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Sustainable Agriculture: Food for the Future

Farmland Stewardship: Can Ecosystems Stand Any
More of It?

J.B. Ruhl*

Old MacDonald had a farm, E-I-E-I-O!¹ And on his farm he
had . . .

15,000 cows
30,000 pigs
55,000 chickens
85,000 gallons of liquid animal waste
3500 pounds of commercial pesticides
6500 pounds of commercial fertilizers
150 acres of highly erodible soils
400 acres of irrigated cropland
125 acres of drained wetlands
300 acres of highly saline soils
50 acres of bio-engineered crops

* Professor, The Florida State University College of Law, Tallahassee, Florida. This Introduction was prepared for the 2002 National Association of Environmental Law Societies' (NAELS) Conference: "Sustainable Agriculture: Food for the Future" held at Washington University School of Law in St. Louis on March 15-17, 2002. Please direct comments to jruhl@law.fsu.edu.

1. See *Old MacDonald Had A Farm*, traditional arrangement (words changed to fit the times).

It may not rhyme, but it is far closer to the reality of what is on farms today than the traditional version of the old children's nursery song suggests. And what are we to make of this modern version of the farm? It is fitting that the 2002 Annual National Association of Environmental Law Societies (NAELS) Conference poses this question prominently in the context of environmental law, for if there is any question that is more important for the future of environmental quality, and yet more ignored in the history of environmental policy, I cannot think of it.

I have been asked to introduce the series of scholarly papers prepared for presentation at the NAELS Conference on *Sustainable Agriculture: Food for the Future* and for publication in this issue of the *Washington University Journal of Law and Policy*. I am honored to do so. They are an impressive group of papers, covering a broad variety of topics thoughtfully and thoroughly. They ask the tough questions about farming and the environment and offer insightful answers. Without doubt, the papers respond to the topic of the Conference in a way that puts the modern farm, the one captured in my not so subtle revision of *Old MacDonald*, squarely in the sights of environmental law and policy.

Of course, my challenge, and my pleasure, is to find the glue that binds the papers together, their common themes. One such theme is obvious, so obvious it jumps from the manuscript pages: All the papers have something to say about the impact of farms on the lands and resources that surround them. This theme should be no surprise, however, as it is the way we have been thinking for decades of other industries in relation to the environment. Particularly, as we develop a keener and more complete sense of ecological dynamics and the profound impact actions in one location can have on the environment elsewhere, often at great distances, this image of the "ecological footprint" of an industry is a useful guide in helping us ask the right questions when formulating environmental policy.

But here is where farmers and the farm lobby wish to convince us that farming should be thought of in a different light. Farming, they contend, inherently requires "stewardship" of the land. Farmers, after all, depend on, even love, the land they farm. They will tend it to ensure its continued farming vitality and, the argument goes, thereby ensure its ecological vitality as well. This natural connection of

farming to the land ensures that farming will tread lightly on surrounding ecosystems, or, perhaps, even provide net benefits. So farmers are really the “first environmentalists.”

This is a nice story. It might have held true for Old MacDonald, but New MacDonald is a different case. Particularly in light of modern farming’s reliance on chemical pesticides and fertilizers, irrigated watering, concentrated animal feeding methods, bio-engineered crops, and other trappings of technology, it is time we examine the farmland stewardship claim critically. The relevant question no longer can be simply whether farmers love *their* land and resources; rather, the question is how good an ecological steward they have been of *our* land and resources.

In Part I of this introductory Article, I explore the farmland stewardship claim in more detail. I endeavor to convince readers that the claim, trumpeted not only by farmers and the farm lobby, but also by legislators and farm regulators of virtually every political stripe, is primarily a rhetorical device to move attention away from farming as a significant source of environmental degradation and, therefore, a worthy target of environmental policy attention. In fact, with the tacit approval of federal, state, and local governments, if not their outright political and financial support, farms have (1) transformed over 900 million acres of our nation from wildness to agriculture; (2) maintained agriculture on their land only with the assistance of massive infusions of ecologically-damaging technology; and (3) exported most of the undesirable effects of that technology to ecosystems found on other lands and resources. Thus, farmers can claim very little in the way of land stewardship. Indeed, they have much to answer for when it comes to the environment.

After stripping the farmland stewardship claim of its mythology, I turn in Part II to the theme that defines the Conference topic and courses through the other articles in this symposium volume: how should we respond to the poor ecological record of farming? In some of my other work, I have broadly surveyed and collated the environmental harms of farms, which in aggregate are astounding, and outlined conceptual approaches for regulating farming through

means other than strict “command and control” measures.² The Conference papers now offer the kind of deep mining on specific topics that can motivate and help formulate a cogent environmental policy for farming.

