

THE ROAD ALSO TAKEN: LESSONS FROM ORGANIC AGRICULTURE FOR MARKET- AND RISK-BASED REGULATION

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INTRODUCTION

In hindsight, the year 1990 was a crossroads in environmental and regulatory policy generally and in the regulation of food specifically. And two different narratives capture the competing regulatory choices presented at that crossroads. The first, a conventional narrative, finds mounting evidence of what many regard as the dominant avenues of regulatory reform in environmental policymaking: market-based incentives and risk-based decision-making.¹ The second, alternative narrative finds the signs of a much more fundamental reform project.

Under the conventional narrative, 1990 is often remembered for amendments to the Clean Air Act that inaugurated the country's largest experiment with constructed environmental markets—a

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1. The literature on reforming environmental law and policy with the use of market-based incentives is large. See, e.g., Robert B. McKinstry, Jr., *Putting the Market to Work for Conservation: The Evolving Use of Market-Based Mechanisms to Achieve Environmental Improvement In and Across Multiple Media*, 14 PENN. ST. ENVTL. L. REV. 151 (2006); E. Donald Elliott, *Environmental Markets and Beyond: Three Modest Proposals for the Future of Environmental Law*, 29 CAP. U. L. REV. 245 (2001); James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607 (2000); Richard B. Stewart, *Models for Environmental Regulation: Central Planning Versus Market-Based Approaches*, 19 B.C. ENVTL. AFF. L. REV. 547 (1992). The literature on reforming environmental law through various forms of risk analysis is equally large. See, e.g., Matthew B. Adler, *Against "Individual Risk": A Sympathetic Critique of Risk Assessment*, 153 U. PA. L. REV. 1121 (2005); Steve P. Calandrillo, *Responsible Regulation: A Sensible Cost-Benefit, Risk Versus Risk Approach to Federal Health and Safety Regulation*, 81 B.U. L. REV. 957 (2001); Jonathan Baert Wiener, *Risk in the Republic*, 8 DUKE ENVTL. L. & POL'Y F. 1 (1997); David A. Dana, Review Essay, *Setting Environmental Priorities: The Promise of a Bureaucratic Solution*, 74 B.U. L. REV. 365 (1994).

nationwide “cap-and-trade” sulfur dioxide market² now fêted not only as a template for a worldwide market in greenhouse gases³ but also as a model for the development of more far-reaching markets in ecosystem services.⁴ The year is also recalled for the qualified endorsement given quantitative and comparative risk assessment by the Environmental Protection Agency’s Science Advisory Board (SAB).⁵ Thereafter, the SAB’s report would be cited frequently for evidence that risk-based environmental regulation was an idea whose time had come.⁶

In the regulation of food, it was easy to see in 1990 the influence of these conventional reforms, especially the prevalence of risk-based regulation. Two highly visible controversies over food—one domestic and one international—were largely framed and resolved in terms of risk assessment. Domestically, 1990 marked the conclusion of a regulatory battle over the pesticide daminozide (known by its trade name, Alar) in which the Environmental Protection Agency (EPA), the Uniroyal Corporation (Alar’s chief manufacturer), and environmental groups each contested the safety of Alar through

2. Clean Air Act Amendments, Pub. L. No. 101-549, sec. 401, §§ 401–416, 104 Stat. 2399, 2584–631 (codified at 42 U.S.C. §§ 7651–7651o (2000)); see also Brennan Van Dyke, Note, *Emissions Trading to Reduce Acid Deposition*, 100 YALE L.J. 2707 (1991).

3. See, e.g., Jennifer Yelin-Kefer, Note, *Warming Up to an International Greenhouse Gas Market: Lessons from the U.S. Acid Rain Experience*, 20 STAN. ENVTL. L.J. 221 (2001); Isabel Rauch, *Developing a German and an International Emissions Trading System—Lessons from U.S. Experiences with the Acid Rain Program*, 11 FORDHAM ENVTL. L.J. 307 (2000). But see Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 YALE L.J. 677, 775 n.361 (1999) (noting important differences between the U.S. sulfur dioxide trading program and proposed international greenhouse gas trading markets).

4. See, e.g., Barton H. Thompson, Jr., *Markets for Nature*, 25 WM. & MARY ENVTL. L. & POL’Y REV. 261, 261–62 (2000) (describing emissions trading under the 1990 Clean Air Act Amendments as an example and precursor to broader experiments with market-like mechanisms to protect ecosystems).

5. RELATIVE RISK REDUCTION STRATEGIES COMM’N, U.S. ENVTL. PROT. AGENCY SCI. ADVISORY BD., *REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION* (1990).

6. See, e.g., Robert F. Blomquist, *The EPA Science Advisory Board’s Report on “Reducing Risk”: Some Overarching Observations Regarding the Public Interest*, 22 ENVTL. L. 149, 151 (1992) (“[T]he remarkable SAB report adds significantly to the policy debate concerning environmental decision making by providing a workable analytical approach to today’s and tomorrow’s environmental problems.”); John S. Applegate, *The Perils of Unreasonable Risk: Information, Regulatory Policy, and Toxic Substances Control*, 91 COLUM. L. REV. 261, 284 & n.120 (1991) (citing the SAB report to support a claim of “centrality” of quantitative risk assessment to EPA policymaking); William Reilly, *Taking Aim Toward 2000: Rethinking the Nation’s Environmental Agenda*, 21 ENVTL. L. 1359, 1366 (1991) (referring to “valuable suggestions” from the SAB report).

opposing risk-based conclusions involving competing exposure models and dose-response relationships.⁷ Internationally, the year also saw battle lines drawn over hormone-treated beef in a dispute between the United States, where the addition of hormone growth implants in livestock was (and still is) common, and the European Community (EC), which took final steps to implement its ban on imported, hormone-treated meat adopted the previous year.⁸ The battle over beef hormones pitted a risk-based approach to environmental issues in international trade (the United States' position) against a precautionary approach (the EC's position). And, within the dispute resolution framework of the World Trade Organization (WTO), the United States' position would prevail, not only in the WTO's eventual decision in 1997 on bovine growth implants,⁹ but also in a 2006 dispute between the United States and Europe over the importation of genetically modified agricultural products.¹⁰

But in the regulation of food, the alternative narrative is needed to capture fully other events that also transpired in 1990. Broadly speaking, this narrative emphasizes the emergence of a *cause-based* approach to environmental reform that seeks fundamental changes in production systems or human behavior to prevent such

7. See, e.g., Marina M. Lolley, Comment, *Carcinogen Roulette: The Game Played Under FIFRA*, 49 MD. L. REV. 975, 984–88 (1990) (discussing different childhood exposure periods used in risk assessments relied on by EPA and environmentalists, different dose-response factors, and claims by Uniroyal that EPA's risk assessment contained too many data gaps to support regulatory action).

