricultural conference is to get more farmers and environmentalists communicating on the same wave length. "We would like to get those two communities in the same room, talking and listening to each other," said conference organizer Kenneth L. Campbell, professor of agricultural engineering at the University of Florida, Gainesville.

One important arena for this dialogue will be the Second Environmentally Sound Agricultural Conference, coming April 20–22 to Orlando. Topics to be considered include new sustainable management systems, such as those designed for dairy farms, and overall resource conservation and management. Nutrient management, economic control, and point-source strategies are examples of farm practices that will be discussed and analyzed.

"There seems to be a fair amount of information related to sustainable agriculture this year—that seems to be a little bit stronger theme," Campbell said. The conference is sponsored by the University of Florida, Institute of Food and Agricultural Sciences. Cosponsors are the Soil and Water Division of the American Society of Agricultural Engineers and the Florida section of the Society.

"Going to sustainable doesn't necessarily mean not using chemicals," Campbell added. "It's not necessarily going to mean organic farming." However, sustainable does mean wiser management, and usually less use of or reliance on chemicals, while still achieving a good bottom line.

Conference topic areas include

- Source and groundwater management (agrichemicals, animal wastes, soil erosion and subsidence, irrigation and drainage, wetlands for nutrient removal, organic farming, and sustainable and alternative agriculture)
- Point sources of contamination (fuel and pesticide spills and storage, confined animal housing waste systems, and processing operations)
- Air pollution (drift from spray systems and nuisance odors)
- Wildlife and habitat preservation (use of wetland and native areas, toxicity of farming practices, and mitigation of farming impacts)
- The urban-agricultural interrelationship (land application of waste; water use compatibility; energy, water, and nutrient recycling; and composting)

State-of-the-art technology in an urbanizing United States will be emphasized. The approximately 70 presentations and 30 poster exhibits will be designed to help farmers preserve resources for future generations while maintaining an adequate food supply. Speakers from Poland and the former Yugoslavia will share their views as well.

For a change of pace, there will be presentations on how to conserve and preserve the Florida Everglades and Lake Okeechobee, the large freshwater lake just north of the Everglades and directly west of West Palm Beach.

The conference will be held at the Sheraton Plaza Hotel in Orlando. Requests for registration may be directed to coordinator Jennifer Johnson, Office of Conferences, University of Florida, P.O. Box 110750, Gainesville, FL 32611-0750, (904)392-5930, (904)392-9734 (fax). CF

Patricia Allen, Debra Van Dusen, Jackelyn Lundy, and Stephen Gliessman,
Agroecology Program, University of California–Santa Cruz

Expanding the Definition of Sustainable Agriculture

Current Definitions of Sustainability

Although sustainability definitions include a range of environmental, economic, and social characteristics, most focus somewhat narrowly on environment, resource conservation, productivity, and farm- and firm-level profitability.... [Such narrow definitions] challenge some but not all of the assumptions that underlie agriculture's nonsustainable aspects, generally neglecting questions of equity or social justice, or devoting little specific language to it....

Limiting Assumptions

To address these types of whole-system issues, we believe that sustainable agriculture concepts must go beyond placing top priority on environment and production practices and give greater emphasis to social issues....

Farm-centric focus. Major institutions promulgating "sustainable" agriculture often focus on the farm level rather than on the whole system.... The system includes not only generating agricultural products, but also distributing those products and the infrastructure that affects production and distribution at regional, national, and global levels. Interactions among the larger environmental, social, and economic systems in which agriculture is situated directly influence agricultural production and distribution.... These larger systems affect agriculture yet remain unaccounted for in many sustainable agriculture programs.

The environmental context. Agricultural practices ranging from the development of irrigation projects to the use of agrichemicals have often had negative environmental impacts such as wildlife kills, pesticide residues in drinking water, soil erosion, groundwater depletion, and salinization. Substituting environmentally sound inputs for those that are damaging is an important step in addressing these problems. But ecological sustainability requires intensive management and substantial knowledge of ecological processes that go far beyond substitution and cannot be achieved merely by substituting inputs. Such substitutions need to account for their complex and long-term ecological consequences....

In most cases, single components of farming systems are being analyzed and little attempt is made to place these analyses in the context of whole agroecosystems.

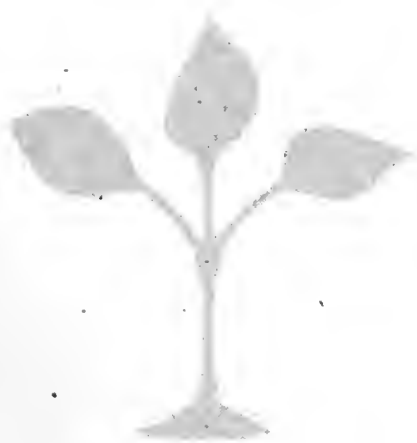
The social context. Agriculture both affects and is affected by the larger society. Farmer production decisions, for example, determine the diversity and quality of foods available to consumers, and farm size and technologies have been associated with the economic and social vigor of rural communities. At the same time, society determines what is possible at the farm level. Farmers lose valuable farmland when encroaching urbanization creates zoning problems, inflates land values, and generates urban pollution, which lowers crop productivity.

Production decisions are heavily influenced by consumer decisions. A recent example is farmers' voluntary discontinuation of Alar on apples. Although farmers continued to endorse the safety of Alar, they realized that this position was untenable in the face of consumer concerns....

Efforts in sustainable agriculture are not unlike those of their conventional counterparts, in that they tend to serve certain clientele selectively and generally do not evaluate the social consequences of the technologies that sustainable agriculture encourages. For example, organic farming strategies are often supported because they are environmentally sound and, in terms of the prices organic foods command, are profitable for farmers. An unintended and unaddressed social consequence of this is that people with low incomes often cannot afford organic products and thus are denied access to food containing fewer pesticide residues.