Three articles offer perspectives on the tangible impacts farming production and land and resource uses can have on distant ecosystems. In *When Voluntary, Incentive-Based Controls Fail: Structuring a Regulatory Response to Agricultural Nonpoint Source Water Pollution*, Professor Douglas Williams offers a thorough and insightful examination of the problem of agricultural nonpoint source pollution, which can carry sediments and pollutants far downstream from any farming operation.³ Professor John Davidson, in *Protecting the Still Functioning Ecosystem: The Case of the Prairie-Pothole Wetlands*, details the vast impact grain production in the northern plains states has had on the fragile Prairie Pothole wetlands ecosystem that once abounded there.⁴ Turning to the sea, and thus illustrating the sheer reach of agriculture’s ecological impact, Professor Robin Kundis Craig provides a telling account of the impacts marine aquaculture—essentially, farming oysters—has had on coastal marsh ecosystems in *The Other Side of Sustainable Aquaculture: Mariculture and Nonpoint Source Pollution*.⁵

The remaining three conference papers illustrate the need to focus on the evolving technology of farming as an ecosystem-level, even global, concern. In separate papers, Professor Michael Healy, *Information Based Regulation and International Trade in Genetically Modified Agricultural Products: An Evaluation of The Cartagena Protocol on Biosafety*, and noted practitioner George Van Cleve, *Regulating Environmental and Safety Hazards of Agricultural Biotechnology For A Sustainable World*, provide comprehensive

2. See J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 *ECOLOGY L.Q.* 263 (2000).

3. Douglas R. Williams, *When Voluntary, Incentive-Based Controls Fail: Structuring a Regulatory Response to Agricultural Nonpoint Source Water Pollution*, 9 *WASH. U. J.L. & POL’Y* 21 (2002).

4. John H. Davidson, *Protecting the Still Functioning Ecosystem: The Case of the Prairie Pothole Wetlands*, 9 *WASH. U. J.L. & POL’Y* 123 (2002).

5. Robin Kundis Craig, *The Other Side of Sustainable Aquaculture: Mariculture and Nonpoint Source Pollution*, 9 *WASH. U. J.L. & POL’Y* 163 (2002).

assessments of the use of genetically-modified organisms and other biotechnology advances in farming, assessing their potential impact on biodiversity and sustainable development.⁶ Finally, Professor F. Scott Kieff explains how the interface between patent law and environmental policy can influence the future of agricultural technology, and thus of its impact on the environment, in *Patents for Environmentalists*.⁷

These six papers are all, in one sense or another, variations on the broader theme of how environmental law and policy should respond to the ecological footprint of farming. To place them in that perspective, I first examine the gap between what farming interests claim that footprint to be and what the environmental record reveals. Only when this gap is revealed will honest discussions of agri-environmental policy, such as those presented in the Conference papers, transpire.

I. PUTTING THE FARMLAND STEWARDSHIP CLAIM TO THE ECOLOGICAL FOOTPRINT TEST

Steward—“1. A person who manages another’s property or financial affairs; one who administers anything as an agent of another or others.”⁸

A landowner’s claim to stewardship of his or her land for a particular purpose implies a tremendous responsibility. The steward cannot treat the land as only his or her own property, but must manage it as if acting as the agent for others, as if the land belonged to others. In the ecological context, therefore, land stewardship must mean that the landowner manages the land with the purpose of minimizing the ecological footprint in mind.

6. Michael P. Healy, *Information-Based Regulation and International Trade in Genetically-Modified Agricultural Products: An Evaluation of the Cartagena Protocol on Biosafety*, 9 WASH. U. J.L. & POL’Y 205 (2002); George Van Cleve, *Regulating Environmental and Safety Hazards of Agricultural Biotechnology for a Sustainable World*, 9 WASH. U. J.L. & POL’Y 245 (2002).

7. F. Scott Kieff, *Patents for Environmentalists*, 9 WASH. U. J.L. & POL’Y 307 (2002).

8. THE RANDOM HOUSE DICTIONARY OF THE ENGLISH LANGUAGE 1868 (2d ed. 1987).

Some commentators argue that all landowners have a duty to manage their land as ecological stewards.⁹ But that question is beside the point if the landowner claims to be doing so. The landowner claiming to be engaged in sound ecological stewardship must demonstrate not only that his or her land is ecologically vital, but that management of the land does not place anyone else's land in ecological jeopardy. That is the test of land stewardship in the ecological sense. That is the test to which we must put any claim by farmers that they are acting as good ecological stewards of their land.

Do farmers make this claim? Most definitely. Does the claim pass the test? Judge for yourself based on the record.