8. GEOFFREY S. BECKER, CONG. RESEARCH SERV., U.S.-EUROPEAN UNION AGRICULTURAL TRADE: THE VETERINARY EQUIVALENCY AGREEMENT 2 (1999) (noting that the EC in 1990 finished "delisting" plants in the United States that produced hormone-treated meat). The beef hormone dispute is discussed generally in Rosemary A. Ford, *The Beef Hormone Dispute and Carousel Sanctions: A Roundabout Way of Forcing Compliance with World Trade Organization Decisions*, 27 BROOK. J. INT'L L. 543 (2002).

9. The reports of both the WTO's Hormones Panel and the WTO Appellate Body are discussed in Vern R. Walker, *Keeping the WTO from Becoming the "World Trans-science Organization": Scientific Uncertainty, Science Policy, and Factfinding in the Growth Hormones Dispute*, 31 CORNELL INT'L L.J. 251, 296–319 (1998); see also George H. Rountree, Note, *Raging Hormones: A Discussion of the World Trade Organization's Decision in the European Union-United States Beef Dispute*, 3 GA. J. INT'L & COMP. L. 607 (1999).

10. See WORLD TRADE ORG., EUROPEAN COMMUNITIES—MEASURES AFFECTING THE APPROVAL AND MARKETING OF BIOTECH PRODUCTS (Sept. 29, 2006), available at http://www.wto.org/English/news_e/news06_e/291r_e.htm. The WTO's decision on genetically modified organisms is discussed in Jonathan G. Dorn, News & Analysis, *The Regulation of Genetically Modified Organisms: Why the Biotech Products Case Is a Win-Win Situation for the European Union*, 37 ENVTL. L. REP. 10225 (Mar. 2007).

environmental harms from arising in the first place.¹¹ In a weak sense, Congress captured this alternative approach in the Pollution Prevention Act of 1990,¹² under which EPA was to promote pollution prevention through various information-based measures and by encouraging source-reduction efforts by industry.¹³ But this alternative approach was captured more strongly that year by developments in “alternative agriculture”—which for purposes of this Essay includes “organic agriculture.”¹⁴

The year 1990 was especially important in the development of federal policy on organic agriculture. In April of that year, the National Academy of Sciences co-sponsored a workshop on research initiatives in “sustainable agriculture,”¹⁵ following up on a widely noted National Academy publication from one year earlier, *Alternative Agriculture*,¹⁶ which found evidence that non-conventional agricultural systems could markedly reduce environmental degradation without significant loss in agricultural productivity.¹⁷

11. Examples of cause-based environmental reforms are discussed in Donald T. Hornstein, *Lessons from Federal Pesticide Regulation on the Paradigms and Politics of Environmental Law Reform*, 10 YALE J. ON REG. 369, 380–85 (1993).

12. 42 U.S.C. §§ 13101–13109 (2000). The Pollution Prevention Act is described in E. Lynn Grayson, *The Pollution Prevention Act of 1990: Emergence of a New Environmental Policy*, 22 ENVTL. L. REP. 10392 (June 1992).

13. Grayson, *supra* note 12; see also Stephan M. Johnson, *From Reaction to Proaction: The 1990 Pollution Prevention Act*, 17 COLUM. J. ENVTL. L. 153 (1992).

14. The term “organic” when affixed as a food label in the United States has a fixed meaning in terms of compliance with the Organic Food Production Act of 1990. More broadly, organic agriculture is one of several forms of low-input agriculture that all have in common either the elimination or reduction of such chemical growing inputs as fertilizers and pesticides. See *infra* text accompanying notes 109–12. The various forms of alternative agriculture are summarized in Hornstein, *supra* note 11, at 401.

15. Charles M. Benbrook, *Introduction to SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION IN THE FIELD: A PROCEEDINGS 1* (Nat’l Acad. of Scis. 1991).

16. See COMM’N ON THE ROLE OF ALTERNATIVE FARMING METHODS IN MODERN PROD. AGRIC., NAT’L RESEARCH COUNCIL, *ALTERNATIVE AGRICULTURE* (Nat’l Acad. Press 1989) [hereinafter *ALTERNATIVE AGRICULTURE*]; see also Christopher B. Connard, Comment, *Sustaining Agriculture: An Examination of Current Legislation Promoting Sustainable Agriculture as an Alternative to Conventional Farming Practices*, 13 PENN ST. ENVTL. L. REV. 125, 136 & n.66 (2004) (citing *ALTERNATIVE AGRICULTURE, supra*); Neil D. Hamilton, *Feeding Our Future: Six Philosophical Issues Shaping Agricultural Law*, 72 NEB. L. REV. 210, 239 n.134 (1993) (“The book set off an intense controversy in the agricultural community and gave a major boost in the national conscience to sustainable agriculture.”).

17. *ALTERNATIVE AGRICULTURE, supra* note 16, at 9 (“Reduced use of these [chemical] inputs lowers production costs and lessens agriculture’s potential for adverse environment and health effects without necessarily decreasing—and in some case increasing—per acre crop yields and the productivity of livestock management systems.”).

Perhaps influenced by these events, Congress passed the Organic Foods Production Act of 1990 (OFPA),¹⁸ as part of the 1990 Farm Bill.¹⁹ The OFPA was, it is safe to say, ironic. It delegated the task of promulgating a uniform set of standards for organic farmers, the National Organic Program (NOP),²⁰ to the United States Department of Agriculture (USDA), the historical and administrative epicenter of conventional agriculture in Washington, D.C.²¹ Once established, the NOP would allow organic farmers to market their products under the nationwide seal, “USDA Organic.”²² After stumbling badly in its initial attempt to implement the delegation,²³ the USDA finally promulgated regulations for the NOP about a decade later.²⁴

The incorporation of organic agriculture within federal environmental and agricultural policy was significant. In facilitating this approach to agriculture, the OFPA brought full circle the deeper reform project suggested by Rachel Carson almost four decades earlier upon the publication of her widely influential book, *Silent Spring*.²⁵ Several accounts of *Silent Spring* link its publication to legislative reforms of the nation’s central pesticide statute, the

18. Organic Foods Production Act of 1990, Pub. L. No. 101-624, 104 Stat. 3935 (1990) (codified at 7 U.S.C. §§ 6501–6522 (2000)).

