The farmer as conservationist

Catherine Badgley

Abstract. *Agricultural landscapes are essential for preserving biodiversity, even though agricultural activities are the leading cause of habitat degradation worldwide. About half of the Earth's productive land area is farmed or grazed, whereas only about 6% of the total land area is protected for native species and ecosystems. The ecological services of healthy ecosystems are fundamental to agriculture, and these services depend upon a large number of species interacting with each other and with inorganic nutrient cycles. Likewise, the quality of ecosystems between reserves is critical to the persistence of species and ecological processes within reserves. Thus, conservation-oriented farming methods are critically important for both agriculture and biodiversity. Three examples illustrate agricultural practices that benefit the farmers, the local ecosystem and the landscape: (1) In Minnesota, rotational grazing, evaluated by the collaborative research of farmers and scientists, improved soil, pasture and stream quality, and boosted the confidence of the farmers in developing more sustainable grazing practices. (2) Predator-friendly ranching in Montana, in which nonlethal methods are used to protect livestock from depredation by native predators, benefited the ranchers with premium prices for wool and meat. The persistence of native predators, many of which have been on endangered species lists for years, benefited the regional ecosystem. (3) Shade-grown coffee in Latin America, in which coffee shrubs grow under an intact forest canopy, often looks and behaves ecologically like native forest and may house high levels of native biodiversity. This system benefited farmers, as long as they received a price premium for shade-grown coffee. The economic viability of these conservation-oriented practices depends upon farmers receiving price premiums for their products and by society rewarding farmers for their practices. A vision of ecological farming as the dominant form of agriculture is presented, with benefits at the scale of the farm, the landscape and society.*

Key words: ecological agriculture, biodiversity, conservation

Introduction

A recent issue of the scientific journal 'Nature' contained a theme section called 'Food and the Future'. The introductory article for this theme section asserted that agricultural technologies have rescued the human population over and over, during many past centuries, from widespread malnourishment, famine and starvation (Trewavas, 2002). A historical appraisal of food production based on this Malthusian premise exalts agricultural technologies—from the horse-drawn harvester to genetically engineered crops—that increase production at the expense of the environmental and social consequences. This Malthusian, industrial view minimizes the significance of the increasing corporate control over what is grown and how, and what is eaten and how. Trewavas highlighted the 'conflicting roles of [the farmer as] steward of the countryside and provider of food' (p. 669). Indeed, the potential conflict between biodiversity preservation and food production is acute, especially since agricultural areas—from tropical forests to northern prairies—are home to most of the world's biodiversity. But outside the industrial mindset, there is fertile ground for the farmer as conservationist.

The title for this paper comes from Aldo Leopold's essay, 'The farmer as a conservationist', written in 1939 (published posthumously in 1991). Leopold's ideas are a rich source of inspiration today, and I find it ironic, as well as hopeful, that Aldo Leopold, who understood so well the importance of 'working landscapes', became the patron saint of wilderness conservationists, who wish to preserve more nonworking landscapes as parks and reserves. Today it is more important than ever to reconcile the goals and visions of agriculture and conservation.

The themes of this paper are: (1) the enduring and essential role of agricultural landscapes for maintaining native biodiversity; (2) the roles of farmers as conservationists; and (3) the imperative that society—especially conservationists—support farmers in this role. I will discuss first the rationale for farmers to be conservationists and for conservationists to be deeply concerned about

Catherine Badgley studies the biogeography and community ecology of mammals as a research scientist at the Museum of Paleontology, University of Michigan, Ann Arbor, MI 48109–1079, USA (cbadgley@umich.edu). She teaches courses about environmental issues, including agriculture and the food system. She also practices organic farming in southeastern Michigan.

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farming; next, offer roles and examples of farmers as conservationists; and then present a vision of ecological agriculture as the dominant form of farming and ranching. Leopold wrote, 'The landscape of any farm is the owner's portrait of himself' (Flader and Callicott, 1991:263). This metaphor prompts us to think in personal and esthetic terms, as well as in ecological and economic terms, about the reciprocal impacts of agriculture and biodiversity.

Rationales

Why is it so important for farmers to be conservationists and for conservationists to be concerned about farming? I offer five reasons from the ecological–evolutionary world view. The first two concern benefits to the farmer.