The economic context. Agriculture's reciprocal relationship with the overall economy is clear. The agricultural industry is a significant portion of the nation's economy: In 1984 about 20 percent of U.S. jobs were in some aspect of food and fiber production, distribution, or service and these workers and their industries contributed 18 percent of the gross national product....

In the context of these economic policies, agriculture is subject to nonagricultural constraints and conditions, a fact acknowledged broadly in the literature of both conventional and sustainable agriculture. Yet most research and extension programs in both conventional and sustainable agriculture do not recognize or address these macrofactors. Sustainable agriculture efforts generally concentrate on environmentally sound farm-level technologies that are economically profitable for farmers to adopt. Less commonly do such efforts address how the technologies they generate will affect or be affected by larger economic concerns in the long run....



Expanding the Concept of Agricultural Sustainability

A useful concept of agricultural sustainability needs not only to acknowledge social issues as priorities equivalent to those of production, environment, and economics, but to recognize the need for balance among those disparate but highly interactive elements that comprise agriculture. Toward this, we offer the following perspective: A sustainable food and agriculture system is one that is environmentally sound, economically viable, socially responsible, nonexploitative, and that serves as the foundation for future generations. It must be approached through an interdisciplinary focus that addresses the many interrelated parts of the entire food and agriculture system, at local, regional, national, and international levels. Essential to this perspective is recognition of the whole-systems nature of agriculture: the idea that sustainability must be extended not only through time, but throughout the globe as well, valuing the welfare of not only future generations, but of all people now living and of all species of the biosphere.

Moving Beyond the Farm and Microeconomics

This sustainability concept moves beyond emphasis of farm-level practices and microeconomic profitability to that of the entire agricultural system and its total clientele. Richard Lowrance [an ecologist with the USDA-ARS in Georgia], and Paul Hendrix and Eugene Odum [ecologists at the University of Georgia], describe a model that approximates a whole-systems approach. They see four different loci or subsystems of sustainability: 1) farm fields where agronomic factors are paramount; 2) the farm unit wherein microeconomic concerns are primary; 3) the regional physical environment where ecological factors are central; and 4) national and international economies where macroeconomic issues are most important....

Institutional Change

When agriculture is viewed in a whole-systems context and sustainability is defined comprehensively, it is clear why the current popular focus on farm production practices is insufficient for achieving agricultural sustainability. Developing nonchemical pest management methods, for example, will effectively reduce pesticide use only if economic structures and policies encourage their adoption by farmers. More importantly, one cannot conclude that improved production practices will transform the agricultural system into one that meets all environmental, economic, and social sustainability goals. Social goals must be addressed explicitly. This is why production techniques such as organic farming, while a likely component of a sustainable food and agricultural system, cannot be thought of as synonymous with sustainable agriculture.

Given the conventional institutional context of most state and federal sustainable agriculture programs, it is not surprising that they tend to focus research on conventional priorities such as production practices and efficiency and have not, for the most part, aggressively addressed social and economic issues. Sustainability priorities—and the definitions that embody them—must be expanded to encompass the many factors affecting production and distribution as well as the larger environmental, economic, and social systems within which agriculture functions....

We believe that it is important to continue exploring the meaning of agricultural sustainability. Before an improved agricultural system can be developed, the biases and structures that have led to agricultural problems must be closely examined and concrete goals articulated, based upon a broadened concept of agricultural sustainability. The concept of sustainability offered in this paper emphasizes that social goals are as important as environmental and economic goals, and widens the opportunity to move beyond the narrow agricultural priorities expressed in the past. It is based upon the whole-systems, interactive nature of all aspects of the agricultural system —that problems and their resolutions must be conceived not only in terms of their immediate time frames and local impacts, but just as importantly, in terms of their future time frames and their global impacts. Sustainability encourages emphasis on optimum production over maximum production, the long term along with the short term, the public's best interest over special interests, and the contextualization of disciplinary work within interdisciplinary frameworks. Our hope is that this definition helps advance the discussion on developing a food and agriculture system that is sustainable for everyone.

This article is excerpted from a paper of the same title published as part of the "Sustainability in the Balance" series by the Agroecology Program, UCSC. Copies of the full report are available free of charge from the Agroecology Program, University of California, Santa Cruz, CA 95064, (408)459-4140.

Nancy Nichols, Publications Editor, Information Services, Office of Agricultural Communications and Education

Envisioning the Future: The 2050 Project

Interrelationships among people, agriculture, and the environment are critical. For example, 25 to 30 percent of nutrition currently consumed in developing countries is lost due to medical reasons —primarily diarrhea caused by unclean water. Providing clean water to all inhabitants of the planet could virtually eliminate this problem.

A major collaborative effort is exploring how humanity can achieve a sustainable existence on the planet by the year 2050.

Sponsored by the World Resources Institute, the Brookings Institution, and the Santa Fe Institute, the 2050 Project has an optimistic goal of "defining conditions under which global society could be sustainable in 2050 and from that vision determining policy strategies and actions for the next decade that would help achieve those conditions." Why 2050? According to project sponsors, "The year 2050 was chosen because it is far enough in the future for critical population, energy, and global warming issues to play out and for large-scale social and economic transitions to occur, yet it is within the lifespan of today's children, giving the results a direct and personal meaning."

Collaborators in the four-year project, launched in January 1993, will begin by examining alternative concepts of sustainability. The goal is to formulate several visions of sustainability—based on input from people in different regions around the world—that will be used throughout the project. The expertise of researchers and others in both developing and developed countries is being sought.

Along with policy analysis and recommendations, the project will produce scenario-modeling tools for decision makers. The project sponsors hope to influence policy decisions and to build popular support through production and distribution of a book, TV and interactive video presentations, and computer games.

Detailed assessments of the conditions necessary for a sustainable global system will be developed in a series of base studies examining key economic and other factors. Topics to be addressed include population and human capital, food and agriculture, energy and climate, environmental toxification, ecosystems, water systems, and industrial structure.