19. Food, Agriculture, Conservation, and Trade Act of 1990, Pub. L. No. 101-624, 104 Stat. 3359 (1990) (codified as amended in scattered sections of 7 U.S.C. and 16 U.S.C.).

20. See 7 U.S.C. § 6518 (2000); see also Lauren Zeichner, *Product vs. Process: Two Labeling Regimes for Genetically Engineered Foods and How They Relate to Consumer Preference*, 27 ENVIRONS ENVTL. L. & POL’Y J. 467, 473 (2004) (“The remaining details of the USDA organic certification program were to be developed by the agency, based in part on the recommendations of the National Organic Standards Board . . .”); *id.* at 474 (“In 1997 the USDA published the first proposed rule, establishing the National Organic Program . . . under the authority granted by the OFPA.”).

21. See Hornstein, *supra* note 11, at 423–27 (describing USDA’s generally pro-pesticide mindset).

22. See Zeichner, *supra* note 20, at 474.

23. See Michelle T. Friedland, *You Call That Organic?—The USDA’s Misleading Food Regulations*, 13 N.Y.U. ENVTL. L.J. 379, 383 (2005) (noting that the USDA originally proposed in 1997 to classify as “organic” such products or processes as genetically modified seeds and the uses of irradiation and sewage sludge, leading to the submission of over 275,603 comments, almost all opposing these classifications—“more public comments than any other USDA regulation in history”).

24. *Id.* at 384.

25. RACHEL CARSON, *SILENT SPRING* (40th anniversary ed., Mariner Books 2002). Much of Carson’s book originally appeared as a series of articles in the *New Yorker*. See CHRISTOPHER J. BOSSO, *PESTICIDES AND POLITICS* 116–17 (1987) (describing the original magazine articles).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).²⁶ But Carson argued for something more fundamental than a broader accounting of the health and environmental effects of pesticides. Carson concluded *Silent Spring* with a chapter entitled “The Other Road,” in which she called on farmers and agricultural researchers to eschew what she termed the “arrogance” of the “control of nature,”²⁷ and instead to develop solutions to agricultural pests “based on understanding of the living organisms they seek to control, and of the whole fabric of life to which these organisms belong.”²⁸ Unlike regulatory reform based merely on quantifying and prioritizing risks, the other road marked by the OFPA led toward a fundamentally different form of agriculture. And unlike the artificially constructed markets in pollution control established in the 1990 Clean Air Act amendments, the OFPA sought to link this different form of agriculture directly into the nation’s broader consumer markets. And it succeeded. For all the attention given the artificial market for sulfur dioxide allowances under the Clean Air Act, its annual market value in 2004 was approximately \$4 billion.²⁹ In contrast, sales of organic food in 2004 were approximately \$15.4 billion, up from \$12.9 billion in 2003.³⁰ Organic foods have for years constituted the fastest growing segment of the agricultural market.³¹ The OFPA marked a road that has been taken.

After recounting briefly in Part I the basic contours of organic agriculture and USDA’s development of the NOP, this Essay squarely addresses in Part II the continuing challenge to the NOP’s legitimacy. Specifically, this Essay responds to attacks—typically framed in the language of risk assessment—that organic agriculture cannot be squared with sound public policy or with what its attackers

26. Federal Insecticide, Fungicide, and Rodenticide Act Amendments of 1964, Pub. L. No. 88-305, 78 Stat. 190 (1964) (codified as amended at 7 U.S.C. §§ 136–136y (2000)); see also Hornstein, *supra* note 11, at 422–23, 426 (describing the influence Carson’s writings had on the congressional revision of FIFRA in 1964).

27. CARSON, *supra* note 25, at 297.

28. *Id.* at 278.

29. CHICAGO CLIMATE FUTURES EXCH., THE SULFUR DIOXIDE EMISSION ALLOWANCE TRADING PROGRAM: MARKET ARCHITECTURE, MARKET DYNAMICS AND PRICING 7 (2004), available at http://www.cfe.com/education_ccfe/SO2_Background_Drivers_Pricing_PDF.pdf (valuing registered trades in 2004 at \$4 billion and over-the-counter trades involving forward and option contracts at an additional \$1–2 billion).

30. William J. Friedman, *The Framework for Global Organic Food Trade Circa 2005: Accomplishments and Challenges*, 60 FOOD & DRUG L.J. 361, 365 (2005).

31. *Id.*

frequently describe as sound science. The central thesis of this Essay is that detractors of organic agriculture too often rest their claims to sound science with arbitrarily narrow framing devices that mask the full range of benefits that organic agriculture may offer. In that regard, the battles over organic agriculture are not unique. In January 2006, the White House Office of Management and Budget (OMB) sought to hardwire just such a limiting rubric across the entirety of the regulatory landscape by proposing, in the name of sound science, a national “risk assessment bulletin.”³² In December 2006, a panel of the National Academy of Sciences, after conducting an eleven-month peer review, took the unprecedented step of returning the proposal to OMB as “unscientific” and “unjustified.”³³ This Essay discusses how the artificially limited perspectives of the rejected OMB proposal reflect just the sort of arbitrary argumentation too often marshaled in defense of conventional agriculture and against organic foods.

I. ORGANIC AGRICULTURE AND THE NATIONAL ORGANIC PROGRAM

Organic agriculture can be understood on three levels, each one of which can be helpful to policy and legal analyses. At its broadest level, organic agriculture reflects a set of ethical positions—toward the environment, toward socioeconomic justice, and toward animal welfare—as well as a set of agricultural methods. The International Federation of Organic Agriculture Movements speaks of four overarching principles of organic agriculture—of health,³⁴ ecology,³⁵ fairness,³⁶ and care³⁷—and stresses their applicability “to agriculture in

32. OFFICE OF MGMT. & BUDGET, PROPOSED RISK ASSESSMENT BULLETIN (2006), available at http://www.whitehouse.gov/omb/inforeg/proposed_risk_assessment_bulletin_010906.pdf [hereinafter OMB BULLETIN].