Agricultural activities involve fundamental ecological processes, including energy flow, nutrient cycling and erosion control, year in and year out. These processes are among the ecological services of healthy ecosystems (Daily, 1997). Other services include pollination, seed dispersal, climate moderation and flood control. Industrial agriculture has developed mechanical and synthetic substitutes for some of these services; synthetic fertilizers and biocides are just that. These shortcuts have often disrupted both local and distant ecosystems—local such as the high rates of soil erosion on most farmland (Pimentel et al., 1995), and distant such as the dead zone in the Gulf of Mexico (McKenney, 2002). In contrast, ecologically minded farmers incorporate and maintain ecological services in their farming practices. This philosophy is at the core of natural-systems agriculture at The Land Institute (Jackson, 2002; Soule and Piper, 1992). Ecological services depend upon a large number of species interacting with each other, with inorganic nutrient sources, with water and with the atmosphere. Farmers benefit from, indeed, depend upon, the ecological services mediated by diverse organisms, from soil fungi to mammal and bird predators (Daily et al., 1997). Moreover, it is often more expensive or impossible to compensate with synthetic solutions for nature's ecological services rather than to maintain and use healthy ecological services (Hawken et al., 1999).

Second, diverse agroecosystems tend to sponsor more of their own fertility and have fewer biological disruptions than do monocultures (Gliessman, 1998; Soule and Piper, 1992). Well-chosen mixtures of agricultural species often use moisture and soil nutrients more efficiently than do single species. In many circumstances, polycultures yield as much biomass or more per unit area than do the same species grown in monoculture. They also reduce the growth of weeds and the incidence of plant diseases (Piper et al., 1996; Piper, 1998). In addition, polycultures may promote various biological-control strategies. Thus, biological diversity at the scale of the field should allow farmers to be more reliant on their ecological knowledge and less reliant on synthetic inputs. Organic agriculture is, in principle, better able to foster local biodiversity and ecological processes than are methods that rely on synthetic inputs. Also, various kinds of low-input sustainable agriculture, such as conservation tillage, entail fewer synthetic inputs and reduced soil erosion compared to conventional agriculture.

From the standpoint of conservationists, the rationale is equally great, for three reasons. First, the sheer magnitude of land area involved in farming or grazing is so great that the fate of many species and ecosystems is closely linked to agricultural practices. Leopold wrote, 'It is the individual farmer who must weave the greater part of the rug on which America stands' (Flader and Callicott, 1991:260). In the United States, 65% of the area in the lower 48 states is agricultural land, including private farmlands, private pasture and rangeland, and public lands such as Bureau of Land Management (BLM) land and wildlife refuges where grazing is allowed (Jacobs, 1992; USDA, 1999). Globally, about half (54%) of the world's ecologically productive land area is farmed or grazed (37% of total land area; Wackernagel and Rees, 1996). In contrast, protected areas occupy 6.4% of the world's total land area (United Nations Development Programme et al., 2000). These figures imply that the quality and management of lands in between the protected areas are critical to the well-being of the biodiversity inside parks and reserves.

In fact, ecological theory and data show that landscape quality is essential to the persistence of species and ecosystems within reserves (Hanski and Simberloff, 1997). Reserves cannot safeguard all of the biodiversity within them—they are too small and too isolated from other protected areas. Fragmented, patchy habitats lose species over time, because small populations are vulnerable to random intrinsic and extrinsic events that may drive a small population to zero (Gilpin and Soulé, 1986). Often, isolated habitats cannot be recolonized naturally by species that have disappeared locally. The intervening habitat may harbor viable populations of species found in reserves, or it may be so inhospitable as to form an ecological moat around ever more isolated reserves. From this perspective, agricultural landscapes and processes are fundamental to conservation. Yet many, in both agriculture and conservation, treat agricultural lands as 'ecological sacrifice areas' (Jackson and Jackson, 2002), forfeited to industrial methods of production so that enough food can be produced on these lands that other lands may be devoted to conservation. The vast areas of farmland treated in this way, from the midwestern corn belt of the United States to tropical banana plantations, contribute to the emphasis of many conservationists on parks and reserves as the primary means for safeguarding biodiversity.

Finally, the direct and indirect effects of agriculture are major threats to most currently endangered and threatened species and ecosystems. The Nature Conservancy cites habitat degradation as the leading cause of the imperilment or federal listing of animal and plant species in the United States (Stein et al., 2000). Habitat degradation affects 85% of such species. Among the activities classified under

habitat degradation, agriculture (which entails farming practices, land conversion, diversion of water, use of pesticides and fertilizers) affects 38% and livestock grazing 22% of endangered, threatened and proposed species. Both terrestrial and aquatic species and ecosystems manifest these impacts. In addition to habitat degradation, introduction of alien species, pollution, over-harvesting and disease are the major threats to biodiversity. Agricultural activities are the context for some of these impacts as well. For example, many alien species and diseases enter this country in association with crops or livestock products.