A. The Claim

Secretary of the Interior Gale Norton recently outlined her approach to the question of western grazing policy and proclaimed that “farmers and ranchers are often the best stewards of the land. We can achieve more by working with them—and capitalizing on their intimate knowledge of the land they depend on—and the land they love.”¹⁰ This proclamation is the mantra of the “first stewards of the land” rhetoric of agricultural policy. The argument is that because farmers “depend” on their land, because they “know” and “love” their land, they are environmentally benign or, even better, a positive environmental force. All we need to do is let farmers do the thing that comes naturally to them, that flows from their love for and knowledge of the land, and everything will be alright.

Is this argument made widely in farm policy? As widely and as loudly as possible. Consider that after just a 10 minutes of “surfing” farm lobby sites on the Internet, I found sound-bite, media-ready farm stewardship claims at every turn. One article at the California Farm Bureau site proclaims that “Earth Day is every day on California farms,” and that “generations of California’s farmers and

9. For a thoughtful exposition on this view, which Aldo Leopold articulated in the mid-1900s and J. Baird Callicott champions most forcefully today, see ERIC T. FREYFOGLE, *BOUNDED PEOPLE, BOUNDLESS LANDS: ENVISIONING A NEW LAND ETHIC* (1998).

10. See *Norton Calls for Incentive-Based Species Program*, *ENDANGERED SPECIES & WETLANDS REP.*, Mar. 2001, at 3.

ranchers have been caring for the environment.”¹¹ This site also covered the story of a farmer who claims that “the key word is stewardship,” that “land that is managed properly for cows will naturally be managed properly for wildlife as well,” and that “the good of the species is our main goal.”¹² The Iowa Farm Bureau site claims that “for more than 83 years, Farm Bureau members in Iowa have promoted and conducted efforts that conserve natural resources and safeguard environmental quality.”¹³ The American Farm Bureau Federation President recently asked, on the issue of endangered species policy, “with U.S. farmers’ and rancher’s record in husbandry, who better to enhance a species’s future?”¹⁴ No site matched the boosterism of the Virginia Farm Bureau’s, however, where it claims that “Virginia farmers represent the best example of what environmental stewardship is all about”¹⁵ and are “the original stewards of our environment and open spaces.”¹⁶

My hunch is that the unison within the farm lobby on this score is no coincidence. Farming has come under increased attention as a source of environmental harm, and thus a likely target of increased regulation. The scripted “farmland stewardship” claim is a way of rallying the troops behind a simple message, a message that appeals to the public’s anachronistic conception of farms as bucolic and artisanal. When put to the test, however, it simply does not hold up.

11. See News Release, California Farm Bureau Fed’n, *Earth Day is Every Day on California Farms* (Apr. 9, 2001), available at <http://www.cfbf.com/release/2001/pr-040901.htm>.

12. See Cal. Farm Bureau Fed’n, *Commitment to Conservation: Management Decisions Reflect Commitment to Stewardship*, at <http://www.cfbf.com/issues/conserv/carver.htm> (last visited Mar. 6, 2002).

13. Iowa Farm Bureau, *Because a Quality Environment Benefits Everybody*, at <http://www.agandenvironment.com> (last visited Mar. 6, 2002).

14. Dean Kleckner, *A Presidential View: Environmental Law Is Ripe For Change*, at <http://www.fb.org/views/prescol/98/pres0398.html> (Mar. 1998).

15. See Va. Farm Bureau Fed’n, *Virginia Farmers Lauded for Helping Clean Bay, Rivers* (Jan. 28, 2000), at http://www.vafb.com/news/2000/jan/012800_3.htm.

16. See Va. Farm Bureau Fed’n, *Early Announces Support for Cabinet-level Ag Post* (July 27, 2001), at http://www.vafb.com/news/2001/July/072701_2.htm.

B. The Test

Pollute—“1. To make foul or unclean, esp. with harmful chemicals or waste products.”¹⁷

Stewardship is more than a state of mind. Where it is claimed, one has to ask whether it is being delivered. With farming, the record in that sense suggests that as the claims have become more shrill, the record has become more dismal.

Consider, for example, these major article headlines culled from the two weekly issues of *Environment Reporter* that appeared while I was wrapping up this introduction:

*Idaho Dairy to Take Corrective Action to Settle Allegations Raised in Citizen Suit.*¹⁸

*Environmental Groups Say Pesticides in Northwestern Waters Can Harm Salmon.*¹⁹

*Earthjustice Petition Challenges Exemption of Farming Operations from Air Act Program.*²⁰

*State Legislature Urges Modification of Rules on Agricultural Field Burning.*²¹

*Irrigation District Accused in Complaint of Illegally Discharging Mud, Silt into Creek.*²²

*Animal Management Practices Could Reduce Particulates, Boost Health, Scientists Report.*²³

Environment Reporter covers the waterfront of environmental law in an objective, news service format that is widely read. To find it devote this much coverage in just two weeks to allegations that farms

17. THE RANDOM HOUSE DICTIONARY OF THE ENGLISH LANGUAGE, *supra* note 8, at 1498.

18. 33 Env't Rep. (BNA) 311 (2002).