33. COMM. TO REVIEW THE OMB RISK ASSESSMENT BULLETIN, NAT’L RESEARCH COUNCIL, NAT’L ACAD. OF SCIS., SCIENTIFIC REVIEW OF THE PROPOSED RISK ASSESSMENT BULLETIN FROM THE OFFICE OF MANAGEMENT AND BUDGET (2007), available at <http://www.nap.edu/catalog/11811.html> [hereinafter NAS REPORT].

34. Int’l Fed’n of Organic Agric. Movements, *The Principles of Organic Agriculture*, http://www.ifoam.org/about_ifoam/principles/index.html (last visited May 10, 2007) (“Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.”).

35. *Id.* (“Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.”).

36. *Id.* (“Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities[.]”).

the broadest sense, including the way people tend soils, water, plants and animals” and to the way people “relate to one another and shape the legacy of future generations.”³⁸ It is not hard to catch in such meta-principles the philosophical, as well as technical, aspects of the “other road” that Rachel Carson propounded. And, while still describing organic agriculture at this broadest level, it bears mention that organic agriculture also has social and organizational dimensionality; there are hundreds of regional and local organic industry trade groups, each often having slightly varying standards.³⁹ Moreover, at the international level, in addition to the standards set by the private International Federation of Organic Agriculture Movements, there are also standards for organic food products set by the Codex Alimentarius Commission, an entity operating under the United Nations Food and Agriculture Organization and the World Health Organization.⁴⁰ Thus, broadly speaking, organic agriculture has all the earmarks of a self-generating, self-policing private organization centered on core norms that might simultaneously deliver both private goods and public *beneficial* externalities.⁴¹

37. *Id.* (“Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.”).

38. *Id.*

39. See Friedman, *supra* note 30, at 362 (“A single database with copies of all of the known organic production and processing standards would be immense and not unlike having a set of all local zoning regulations or building codes. This is because the organic market is confronted with hundreds of private sector standards and governmental regulations . . .”).

40. On the organization of the Codex Alimentarius Commission, see Cindy Joffe Hyman, Comment, *Food for Thought: Defending the Organic Foods Production Act of 1990 Against Claims of Protectionism*, 14 EMORY INT’L L. REV. 1719, 1723 (2000). On the Codex’s specific organic standards, see Lawrence Speer, *Food Safety: International Food Organization Sets Out Guidelines for Organically Produced Foods*, INT’L TRADE DAILY (BNA), July 2, 1999, at D7. In general, the Codex offers the following definition of organic agriculture:

“Organic” is a labeling term that denotes products that have been produced in accordance with organic production standards and certified by a duly constituted certification body or authority. Organic agriculture is based on . . . avoiding the use of synthetic fertilizers and pesticides. . . . The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people.

Friedman, *supra* note 30, at 363 (quoting *Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods*, in JOINT FAO/WHO FOOD STANDARDS PROGRAMME, CODEX ALIMENTARIUS COMMISSION 9 (July 2005), available at http://www.codexalimentarius.net/download/standards/360/CXG_032e.pdf).

41. Of the potential value of groups motivated by social norms generally, see Richard H. McAdams, *The Origin, Development, and Regulation of Norms*, 96 MICH. L. REV. 338, 356 (1997) (explaining how private individuals might follow beneficial social norms from which they derive individual esteem). Of the social value, if not necessity, for further gains in

At a second, narrower level, organic agriculture can be understood as one of several “alternative” agricultural systems. All of these systems share the goal of reducing, if not eliminating, reliance on such chemical or artificial agricultural inputs as conventional pesticides and fertilizers. There are roughly four alternative methods most often suggested as substitutes. First, there are cultural methods of disease, weed, and pest control, such as crop rotations and staggered planting dates.⁴² Second, there are biological control methods, such as the release of “beneficial” predatory or parasitic insects that can attack pests.⁴³ Third, there are “biorational” pest control measures such as pheromone-baited traps.⁴⁴ And fourth—although not an option embraced by organic agriculturalists—there is “integrated pest management,” (IPM) a “decisionmaking system designed to use all ‘suitable’ pest control techniques, including chemical pesticides, to keep pest populations below economically injurious levels while satisfying environmental and production objectives.”⁴⁵ The National Academy of Sciences spoke of alternative agriculture generally when it concluded in 1989 that “[w]ider adoption of proven alternative systems would result in even greater economic benefits to farmers and environmental gains for the nation.”⁴⁶

Finally, there is the legal regime governing organic agriculture developed under the Organic Foods Production Act. In the late 1980s, against the backdrop of legislation in over twenty states regulating organic food labeling in different ways,⁴⁷ the organic food industry petitioned Congress for legislation that would create a set of national standards for organic products.⁴⁸ The OFPA, from the point of view of regulatory design and administrative law, was strikingly innovative. At the same time that alternatives to traditional

environmental protection of encouraging the self-referential value of nonlegal social institutions, see Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U. L. REV. 1227, 1231–32 (1995) (suggesting possibilities of gains from non-state-centered solutions).

42. Hornstein, *supra* note 11, at 401 (citing Brian P. Baker, *Pest Control in the Public Interest: Crop Protection in California*, 8 UCLA J. ENVTL. L. & POL’Y 31, 33 (1988)).

43. *Id.*

44. *Id.* at 401 n.174 (explaining that pheromone-baited traps emit chemical scents that draw pest insects into devices from which they cannot emerge).

45. *Id.* at 401.

46. ALTERNATIVE AGRICULTURE, *supra* note 16, at 6.

47. Friedland, *supra* note 23, at 382.

48. JEAN M. RAWSON, CONG. RESEARCH SERV., ORGANIC AGRICULTURE IN THE UNITED STATES: PROGRAM AND POLICY ISSUES 3 (2006).

command-and-control regulation such as risk-based decisionmaking and market-like incentives were drawing so much attention, the OFPA created a system that could tie public environmental and ethical values into existing, real markets; that informed the development of governmental organic standards with input from a National Organic Standards Board composed of nongovernmental representatives from different facets of the organic industry; and that centered regulatory compliance on a system of approved private-sector certification rather than a large federal bureaucracy.