In summary, farmers and conservationists have vested interests in each other's practices. Also, they have a common enemy—the abuses of land and local economies by industrial agriculture (Berry, 2002; MacKay, 2001). 'To enlarge the areas protected from use without, at the same time, enlarging the areas of *good* use is a mistake' (Berry, 2002:374). As Berry, Leopold, and now the contributors to 'Fatal Harvest' (Kimbrell, 2002) have argued, maintaining and restoring working landscapes and safeguarding biodiversity are interdependent goals.

Farmers as Conservationists

Every decision that farmers make about land use, plants and animals has repercussions for conservation. The choice of crop and livestock varieties, the rotation schedule, the tillage method, the presence or absence of cover crops, the plowing pattern, the amount of native habitat interspersed among fields and pastures all affect the capacity of the land to provide ecological services and maintain local biodiversity. Equally important is what happens at the landscape scale. Many decisions at the scale of the farm and landscape affect distant regions of the continent, especially where rivers and migratory species are concerned. Leopold wrote, 'Conservation implies self-expression in [the agricultural] landscape rather than blind compliance with economic dogma' (Flader and Callicott, 1991:263). Below are three examples of farming practices that exemplify his statement.

Rotational grazing in Minnesota

In 1988, the Land Stewardship Project and the Sustainable Farming Association of Minnesota began a farmer-to-farmer information exchange (Nerbonne and Lentz, 2003). Among the farmers involved, six embarked on a change to rotational grazing for their cattle, following a workshop by Allan Savory (1988). (Rotational grazing involves grazing livestock on only a portion of their total pasture area, and moving the herd to a different grazing area every few days. Each patch is intensively grazed, but for a very short time. This method has the potential to improve weed control, reduce soil compaction and reduce erosion around streams.) These six Minnesota farmers also proposed a series of on-farm research projects to monitor the impacts of rotational grazing on their pastures and streams. The group developed contacts with scientists at the University of Minnesota, Iowa State University and the Minnesota Department of Natural Resources. Various scientists were invited to join the research projects. Together the farmers and invited scientists developed the specific research questions and protocols. The monitoring teams gathered data over three summers.

One research project focused on stream quality, including the degree of bank erosion, the diversity of aquatic insects and fish, the amount of silt in streams and vegetative cover of the stream banks (DeVore, 2002). Ralph Lentz, a participating farmer, fenced off a section of his stream from grazing 30 years ago. That area is now heavily forested. There, the stream is wide and shallow, with erosive banks, and a mucky bottom. The forest shaded out the ground layer of vegetation so that it no longer holds the soil in place. In the grazing area, cattle graze the stream banks for a few days at a time in the rotational schedule. There, the stream bank slopes gently and is fully vegetated, and the stream runs deep and clear with a fine-gravel bottom. In that stretch, the stream has species of aquatic insects that are sensitive to stream pollution and diverse fishes that require a premium stream habitat, including trout (R. Lentz, personal communication, 2002). The results of the research project confirmed that rotational grazing had beneficial impacts, compared to conventional grazing, throughout the farm ecosystem.

The outcomes of the farmer-to-farmer information exchange and research projects were threefold (Nerbonne and Lentz, 2003): (1) the research teams successfully documented the impacts of rotational grazing compared to conventional grazing practices on pasture, soils, streams, and local plant and animal diversity; (2) the partnership between farmers and university scientists resulted in several published research projects and numerous oral presentations to farmer audiences and scientific meetings; (3) the collaboration changed the participants' views of each other and of themselves.

The farmer-to-farmer information exchange and the partnership with scientists boosted the confidence of the farmers. In a survey following several years of collaborative research, one farmer wrote, 'I literally bet my livelihood on [switching to rotational grazing]. Forming this team gave me the confidence to go forward' (Nerbonne and Lentz 2003:72). Another farmer wrote, 'Being part of this [team] broadened my perspective on whole systems and reinforced my beliefs about what I observed. I was trained [as a university student] to believe that streams and cattle were incompatible, but this project absolutely gave me the confidence that what I was doing might have some truth in it'. Also, the farmers became more interested observers of their land. For example, one farmer said, 'I used to always take my four wheeler out to shut the gate. Now I walk out because there's so many things I'm afraid I'll miss. The other day I saw a scarlet tanager, it just made my whole day'.

