

Summer 1993

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From the Director

Land Grants & Society

Institutions across the country are changing because of demands being made by society. Land grant institutions have traditionally been very important to agriculture. They were created by legislation during the administration of Abraham Lincoln, a time of great change. These universities were brought into being to help an agrarian society deal with the day's contemporary problems. Today, many question whether land grant universities have a role in modern society. They question the relevance of what we do. They ask whether we work for society in general, or is the mission agricultural production only? Do we have a role in the stewardship of the state's natural and human resources? These are complex questions, particularly with financial resources declining in California and across the country. **John Kinsella**, dean of UC Davis' College of Agricultural and Environmental Sciences, said in a February newsletter that the land grant "model must now be adapted and directed to a broader range of activities (e.g., social issues, sustainable systems), in addition to agricultural production." I agree with Kinsella and believe that dialogue with people outside the land grant system is essential if we are to survive. Two very different pieces I read recently also make this point. One was an editorial in the mid-January issue of *California Farmer* by editor **Len Richardson**, an astute observer of California agriculture and the UC system. He said the university and the Regents must demonstrate that:

- the Land Grant vision of extension and public service is vital and relevant in today's urban society;
- the public service mission is supported as a prioritized goal in budgets and commitments
- at the highest levels of the university-i.e., the president and regents;
- this commitment to the next generation of Californians puts research to work for inner-cities, communities and families through the transfer of knowledge. This includes financial support for research to guide the development of youth programs needed in a fast-changing society.

Finally, Richardson said, "we doubt that needed research or academic quality can be maintained in today's leaner environment unless something is done at all levels of education to eliminate the tenure system. At UC, the Academic Senate has a choke-hold that is strangling not only the university, but the future of California. If the Regents and legislature can't act, it is time for a ballot initiative."

The second article was the text of a speech presented to the Board of Agriculture of the National Academy of Sciences last year by **Karl Stauber**, vice president of the Northwest Area Foundation in St. Paul, Minnesota. The text appeared in the Minnesota Food Association's newsletter last October.

The Northwest Area Foundation has given \$6 million in recent years to land grant institutions focusing on agriculture, natural resources and rural poverty issues. Stauber asked all those who work within the land grant system: Will land grant universities survive? In the debate about the mission of land grant universities he says we should be prepared to answer the following questions about our work:

- Is the land grant university still an engine of positive social change? How do you prove it?
- Is there a size bias, sector bias, or capital intensity bias in your work? Is that bias
- socially responsible?
- Will your work lead someone to be disadvantaged? How do you decide who "should" be disadvantaged? Why should society let you make that decision? Why should society pay for this?
- Some would argue that increased yield without regard to externalities has been the driving strategic vision of the land grant university since at least the 1950s. Is this the case? If so, how is it justified?
- Why are professional societies given such an important role, directly and indirectly, in determining career advancement within the land grant system? How does one defend the weight given to the opinion of a peer scientist from another part of the country over that of a tax-paying resident and consumer in the state of origin?

If we in the land grant institutions are to survive and succeed, Stauber suggested we must do the following: "be inclusive rather than exclusive. Become the place where diverse points of view come together. Develop new mechanisms for multidisciplinary, user-focused research." He said we must be aware that almost all decisions are tradeoffs, and that the land grant university can help society understand this. Stauber concluded by noting that for the past 30 years, many of us have made our professional careers on quantification. "If maximization of production is not going to be society's major objective for the land grant institution," Stauber said, people within the land grant universities can help fellow researchers address "critical, nonquantifiable issues where good science may not be able to predict the outcome, but can assist in the development of reasonable alternatives."

These messages have a clear meaning. The public needs to be included in discussions of both natural and human resource issues and in setting the research and education agenda. We at the land grant institutions can be the positive change agents for this new agenda. We must see these changes for what they are: opportunities. Our very survival depends on this. -*Bill Liebhardt, director UC Sustainable Agriculture Research & Education Program.*

Sustainable Ag Summer Course

Reservations are now being accepted for an eight-week summer course "Introduction to Sustainable Agricultural Systems," offered through the UC Davis Student Experimental Farm (Agronomy 192). The eight-unit course is scheduled five days per week from June 28 to August 20, 1993. The intensive class includes lectures, labs, discussion, field trips and 12 hours per week of practical field experience. Topics include ecological management of soil, water, crops, plant diseases, insects, genetic preservation, small farm equipment use, integrating plant and animal systems, and socio-economic aspects of sustainability. The \$422 course is open to University of California students and non-students with the instructor's consent. Enrollment is limited and space should be reserved by May 14, 1993. Contact **Mark Van Horn**, Student Experimental Farm, Department of Agronomy, University of California, Davis, CA 95616. Tel. (916) 752-7645.

Briefly Noted

Compiled by David Campbell, SAREP

GAO Reviews USDA Sustainable Erg Management

The General Accounting Office (GAO) has released a report praising the SARE program for increasing interest and research in sustainable agriculture. The same report laments that many SARE program goals are undercut by conflicts with other USDA programs. The report notes the fragmentation of sustainable agriculture programs among nine separate agencies headed by four assistant secretaries and two under secretaries. No departmental policy currently exists to guide the efforts of these scattered programs. For copies of the report, *Sustainable Agriculture: Program Management, Accomplishments, and Opportunities*, write: U.S. General Accounting Office, P.O. Box 6015, Gaithersburg, MD 20877; or call (202) 275-6241. The first copy is free, additional copies are \$2.

Whitten replaced as chair of House Agricultural Appropriations

Rep. **Jamie Whitten**, a Mississippi Democrat, was removed in December from his powerful roles as chair of the House Appropriations Committee and the Agricultural Appropriations subcommittee. He had served in the latter role for the past 33 years, a position from which he controlled USDA and FDA spending. He was often described as the real Secretary of Agriculture, as he controlled the Department's purse strings regardless of who was Secretary or which party was in power. Whitten was not considered a friend of sustainable agriculture and his departure marks an opportunity for reconsidering USDA spending patterns. Whitten's replacement as chair of the Agricultural Appropriations Subcommittee is **Richard J. Durbin**, a Democrat from Illinois. See "Old Order Changes as Whitten Pushed Aside," *Nutrition Week*, newsletter of the Community Nutrition Institute, December 18, 1992, page 6.