The OFPA is a marketing-oriented statute designed to regularize what was at the time a potentially confusing Babel of competing standards with an official federal “organic” label.⁴⁹ Not only was a federal label thought useful in promoting consumer confidence in the growing organic industry within the United States,⁵⁰ but it was also viewed as helpful in facilitating trade in “a potentially lucrative international organic market.”⁵¹ For this reason, the OFPA’s primary administrative delegation to develop the National Organic Program was to the USDA’s Agricultural Marketing Service (AMS).⁵² But because the AMS had little direct experience with organic agriculture, its decisions were to be informed by recommendations from organic industry representatives serving on the National Organic Standards Board (NOSB).⁵³ Although USDA was slow even to propose establishment of the NOP,⁵⁴ by 2002 final rules had been implemented that allowed, among other things, qualifying products to use the official USDA “organic” label in conjunction with terms such as “100 percent organic” or “organic.”⁵⁵

49. *Id.* at 3 (“The industry maintained that federal standards would reduce consumer confusion over the many different state and private standards then in use, and would promote confidence in the integrity of organic products over the long term.”).

50. *Id.*

51. *Id.*

52. *Id.*; see also Friedman, *supra* note 30, at 366 (noting that implementation of the National Organic Program was located within the AMS “because it is considered a marketing program”).

53. See RAWSON, *supra* note 48, at 3–4 (“The [A]ct established a 15-member National Organic Standards Board (NOSB) to ‘assist in the development of standards for substances to be used in organic production . . . and to provide recommendations to the Secretary regarding implementation.’”).

54. AMS’s first proposed rule to establish the NOP was not issued until December 1997, some seven years after passage of the OFPA. See National Organic Program, 62 Fed. Reg. 65,850 (proposed Dec. 16, 1997).

55. See 7 C.F.R. § 205.100(a) (2007) (referring to regulatory requirements needed); National Organic Program, 65 Fed. Reg. 80,548, 80,550 (Dec. 21, 2000) (codified at 7 C.F.R. pt.

By two measures, the NOP has been successful. First, in its definition of organic farming, even a business-oriented institution like the AMS recognized that, broadly speaking, organic agriculture was more than simply the application of certain techniques. True to the movement's overarching principles, organic farming was defined under the OFPA as “[a] production system that is managed in accordance with [OFPA regulations] to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.”⁵⁶ But second, and as importantly, the national system of organic certification has contributed to the underlying growth of the organic food market, both domestically and internationally. The Congressional Research Service reported in 2006 (based on 2004 data) that over 11,000 certified organic crop, livestock, and handling operations were involved with over 2 million acres of certified organic cropland and pasture/rangeland in a domestic market that maintained an astonishing annual rate of growth of 20 percent beginning in 1990.⁵⁷ By one account, the domestic sale of organic foods might exceed \$23 billion by 2010, or 3.5 percent of total U.S. retail sales (up from \$10.4 billion in sales in 2003, accounting then for only 2 percent of total U.S. sales).⁵⁸ Internationally, as of 2005 organic food production is reported to occur in 110 countries, on over 558,000 farms cultivating over 64 million acres,⁵⁹ with global sales maintaining an annual expansion rate of 7–9 percent and having already exceeded a total of \$25 billion.⁶⁰ Following the United States' lead in 1990, both Europe and Japan similarly adopted national standards for organic products.⁶¹ To the extent the OFPA was

205). Generally, the term “organic” may be used for products containing at least 95 percent organic materials, whereas the term “100% organic” is reserved for products containing 100 percent organically produced materials. See Claire S. Carroll, Comment, *What Does Organic Mean Now? Chickens and Wild Fish Are Undermining the Organic Foods Production Act of 1990*, 14 SAN JOAQUIN AGRIC. L. REV. 117, 128–29 (2004).

56. 7 C.F.R. § 205.2 (2007). See RAWSON, *supra* note 48, at 1 (“This definition indicates that organic agriculture is both an approach to food production . . . and a broadly defined philosophical approach to farming that puts value on resource efficiency and ecological harmony.”).

57. RAWSON, *supra* note 48, at 1–2.

58. *Id.* (citing an estimate from a business journal).

59. Friedman, *supra* note 30, at 364–65.

60. *Id.* at 365.

61. See, e.g., *id.* at 361 (citing Council Regulation (EEC) No. 2092/91 of June 24, 1991 on Organic Production of Agricultural Products and Indications Referring Thereto on Agricultural

premised on the contribution national standards might make to market growth, the NOP has been successful.⁶²

But there have also been signs that USDA implementation of the NOP has misunderstood the full sweep of organic agriculture's principles. The clearest sign occurred in 1997 when the NOP was first proposed. Then, the USDA had included the use of genetically modified organisms⁶³ among its range of acceptable "organic" practices over the strong objection of the NOSB.⁶⁴ The USDA's reasons for doing so were defensive rather than descriptive. The agency pointed to no evidence that organic farmers actually used genetically modified organisms, or that such use would be consistent with the broader principles of organic agriculture, or even that an independent scientific inquiry had led the agency to believe that

Products and Foodstuffs, 1991 O.J. (L 198), 22.7, 1 (on European standards) and Japanese Agric. Standards of Organic Agric. Prods., Ministry of Agric., Forestry and Fisheries Notification No. 59 of 2000, available at <http://www.maff.go.jp> [in Japanese] (last visited May 10, 2007) (on Japanese standards)).

62. Certainly, however, there is still work to be done, especially as to the coordination of different international standards. In 2002, Japan became the first—and so far, the only—country to accept USDA certification for importation of organic goods. See U.S. Dep't Agric., *Japan Accepts U.S. Organic Standards for Some Food Exports* (Mar. 27, 2002), <http://usinfo.org/wf-archive/2002/020328/epf409.htm> (last visited May 10, 2007); U.S. DEP'T AGRIC., *USDA MARKET PROFILE FOR ORGANIC FOOD PRODUCTS 10 (2005)*, available at <http://www.fas.usda.gov/agx/organics/USMarketProfileOrganicFoodFeb2005.pdf>.

63. See Zeichner, *supra* note 20, at 474. Also included in the proposed rule was the use of sewage sludge and irradiation. *Id.* As a note on terminology, the phrase "genetically modified organism" (GMO) is sometimes criticized as overbroad, as it could include any agricultural practice (such as traditional cross breeding) that seeks to give a plant or animal a new combination of heritable traits, as opposed to the more precise objection to doing so via the transfer of altered DNA or via the transfer of one species' DNA into the cells of another species. See Friedland, *supra* note 23, at 387. Such critics prefer terms such as "biotechnology" or "bioengineering" to capture the distinction. *Id.* In the regulatory history of the NOP, however (not to mention the broader social debates surrounding these techniques), the terms "genetically modified organism," "genetic modification," or "GMOs" are used so frequently to capture the meaning of biotechnology that my use of those phrases throughout this Essay is unlikely to cause any confusion—and has the historical virtue of using the same terms as were used by participants in the development of the NOP. Moreover, the NOSB, in its biotechnology policy, preserves much of this distinction when it states, "[g]enetically engineered is defined as: Made with techniques that alter the molecular or cell biology of an organism by means that are not possible under natural conditions or processes... and shall not include breeding, conjugation, fermentation, hybridization, in-vitro fertilization, and tissue culture." Nat'l Organic Standards Bd., *Biotechnology Policy—1996*, <http://www.ams.usda.gov/nosb/archives/biotech/policy.html>.