19. *Id.* at 316.

20. *Id.* at 324.

21. *Id.* at 366.

22. *Id.* at 367.

23. *Id.* at 369.

are not living up to their stewardship claim suggests that deeper examination of the farming record is warranted.²⁴

Let's unpack the farmland stewardship claim into what is really involved when we consider what farming entails. First, the farm stewardship claim uses land used for farming as its baseline. But we must not overlook the fact that, in the first instance, farming came to the land, which was wilderness or close to it in most places. To apply the ecological stewardship test in its full scope we should examine the degree of transformation farming caused in this initial sense. Once established, farming uses the transformed land for a limited purpose—to produce crops or raise livestock. The ecological stewardship test requires that we ask how farms have farmed their land against the goal of ecological vitality. We cannot limit the ecological stewardship test to the property line. Farms exist in a landscape and we must apply the test to as to measure the impact of farming in that dimension as well. Alas, farms do not do well in any of these categories.

1. The Land that Once Was

Farming consumes over 900 million acres of our nation's present land mass. What were those lands before farming? Did farming tread lightly on them? Has their ecological integrity been largely retained or degraded?

Consider our nation's wetlands. At the time of European settlement in the early 1600s, the land area that now comprises the United States contained almost 392 million acres of wetlands, 221 million of those being in the lower 48 states.²⁵ By the 1980s, only 103

24. These two weeks of *Environment Reporter* were by no means exceptional in their coverage of agri-environmental issues. I have been collecting articles of this sort from *Environment Reporter* for five years, and while the average number of such articles each month has built over that time, coverage of agri-environmental issues has steadily been a major topic.

25. For background on historical wetlands losses, see THOMAS E. DAHL & GREGORY J. ALLORD, U.S. GEOLOGICAL SURVEY WATER SUPPLY PAPER 2425, TECHNICAL ASPECTS OF WETLANDS: HISTORY OF WETLANDS IN THE COTERMINOUS UNITED STATES, available at <http://water.usgs.gov/nwsum/WSP2425/history.html> (last modified Mar. 7, 1997); THOMAS E. DAHL, U.S. GEOLOGICAL SURVEY, WETLANDS LOSSES IN THE UNITED STATES 1780S TO 1980S (1990), available at <http://www.npwrc.usgs.gov/resource/othrdata/wetloss/wetloss.htm>; RALPH E. HEIMLICH ET AL., ECONOMIC RESEARCH DIVISION, U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL ECONOMIC REPORT NO. 765, WETLANDS AND AGRICULTURE: PRIVATE

million acres remained in the lower 48 states. Most of that loss was attributable to the conversion of wetlands to agriculture:

Most wetland conversion in the 19th century was originally done for agricultural purposes, although converted land subsequently was often used for urban development. Net rates of wetland conversion dropped from more than 800,000 acres per year between settlement and 1954 to less than 80,000 acres per year in 1982-92. Agriculture's share of gross conversion dropped from more than 80 percent in 1954-74 to 20 percent in 1982-92, while urban development's share rose from 8 percent to 57 percent This long term reduction in wetland conversion for agriculture coincided both with changing economic conditions that were less favorable for conversion and with enactment of Federal and State wetland regulatory programs.²⁶

In other words, the vast majority of the wetland losses this nation has suffered—well over 100 million acres—are due to agricultural conversion, and the practice abated only when it became difficult economically and legally for agriculture to continue it. Is this a record of ecological stewardship?

This story is repeated for other ecological settings. For example, one of the states hardest hit by agriculture, ecologically speaking, is Illinois. A recent comprehensive assessment of the state's environmental history reveals severe losses of forests, wetlands, and prairie due to agriculture.²⁷ These changes are thanks largely to agriculture: only 0.9% of the state's pre-settlement forest remains; more than 70% of the state's original wetlands are gone; and a staggering 0.01% of the state's original high quality original prairie survives.²⁸

What should we make of this history when, today, farmers claim to be good ecological stewards? In other words, what should we use

INTERESTS AND PUBLIC BENEFITS (1998).

26. HEIMLICH ET AL., *supra* note 25, at 18.

27. See ILL. DEP'T OF ENERGY AND NATURAL RES. AND THE NATURE OF ILL. FOUND., THE CHANGING ILL. ENV'T: CRITICAL TRENDS (1994).

28. See *id.* at 34, 42, 46.

as the reference date to begin measuring the record of farmland stewardship? If it is 1600, then the claim appears rather hollow.