Self-reliant City Food Systems

Political scientist **Kenneth A. Dahlberg** is working with a project to encourage cities to become more self-reliant and efficient in operating their local food systems. Dahlberg and others have worked to create a Food Policy Council in cities like Knoxville, Tennessee. Dahlberg writes, "One of the major challenges at this point is that few citizens or officials are aware of the extent and complexity of their local food systems, much less their potential. This is reflected in the fact that no city has a Department of Food. Equally, few people are aware that the value of the produce from all U.S. gardens (urban and rural) is roughly equivalent to that of the corn crop (approximately

\$18 billion/year!)." See "Knoxville Serves as Model for Local Food Systems," in *Nutrition Week*, Jan. 1, 1993, pages 4-5.

Sustainable Agriculture and Rural Communities

A recent study by three South Dakota State University professors examined the economic and social implications of a shift from conventional to sustainable agriculture. Part of the study focused on the impacts of such a conversion on rural community economic viability. The researchers concluded that during the transition some difficult economic adjustments might cause an overall decline in rural community economic health, unless government policies to support the transition are adopted. They believe that, in the long term, sustainable agriculture will benefit rural communities, especially if systems are developed that enhance moderate-sized family farms, leading to the need for new local marketing facilities, machinery, and services. See **Thomas L. Dobbs, Donald Taylor, and James D. Smolik**, *Farm, Rural Economy and Policy Implications of Sustainable Agriculture in South Dakota*, South Dakota Agricultural Experiment Station, B 713, May 1992. For copies contact Thomas L. Dobbs, Economics Department, Scobey Hall, Box 504A, Brookings, SD 57007-0895.

California Sustainable Agriculture Working Group Forming

Work is under way to create a California Sustainable Agriculture Working Group (CA SAWG). The group would be modeled after similar groups in other states and regions, such as the Midwest Sustainable Agriculture Working Group. Among the aims of the group would be to provide grass roots input from California into the national level policy discussions that will shape the 1995 Farm Bill, as well as state and local policy initiatives. For more information, contact **Will Allen**, CIRS Rural Toxics Program, 418 Barch Ave., Patterson, CA 95363; (209)892-8832.

ISF Develops Criteria for Certified Forest Products

The Institute for Sustainable Forestry in Redway, California has developed criteria for a certification and labeling program for ecologically harvested forest products. The program is known as Pacific Certified Ecological Forest Products (PCEFP). The criteria for the certification program are copyrighted as *The Ten Elements of Sustainability*. Among the elements are forest practices that maintain and/or restore the natural processes of the forest ecosystem, surface and groundwater quality, soil fertility, and a natural balance and diversity of native species in the area ecosystem. For more information contact The Institute for Sustainable Forestry, P.O. Box 1580, Redway, CA 95560.

Scavenging Nitrogen in Orchards

by Chuck Ingels, SAREP and Rick Miller; Agronomy and Range Science Department, UC Davis

Nitrate levels in many wells throughout California exceed established health standards, largely due to percolation of highly contaminated water from agricultural soils. Soil water beneath fertilized orchards, for example, can exceed 100 milligrams per liter (mg/l) of nitrate-nitrogen, while health levels in drinking water have been set at 10 mg/l. Nitrate leaching may be especially serious in tree crops, since the proportion of nitrogen removed in the harvested crop to the fertilizer applied is often far less with tree crops than in other crops. Many practices aimed at improving nitrogen-use efficiency have been developed, although many gaps in information still exist. Overfertilization in tree crops is still common because most growers rely on synthetic fertilizers.

One strategy that will reduce nitrate leaching is the use of winter annual cover crops. These covers grow during the period when uptake of nitrogen by trees is at a minimum and percolation from rainfall is greatest. While few growers have economic or legal incentives to grow cover crops solely to prevent nitrate leaching, it is one of many benefits of cover cropping and should be an integral part of orchard floor management decisions.

Timely Growth

The amount of nitrogen taken up by the cover crop is closely related to the biomass production of the cover crop. Cover crops must grow vigorously in the fall and winter to be most effective. In some orchards, this requirement maybe difficult to meet. For example, drip irrigated orchards are usually dependent on fall rain for cover crop germination, but rain often does not occur until November. Also, late harvesting in walnut orchards can delay cover crop planting until November.

Effects of Cover Crop Species

Resident Vegetation. Using resident vegetation, or weeds, can be an inexpensive and simple way to capture soil nitrate. However, the amount of nitrate taken up by weeds varies greatly among species. Since weed species composition among orchards varies greatly, resident vegetation will vary in its nitrate uptake capacity. Chemical mowing in the aisles often results in a weed population with little biomass and therefore a negligible effect on nitrogen cycling.

Nonlegumes Nonlegume cover crops will often accumulate about 80 pounds of nitrogen per acre. However, they have been shown to accumulate up to 100 to 150 pounds. Most of the research on nitrate scavenging in nonlegumes

has focused on a few key species. Of the grasses, cereal rye has received the most attention, although others have been successfully used, such as barley, annual ryegrass, oats, and wheat. The crucifers showing the greatest potential include oilseed radish, mustard, rape, and turnip. Another cover crop species which has shown promise in lettuce rotations is phacelia, also called bee phacelia.

Legumes. Legumes will use symbiotic nitrogen fixation to obtain nitrogen, but only when soil nitrate levels are low. While legumes usually recover less nitrate than nonlegumes, one study showed that vetch acquired 125 pounds of nitrogen per acre from a high-nitrogen soil. The remainder of the nitrogen in the vetch-about 70 pounds-was derived from nitrogen fixation. Mixing grasses and legumes is a practical strategy for both conserving and adding nitrogen.