64. Regarding the incompatibility of genetically modified organisms and organic agriculture, the National Organic Standards Board had recommended in 1996 "that the class of genetically engineered organisms and their derivatives be prohibited in organic production and handling systems." Nat'l Organic Standards Bd., *supra* note 63.

genetically modified products were either beneficial or free of dangers. Rather the agency principally explained that, because the United States was otherwise the leading advocate for genetically modified agricultural products, it was concerned that excluding the use of genetic engineering from the NOP would cause its foreign trading partners to believe that the federal government was concerned with the safety of food grown with some use of genetic engineering.⁶⁵ The public response to the proposed rule is legendary. By one account, public opposition was so enormous—“it was one of the largest [public responses] in the history of the federal government”⁶⁶—that USDA was twice required to extend the comment period to accommodate the sheer number of critical written submissions.⁶⁷ By another, more than 275,000 comments, almost all opposing USDA’s proposed rule, were received.⁶⁸ In the end, USDA retracted the proposal and the final NOP prohibited the use of genetic engineering as an approved practice.⁶⁹ In doing so, the agency stated that the OFPA was primarily a marketing statute and that as the public overwhelmingly views “organic” foods not to have been grown with genetic modification techniques, excluding them was necessary to preserve the meaningfulness of the USDA’s “organic” label.⁷⁰

As a matter of statutory interpretation, the USDA’s final position was unquestionably consistent with the OFPA. But within USDA’s explanation lie shades of a less defensible conclusion: that organic agriculture, including the non-utilization of genetically modified processes, gains its legitimacy only within the realm of public perception and could not survive the scrutiny of full-fledged scientific inquiry. The American Crop Protection Association, an organization that supports the use of genetic modification in farming, came close to stating this explicitly: “The [ACPA] can accept the exclusion of modern biotechnology from organic production as an ‘excluded method’ only with the clear understanding that the organic

65. Zeichner, *supra* note 20, at 474–76.

66. Carroll, *supra* note 55, at 127.

67. *Id.*

68. See Zeichner, *supra* note 20, at 475.

69. National Organic Program, 65 Fed. Reg. 80,548 (Dec. 21, 2000) (codified at 7 C.F.R. pt. 205).

70. See, e.g., *id.* at 80,549 (“A variety of methods [is] used to genetically modify organisms or influence their growth and development by means that are not possible under natural conditions or processes and are not considered compatible with organic production.”).

designation is in no way an indication of safety or quality but is rather a marketing standard.”⁷¹ In the remainder of this Essay, I address this inference.

II. FRAMING THE SCIENTIFIC INQUIRY OVER CONVENTIONAL AND ORGANIC AGRICULTURE

Criticism of nonconventional agriculture is often quite blunt. In 1978, at congressional hearings on pesticide reform legislation, one proponent of conventional agriculture framed the debate in the starkest of terms: “[Without pesticides, o]ur concern will not be that of a silent spring, but a silent summer, silent autumn, silent winter and a silent world. Silence will be broken only by those crying for food. The name of that game is famine!”⁷² Twenty-five years later, shortly after USDA adopted the National Organic Program, the science correspondent for *Reason* magazine addressed the merits of organic agriculture in similarly bleak terms: “[t]he greatest catastrophe that the human race could face this century is not global warming but a global conversion to ‘organic farming’—an estimated 2 billion people would perish.”⁷³

Yet what is interesting in the debate between conventional and nonconventional agriculture is how often one can see the influence of framing devices—rather than comprehensive risk-cost-benefit analyses—on the conclusions reached. To be sure, it is hardly clear that a full comparative analysis is desirable or even possible. In part, this is because such an analysis would implicate philosophical and political aspects of agriculture for which there are not agreed-upon goals or metrics such as the optimal socioeconomic structure of farming communities and the extent to which animal welfare should matter. Moreover, a full analysis even about such measurable outputs as long-term crop yield, effects on farm soils, energy use, and

71. See American Crop Protection Association comment on Docket No. TMD-00-02-PR2, RIN 0581-AA40, National Organic Program, 62 Fed. Reg. 65,890 (Dec. 16, 1997).

72. *Federal Insecticide, Fungicide, and Rodenticide Act: Hearings Before the H. Comm. on Agric.*, 94th Cong. 134 (1977) (statement of Arthur Bassett, Secretary, Onondaga County [New York] Pest Control Association); see also *Federal Insecticide, Fungicide, and Rodenticide Act Extension: Hearing on H.R. 8841 Before the H. Comm. on Agric.*, 94th Cong. 129 (1976) (remarks of Rep. Poage) (“Now if we are to go back to the ecology [without pesticides] as it existed when Columbus discovered this country, then everyone [sic] of us is going to starve in 3 weeks.”).

73. Ronald Bailey, *Organic Alchemy*, REASONONLINE, June 5, 2002, <http://www.reason.com/news/show/34820.html> (quoting Cambridge University chemist John Emsley).

environmental externalities would be difficult in light of data that are incomplete, uncertain, and contested.

But in this part of the Essay nothing as heroic as a full policy analysis of agricultural systems is necessary. Rather, to rebut the strident claims typically made against organic agriculture only two points need be made. First, claims against organic agriculture have in the past often relied on artificially constructed risk assessments that frame conventional agriculture in a manner that may not be justified on the merits. And second, once one begins to adjust the relevant frames of inquiry, organic agriculture can make a sufficient showing on the merits—akin to fulfilling a burden of coming forward—to warrant support as a policy matter and not simply as a marketing regime.