The food and agriculture base study will address the question, To what extent can the linked challenges of world hunger, food production, and environmental sustainability in the agricultural sector be met by 2050? This base study will look at the full range of issues affecting worldwide availability of food—from estimates of the maximum potential for global food production, through food's end use as a nutritional substance. Factors affecting the efficiency of food use will be studied, such as farm production efficiency, the extent to which nonfood farm activities reduce food production, pre- and post-harvest losses, losses in processing and distribution, the dietary composition of various populations, and the nutritional health status of populations.

The principal investigator for the food and agriculture base study is William Bender, visiting assistant professor at the Alan Shawn Feinstein World Hunger Program of Brown University. Margaret Smith, Extension agronomist at Iowa State University, is examining issues of resources and production.

For more information on the 2050 Project, call project director Rob Coppock at (202)662-2528. *NN*

– Richard Warner, Interim Assistant Director for Natural Resources, Illinois Agricultural Experiment Station, and Leader of the College of Agriculture Agro-Ecology Program

The Agrarian Librarian

The following publications are valuable additions to my agroecology resources library. They may be of interest to you, too. Along with the title, author, and year of publication, I've included ordering information. Watch for a listing of videotapes in the next issue of this newsletter. *RW*

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Cheryl Frank, Publications Editor, Information Services, Office of Agricultural Communications and Education

First Annual Bioethics Institute

Food and agriculture professors at the University of Illinois can "ask the philosophers" at the first Bioethics Institute, to be held May 15–20 on the Urbana-Champaign (UIUC) campus.

Among topics for discussion: How to conserve nonrenewable natural resources, how to ensure a safe food supply, whether to change policies to favor family farms as opposed to large-scale farming, and how genetically engineered foods and other such products should be viewed.

At the conference, UIUC agricultural faculty—along with professors in veterinary medicine, life sciences, biology, and other related fields—will sit down with some well-known moral philosophers, some of whom are specialists in environmental ethics. Participants will have an opportunity to explore some of the ethical issues that arise in their research and teaching and to advance their thinking about conservation of the Earth.

The Institute is modeled after a successful program at Iowa State University under the direction of Gary Comstock, ISU philosophy professor and conference co-director. Institute members plan to meet once a semester for three years to further refine their teaching skills in this area.

"We'll not only be talking about applied issues but also ethical theory and pedagogy....We will take a pragmatic approach, which is designed to help teachers in the classroom," Comstock said.

"The major goal is to educate students about the ethical questions around food and agriculture" by first educating their professors, he said. Another goal is to look into the safety issues surrounding genetically engineered foods. A third big concern is whether to intervene in farming policy to help preserve family farming as a practice and way of life.

Undergraduates and graduate students face significant and complex problems related to their eventual professions, and the Institute will help to enhance the faculty's ability to address these issues, said the other co-director of this year's Institute conference, Professor Robert McKim of the UIUC philosophy and religion departments.

For more information about the Institute or the UIUC Program for Cultural Values and Ethics, call (217)244-3344. *CF*

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Science and Education for a Sustainable Agriculture

Volume 6 Number 1
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Livestock on Grain Farm: Researchers Test Old Rotation with New Technology — The Ewing family explores a return to integrated crop and livestock production.

New Book Examines Social and Technical Pressures on the Land — Michael J. Scully gives a synopsis of *Soil and Water Quality: An Agenda for Agriculture.*

Agrarian Librarian Reviews Videos — Rev up your VCR — Dick Warner has new agroecology videos to recommend.

On Becoming Lovers of the Soil — Frederick Kirschenmann makes a plea for us to heal our soil and our souls.

1993 On-Farm Research Report Available Soon — Dan Anderson tells how to obtain the latest results of Illinois on-farm research.

University of Illinois at Urbana-Champaign
College of Agriculture

Tina M. Prow, Science Writer, Illinois Agricultural Experiment Station

Livestock on Grain Farm: Researchers Test Old Rotation with New Technology

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This newsletter is printed on recycled paper.

Kerry Ewing expects the next few years to be busier than ever. This fourth-generation Pana farmer will be tending livestock on one of the four corn and soybean farms he and his father, Gary Ewing, farm for Dudley Smith. Smith, 98, recently gave the 224-acre farm to the University of Illinois, with the stipulation that it be used for agricultural experiments.

"Dudley Smith was always looking to the future, always looking for a better way," the elder Ewing said, recalling a time when Smith planned annual farm tours from his home in North Carolina. "He had 5,000 acres in central Illinois, and he wanted his heirs to have a feel for the ground—the farmland was more important to him than the money that came from it."

Smith's generosity will allow UI researchers to learn more about the potential for integrated crop and livestock production systems in the Midwest. For this study, agronomists Donald Bullock and Jim Kaiser collaborated on experimental designs to assess intensive grazing systems for cattle on a grain farm. Robert Hornbaker, a UI agricultural economist, will track and analyze economic consequences of the systems.

"Does it make sense to bring cattle back on the farm? In terms of economics? In terms of time management? These are the basic questions we're looking at," Bullock said. "Livestock used to be part of most farms, but never in systems of intensive grazing. This is an old rotation, with new technology."

To study how intensive grazing might fit into a normal farm operation, researchers plan to place cattle on 20 acres of 1-acre fenced plots; 50-acre plots; and 100-acre plots. The fenced plots are planted to annual alfalfa. The study also includes a perennial alfalfa pasture for hay and silage.

"Now farmers raise corn and beans and ship them to feedlots for cattle. We want to know if we can use these newer grazing technologies to increase diversity on the farm, and, if so, is it better?" Bullock said.

Gary Ewing remembers when livestock were more common in the Midwest and has reservations about "growing livestock instead of grain."

"This farmland is so productive that not growing grain could bring a loss," he said. "But there could be some value to the land in bringing livestock back."

Day-to-day care of the livestock will fall to Kerry Ewing. He already tends a farrowing-to-finish hog operation on another farm and has experience with cattle from earlier years.