Effects on Tree Nutrition

While cover crops can greatly affect nitrate leaching, it is also important to consider their effects on tree nutrition. The carbon-to-nitrogen ratio (C/N ratio) of residues is an indicator of subsequent nutrient availability. With the incorporation into the soil of a high C/N ratio material (e.g., grass residue), microorganisms will scavenge available nitrogen from the soil, creating a temporary deficiency for the trees. If a low C/N ratio material is incorporated into moist soil, it will decompose rapidly and will release a large flush of available nitrogen in the soil within a few weeks. The time of incorporation (spring) corresponds to the time of high demand by tree crops. The C/N ratios of some residues are as follows:

| Residue | C/N ratio |
|----------------|------------------|
| Legume | 15:1 to 20:1 |
| Mustard | 20:1 to 30:1 |
| Grass | 40:1 to 80:1 |

Under nontillage, residues with a high C/N ratio will decompose slowly due to a lack of nitrogen source for microorganisms which decompose surface mulch. The nitrogen contained in the residue will become available to plants only after the residue has become incorporated into the soil organic matter pool. If low C/N residue is left on the surface, microbial decomposition will be more rapid because of the favorable nutrient status. About 80 to 85 percent of the nitrogen in cover crops is contained in the above-ground portion.

Limitations on Effectiveness

Several obstacles can limit cover crop production and nitrate scavenging in orchards. These limitations usually do not preclude the ability to grow cover crops. However, they can reduce their ability to scavenge nitrate.

Herbicide strips. The ability of cover crops to remove nitrate is reduced by the use of herbicide strips. For example, an orchard with rows 24 feet apart and with a 6-foot herbicide strip has only 75 percent of the soil planted to

cover crops. In addition, some growers fertilize in the treated strips only, since this area contains a large portion of the tree roots. During the winter, fertilizer nitrogen remaining in the strips may easily leach beyond the tree root zone, especially if late summer or fall applications were made.

Shading. Deciduous orchards with a complete canopy cover can cast considerable shade on the orchard floor in the fall and spring. Shading from the branch structure of deciduous trees probably has minimal effect on cover crop growth during the winter. Cover crops grown in citrus orchards, however, may receive little or no direct sunlight, especially in orchards with east-west row orientation.

Winter orchard operations. Cover crops in orchards can rarely be left undisturbed during the winter. The traffic required for pruning and spraying can seriously diminish the growth capacity of the cover. Most species can tolerate a moderate amount of traffic, however, especially when they are older. One operation that can nearly eliminate most cover crops is pushing brush out of the orchard. This practice should be done before planting or seedling emergence. Cover crops could also be planted in alternate rows, with brush stacked on rows with resident vegetation. Alternatively, large wood can be removed and smaller wood can be shredded with equipment now on the market.

Cover crops offer an important way to conserve excess soil nitrate during winter and to supply nitrogen when needed by the trees in the spring. Because of these and other benefits, orchardists should consider using cover crops rather than relying solely on synthetic nitrogen fertilizers for managing nitrogen. Cover cropping can then become a tool for integrated floor and fertility management.

FOR MORE INFORMATION:

Jackson, L.E., L.J. Wyland, J.A. Klein, R.F. Smith, W.E. Chaney, and S.T. Koike. Management of cover crops with reduced tillage in lettuce production systems. Manuscript submitted to California Agriculture.

Janzen, H.H. and S.M. McGinn. 1991. volatile loss of nitrogen during decomposition of legume green manure. *Soil Biol.Biochem.* 23(3):291-297.

Hargrove, W.L. (ed.). 1991. *Cover Crops for Clean Water*. Soil & Water Conservation Society, 7515 N.E. Ankeny Rd., Ankeny, IA50021-9764.

Shennan, C. 1992. Cover crops, nitrogen cycling, and soil properties in semi-irrigated vegetable production systems. *HortSci.* 27(7):749-754.

Weinbaum, S.A., R.S. Johnson and T.M. Dejong. 1992. Causes and consequences of overfertilization in orchards. *HortTechnology* 2(1):112-121.

Sources of Funding

Organic Research Grants

The Organic Farming Research Foundation is offering funds for organic farming methods research, dissemination of research results to organic farmers and to growers interested in making the transition to organic production systems, and public education on organic farming issues. Projects should involve farmers in both design and execution, and take place on working farms whenever possible. Proposals of \$3,000-\$5,000 are encouraged. Most projects will be less than \$10,000. Matching funds from other sources and/or in-kind contributions from cooperators are encouraged but not required. Proposals are considered twice a year. Proposals received by July 15, 1993 will be awarded by October 30, 1993. To receive copies of grant application procedures and the "OFRF Research and Education Priorities" which describes target areas, write Grants Program, Organic Farming Research Foundation, P.O. Box 440, Santa Cruz, CA 95061 or call (408) 426-6606.

Charles A. Lindbergh Fund

Each year the Charles A. Lindbergh Fund, Inc. provides grants of up to \$10,580 (a symbolic amount representing the cost of "The Spirit of St. Louis") to individuals whose work furthers the balance between the environment and technological progress. Categories of the award include aviation/ aerospace, agriculture, arts and humanities, biomedical research, conservation of natural resources, exploration, health and population sciences, intercultural communication, oceanography, waste disposal management, water resource management, and wildlife preservation. Grants are directed at individuals rather than institutional programs. All application materials must be postmarked by June 15, 1993. For applications and more information contact Marlene K. White, The Charles A. Lindbergh Fund, Inc., 708 South 3rd Street, Suite 110, Minneapolis, MN 55415.

Field Research Money

University Research Expeditions Program (UREP) provides funds and field assistance to University of California researchers worldwide. Applicants need not qualify for principal investigator (PI) status. Support is provided by selected members of the public who subsidize research costs through tax-deductible donations and contribute their own skills and time as short-term field assistants. UREP funds can be used for short or long-term field research, as seed money for new research, to extend continuing projects, supplement other grants and support graduate students or additional staff. Proposal deadlines: April 9, 1993 (for projects during November 1993-May 1994); October 1, 1993 (for projects during June 1994-Oct. 1994). For more

information, contact University Research Expeditions Program, Desk D06, University of California, Berkeley, Ca 94720, (510) 642-6586, FAX (510) 642-6792.