The scientists also changed their views, and some their research. One university scientist commented that he 'came into [the team] thinking that he would help farmers see what was out there by building baseline information' (Nerbonne and Lentz, 2003:73). Instead, he learned from farmers that 'the whole was more than its parts and that we must build on the [farmers'] strong instincts for the land'. Another scientist said, 'The team really changed the direction of research that I do. I used to study fish; now I have an ecosystem restoration focus'.

In this example, the change to rotational grazing improved the ecosystems on the farms and benefited the standing of the farmers among themselves as well as in the research community. Also, the farmers received premium prices for their grass-fed beef.

Predator-friendly ranching in Montana

The second example involves a relatively new concept that influences the ranch and the larger ecosystem in which it lies. 'Predator-friendly' ranching refers to nonlethal methods of warding off large native predators from livestock (Imhoff, 2001). This approach represents a substantial departure from the typical rancher's attitude toward native predators—which is to get rid of them by any means possible. Historically in the United States, farming in the East and ranching in the West have been the major force behind predator-control programs, which have driven many mammal and bird predators off much of their original geographic range (Badgley, 2002; Wuerthner and Matteson, 2002). In addition, ranchers are the major opponents of reintroduction programs for large native predators, such as the wolf and the grizzly bear. But some ecologically minded ranchers have taken a fresh approach. They keep their livestock animals safe from predators by their own vigilance and with guard animals, including llamas, burros and guard dogs. A special certification gives these ranchers the opportunity to sell meat, wool and wool garments as Predator-Friendly.

At Thirteen Mile Ranch in Belgrade, Montana, the ranchers raise sheep and cattle organically and use llamas to protect their herds from coyotes, wolves, bears and mountain lions (www.lambandwool.com). These ranchers are assuming risk in order to share the ecosystem with wide-ranging native predators. 'What makes the Northern Rockies region special is the presence of these extraordinary mammals and the habitat that sustains them. If I wanted to remove all risk from ranching, I would move to a cornfield in Illinois', wrote Becky Weed, formerly a geologist and now one of the ranchers at Thirteen Mile Ranch (Weed, 1999:18). She argues that nonlethal predator-control methods are more effective, less expensive, and more ecologically appropriate than lethal control methods. She is enlisting consumers of her beef, lamb and wool in support of agricultural communities, open space and wildlife.

This system also has multiple benefits. To the ranchers, the advantages are premium prices for their products, the satisfaction of practicing their vision of conservation-oriented ranching, and leadership in a movement to practice farming and ranching that coexist with the local biodiversity. The benefits of predator-friendly ranching for the regional ecosystem are the persistence of wide-ranging predators whose presence holds populations of prey species, including rodent 'pests', such as gophers and prairie dogs, as well as smaller predators, at lower levels. Consequently, forest and rangeland are less severely grazed by wild herbivores. Native bird and small-mammal populations, which have declined in some areas from increased predation by 'mesopredators' such as foxes and raccoons, persist more readily. Thus, the effects ripple through the ecosystem much larger than the ranch itself. The persistence of predators that have long been on state or federal endangered species lists results in restoration of ecological processes that have been severely weakened over the past 200 years (Terborgh et al., 1999).

Shade-grown coffee in Latin America

The third example occurs in the tropics, where the number of species of plants and animals is roughly as high in individual countries as it is in all of the United States. In Central America, Colombia and Brazil, coffee farms have great potential to harbor or reduce native biodiversity, depending on the method of coffee production (Perfecto and Ambrecht, 2002). This region grows about one-third of the world's coffee on 3.1 million hectares of land. Mexico, Colombia and Brazil are recognized as megadiverse by Conservation International, and coffee is an important crop in all three countries. Much of the coffee is grown at middle elevations in mountainous regions, where high levels of biodiversity and deforestation both occur.

Coffee is grown by a variety of methods, ranging from rustic coffee, in which coffee shrubs are planted in the original understory of native forest, to sun coffee, in which coffee monocultures are grown in fields stripped of the original vegetation, with synthetic fertilizers and pesticides applied to manage fertility and pests (Perfecto and Ambrecht, 2002). Shade-coffee production refers to all methods in which coffee shrubs grow under an intact forest canopy, whether planted or natural. Shade-coffee farms often look and behave ecologically like a native forest. In some parts of northern Latin America, shade-coffee farms provide most of the remaining forest habitat. For example, El Salvador has lost more than 90% of its original forests, and 80% of its remaining forests are shade-coffee farms.