"I like cattle," he said. "I'm as curious as anyone to see whether this intensive grazing plan will work. When we had cattle on pasture, it took three times the land they're talking about to handle the number of cattle they'll bring."

The Ewings are particularly curious about how integrating cattle into the operation might affect soils.

"It will be interesting to see whether resting the ground from grain production changes it," Kerry said, "whether alfalfa helps the ground, and whether there is some effect on nitrogen fertility when we go back to corn. I expect to see a lot of neighbors and farmers stopping by to look and talk about this."

Researchers also expect high interest in the project and are planning to have on-farm demonstrations and exhibits as results become available. This project is funded in part by the 1993 North Central Low Input Sustainable Agriculture (NC-LISA) program through 1995. *TMP*

Michael J. Scully, Organic Farmer and Trustee, Scully Estates, Lincoln, Illinois

New Book Examines Social and Technical Pressures on the Land

Based on a recent study sponsored by the National Research Council, *Soil and Water Quality: An Agenda for Agriculture* is a thorough and convincing report on the impact of modern agricultural methods on our soil and water in the United States. The book, published in 1993, appears at a time of mounting concerns about soil degradation and chemical contamination and offers a systems approach to solve the problems.

Not everyone will have the time to read the 516-page tome cover to cover. So I have summarized its contents to make it more accessible, especially as a reference book.

After a listing of tables and figures that occur throughout the 12 chapters, *Soil and Water Quality* opens with an executive summary. Part I expands the summary with four chapters and many tables, graphs, and statistical data. Part II enters into great detail, with eight chapters on the nature of soil quality, nitrogen, phosphorus, pesticides, sediments, salts and trace elements, manure, and landscape. This is followed by an appendix on nitrogen and phosphorus mass balances, references to the many scientific papers quoted in the text, a glossary of scientific terms, biographies of the authors, and an index. The last two pages list recent publications of the Board of Agriculture of the National Academy.

In the executive summary and in part I, the credo of the National Research Council is set off in italic print. To paraphrase,

> *The national environmental policy should be to protect soil quality with air and water quality. Sources of contamination by nutrients, pesticides, sediments, salts, and trace elements should be reduced. Profitable production of food and fiber should be maintained. Problem watersheds and farms should be a first concern. Financial aid should help only those farms with approved integrated farming systems. Farmers should be required to keep detailed records of their production methods. USDA and EPA should be required to develop monitoring methods and quantifiable standards. Research should be accelerated to develop viable cropping systems to meet the new soil and water parameters. Long-term easements should be used to purchase environmentally sensitive lands. The legal responsibilities of landowners and land users to manage land in ways that do not degrade soil and water quality should be clarified in state and federal laws.*

For an opening volley, this is stiff, and we are only on page 17. At this point, I suggest that readers aspiring to consume the entire text should reward themselves with a comfortable chair, a large bag of M&Ms, and a roaring fire (winter) or the shade of an apple tree (summer). Add to this a large flagon of fortitude. Consume the book in small sections. Limit the M&Ms to one bag a chapter. Take notes.

Part I states that soil and water quality is an environmental problem of the first rank. Soil degradation is underestimated, and the enhancement of soil quality is not appreciated. At least one study suggests that more organic carbon is released into the atmosphere by soils than by fossil fuels and deforestation combined. Water quality is a function of soil quality, and the latter depends on its compaction, salinization, acidification, biological activity, and erosive nature.

continued on page 4

The U.S. economy and the livelihood of citizens depend on soil, water, air, plants and animals, and natural and managed ecosystems as fundamental resources. Agricultural production, by its very nature, has pervasive effects on all these resources. Agricultural production takes place within farming systems. Those systems are defined by the pattern and sequence of crops; the management decisions regarding the inputs and production practices used; the management skills, education, and objectives of the producer; the quality of the soil and water; and the nature of the landscape and the ecosystems within which production takes place.

From executive summary, Soil and Water Quality: An Agenda for Agriculture.

We should think about better use of our land, not just our farmland, but also our forest land, recreational land — all land. We in America have thought of our land as inexhaustible, something that did not need a lot of attention because we had plenty. We know now that attitude is not right. We have a lot of land that is misused. We don't have too much land; we simply have too much land in the wrong use.

William Larson, former ARS soil scientist in Iowa, from Soil Management for Sustainability, *edited by R. Lal and F.J. Pierce, 1991, Soil and Water Conservation Society, Ankeny, Iowa.*

Approaching the problem as a system, the authors suggest linking regulations on regional or watershed areas between federal, state, and local agencies. The Soil Conservation Service (SCS) should set national state goals for soil and water quality. Data could be computerized in geographical information systems. From 1986, funding has increased 2.5 times for soil- and water-quality programs, most of the money being allocated to the Conservation Reserve Program. Additional funds could come from taxes on nutrients and pesticides, and reallocation of commodity programs.

Chapter 4 gives a brief conservation history. Exploitation of land was recognized in the 1890s. In its early bulletins, USDA urged producers to conserve the land they owned. Government involvement in set-aside acreage to improve prices started with the Agriculture Adjustment Act of 1933. It was later declared unconstitutional. Congress sidestepped this with the Agricultural Conservation Program of 1936.

Part II delves into the basis of recommendations made in part I. In chapter 5, the authors discuss soil quality and the relationship of various factors to soil functions. Listed are nutrient availability, organic carbon, labile carbon, texture, water-holding capacity, soil structure, maximum rooting depth, salinity, acidity/alkalinity, pedotransfer functions, and biological activity. The SCS's 1989 appraisal of soil loss in the United States was 4.4 tons per acre per year for sheet and soil erosion and 3 tons per acre per year for wind erosion. Forty percent of the country's cropland was eroding faster than the soil tolerance level; 20 percent was eroding at more than twice that level.