A. *Framing Risk Assessments of Synthetic Pesticides*

As a starting point, pesticides—and modern conventional agriculture generally—certainly deserve credit for improving agricultural output. Estimates of increased productivity indicate a 400 percent rate of return in the aggregate on the pesticide dollar.⁷⁴ Yet each particular type of pesticide carries within its application a form of self-limitation: the tendency of the pesticide to induce genetic resistance in future populations of the target pest and the destruction of beneficial organisms that had previously kept target populations in check.⁷⁵ Thus, shortly before the OFPA was passed in the late 1980s the country lost roughly the same percentage of its crops to pests as it did in 1900, despite the application in 1987 of some 430 million pounds of pesticides.⁷⁶ Although this does not mean that pesticides in the aggregate are not beneficial—as new pesticides are developed to counteract resistant pests—it also does not necessarily mean that pesticides are necessary. At the time of the OFPA's passage, there

74. See David Pimentel et al., *Benefits and Costs of Pesticide Use in U.S. Food Production*, 28 BIOSCI. 772, 781 (1978), cited in Hornstein, *supra* note 11, at 393.

75. Between 1938 and 1984, the number of pesticide-resistant insects and mites grew from seven species to four hundred and forty seven “and included most of the world's pests.” Sandra Postel, *Controlling Toxic Chemicals*, in STATE OF THE WORLD 1988, at 22 (Linda Stark ed., 1988) (citing George P. Georghiou, *The Magnitude of the Resistance Problem*, in NAT'L RESEARCH COUNCIL, PESTICIDE RESISTANCE: STRATEGIES AND TACTICS FOR MANAGEMENT (1986)). By 1999, almost 1,000 agricultural pests were immune to common pesticides. See LESTER R. BROWN ET AL., VITAL SIGNS 1999, at 124 (1999).

76. Postel, *supra* note 75, at 122 (“Insects and weeds now reduce crop production by about 30 percent, apparently no less than before the chemical age dawned.”).

were data showing that pesticide use could be cut in half on some crops without significant reductions in yields or significant increases in price.⁷⁷ Thus, in determining whether organic agriculture has something to offer as a public policy matter, one must credit conventional agricultural pesticides with benefits but perhaps not the extreme benefits often claimed by their most ardent defenders.

This, then, puts the focus on pesticides' risks and highlights the role that framing can have on our appreciation of these risks. Many of the debates over agriculture focus on the extent to which there are health risks to consumers from pesticide residues.⁷⁸ And, although I discuss the effects of framing on this debate, it bears emphasis that the focus on health effects itself is not necessarily the dominant frame of reference by which the risks of pesticides (or the corresponding benefits or organic agriculture) ought to be resolved. Not only are many purchasers of organic products concerned about the adverse effects on the environment of conventional agriculture (as opposed to health effects),⁷⁹ but the severe environmental effects of agriculture in general are increasingly drawing the attention of commenters.⁸⁰

77. See JENNIFER CURTIS ET AL., *HARVEST OF HOPE: THE POTENTIAL FOR ALTERNATIVE AGRICULTURE TO REDUCE PESTICIDE USE* 4 (1991) ("A new study by Cornell University Entomologist, David Pimentel, estimates that if 50 percent of pesticides now used in American agriculture were replaced by nonchemical control techniques, crop yields would not decline and food prices would rise less than one percent.") (citing David Pimentel et al., *Environmental and Economic Impacts of Reducing U.S. Agricultural Pesticide Use*, in *HANDBOOK OF PEST MANAGEMENT IN AGRICULTURE* (1991)); see also *ALTERNATIVE AGRICULTURE*, *supra* note 16, at 209–12 (the use of integrated pest management for insects on nine crops in ten states shows better yield for IPM users over nonusers).

78. See Barbara J. Goldman & Kathryn L. Clancy, *A Survey of Organic Produce Purchasers and Related Attitudes of Food Cooperative Shoppers*, 6 *AM. J. ALTERNATIVE AGRIC.* 89, 95 (1991) (measuring a high level of concern over pesticide residues on produce among those who seek out and purchase organic products), *cited in* Friedland, *supra* note 23, at 410 n.154; see also Dennis T. Avery & Alex A. Avery, 'Negative Campaigning' for the New U.S. Organic Food Standards, Hudson Institute, Center for Global Food Issues, Oct. 2002, http://www.cgfi.org/materials/articles/2002/oct_18_02.htm (rebutting health claims made by advocates for organic food in part by noting that allowable pesticide residue amounts "are 1/100th or 1/1000th of the 'no-effect' level in animal tests"); Richard A. Halpern, Dirty Pool, Hudson Institute, Center for Global Food Issues, Feb. 2000, http://www.cgfi.org/materials/articles/2000/feb_23_00.htm ("Monsanto's Roundup, for example, probably the most widely used herbicide in history, is half as toxic as table salt or Vitamin A and hundreds of times less toxic than caffeine.").

79. See Friedland, *supra* note 23, at 407–08 ("Many consumers are motivated to buy organic food at least in part because they think organic farming is less harmful to the environment than conventional farming.").

80. See, e.g., Holly Doremus, *Agriculture and the Environment: Introduction to the Conference Issue*, 25 *ENVIRONS ENVTL. L. & POL'Y J.* 47, 49 (2002) ("Disputes involving

Although organic agriculture can contribute to some environmental problems, its reduction in synthetic pesticide use can constitute an enormous public benefit.⁸¹ J.B. Ruhl documents the “undeniable” adverse environmental effects of pesticides⁸² on surface waters,⁸³ ground water,⁸⁴ endangered species,⁸⁵ and air pollution.⁸⁶ Even in 1990, when the OFPA was enacted as a “marketing” program, EPA’s Science Advisory Board was elsewhere concluding that, “when compared with dozens of other risks, pesticides presented one of the country’s more widespread and severe environmental problems.”⁸⁷

Assuming the premise, however, that the risks of pesticides are to be measured principally by the health effects of pesticide residues on consumers, the conclusions reached can reflect the risk assessor’s frame of reference and not necessarily the underlying reality. This was perhaps best illustrated in the years following passage of the OFPA when evidence began to mount that pesticides may be more dangerous to infants and children than previously thought. In 1993, the National Academy of Sciences published the results of a five-year inquiry, *Pesticides in the Diets of Infants and Children*.⁸⁸ Among its major findings were that risk assessments of pesticides were typically based only on the “average exposure of the entire population,”⁸⁹ and

agriculture and the environment have been frequent and varied over the last several years.”); J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 *ECOLOGY L.Q.* 263, 269–70 (2000) (“But the reality is that farming, particularly in the modern American style, is an intensive land use involving a multitude of polluting and land transforming activities.”).