Research over the past 20 years has shown that shade-coffee plantations house high levels of native biodiversity. Also, shade coffee provides erosion control for the mountain slopes where it is grown, carbon sequestration, and other ecological services. More kinds of resident and migratory birds, bats, ground-dwelling mammals and arthropods (including most ants, butterflies, moths, beetles and spiders) live in shade-coffee plantations than in other agricultural habitats, often at similar levels to the

biodiversity in undisturbed tropical forests (Perfecto and Ambrecht, 2002). In contrast, most animal groups studied thus far decrease in species number and are more uniformly distributed over space in sun-coffee monocultures. Traditional rustic coffee farms have low levels of pests, probably because of the high diversity of predators and parasites in the immediate vicinity. The ability of insectivorous birds and ants to reduce levels of insect pests on coffee is currently under investigation. Insectivorous birds significantly reduce the abundance of herbivorous insects in some coffee plantations (Greenberg et al., 2000). The rate of insect removal is higher in shade-coffee plantations than in sun-coffee plantations (Perfecto and Ambrecht, 2002). In Colombian coffee farms, leaf-litter ants prey more heavily on the coffee berry borer in shade-coffee than in sun-coffee farms (Ambrecht, personal communication, 2002).

Just as important as the native biodiversity within shaded farms is the role of these farms as part of the landscape matrix for forest reserves scattered through the same regions. Ecological theory and preliminary data for ants and frogs show that the quality of the landscape surrounding tropical-forest fragments affects migration and persistence of native species (Perfecto and Ambrecht, 2002; Vandermeer and Caraval, 2001). Thus, from a conservation standpoint, maintenance of shade-coffee farms has considerable value in the face of economic pressures pushing farmers toward high-input sun-coffee production. The trade-off is that coffee yields are lower in shade-coffee polycultures than in sun-coffee monocultures. For shade-coffee farmers to make a living, they need a price premium for their coffee beans. Recently, some conservation organizations have provided biodiversity-friendly certification for shade coffee (Imhoff, 2001). The Smithsonian Institution's Migratory Bird Center developed a bird-friendly label, and the Rainforest Alliance developed the 'Eco-OK' label to integrate shade canopy with other ecological and social-justice issues. To gain wider acceptance among coffee farmers, the biodiversity-friendly certification programs need to include the economic concerns of the growers. These concerns are especially acute now, because the collapse of supply management by the International Coffee Agreement in 1989 and global overproduction of coffee have caused wholesale coffee prices to fall to a 30-year low (Oxfam, 2001). This economic crisis has forced many small coffee farmers out of business. Some farmers, if they have not abandoned the farm altogether, have converted shade coffee to subsistence crops or cattle pasture (Perfecto and Ambrecht, 2002).

Shade-coffee production benefits the farmers if they receive fair compensation for their coffee. The shade-coffee farm provides the farm family not only with a coffee crop but also with shade, fruit and wood, as well as other ecological services of a moderately to fully intact forest. For the ecosystems, the benefits are a high-quality landscape in which much native biodiversity persists as residents or migrants. In fact, shade-coffee farms are critical to ongoing efforts to establish a Mesoamerican corridor for protection of the jaguar and other large, vulnerable species (Miller et al., 2001).

These three examples have features in common. The focus of the agricultural activity is the rearing of various non-native species in sufficient amounts to support a decent living. But in each case, the farmer adopted species or processes of the local ecosystem to suit his or her needs, and often received a price premium through certification. The results worked for the farmer, the ecosystem, the landscape and the conservationist. Richard Levins describes such examples as 'less capital-intensive and more thought-intensive' ways of farming (Levins, in a talk given at Prairie Festival, Land Institute, Salina, Kansas, 1998).

A Vision of Ecologically Sustainable Agriculture

Ecologically minded farmers and their supporters are often criticized as wanting to go back to romantic conditions of the past, such as Victorian times, Medieval times or even hunting and gathering times (Trewavas, 2002). This reaction is ridiculous. Rather, ecologically minded farmers are crafting a unique future that contributes to the well-being of society and the environment, in contrast to the genetic engineers who are benefiting mainly agribusiness. Below I present elements of my vision of farms, landscapes and society in which the dominant form of agriculture is ecological in practice, economically viable and publicly supported. The vision helps to focus our hope and our efforts.