Stewardship Incentive Program

Federal Stewardship Incentive Program (SIP) funding of up to \$10,000 per landowner per year is available to private individuals, groups, associations, corporations, Indian tribes or other legal private entities who own rural lands with existing tree cover or woody vegetation or land suitable for growing such vegetation. The Food, Agriculture, Conservation and Trade Act of 1990 authorizes the SIP to offer cost-sharing assistance to improve management of nonindustrial private forest lands. Landowners must maintain and protect SIP funded practices for a minimum of ten years. Eligible landowners must have an approved Forest Stewardship Plan and own up to 1,000 acres of qualifying land. (Authorizations must be obtained for exceptions of up to 5,000 acres.) Existing management plans can be modified to meet guidelines. Specific SIP practices approved for cost-share assistance include management plan development, reforestation, forest and agroforest improvement, windbreak and hedgerow establishment and maintenance, soil and water protection and improvement, riparian and wetland protection and improvement, fisheries habitat enhancement, wildlife habitat enhancement, and forest recreation enhancement. For more information contact a state forester, Agricultural Stabilization and Conservation Service office, County Extension office, or Soil Conservation office.

Fertilizer Research Awards

April 2, 1993 is the deadline for submission of project proposals to the California Department of Food and Agriculture's Fertilizer Research and Education Program. Funding is available for projects directed toward the environmentally safe and agronomically sound use and handling of fertilizer materials. For details and to be put on next year's proposal request mailing list, contact Jacques Franco or Natalie Clohossey at (916) 654-0574.

Resources

Sustainable Erg "Yellow Pages," Cover Crops Handbook

Sustainable Agriculture Directory of Expertise-1993, 300 pages. Lists hundreds of people and groups with information on building soil health, pest-control, diversifying cash flow and other topics. Produced by the Sustainable Agriculture Network (a project of USDA's Sustainable Agriculture Research and Education program), the directory's seven indexes are organized by state, person, organization, enterprise, expertise, product/service, or management method. Contains 717 entries. \$14.95. Also available from the network is *Managing Cover Crops Profitably*, a 124-page handbook for farmers on more than 40 legumes, grasses and legume-grass mixtures that can be used to build soil and cut chemical costs. \$9.95. For either publication, send check or money order payable to Sustainable Agriculture Publications, Hills Building, Room 12, University of Vermont, Burlington, VT 05405. Prices include postage/handling. Payment must accompany order.

Free Biological Controls Booklet

Suppliers of Beneficial Organisms in North America, by **Charles D. Hunter**, 1992, 31 pages. The California Environmental Protection Agency's Department of Pesticide Regulation has published a booklet that lists 95 commercial suppliers of more than 126 different organisms used for biological control of pests. It is indexed to help match suppliers with the specific natural enemies they sell. The booklet also includes an index of beneficial organisms, with scientific names and target pests. Microbials are not listed. Free, single copies of the booklet are available from Department of Pesticide Regulation, Environmental Monitoring and Pest Management Branch, Attn: Beneficial Organisms Booklet, 1220 "N" Street, P.O. Box 942871, Sacramento, CA 94271-0001. To order by telephone call (916) 654-1141.

Sustainable Erg Survey

Results from the Montana Agricultural Assessment Questionnaire: A Survey of Sustainable Agriculture, by **Keith Jamtgaard**, 1992, 48 pages. Describes the potential and perceived social impacts of switching to sustainable farming systems in Montana. Drawn from the results of a two-year survey of almost 600 Montana farmers and ranchers. Available for \$5 from Alternative Energy Resources Organization (AERO), 44 N. Last Chance Gulch, Helena, MT 59601; (406) 443-7272 (for Visa or MasterCard orders).

Market Garden Newsletter

Growing for Market, a monthly journal of news and ideas for market gardeners is published by Fairplain Publications, P.O. Box 365, Auburn, KS 66402. Subscriptions are \$24 per year (\$30 Canada, \$32 overseas). It includes a wholesale vegetable and herb price list adapted from USDA's Market News Service, market garden farmer profiles, articles on how to get grants, how to sell to restaurant chefs and florists, the advantages of marketing co-ops, produce auctions and apprentice programs. The editor/publisher is **Lynn Bycznski**, a market gardener.

New Plant Economy

The Carbohydrate Economy: Making Industrial Materials and Chemicals from Plant Matter, by **David Morris** and **Irshad Ahmed**. This 90-page study was funded by the Rockefeller Foundation and published by the Institute for Local Self-Reliance (ILSR). It describes how plant matter (carbohydrates) provided the raw materials from which the majority of medicines, inks, dyes, paints, industrial materials, clothing and fuels were made in the 1800s. By 1970, hydrocarbon-based technologies made up 95 percent of those products. Currently, the price of plant matter-derived products is going down, while environmental regulations have raised the price of petroleum-derived products. The result is the potential emergence of a new carbohydrate economy, with major implications for the environment and the economic well-being of rural America, according to the authors. Available for \$25 plus \$3.75 for postage and handling in U.S. funds from the ILSR, 2425 18th Street SW, Washington DC 20009; (202) 232-4108.

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Farmer/scientist focus sessions: A how-to manual.

McGrath, Daniel, Larry S. Lev, Helene Murray and Ray D. William

Working Paper No.92-104, December, 1992, Graduate Faculty of Economics, Oregon State University, Corvallis, OR 97331.

Reviewer's Note: This paper describes a valuable and practical method of managing meetings whereby farmers and scientists can collaborate to solve complex problems. This approach is becoming increasingly popular because it can unleash collective creativity while reducing conflict. The technique is especially relevant in developing understanding of interrelationships among sustainable agricultural practices, which are often more complex than among those in chemically-intensive farming.

Agricultural researchers use lectures, publications, and demonstrations for communicating **to** farmers. Surveys and focus groups are emphasized in order to obtain information **from** farmers. The farmer/scientist focus session (FSFS) makes use of the creativity and synergy that arise when farmers and scientists listen to each other and learn as a team. FSFSs are especially useful in addressing complex cropping or livestock systems, in designing experiments, and to enquire into controversial issues that have incomplete research bases.