2. Their Land Today

The past is the past. What if we don't count what farmers did to the land from 1600 to 1980 and measure the farmland stewardship from that date forward? How have farmers fared as ecological stewards of their land in the recent past?

Indeed, some people argue that farms are improving their performance on several important environmental indicators. Soil erosion appears to be falling slightly in rate and amount; wetland conversions are, as noted previously, falling, and wetlands restoration has slightly outpaced conversions; and the availability of wildlife habitat on farms has improved somewhat.²⁹ The problem with relying on these points to stake out the farmland stewardship claim is that, first, even the most avid defenders of farmland stewardship claims go no further than these three indices, and second, even they concede that in fact most of the progress on these three fronts is the result of direct regulation of farming or direct subsidization programs designed to pay farmers to change their practices.³⁰ The farmland stewardship claim seems rather empty when the three primary accomplishments on which it relies for its case are the result of regulation or subsidy.

The ledger is far from being all on the positive side. I have documented elsewhere in detail the environmental harms of farming.³¹ On the farm itself, chief sources of environmental degradation include soil erosion, irrigation, particularly in arid lands, and chemical releases. Soil erosion from croplands, while possibly on the mend, is still occurring at alarming rates—about 5 tons per acre, or 1.9 billion tons per year.³² Irrigation in arid environments depletes water supplies and leads to the leaching of salts and minerals from

29. See ROGER CLAASSEN ET AL., ECONOMIC RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL ECONOMIC REPORT NO. 794, AGRI-ENVIRONMENTAL POLICY AT THE CROSSROADS: GUIDEPOSTS ON A CHANGING LANDSCAPE 16-20 (2001).

30. See, e.g., *id.*

31. See Ruhl, *supra* note 2, at 274-92.

32. See *id.* at 277-79.

the soils. Over 48 million acres of crop and pasture lands are considered too saline to raise crops, and this impaired acreage is growing at 10% each year.³³ Most significantly, farms are now massive users of chemicals in the form of pesticides and commercial fertilizers. Over 750 million pounds of pesticides are applied to crops annually, and commercial fertilizer applications have increased steadily in intensity and in scope, topping \$9.6 billion in expenses and 233 million acres in application.³⁴ None of these experiences, however, comes close to the near total devastation that results from the practice of confined animal feeding operations. In a class by themselves, these operations jam tens of thousands of livestock into close quarters, often in enclosed structures, and thus, quite naturally, have to manage a staggering amount of animal waste. The United States produces 200 times as much livestock waste as it does human waste each year—about 1.8 billion metric tons, much of which is applied to crop land as “natural” fertilizer.³⁵

Overall, farms do not test well as ecological stewards of their lands even when we forgive the past. The farm lobby will point to success stories and model farms, but they are merely a drop in the bucket. Take away the “success” attributable to regulation and subsidy, and the story is overwhelmingly one of farms pumping water, chemicals, and animal waste onto their land and steadily losing soil quality and quantity along the way. I won’t venture to say here whether that is good farming, but it hardly speaks of good ecological stewardship.

3. Our Ecosystems of Tomorrow

Where do farmers put all those eroded soils, leached minerals, applied chemicals, and piles of animal waste? Do they “steward” them on their land? Not quite.

Indeed, farmers have become quite adept at transferring most of this nastiness to other lands and resources. Over 1 billion tons of

33. *See id.* at 279-82.

34. *See id.* at 282-85.

35. *See id.* at 285-87.

eroded farmland soil reaches water bodies each year.³⁶ Farmers routinely “steward” saline soils by flushing them with excess water and discharging the highly saline water into adjacent lakes and streams.³⁷ Only a small percentage of pesticides actually reach their target pest; the rest washes or blows away or infiltrates the soils to leach away later.³⁸ Over 1.1 million tons of phosphorous and 4.6 million tons of nitrogen enter waterways each year as a result of agricultural fertilizer runoff.³⁹ Millions of gallons of animal waste spill into waterways each year.⁴⁰ As a result of these “stewardship” practices, runoff from agricultural lands, with its loading of sediments, minerals, pesticides, nutrients, and pathogens, is the leading cause of water quality impairment in the nation.⁴¹

Whatever one thinks of farming’s stewardship of *farmland*, these trends do not paint a pretty picture of farming’s stewardship of their surrounding ecosystems. Shouldn’t these impacts be counted in the test of ecological stewardship? If they are, and if we also consider as well the legacy of historical conversion of wildlands to agriculture and the impact of farming just on agricultural lands, is there anything left of the farmland stewardship claim? Apparently, if the pages of the *Environment Reporter* are any indication, many think not.