At the scale of the farm, this vision has core values of biological diversity and knowledge of local ecosystems. Ethical aspects include respect for the quality of life of the agricultural and native species. Farms feature a diversity of crop plants and animals grown to reflect the structure and processes of the native ecosystem—the approaches of natural-systems agriculture (Jackson, 2002) and permaculture (Mollison, 1988). Fields contain polycultures of row crops, including tree crops where ecologically appropriate. Agricultural technologies are present in the form of plant or animal breeds well suited to the local ecological circumstances, pest-management systems that utilize ecological interactions, suitably sized planting and harvesting equipment, and reduced tillage. Mineral powders, such as gypsum and lime, as soil amendments or pesticides, and sprays, such as bacterial fungicides and mineral pesticides, provide supplemental fertility or pest control. New agricultural methods are evaluated for their local and distant ecological impacts, as well as for their immediate utility. The farmer has detailed knowledge of the fields and pastures by working them rather than from using precision-agriculture technology. Farm animals range over abundant, healthy pasture because it suits their natural behavior and distributes their manure over a broad area without extra effort by the farmer. Farms have areas of native habitat,

such as wetlands, woods, streams or patches of native grassland, because farmers are rewarded for their preservation and knowledge of these areas. Locally, farms are known both for their farm products and for distinctive natural features, such as particular wetland orchids, several species of frogs calling, or a high number of butterfly species. Each year, farmers lead field trips for students and interest groups to see these native features. Farmers are trained not only in agricultural practices but also in ecology and local natural history. Such knowledge facilitates farmer-to-farmer information exchange, and each farmer is the local expert on his or her farmlands. This system would only be viable if farmers receive a fair price for their products and if the local human community values farmland and natural habitats enough to safeguard them from urban development. This system would attract young people to farming.

At a larger scale, farms and ranches are situated in a landscape retaining areas of intact native ecosystem. Such a landscape, if shared by natural-systems agriculture and areas of native ecosystem, harbors high levels of native biodiversity. Farmers have economic and esthetic incentives to evaluate the role of their farms in the landscape matrix. Since farmers are knowledgeable about local species and ecosystems, they contribute to the development of habitat-conservation plans for local species or ecosystems. In some areas, farmers and ranchers participate in restoration of extirpated native predators. Rural areas increase in popularity as destinations for vacations and ecotourism, contributing to the economic growth of rural communities. More species are taken off than are added to state and federal lists of endangered and threatened species, because of widespread, ecologically diverse, working landscapes.

At the scale of society, farmers and consumers are more interactive than they are under industrial agriculture. Farmers are regularly elected as heads of conservation organizations, because of their knowledge of, and commitment to, healthy local ecosystems and working landscapes. Since many agricultural practices benefit society and ecosystems both on and off the farm, the public and the administration strongly support government subsidies for environmentally beneficial farming. Examples in the current Farm Bill include the Conservation Security Program, the Wetland Reserve Program and the Wildlife Habitat Incentive Program (http://www.usda.gov/farmbill). Governmental and nongovernmental organizations foster programs for some farmers each year to travel to other regions of the country or the continent to see the long-distance effects of their farming practices (e.g., a farmer situated near the headwaters of a river system visits communities living at the mouth of the river to evaluate water and habitat quality in relation to upstream sources). Consumers rely heavily on locally grown food, through local marketing arrangements. The economy values food at its worth, not at prices driven well below its value.

This vision is ambitious in scope and incomplete in many elements. Each idea is based upon examples in progress already; thus the individual components are feasible at present somewhere in the United States and certainly elsewhere as well (Pretty, 2002). All involved—farmers, conservationists, the public and biodiversity—would benefit from the alliance of knowledge, goals and political power.

Conclusion

On a personal note, I grew up as a conservationist first and only in the past 12 years have also become a farmer. Although I do not gain my income from farming, I have seen and experienced the issues that preoccupy farmers and conservationists from both sides. It is a false dichotomy that farmers and conservationists have opposing interests. While their goals do not overlap fully, they have greater similarity in knowledge and goals than they have differences (Berry, 2002). Leopold wrote that conservationists need farmers who will 'keep the resources in working order, as well as preventing overuse' (Flader and Callicott, 1991:257). Farmers can benefit from conservationists as advocates for farming practices that raise the quality of the landscape for farmers and for biodiversity. Conservationists can benefit from farmers who enhance the ecological value of working landscapes for more native species. The rest of us need to support both groups in our purchases and our political activism. This vision requires a revolution in agriculture and society, one that is already under way all over the world.

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