Although farmers often conduct studies on their own farms and discuss the results with each other, they participate little in planning and implementing research and extension efforts conducted at universities and other governmental institutions. The FSFS technique can aid in the integration of these separate research approaches. Depth and breadth of knowledge differ among farmers, extension agents, extension specialists, and research scientists (Fig.1). For example, farmers typically have greater breadth but lesser depth of knowledge about farming systems than do University scientists. These differences lead to complementarity in the context of FSFSs. The technique works best when more than half of the members are growers, and there are from 8 to 20 group members.

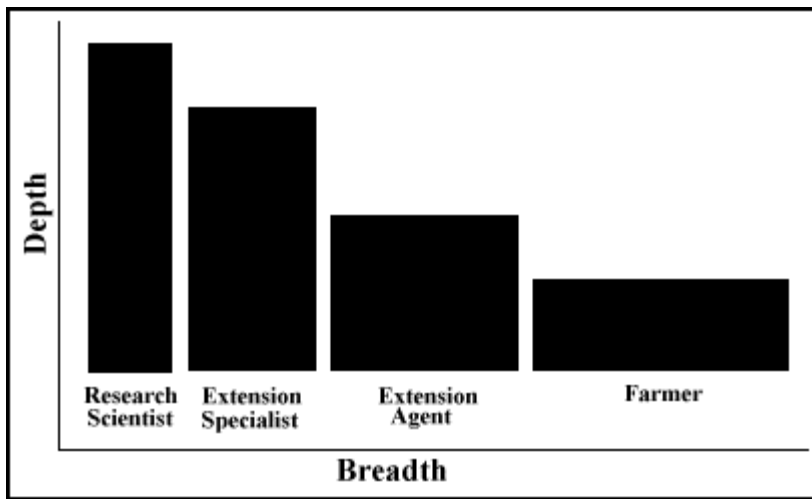


FIG.1. Depth vs. breadth of knowledge

Participant Roles

The FSFS is not a transfer process by which one subgroup gives and another receives information. Rather, the process provides a forum for discovery by all participants. The approach may require acclimation, with scientists learning to restrain themselves and farmers encouraged to speak. FSFSs works best when the team members are jointly responsible for managing and developing the meeting.

Key roles are the **facilitator**, the **process observer**, and the **recorder(s)**. The **facilitator** controls the flow of the meeting, requesting clarification where necessary, and draws out quiet members while respectfully restraining those who are more outgoing. The facilitator does not insert personal opinions.

The **process observer** quietly watches the meeting and helps guide it by providing non-verbal cues to the facilitator. The process observer may also request a break in the meeting or a change of roles if the meeting gets off-track.

Recorders register the group memory. When participants see their ideas recorded, they relax. The group memory also enables group ownership of these ideas. If possible, two recorders or note takers are desirable. One develops a "discussion map" that depicts the relationship of themes and sub-themes discussed. This map is organized much like a strawberry plant with runner plants spreading out in different directions. The other recorder transcribes the proceedings in greater detail using a conventional outline form.

Conducting the Meeting

Coordinators should reiterate or clarify goals and boundaries at the outset of the session to avoid misconceptions that may persist despite prior correspondence or phone conversation with group members. Narrow definition of content is important where a specific, urgent problem is being addressed. A two to three-hour session with a long break may generate tentative solutions to such problems. In order to evaluate the success of FSFSs, it may be important for participants to establish at the outset what

they would consider successful outcomes. These might include better understanding of an issue, a written document depicting a problem and a list of alternative solutions, identifying key researchable issues, a better sense of teamwork, or learning more about issues.

Time boundaries are also a consideration. Complicated issues may require two to three sessions over several weeks. Such sessions may be organized to begin with general discussion and become increasingly specific. Gaps between sessions allow reflection that can lead to improvements. For issues that are neither narrowly defined nor pressing, there may be no established boundaries. If such sessions are not managed carefully, they may drift into pointless complaining. By contrast, with proper handling, such meetings can promote greater understanding of a range of viewpoints.

In managing FSFSs, a horseshoe seating arrangement with a board in front focuses attention on the issue and reduces emphasis on personality. This arrangement is superior to a circle of chairs, which encourages debate, or rows of chairs, which encourage passive listening. The facilitator should announce at the beginning that all are expected to participate, and that the group as a whole is responsible for preventing strong personalities from dominating and for increasing the involvement of quieter people. Participants should then be asked to introduce themselves, and to share their concerns. Other techniques involve writing before speaking; this generates more ideas because all participants are engaged intellectually, not just those who are speaking.

Rather than allowing the group to plunge directly into debate on the "best solution" to a problem, discussion should start out broad, enabling the evolution of a "rich picture" of the issues. This is the **brainstorming phase**, and should not involve judgments or analyses of individual comments. Important themes will emerge during this phase.

At some point in the discussion, the need for a phase change will arise. A **short break** at this point allows informal discussion in small groups. After the break, it is time to **prioritize the themes** that emerged during the earlier brainstorming. Next, the group can **brainstorm potential solutions**. In the final phase, the **proposed solutions are evaluated critically**.

Closure of FSFSs usually occurs after two to three hours, and can involve verbal and visual cues from the facilitator. Closing thoughts of participants may be requested, and an evaluation of the session is typically made, including an appraisal of the overall value of the meeting and of specific aspects.

Post-Meeting Follow-up

After the meeting, the planning team holds debriefing and reporting sessions, at which notes are again taken. The recorders organize the group memory and circulate it among all participants, setting a deadline for corrections and additions. The resulting document may be used in newsletters or for special mailings to interested parties.

Several references on related themes are listed at the end of the manual.

(DEC.456)

Contributed by Robert L. Bugg and Chuck Ingels

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Loss of nitrogenous compounds during composting of animal wastes.

Martins, O. and T Dewes

Bioresource Technology 42:103-111.1993.

It is well known that aerobic composting of animal manures results in the loss of a portion of the nitrogen originally contained in the manure. This loss can be ecologically significant if nitrate leaches to groundwater or if large quantities of nitrogen gases volatilize into the atmosphere. This paper quantifies these nitrogen losses through research conducted under "semi-technical conditions."