Chapters 6 and 7 take up the nitrogen and phosphorus situation. State and national input and output tables are shown along with diagrams of the nitrogen and phosphorus cycles. Mass balances of both elements show large increases in the soil. Excess residual nitrogen leaches into the groundwater. Excess phosphorus tends to cling to soil particles and move off the land with erosion. Corn uses 41 percent of the fertilizer-applied nitrogen and 42 percent of the fertilizer-applied phosphorus in the United States. Strategies are set forth to reduce the use of both nutrients.

Chapters 8 and 9 cover the fate and transport of pesticides and sediment. In 1980, agriculture used 89 percent of all herbicides and pesticides in the United States. There are 50,000 registered pesticide products. Chapter 8 includes a table of nonpersistent, moderately persistent, and persistent pesticides. Some researchers have estimated that only 1 percent to 2 percent of insecticides applied to foliage is absorbed by the target pest. Other studies indicate that pesticide losses from spray drift, volatilization, wind, and chemical composition can vary from 3 percent to 90 percent. The following are recommendations on how to reduce pollution:

- Use integrated pest management
- Reduce erosion
- Select pesticides with low water solubility, high sorptive capacity, low vapor pressure, high degenerative properties, short half-life, and granular form
- Follow directions, calibrate, be timely, and have the best technical equipment

Soil and Water Quality is all about that magic one or two feet of topsoil which supports ourselves, our families, our neighbors, our towns, our cities, our everything.

Sediment erosion, the subject of chapter 9, is an old story. When my brother and I came to this country as boys in 1939, we swam in Kickapoo Creek near Lincoln. Coming out of the water, we always wore a mustache of sediment. The introduction of intensive agriculture is estimated to have increased erosion from 10 billion tons to between 25 and 50 billion tons annually. Erosion worldwide renders an estimated 49 million acres unprofitable. Research begun in the 1930s by Hugh Bennett of the Soil Conservation Service led to the Universal Soil Loss Equation and the Wind Erosion Equation. Today we have CREAMS (Chemical, Runoff, and Erosion from Agricultural Management System), WEPP (Water Erosion-Prediction Project), and WEPS (Wind Erosion Prediction System). All have their limits. Bare soil, however, erodes the most. One study, fallow after wheat, gave a soil loss of 9,401 kilograms per hectare with 4 percent of the land covered. No-tilled wheat in a similar situation gave a soil loss of 17 kilograms per hectare with 96 percent of the land covered. There *is* a difference.

Ten percent of the cropland in the United States is irrigated: 47 million acres. One-third is affected by salt. An estimated 25 billion acres worldwide are excessively salty, and about 25 million acres of salty land are abandoned annually. Historical records reveal a very long-term trend of failed civilizations based on irrigated agriculture: the Sumerians in Mesopotamia, the Harappas in the Indus Plain, the Hohokam Indians in Arizona. Today the San Joaquin Valley of California has severe salt problems. Selenium and other toxic elements are a problem. Before it concludes, chapter 10 describes the sources of salts and trace elements and their effects on soils and plants, and explores alternative management options.

Manure is the focus of chapter 11. In 1938, experts at the USDA saw the value of livestock "waste," noting in the *Yearbook on Agriculture* that "one billion tons of manure—the annual product of livestock on American farms—is capable of producing $3 billion worth of increase in crops." Since then, we have gotten away from integrated farming systems. Today animal excrements are largely disposed of. This is due to the prevalence of animal confinement systems and the low cost of making artificial nitrogen. Chapter 11 discusses the special problems of manure management: handling, application costs, nutrient value, N-P tradeoffs, point and nonpoint source control, and alternative uses.

There is a final chapter on landscape and nonpoint source pollution. Filter strips, riparian buffer zones, undisturbed forest, managed forest, and pasture all have a role to play as sinks to trap nutrients, trace elements, sediment, and organic compounds.

For those of us who are in the engine room of agriculture, *Soil and Water Quality* is an excellent manual. It is a handbook for those who wish to understand in rational terms the stresses our social and technical habits are placing on the land we love and ignore. The book does not view agriculture from the bridge. Not a word is spoken of sunrises or sunsets, or champagne dinners at the captain's table. It is all about that magic one or two feet of topsoil which supports ourselves, our families, our neighbors, our towns, our cities, our everything. *MJS*

Richard Warner, Interim Assistant Director for Natural Resources, Illinois Agricultural Experiment Station, and Leader of the College of Agriculture Agro-Ecology Program

Agrarian Librarian Reviews Videos

In the last issue, I included a list of printed resource materials for the "serious agroecologist." Now it's time to look at videotapes. The following is a list of videos that focus on sustainable agriculture and related issues. I have included information on the publisher for readers who wish to obtain copies. *RW*

While the economics and ecology of agriculture are profoundly intertwined, a sound ecological basis is essential for the long-term sustainability of agriculture, simply because agriculture is essentially and primarily a biological system.

From Farming in Nature's Image: An Ecological Approach to Agriculture, *by Judith D. Soule and Jon K. Piper, with foreword by Wes Jackson, 1992, Island Press, Washington, D.C.*

Videotapes

Alive and Well: Sustainable Soil Management. 1992. Rickland, R. University of California Visual Media, University of California, Davis, CA 95616. Lively yet serious film that features several California farmers and ranchers involved in a wide range of commodities (orchards, public gardens, cattle ranching, grain production). Exclusively male farmer testimonials and narration provide coherent explanation of concepts such as *(a)* why attention to soil factors beyond fertility are key to sustainable farming and *(b)* how sustainable farming practices can be as profitable as conventional methods. Early on, the film establishes that many sustainable farming techniques are well-known "best management practices that should be more often employed." Topics include: large-scale compost production and application, no-till rice production, intercropping with hairy vetch and brassicas, and basic topics such as manure management. Larger scale farmers are featured. The strong emphasis on California agriculture and dryland farming detracts from its usefulness to educators in some other regions, despite high-quality selection.