II. LAW AND POLICY RESPONSES

To be fair, most farmers in my experience do not go to great lengths to defend the farmland stewardship claim. They don’t mind the political capital it buys them, but these farmers concede that farming has much to rectify environmentally. They also are quick to point out, justifiably, that doing so will be expensive, affect many marginal farmers, and increase consumer prices. The average farmers simply cannot realistically “go ecological” overnight and the average consumer may not want them to do it. Farmers also point out, as have I, that the environmental law of agriculture largely condones all of

36. *See id.* at 278.

37. *See id.* at 281-82.

38. *See id.* at 283, 291-92.

39. *See id.* at 284-85.

40. *See id.* at 285-86.

41. *See id.* at 287-91.

the practices recounted above.⁴² A complex and deeply entrenched mixture of regulatory exemptions and subsidies acculturated farming to fall short of the level of environmental performance expected of other industries, and existing farm practices and farm technology evolved in reliance on that framework remaining in place. In short, while farmers and non-farmers alike share the ecosystems within which farms operate, farmers and non-farmers alike share the blame for the dismal record of farmland stewardship.

So how is environmental policy to proceed? Mired deep in its farmland stewardship rhetoric, the farm lobby almost universally confronts this question by extrapolating from its stewardship claim to its final solution for almost every question of environmental policy: voluntary, incentive-based programs. The argument goes something like the following: because farmers are *already* good ecological stewards, the costs of implementing any further environmental performance demands should be optional and borne by someone other than farmers. The American Farm Bureau, for example, loudly proclaims the farmland stewardship claim, but unflinchingly demands that “[t]he use of regulatory mechanisms would impose excessive cost burdens on producers. . . . Properly funded assistance programs that work with farmers to retain productivity while improving water quality will be more efficient and effective.”⁴³ This statement is the organization’s official position with respect to restoring polluted waters,⁴⁴ controlling animal waste from concentrated animal feeding operations,⁴⁵ protecting endangered species,⁴⁶ conserving wetlands,⁴⁷

42. *See id.* at 293-316.

43. News Release, Am. Farm Bureau Fed’n, *Voluntary Approach to Dealing with Hypoxia is Best* (Jan. 23, 2001), available at <http://www.fb.org/news/nr/nr2001/nr0123.html>.

44. *See* Am. Farm Bureau Fed’n, *Clean Water Act Regulatory Expansion—Total Maximum Daily Loads Program* (Jan. 2001), at <http://www.fb.org/issues/backgrd/cwa107.html> (“AFBF policy supports voluntary incentive-based approaches based on sound scientific information, technical assistance to landowners and site-specific flexibility.”).

45. *See* Am. Farm Bureau Fed’n, *Animal Feeding Operations* (Jan. 2002), at <http://www.fb.org/issues/backgrd/cafo107.html> (“Farm Bureau submitted comments to EPA objecting to the proposed regulatory expansion of CAFO’s. Farm Bureau pointed out the need for voluntary, incentive based programs to be useful and effective for water quality improvement.”).

46. Am. Farm Bureau Fed’n, *Endangered Species Act Reform* (Jan. 2002), available at <http://www.fb.org/issues/backgrd/esa107.html> (“Farm Bureau believes that farmers and ranchers can be at the forefront of the effort to protect endangered species . . . there needs to be

and much more.

Stripped of their farmland stewardship premise, however, the voluntary, incentive-based policy proposals seem entirely disingenuous. Farming got a “bye” in the first generation of environmental regulation that imposed costly, demanding performance standards on other polluting industries.⁴⁸ Those other industries may be ready for voluntary, incentive-based techniques as part of a second generation of policy instruments. Is farming? To put it more bluntly, there is little evidence that voluntary, incentive-based programs led farming very far toward ecological stewardship in the past, so why should we believe they will do so in the future?⁴⁹

At bottom, this is the present day dilemma of agri-environmental policy. It may not be realistic, now or ever, to subject farming to the barrage of environmental regulation other industries withstood during the past three decades. But neither will it be realistic to continue naively down the path of voluntary, incentive-based programs. Some serious, focused thought must be directed at the question of what alternatives exist to these two dead ends.

This is where the Conference papers come into play. If legal scholars such as I demand that farming back up its farmland stewardship claim, or at least measure up to some meaningful level of ecosystem performance, we ought to share in the burden of crafting a realistic legal framework for doing so. The Conference papers do so thoughtfully and comprehensively, and in all cases call to mind the

financial incentives and protections for landowners who find endangered species on their property.”).

47. Am. Farm Bureau Fed’n, *Wetlands* (Jan. 2002), at <http://www.fb.org/issues/backgrd/wetlands107.html> (stating that wetlands conservation “legislation should require [that] compensation be provided to landowners for the loss of economic use of private lands”).