Methods

The experiment utilized liquid manures from two pig sources, three cattle sources and three poultry sources. Each type of manure was mixed separately with chopped straw to form a homogeneous mixture; a blend of all manure types was also used. The mixtures were placed into individual composting tents in triangular heaps about 2.5 feet tall. The composters had drain pipes to collect the leachate and air sampling tubes to measure gaseous emissions. The heaps were turned when average temperatures fell below 30 C (86 F), which was three to six times during the composting period. After analysis, the collected leachate was sprayed back on the outer edges of the heaps to prevent drying and to recycle leachate.

Results

Leaching. During the composting period, about 10 to 20 percent of the initial nitrogen was recovered as leachate. Over 70 percent of the total nitrogen that was leached occurred within the first ten days (before the first rewetting). As the composting period progressed, leaching generally occurred only after the heap was turned. The total nitrogen concentration of the leachate, and to a large extent the amount of nitrogen carried with it, was determined by the nitrogen content in the initial material. The majority of the nitrogen leached was ammonium-nitrogen; much less organic nitrogen and only minute quantities of nitrate (0.1-2.2%) were recovered. The author implies that this small amount of nitrate does not pose a significant threat to groundwater quality. (*Reviewer's note: In soils, ammonium is usually quickly converted to nitrite and then to nitrate through the process of nitrification. Therefore, leachate from composting operations, if allowed to drain into the soil, may indeed pollute groundwater.*)

Gaseous losses. Fifty to 75 percent of the nitrogen in the original mixture was lost to volatilization during the composting process. The gases consisted primarily of ammonia, with very small quantities of oxides of nitrogen. The

most important factors that increased ammonia losses were high nitrogen concentration of the initial material, high compost temperature, and more frequent turning.

Since the leachate was returned to the compost heap, the nitrogen lost during the composting process was solely due to volatilization. Although over half the nitrogen was lost by this means, total nitrogen concentration actually increased. This apparent nutrient enrichment was a result of about a 75 percent reduction in mass, which was presumed to be caused by water loss.

Recommendations

The author notes that some loss can be prevented by capturing the leachate and either using it to rewet the heap (when it is protected from rain) or using it as a liquid fertilizer. Emissions of ammonia and nitrous oxides are considered to be a more serious ecological hazard from an air quality standpoint. Among the preventive strategies for reducing gaseous losses are the appropriate use of raw manure and composting at lower temperatures, although the latter practice may allow weed seeds and pathogens to survive. The use of natural materials with large adsorptive surfaces (e.g., bentonite) may also be useful. Finally, reducing the use of protein-rich animal feeds could reduce the amount of ammonia released. Other methods of reducing ammonia from waste gases in central facilities are currently under investigation.

(CI-SWN.1 05)

Contributed by Chuck Ingels

Alfalfa and the nitrogen cycle in the Corn Belt.

Peterson, T.A. and M.P. Russelle

J Soil and water Conservation 46(3):229-235. 1991

This article provides the following estimates regarding alfalfa's contribution to the cycling of nitrogen in agricultural systems.

1. Alfalfa forage is about 17.5 percent crude protein, 2.8 percent nitrogen.
2. Roughly 50 percent of the nitrogen in the herbage is derived from N₂ fixation in the seeding year and 80 percent is derived from fixation in succeeding years.
3. Published estimates of annual N₂ fixation by alfalfa range from 70 kilograms per hectare (63 lb/acre) for seedling stands to 400 kilograms per hectare (356 lb/ acre) in mature stands.
4. Alfalfa roots have the capacity to absorb water and nutrients at depths of 11 meters. This characteristic makes alfalfa an efficient interceptor of residual soil nitrogen.
5. The total nitrogen content of soil increases during alfalfa growth, possibly through excretion of symbiotically fixed nitrogen, or sloughing off of old root cells. Recent estimates agree that about 56 kilograms per hectare (50 lb/acre) are added per year.
6. There is little nitrate leaching loss from a stand of developing alfalfa. However, nitrate leaching losses following destruction of an alfalfa stand can be significant under certain soil, climatic, and irrigated conditions.

Discussion

Alfalfa acts as a buffer in the nitrogen cycle by adjusting the amount of nitrogen fixed from the atmosphere to complement soil nitrogen available from other sources. Alfalfa may also be able to intercept and remove nitrate-nitrogen from great depths in the soil and prevent it from being leached into groundwater. Because of its high nitrogen content, care must be exercised when rotating a stand of alfalfa to other crops.

The authors recommend practices that prevent excessive or poorly-timed nitrogen mineralization and minimize potential leaching of nitrogen during noncropped periods. For example, the common practice of fall tilling alfalfa stands when rotating to a nonlegume should probably be discouraged; instead, growers should plowdown early spring regrowth. For a 3-year old alfalfa stand, this could contribute 380 kilograms nitrogen per hectare (339

lb/acre) to the available soil nitrogen pool over the next five years. In addition to minimizing nitrate-nitrogen leaching losses, this practice would permit alfalfa to use water in the fall and early spring, water that might otherwise be available for leaching.

In summary: "Producers and policymakers should be aware of the potentially negative effects of alfalfa and of ways to minimize chances for groundwater contamination when rotating to another crop. Most important, it is crucial that producers recognize the nitrogen supplied by legumes and manure, and reduce fertilizer nitrogen application rates for succeeding crops accordingly."

(RTN.1 29)

Contributed by [David Chaney](#)

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Plastered straw bale construction: A waste to a resource.

Bainbridge, David A.

Article written for *Sustainable Agriculture* Technical Reviews.

The field burning of waste straw in California produces more carbon monoxide and particulates than all of the electric power generating plants in the state combined. These byproducts of burning have a significant effect on the quality of air in certain regions at certain times of the year.

During the past decade, many grain farmers in California have been looking for other ways to manage crop residues. In fact there are a number of alternatives to field burning. One option is to incorporate straw back into the soil. Another option is to bale and remove the straw for some other purpose. This article summarizes an innovative construction technique that utilizes straw bales.