Alternative Agriculture: Growing Concerns. 1989. Videocassette No. 479 from National Agricultural Library Document Delivery Service Branch, (301)504-5994. This selection is appropriate for farmers, agricultural educators, students, and policy makers who want to know the philosophical and scientific base for the sustainable farming movement, and how government and farmers are reacting to the call for sustainable agriculture systems. Although of high quality, this film is somewhat outdated by references to specific legislative initiatives. Featured are men and women from the USDA and land-grant universities, and organizations such as Resources for the Future and Rodale Institute. Includes profiles of model farmers such as Dick Thompson of Boone, Iowa. Controversial aspects of sustainable agriculture are acknowledged in this selection.

Rotational Grazing: Farmer to Farmer Strategies for a Sustainable Agriculture. 1992. Rooy Media/Rodale Institute. Rooy Media, 7407 Hilltop Drive, Frederick, MD 21702. This selection blends salt-of-the-earth farmer testimonials with clear explanations of principles. A wide range of intensive pasture systems is featured, though emphasis is squarely placed on the usefulness of rotational grazing for small-scale livestock operations. Farm operations feature beef, dairy (Holstein, Jersey), and sheep operations, with the largest dairy herd at 200 head (milking) and the largest sheep herd at 700 ewes. Farmers from Maine, Vermont, New York, and Pennsylvania are represented by operations with a variety of fencing systems, paddock layouts, supplementary feeding systems, and soil resources. Three research-based presentations are provided by Bill Murphy, University of

Vermont; Steve Kaffka, Sunny Valley Foundation, Connecticut; and the manager of Wolfe's Neck Farm, University of Southern Maine. The video provides some data such as feed value, forage tonnage, changes in milk production, and change in costs of production. Includes short discussion of alternative forages (brassicas, triticale, peas).

Sustainable Agriculture. 1991. San Luis Video Publishing, P.O. Box 4604, San Luis Obispo, CA 93403. Likable, balanced, professionally produced film that defines and describes the principles of sustainable farming, with an effort to acknowledge traditional technologies such as rotations and the value of technological advances such as purchased biological controls and computer records management. Concepts are presented logically and clearly. Farmers and farms shown are from California, yet the film should be acceptable to audiences in many parts of the country.

Sustaining America's Agriculture: High Tech and Horse Sense. 1992. National Association of Conservation Districts, P.O. Box 855, League City, TX 77574-0855. An exciting, serious film, utterly respectful of the role of the farmers in defining and practicing sustainable agriculture, that at the same time acknowledges the breadth and depth of the challenge. This beautiful film, narrated by Raymond Burr, features men and women on farms and ranches (mostly large-scale) throughout the United States engaged in the production of a range of commodities. The film shows traditional conservation techniques and more novel approaches to practicing sustainable agriculture. The video is accompanied by an informative pamphlet, multiple copies of which may be obtained separately and used for publicity or other purposes. Broadcast-quality copies of the video are available for placement with local television stations.

The Wealth in Wetlands. 1992. National Association of Conservation Districts *et al*. National Association of Conservation Districts, P.O. Box 855, League City, TX 77574. An excellent contribution. Stunning views of the beauty of wetlands on farms. From the pamphlet: "Includes interviews with five farmers who believe that there is a place for wetlands on their farms. Each explains personal conviction on the values of wetlands, in terms of both the farming operation and sources of help in wetlands conservation and restoration in the United States." Farmers represent both traditional and nontraditional farms. Economics of restoration, including lost income from land removed from farming, are mostly absent. A concern raised by reviewers but not by the presentation is the impact of agrochemicals when land is more intensively used by wildlife.

Vegetables: Farmer to Farmer Strategies for a Sustainable Agriculture. 1992. Rooy Media/Rodale Institute. Rooy Media, 7407 Hilltop Dr., Frederick, MD 21702. Informative, comprehensive selection that features farmers, both men and women, from throughout the Northeast who use a variety of organic/sustainable management practices for fresh market produce. Topics include: biological control, IPM, building healthy soils, planning the transition to organic/sustainable, cultivation and cover crops, trap cropping, rotation strategies, and partnerships with researchers. David Ferro, University of Massachusetts, is the featured resource person.

Videocassettes in the NAL Collection Pertaining to Alternative Farming Systems. 1992. SRB 92-14. Stevens, R., and AFSIC staff. Alternative Farming Systems Information Center, National Agricultural Library, Room 111, 10301 Baltimore Boulevard, Beltsville, MD 20705-2351.

Frederick Kirschenmann, Manager, Kirschenmann Family Farms, North Dakota, and President, Organic Foods Production Association of North America and Farm Verified Organic

On Becoming Lovers of the Soil

About the author...

Frederick Kirschenmann is a successful and totally dedicated organic farmer. A member of the board of directors and executive committee of the World Sustainable Agriculture Association (WSAA), Fred combines the spiritual and the practical, beyond creed or dogma, beyond the many cultural barriers that separate people from one another, and beyond narrow cosmological views that separate humanity from the Earth and the creatures hereon. In a subtle but powerful way, Fred has reflected much of the philosophical essence of WSAA in this brief essay.

J. Patrick Madden, Executive Vice President, WSAA.

As farms and farmers continue to disappear from the landscape in many parts of the world, citizens have increasingly begun to ask themselves whether or not they should become more concerned about farm issues.

It is a good question. Why *should* we be concerned about what happens to farms or farmers? After all, food is more abundant and available in global supermarkets today than ever before. For the most part, our food is safe. Industrialized nations spend less of their earned income on food than ever before. And all this despite the fact that farm numbers have been declining steadily for almost a century. So why should we be concerned about farms and farmers? Isn't everything just fine?

Yet at some level most of us *are* concerned.

Why Farmers Are Concerned

In the first place, a growing number of farmers are concerned. We might, of course, expect farmers would be concerned because their own livelihoods and way of life are at stake. Yet fewer farmers seem to be concerned about their own survival than we might expect. Many farmers still believe that they will benefit when their neighbor goes out of business.