48. As one leading agri-environmental law scholar has put it, whereas many sectors of the economy are exploring “next generation” environmental policy, “agriculture is different.” It never had coherent first-generation environmental protection programs.” C. Ford Runge, *Environmental Protection from Farm to Market*, in *THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY* 200, 200 (Marian R. Chertow & Daniel C. Esty eds., 1997).

49. As John Davidson, one of the Conference participants, has observed elsewhere, “despite one-half century of heavily subsidized volunteerism, pollution from agriculture has worsened steadily. Only the well-intentioned farmers have participated in voluntary conservation programs.” John H. Davidson, *Conservation Plans in Agriculture*, 31 *Envtl. L. Rep.* 10,501 (2001).

image of agriculture's ecological footprint. The six papers fall into two groups of three by subject matter. The first group deals with topics involving the direct, tangible consequences of agricultural production resource uses. The second group covers issues of agricultural technology and the profound impact it can have on global biodiversity.

On the resource impacts front, the papers cover water pollution, wetlands degradation, and the marine environment, thus illustrating the long reach of agricultural production's impact on distant ecosystems. Doug Williams, for example, takes the farmland stewardship claim and its voluntary, incentive-based policy construct head-on in his comprehensive exploration of the agricultural non-point source water pollution problem. Water quality policy, particularly for our nation's lakes and rivers, is at a crucial focal turning point, one Williams puts dead in the sights of his analysis. As Williams points out, the tremendous environmental quality gains achieved during the last three decades were built primarily on a system of regulatory emissions limits and performance standards applied to industrial and municipal point sources—i.e., discharge pipes and other discrete pollutant conveyances. But this approach is, for the most part, tapped out technologically and economically. The incremental costs of additional point source controls are often high, and the environmental gains perhaps not nearly as responsive to investment as they were in the past. Yet this cost-benefit matrix is beside the point when it is now abundantly clear that most of the water quality impairment we hope to cure is not caused by point sources, but rather is the result of non-point source pollution and, chiefly, agricultural production pollution. Sheer equity demands that, as we battle the remaining increment of water quality impairment, we ask more of agricultural production than we do of other industries. In Williams's assessment, with which I have to agree based on the record, voluntary, incentive-based programs simply won't get us there. A regulatory program must emerge, one that is capable of being coherently implemented and enforced. Williams lays out a multi-faceted program for doing so, bearing in mind the need for easing farming through the transition period from the existing exemption/subsidy framework to one in which something is actually demanded of farming. He makes a convincing case for relying on

minimum national standards to provide the core of regulatory content, on watershed-level planning as the appropriate forum for implementation, and on citizen suits as a critical component of enforcement.

Following suit, John Davidson presents an eloquent, albeit depressing, description of the effects grain production has had on the vast Prairie Pothole wetland ecosystem of the northern plains states. Giving life and detail to my general observations of farming's impact on the land that once was, Davidson recounts the emergence of "soybean deserts" as the end result of agricultural production techniques that drained, leveled, and denuded the landscape to make way for waves of grain. Grain production soared, but at the expense of biodiversity and ecosystem integrity. Unfortunately, as Davidson soberingly observes, we know how much grain production increased, yet we will never truly know the cost to nature *and* to society in lost ecosystem services. The dilemma is that most of what remains of the Prairie Pothole wetland ecosystem is on private lands in the private working landscape of agriculture. Therein lie the seeds of two dynamics that makes policy formulation so difficult. First, the effect any single landowner has on the ecosystem is small, but these tiny increments of degradation accumulate over the landscape into dramatic consequences. Second, the cost of conserving the ecosystem resources is concentrated in the private landowner, whereas the benefits are shared by many in tiny increments. Davidson skillfully unpacks the "cumulative effects" and "incrementalism" problems in the context of the prairie pothole system, demonstrating why they also plague so many other natural resource management contexts. He echoes Williams in his calls for an ecosystem/watershed-based level of management that recognizes the physical and biological connectivity inherent *system* of potholes. Unfortunately, like many of our resource protection programs, the grab-bag of instruments currently available for the prairie pothole system—the Endangered Species Act, Swampbuster, Section 404 of the Clean Water Act, and the National Environmental Policy Act—have been applied, at best, as gap fillers and crisis managers. In Davidson's estimation, what remains of the ecosystem is in peril unless the environmental law begins to function as a system itself, with the ecosystem dynamics in mind.