Straw bale construction is one of the best building systems known. Straw bale construction began in the late 1800s in the Nebraska Sandhills, a vast grassland area with few trees. This method of building proved to be durable and more comfortable than either wood frame or sod houses. A straw bale renaissance is currently underway, led by builders and pioneers who have rediscovered the benefits of this low cost, durable, and super energy-efficient building material.

Straw bales have been used to build houses, apartments, farm buildings, schools, hotels, government buildings, and churches. Many buildings more than 50 years old are still in "like-new" condition, loved by their occupants, and unrecognized by passers-by. These include two churches, a post office, and a county courthouse. This building method is particularly attractive for farm structures in areas where straw is a waste material available at low cost (this includes the Sacramento Valley, Willamette Valley, and the area around Couer de Lane, Idaho). Bale prices as low as \$1 per bale are found in rural areas - but even at suburban prices it makes sense to build with bales.

This is perhaps the only ecologically and economically sound building system. Homes can be "grown" in sustainable agroecosystems without pillaging the old growth forests, at owner-built prices competitive with mobile homes (now the home of approximately 16 million Americans.)

The Canada Mortgage and Housing Corporation (the equivalent of the U.S. Dept. of Housing and Urban Development) sponsored a technical report that concluded, "The basics of this technique can be learned in a few days. A two week practical training is sufficient to teach all intricacies related to this construction method. These factors make it a well suited self-help building method for people with limited resources."

These Canadian tests also verified the fire safety and structural integrity of plastered straw bales. "The straw bales/mortar structure wall has proven to be exceptionally resistant to fire. The straw bales hold enough air to provide good insulation value but because they are compacted firmly they don't hold enough air to permit combustion."

Material costs represent less than one-fifth of the cost of the wall system so owner-builders can realize greater savings by providing their own labor. These structures also lend themselves to work parties because unskilled labor is needed. Several houses have been built for less than \$10 per square foot by combining several other cost saving techniques with the low cost super-insulated bale walls.

Building Options

Structural Use of Bales. Bales should be compact for structural use. Dry straw bales are preferred (rice, wheat, rye, oats, etc.). Three-wire bales at about nine to ten pounds per cubic foot are good. If bales are bought directly from the baler both full and half bales should be ordered. The bales are laid flat (like bricks) and pinned with hardwood dowel or rebar pins set at an angle and vertical in the corners. Joints are staggered to provide additional strength.

Non-Structural Infill. Bales can be used as insulated infill in timber frame or pole structures to meet building code structural requirements. However, building a timber or wood frame and then cutting and fitting bales to fit around the frame adds a considerable amount to the work and cost. Most bales today are quite strong and the timber frame is generally an unneeded and unwarranted expense.

Finishes. Temporary buildings can be left exposed (an uncoated bale wall had held up fine for many years in northern New Mexico and agricultural buildings often last 20 years if the straw is protected with snow fence or mesh). One farmer in Alberta has regularly used unplastered bale buildings for livestock. But in most cases a fire-resistant and water-proof finish is desirable. Stucco and plaster are commonly used. Gunitite or shotcrete (sprayed concrete) has worked very well on straw bale walls and was used to finish the State of Texas Demonstration Farm in Laredo, Texas. This finish goes on quickly and the pressure of the sprayer promotes an excellent bond with the bales. This is not a do-it-yourself operation but it is very fast. Asphalt stabilized earth plaster has been very effective in tests in Arizona. This mix is very inexpensive (a gallon of asphalt per 30 shovels of adobe mix) and strong. An evaluation of alternative coatings that can be sprayed on quickly and economically is needed.

The plaster coats are normally reinforced with wire mesh. The reinforcing wire can be tied to the wall with wire laced between the bales, wire laid up in the wall, or nailed to stakes pounded into the bales. Expanded metal lath at corners and around windows and doors provides additional strength and makes it easier to plaster.

Wiring and Plumbing. Wiring and plumbing can be done as they are with cement block or adobe buildings. Utilities can be laid up in the walls as they

are built or run in moldings, interior walls, under the floor, or in the attic. Polyfans (used for infiltration control) can be used to back up the electrical boxes. A chain saw or wood drill can be used to make room for wire and pipe runs. Many builders have simply used ROMEX like a normal stud-framed building.

Further Reading

A more detailed description of this construction technique is presented in *Plastered Straw Bale Construction* by David Bainbridge, and Bill and Athena Steen. The book is 44 pages and contains more than 85 references about or related to straw bale building. It is available for \$10 ppd. from agAccess, Box 2008, Davis, CA 95617, (916) 756-7177. For information about workshops on straw bale construction contact: Matts Myhrman, 1037 E. Linden Street, Tucson, AZ 85719.

(DEC.457)

Contributed by David Bainbridge

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Role of animals in sustainable agriculture.

Parker, Charles F.

In: Edwards, C.A., R. Lal, P. Madden, R.H. Miller and G. House (eds.) *Sustainable Agricultural Systems*. Soil and water Conservation Society, Ankeny, Iowa. pp.238-245.1990.

Sustainable agricultural systems involve animals for their unique ability to use noncompetitive, nonrenewable resources, and for their integration with other farm practices. They complement plant production systems, and provide biological and economic diversity. Management of such mixed or integrated systems is the greatest challenge.

Forages are grown on over half the land area of the United States. The economic success of forage farming requires animal grazing. Nutrient cycling, soil-water conservation, and enterprise flexibility are also affected. Animal reproductive cycles are timed to seasonal availability of forage, and differences among species (nutrient requirements, behavior, and diet preferences) allow the efficient use of resources in both biological and economic terms. Controlled intensive grazing, made possible by technological advances in electrified fencing, has improved the economic and biological output of animal-forage farming.

Sustainable cropping systems often emphasize the use of nitrogen-fixing legumes for their value in soil improvement and as cover crops. Increased production of these legumes, which improve animal performance, should enhance the role of animals in these resource-conserving systems. Animals can also use other crop residues, which are currently produced in the United States in excess of amounts needed to prevent serious soil erosion. Returning animal feces and urine to the soil can help cycle nutrients, and animal grazing can help control weeds in agroforestry or pasture systems. For example, sheep can effectively control leafy spurge, a serious pest in the north central United States and Canada which is toxic to cattle.