But that is beginning to change. There are now so few farms left (in the United States, only 315,000 commercially viable farms by some estimates), that it is increasingly apparent that no farm is safe from this demolition.

But farmers have always been quietly concerned about more than their own livelihoods.

As I listen to the stories of farmers who are pushed to the brink of bankruptcy, I often hear about their guilt over losing both the family tradition and the family heritage of farm and farming that has been an integral part of their ancestry. So they are concerned about the loss of continuity and family traditions.

I often hear farmers lament the erosion of values they have experienced. As they were gradually forced into economic pressures to "get big or get out," they found themselves valuing their neighbor's land more than their neighbor. As they watched their community schools, places of worship, and places of business deteriorate and disappear, they began placing less value on good schools, community activities, and local businesses. So they are concerned about community and the values that bind communities together.

And I often hear farmers wondering aloud who will take care of the land once the last farmer disappears from the landscape. When no one is left who grew up on that particular soil, and knows its vulnerabilities and its powers, who will know how to care for the land? So they are concerned about land stewardship.

But I think it is fair to say that the majority of people in our global society do not feel that these are valid reasons for being concerned about farm issues. And to some extent, they are correct. Most national constitutions guarantee their citizens the right to life, liberty, and the pursuit of happiness, not to a particular way of life and work. National governments have no more obligation to guarantee farmers a living on the farm than they do to guarantee lawyers a job practicing law.

Why Eaters Are Concerned

There are others besides farmers who are concerned about farm issues. We

all eat. And so we are all rightly concerned about food safety, the pleasure of good eating, and food security.... But most of us believe that eventually food technologists will be able to solve our remaining food-safety problems. We may have a little more difficulty believing that technology will give us the pleasures of good eating—but given enough time, many of us believe, technology may solve that as well.

Technology will have more difficulty solving the food-security problem. The concentration of our food system into the hands of a few gigantic multinational corporations is increasingly worrisome. Our food is simply a lot more secure in the hands of millions of farmers than it is in the hands of one or two multinational companies. Still, there may be other ways of solving the problem of concentration besides putting farmers back on the land. So why should we be concerned about farm issues?

Why Environmentalists Are Concerned

Environmental activists are also increasingly concerned about farm issues. The impact that food production is having on the environment is a hot social issue. But again, this is probably not going to be a reason to be concerned about farm issues in the long run. Most of our immediate environmental concerns (groundwater depletion, pesticide contamination, soil erosion, and atmospheric damage) can probably be solved, once again, with alternative technologies. Whether we continue to find the necessary sources of energy to fuel those technologies may be another matter—but some of our technologists are even optimistic about that.

So why not just opt for technological solutions and tough regulations and forget about farms and farmers?...

Why Social Critics Are Concerned

Somewhat more unsettling are the concerns raised by social critics.

Almost two decades ago, Wendell Berry, a U.S. farmer, warned us about some of the social consequences that our society would endure if farms and farmers continued to disappear.

In *The Unsettling of America: Culture and Agriculture*, Berry argued that there is something about the nature of culture in a society, and about the essence of good farming on which our food depends, that is inextricably tied up with farms and farming—something that can never be replaced by technology. He reminded us that:

> *A culture is not a collection of relics or ornaments, but a practical necessity, and its corruption invokes calamity. A healthy culture is a communal order of memory, insight, value, work, conviviality, reverence, aspiration. It reveals the human necessities and the human limits. It clarifies our inescapable bonds to the Earth and to each other. It assures that the necessary restraints are observed, that the necessary work is done, and that it is done well. A healthy* farm *culture can be based only upon familiarity and can grow only among a people soundly established upon the land; it nourishes and safeguards a human intelligence of the earth that no amount of technology can satisfactorily replace....*

In other words, the long-term preservation of good food and environmental care are dependent on good farming, and good farming is dependent on good farmers, and good farmers are the product of good, local culture.

Other social critics have warned us about additional technological tricksters that produce unintended consequences..., that the more powerful, the more complex, and the more dramatic that a technology we employ in agriculture is, the more devastating the results may be to the Earth's species, to the Earth's atmosphere, and to the Earth's welfare. It would be well to ponder that as we plunge ahead to put bandages on the sores of chemical technology with genetic engineering technologies.

The Heart of the Matter

So why *should* we be concerned about farm issues? I think we need to be concerned because there are some issues at stake that go to the very core of who we are as human beings on a planet that nurtures our life. If I really want to answer the question "Why should I be concerned about farm issues?" I have to ask more than food-safety and environmental protection questions. I have to begin exploring my real connection to the soil and how that connection, or lack of connection, affects who I become as a person and who I, together with other persons, become as a society.

What has happened to our modern industrialized society is that we have gone through a divorce. We have become divorced from the soil. And I submit that until we heal that divorce and become lovers of the soil again, many of our social problems will go unsolved—including our food-safety and environmental protection problems.

So this paper is an invitation of sorts—it is an invitation to all of us to

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Soil is not a tangible thing like timber, water, or coal—all of which are included along with soil in the general class of resources. In truth, soil really is scarcely a* thing *in the common sense of that term. Soil really is a dynamic* condition *of the earth's surface; and our real aim when we speak of soil conservation is to retain that dynamic status if we have it, or to regain it if we have lost it. Most of our soils, obviously, have lost it.

From Soil Development, *by Edward H. Faulkner, 1952, University of Oklahoma Press, Norman.*

become lovers of the soil again—as a way of healing our soils and our souls....

Now I realize that an invitation to become lovers of the soil is an alien request. It is not something that one can take to one's national government or the United Nations as part of the sustainable agriculture debate. It is not something that you can put on the agenda of national environmental organizations. It is not an issue that food activists can take to their members. It will not appeal to university researchers. It isn't even an invitation that one can readily take to organic farmers. It is certainly not a project that will attract funding from a private foundation.