Robin Kundis Craig moves this theme from land to sea, focusing

on mariculture, or aquaculture in coastal and marine settings. Williams and Davidson cover land-based agricultural production and its impact on inland aquatic ecosystems. By shifting to the marine ecosystem context, Craig's topic truly illustrates the profound impact farming can have on distant, and different, ecosystems. Indeed, her description of mariculture illustrates that farming in one location (inland) can have debilitating effects not only on surrounding ecosystems, but even *on farming* in other locations (downstream). Many state and federal government programs promote aquaculture, and the public's perception may be that this is a low-impact, win-win solution for our nation's fish and seafood supply. But mariculture, sitting as it does in the transition zone between inland and coastal aquatic systems, gets it coming and going: nonpoint source pollution from upstream agriculture degrades the water upon which mariculture depends; and mariculture, in turn, contributes to degradation of surrounding coastal ecosystems. Like inland farming, mariculture needs space devoted principally to one thing—mariculture—and its leveling of mangroves and coastal wetlands is the aquatic equivalent of the massive land conversion inland agriculture caused in the 1800s. Ironically, the more pernicious consequence of mariculture may be its demand for wild fish to stock the breeding operations and feed the masses. In other words, mariculture is becoming the coastal form of concentrated animal feeding operations, and the feed is taken from the sea itself. Craig thoroughly documents this need to protect coastal environments from the unchecked consequences of mariculture, as well as the need to protect mariculture from the unchecked consequences of inland farming. She also surveys the complex, elaborate regulatory framework brought to bear on those two issues, explaining why it is hamstrung by the patchwork division of state and federal jurisdictions in the coastal zone and the sheer lack of political will to tackle the challenge of inland nonpoint source pollution.

The focus of the agricultural technology papers, quite fittingly, shifts to the impact and regulation of rapidly evolving bio-technology applications in agriculture. In their separate papers, Michael Healy and George Van Cleve put their respective fingers on the hot button of this topic—genetically modified organisms (GMOs). As Van Cleve points out, the potential upside GMOs hold for the global food

supply are demonstrable and huge. Yet, while GMOs are not inherently dangerous, they are potentially so. And their potential is to present risks to the environment and to human health that have not been experienced or imaginable under conventional agriculture. The group of papers focusing on production tie the risks of conventional agriculture primarily to land conversion (draining wetlands) and water pollution (nonpoint source runoff). As Healy documents, high-tech agriculture poses its own forms of conversion and pollution, but with transgenes as the agent of change. In short, as GMOs enter the environment, the transgenes have the potential to migrate to other organisms, altering and eroding the gene pool. And as other biological and physical conditions in the ecosystem respond to this genetic pollution, ecosystem dynamics at scales far larger than genes can be converted. Where, when, and how much will this happen? We don't know. That is the problem.

As the two authors detail, GMOs are on the brink of going "big time," yet the legal structure for dealing with their potential downsides can hardly keep up at domestic or international levels. How, Van Cleve asks, can we construct a domestic legal framework for GMOs that meets all the objectives of (1) sustainable food supply; (2) maintaining biodiversity; (3) internalizing costs to the relevant actors; (4) transparent political process; and (5) public participation? That is no small task. We failed miserably in doing so even with conventional agriculture, except, of course, for the first objective. What will be different about GMOs? Van Cleve posits that hope comes in the form of covering GMOs under a food and drug regulation model supplemented by rules of tort liability to mop up the consequences of residual risk not detected in the product screening and approval process. He believes this "U.S. model" is preferable to the "European model" of more aggressive, public choice based regulation of GMOs. It is hard to know which path to take in law, not knowing the paths GMOs will take in the environment.

At the international level, Healy focuses on the issue of international trade and the approach taken in the Cartagena Protocol of 2000. Healy examines the Protocol's two core information-based programs for transboundary trade in GMOs: advanced notice for trade in GMO products intended for use in the environment and detailed shipment labeling for GMO products intended for human

consumption. While the programs have deficiencies in Healy's assessment, he finds the information-based approach, which has become popular and effective in other environmental policy settings, laudatory for its communication of choice to ultimate consumers.

Finally, the contribution by F. Scott Kieff illustrates how the GMO issue has reverberated not only throughout agri-environmental law, but also into other legal fields such as patent law. For example, the so-called "terminator technology" seeds—those that yield crops whose resulting seeds are sterile—illustrates how the contours of patent law may drive agricultural bio-technology in directions not necessarily the most promising for the environment. Is agricultural technology, like the Internet, yet one more bit of evidence that patent and copyright law is in need of change? Kieff argues this is not the case, rather that an adequate array of legal and non-legal mechanisms exists, within which patent law is simply one facet, to allow agricultural biotechnology invention to prosper.

CONCLUSION

Our society needs farming. Our society needs healthy ecosystems. What we don't need are farmers who pretend to be delivering both, or legal scholars who pretend that delivering both will be easy. I commend the Conference papers, the NAELS Conference itself, and the *Journal* for avoiding both traps and confronting the question of agri-environmental law and policy cogently and realistically. The bigger challenge, I am afraid, will be in convincing the farming industry to begin to talk as honestly about itself as I believe these authors have talked about environmental policy.