More attention should be paid to developing farming systems that exploit the complementarity and synergism between plants and animals in resource-conserving systems.

(JSA.106)

Contributed by Jill Auburn

Ecology and vegetarian considerations.

Gussow, Joan Dye

Keynote speech given at the Second International Congress on Vegetarian Nutrition, Arlington, Virginia, June 29, 1992.

In recent years, ethical and environmental concerns about eating meat have merged in the effort to achieve public reform. This paper focuses on the environmental issue: Does the optimal relationship between humans and the environment include or exclude animals as food? This question is addressed in three parts: 1) the popular development of the idea that environmental responsibility is linked to vegetarianism, 2) the destructive effects of present methods of animal raising on farmers, animal welfare, and the environment, and finally 3) asking whether vegetarianism is the appropriate response to these problems: "Is universal vegetarianism the goal?"

The Origins of the Vegetarianism-Environmental Link

The public first became widely conscious of the problems of modern animal raising in the United States about 20 years ago when Ballantine Books published Francis Moore Lappe's *Diet for a Small Planet*, which sold over two million copies in ten years. Lappe presented evidence that agricultural resources were being wasted and the planet degraded to satisfy the U.S. hunger for grain-fed beef. Further, she postulated that this meat-based diet is one cause of world hunger and that vegetarianism is kinder to the planet.

Many of the same problems first articulated by Lappe have been more recently documented by John Robbins in *Diet for a New America* and Jeremy Rifkin in *Beyond Beef*. Rifkin implies in his book that giving up beef will resolve many of the world's social and environmental problems, and that nature will recover. Although the notion that "nature can restore what a troubling culture has destroyed" is implicit in Rifkin's and many others' logic, Gussow points out that this notion is unrealistic given millennia of human intervention. In fact, leaving nature alone now may not result in the natural succession of plant and animal species as Rifkin suggests, but instead, in a takeover by weeds from surrounding territories. Thus, Gussow concludes that "leaving nature alone in a world already deeply affected by humans is a practical impossibility."

Ruth Harrison's *Animal Machines* published in Britain in 1964 was one of the first popular books deliberately drawing public attention to the ethics of modern animal raising. As with crop production, the aim of animal agriculture has become efficiency: how to produce more animal or animal product in less time and with the least labor. To meet this goal, industry established large, confined animal facilities, a trend that has continued to the present.

The Ecological Desirability of Vegetarianism

Our present livestock production system relies largely on feed grain. (Thirty-eight percent of the world's grain production is used for livestock feed.) Although land used for feed grain would probably not be used to feed the poor in rich countries, this is not true in developing countries. To satisfy a growing demand for animal products, feed grains must be imported or grown at the expense of traditional food crops which may then have to be imported, all of which reduces a nation's self-reliance. In addition, feed grain is often grown in monocropped systems, which can degrade topsoil and use excessive energy. Production of livestock in confined systems also concentrates large quantities of manure in one place, which has become a major management problem in recent years.

Even livestock that are not raised intensively are creating worldwide environmental stresses due to their increasing numbers. "World meat production has nearly quadrupled since 1950 as the populations of affluent countries and the newly affluent of poor countries, increased their intake of meat." This has led to overstocking of pastures, degradation of grazing areas and decimation of forestlands to make way for pastures. So, whether confined or free ranging, domestic livestock are putting an unsustainable burden on croplands and grazing lands around the world. "Is the solution vegetarianism?"

Livestock and Sustainability

Animals are an important component of many natural and managed ecosystems. In many parts of the world, crops and animals are integrated within the farm system. In these areas animals may act as a "savings account" for the farmer, and livestock and their products may represent the margin between survival and starvation. Ruminants, in particular, can produce high quality food from grazing lands not suitable for growing crops. In addition, livestock manure (a problem in intensive, confined systems) is a precious fertilizer and indispensable source of fuel in much of the world. Therefore, one important measure of sustainability, according to Gussow, is the extent to which livestock and crop production are integrated in farming systems. She urges that we reestablish integrated systems where they have disappeared, and encourage them where they survive. In range-land areas, suitable for livestock only, sustainability would be dependent on establishing and maintaining functional ecosystems rather than maximizing production.

Editor's note: This paper emphasizes the role livestock play in developing regions of the world. Readers should note that livestock also have an important place in North American agriculture, both from an economic and ecological standpoint. Integration takes place at a different level in North American agriculture (i.e., between farms within a region), but the cycling and exchange of resources and nutrients between the systems is still an important consideration.

Conclusion

Finally, Gussow raises the larger question of who is in control of the food

system. She states: "The issue then is not beef, and not the consumption of animals *per se*, but the ways in which the human species misuses nature for profit in the name of producing food...What drives the food system is not human appetite, but profit." Gussow asserts that the real problem we face is one of scale and control. "Giant corporations that are rapidly gaining control over the world's food from seed to table are working to create a system from which nature is largely excluded."

We are all responsible for thinking about and participating in the decisions about how the world's resources are used. On a global scale, vegetarianism may actually be unecological. Eliminating animals in the many integrated systems around the world that are producing food for human consumption would decrease both sustainability and food output. These systems need to be nourished as part of a diversified ecosystem that will be required for long-term sustainability. Animals and their products have a vital role in that system.

(GWF.010)

Contributed by [Gail Feenstra](#)

Organic Desert Plot Available

A three-acre parcel designated for organic crop and material testing is available for research at the UC Desert Research and Extension Center (Meloland) in Imperial County. The plot has been kept free of chemical fertilizers and pest control material for three years, according to Imperial Country farm advisor Keith Mayberry who established the parcel.

The space is available for all researchers in the UC system. Applications for the land and labor are available from Charles Dunn, academic coordinator, at (619) 352-0111. The deadline to submit applications to the Center's Research Advisory Committee is April 15.

"We would like to be sure that any interested researcher has an opportunity to do organic farming in the low desert," Mayberry said.