But I would submit that it is absolutely fundamental to all the work that all of us are doing. Soil is the connection to ourselves. From soil we come, and to soil we return. If we are disconnected from it, we are aliens adrift in a synthetic environment. It is the soil that helps us to understand the self-limitations of life, its cycles of death and rebirth, and the interdependence of all species. To be at home with the soil is truly the only way to be at home with ourselves, and therefore the only way we can be at peace with the environment and all of the earth species that are part of it. It is, literally, the common ground on which we all stand.

So why have we become so divorced from it? If soil is the source of life, why have we become so alienated from it? Probably because of our arrogance. Our arrogance prevents us from acknowledging our tie to dirt. We are such an elegant, smart, inventive species—it is simply beneath us (no pun intended) to entertain the notion that we are somehow inextricably tied to dirt. But the fact remains that we are tied to it. My friend, John Pitney, who has made a career of writing songs about the land, has put it eloquently: "The fact that we are not *now* dirt, is only temporary."

...There are limits, and many of us would like to insulate ourselves from those limits. Becoming lovers of the soil puts us back in touch with those limits. The fact is, we don't like being tied to the soil's limits. Most of us *like* the idea that modernization insulates us from plain dirt, toil, flesh, soil, and grave.

But for that divorce, we have paid a great price—and we will continue to pay a great price.

On Becoming Lovers of the Soil

How do we become lovers of the soil again? Becoming any kind of lover is, of course, a very personal matter. But there are some clues that can help us in our quest to become lovers of the soil....

The first clue comes from Clarissa Pinkola Estes's remarkable rendition of *How to Love a Woman*. In Estes' view, loving a woman has a great deal to do with proper eroticism. Eroticism, as Estes explains, has little to do with sex. It has, rather, to do with "seeing." Proper eroticism is tied to the ability to really *see* one's lover—to see from both the "inner" and the "outer" levels. Eroticism is tied to really seeing the lover's hair, eyes, body movements—even the tiniest nuances. To love erotically means listening not only to words but to all of the silent communications that lie behind and beyond words.

Eroticism, in other words, involves a level of "seeing" that goes beyond ordinary sight—to penetrate the soul

of being. Loving soil involves much the same kind of sight. To love soil requires that we see more than dirt. It requires that we become intimately involved with soil—see its life and beauty, smell its rich aroma, hear its voice.

A second clue on how to become lovers of the soil comes to us from Wendell Berry in his essay titled "The Pleasures of Eating" in *What Are People For?* Berry suggests that one of the ways to overcome our insulation from soil—our industrial eating, as he calls it—is (among other things) to grow and prepare our own food. Growing something to eat (even if it's only a tomato plant in a pot) begins to acquaint us with the "energy cycle that revolves from soil to seed to flower to fruit to food to offal to decay, and around again." We will, in other words, begin to "see" the soil as that part of the cycle of life that feeds us and to which we return.

A third clue on becoming lovers of the soil comes from Paul W. Brand. In a delightful story titled "A Handful of Mud" from the book *Tending the Garden*, Paul Brand tells us about growing up in the mountains of South India, where families were fed for generations on rice grown in terraced paddies on the slopes of the mountain. Each paddy had been carefully crafted to hold water with a grass spillway to allow water to trickle to the next paddy. These spillways were controlled by a village elder whose job it was to make sure that the water was equally shared by all of the villager's paddies....

[As the story continues, the village elder, Tata, taught a group of boys playing in the rice paddies the importance of preserving the soil by shaming them for muddying the water, which caused soil to be lost by running over the dam]:

> *Tata went on to tell us that just one handful of mud would grow enough rice for one meal for one person, and it would do it twice a year for years and years into the future. "That mud flowing over the dam has given my family food every year from long before I was born, and before my grandfather was born," Tata said. "It would have given my grandchildren food, and then given their grandchildren food forever. Now it will never feed us again. When you see mud in the channels of water, you know that life is flowing away from the mountains...." I had gotten a dose of traditional Indian folk education that would remain with me as long as I lived. Soil was life, and every generation was responsible for preserving it for future generations.*

Each of these clues has to do with "seeing." Seeing by attending, seeing by being in touch, and seeing by cultural memory. One of the ways that we can become lovers of the soil again is by learning to "see."

A friend and I have begun some conversations around the idea of developing "rituals of consent" that growers might use before they prepare the soil for seeding. It occurred to us that some regular ceremony during which growers asked the soil's consent for what they were about to do in preparing it for seeding, would awaken the consciousness of "seeing." If I ask the soil's consent for what I am about to do, I am more likely to attend to its needs, to be in touch with its cycles, and to invoke a cultural memory of caring for the soil in that place. It might be one way of beginning the long journey back to loving the soil again. *FK*

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Dan Anderson, On-Farm Research Coordinator, Illinois Agricultural Experiment Station and Cooperative Extension Service

1993 On-Farm Research Report Available Soon

The results of research conducted by farmers involved in the Illinois Sustainable Agriculture Network's on-farm research program will soon be available. A total of 47 on-farm projects were completed by Network farmers in 1993. The farmers researched topics ranging from nitrogen rates in corn to testing the cost-effectiveness of using guardrails in pastured sows and gilts. Other topics included aeration in corn and soybeans, various cover crop trials, and earthworms.

The on-farm research program trains farmers in proper field research methodology and provides assistance in experiment design and data analysis. Participating farmers are characterized by a strong interest in farming practices that promote a sustainable agriculture. Farmers conduct research to test new ideas or adapt new technology to their particular situations. Many of the trials are unique, but sometimes farmers coöperate on the same project. For example, studies that tested corn yield response to nitrogen rates were combined in 1993 to provide a broader view of nitrogen in corn across Illinois.

To order a copy of the *1993 On-Farm Research Report*, call Deborah Cavanaugh-Grant at (217)968-5512 or Dan Anderson at (217)333-1588. *DA*

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