81. The NOP does allow certain nonsynthetic “natural” pesticides to be included on a “National List” of approved substances that can be used in organic food production (and in some instances even such non-organic substances as pectin and cornstarch). See RAWSON, *supra* note 48, at 3–4, 11.

82. Ruhl, *supra* note 80, at 282 (“Although pesticides have undoubtedly improved agricultural efficiency . . . their adverse environmental impacts are also undeniable.”).

83. *Id.* at 276–77, 283.

84. *Id.* at 283 n.107 (“In 1992, the EPA reported that 132 pesticide-related compounds, 117 parent pesticides, and 16 pesticide degradates had been found in ground water in 42 states.”).

85. *Id.* at 277 & n.51; see also Hornstein, *supra* note 11, at 395 n.142 (“[A]dverse effects on wildlife have forced North Dakota to prohibit applications of 37 different kinds of pesticides under its endangered species program.”).

86. Ruhl, *supra* note 80, at 292 (“In California, two weeks of ambient air monitoring near sugar beet and potato fields for the carcinogen fumigant Telone II measured ambient air levels that exceeded the safe level for chronic inhalation exposures . . .”).

87. See Hornstein, *supra* note 11, at 394 & n.130.

88. COMM. ON PESTICIDES IN THE DIETS OF INFANTS AND CHILDREN, NAT’L RESEARCH COUNCIL, *PESTICIDES IN THE DIETS OF INFANTS AND CHILDREN* (1993) [hereinafter *INFANTS AND CHILDREN*].

89. *Id.* at 2.

failed to recognize that infants and children had different (typically far higher) exposure levels and, as importantly, that pesticides can cause different (and sometimes more adverse) health effects in the developing body than they do in adults.⁹⁰ Armed with these new insights, Congress passed the Food Quality Protection Act of 1996 (Food Protection Act)⁹¹ designed to establish administrative mechanisms that reevaluated the safety of pesticides specifically in light of the National Academy's report.⁹²

To appreciate the battles over risk assessments that followed the Food Protection Act, it is helpful to understand the basic mechanisms by which EPA, prior to the Act, would determine the safety of pesticide residues on food. Under the Federal Food, Drug, and Cosmetic Act (FFDCA),⁹³ EPA would establish "tolerances" for residues on raw agriculture commodities such as fresh produce under FFDCA section 408.⁹⁴ Generally, these tolerances reflected a level of pesticide residue on food that EPA first determined to be "reasonably safe for an adult" often based on animal testing results and then, second, a discounting of this level by a factor of 100—a ten-fold reduction to account for the uncertainties in scaling from animal tests to effects on humans and another ten-fold reduction to account for normal human variations in susceptibility to toxins.⁹⁵ Prior to the Food Protection Act, however, EPA set tolerances "without regard to the special susceptibilities of children to pesticides."⁹⁶ Yet in its 1993 Report, the National Academy of Sciences found that in their potential susceptibility to pesticides, "[p]rofound differences exist between children and adults" such that "the toxicity of pesticides is frequently different" between them.⁹⁷ The Report suggested that, given the lack of basic data on "the effects of pesticide exposure on

90. *Id.* at 4–6 (exposure), 3 (age-related differences in children's absorption, metabolism, detoxification, and excretion abilities as compared to adults).

91. Food Quality Protection Act of 1996, Pub. L. No. 104-170, 110 Stat. 1489 (1996) (codified as amended in scattered sections of 7 U.S.C. and 21 U.S.C.).

92. See H.R. REP. NO. 104-669(II), at 43 (1990), *reprinted in* 1996 U.S.C.C.A.N. 1268, 1282 (House Commerce Committee's Report on the Food Protection Act, citing the 1993 National Academy report).

93. 21 U.S.C. §§ 301–393 (2000).

94. See 21 U.S.C. §§ 342, 346a(a)(1)(A) (2000).

95. See Valerie Watnick, *Risk Assessment: Obfuscation of Policy Decisions in Pesticide Regulation and the EPA's Dismantling of the Food Quality Protection Act's Safeguards for Children*, 31 ARIZ. ST. L.J. 1315, 1318–19 (1999).

96. *Id.* at 1318.

97. INFANTS AND CHILDREN, *supra* note 88, at 3.

neurotoxic, immunotoxic, [and] endocrine responses in infants and children,”⁹⁸ and that when toxicity testing in relation to children reveals certain fetal development effects or testing in relation to post-fetal development is “incomplete,” an additional ten-fold reduction in pesticide tolerances should be used.⁹⁹

The Food Protection Act codified many of the National Academy’s recommendations. In particular, it required EPA to set tolerances that considered the special susceptibility of infants and children to pesticides; that considered the higher levels of consumption by children of fruits, vegetables and other products; that accounted for the “cumulative” effects of exposures to other chemicals (pesticides or not) that shared a common mechanism of toxicity with the suspect pesticide; and that considered the “aggregate” amount of the pesticide to which an individual might also be exposed (such as amounts of the same pesticide that might be found in tapwater or that might be found in household and garden products).¹⁰⁰ The Act specifically directed EPA to apply an additional “tenfold margin of safety” to account for the special susceptibility of infants and children, allowing the use of a different margin of safety “only if, on the basis of reliable data, such margin will be safe for infants and children.”¹⁰¹ At bottom, EPA was to readjust its approach to pesticides and to issue tolerances for new pesticides, as well as to reanalyze tolerances for all existing pesticides, such that “there is a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information.”¹⁰² To help with the enormous scientific task with which EPA had been charged—reassessing over 9,000 then-existing tolerances—the Act allowed EPA to approach the problem in stages: to reassess one-third of these tolerances by August 1999, the next third by August 2002, and the final third by August 2006.¹⁰³

98. *Id.* at 4.

99. *Id.* at 9.

100. *See, e.g.*, 21 U.S.C. § 346a(b)(2)(C), (D) (2000). *See generally* Thomas O. McGarity, *Politics by Other Means: Law, Science, and Policy in EPA’s Implementation of the Food Quality Protection Act*, 53 ADMIN. L. REV. 103, 118–19 (2001) (elaborating on the statutory requirements).

101. 21 U.S.C. § 346a(b)(2)(C) (2000); *see also* McGarity, *supra* note 100, at 118.

102. 21 U.S.C. § 346a(b)(2)(A)(ii) (2000).

103. *See* CONSUMERS UNION OF THE U.S., A REPORT CARD FOR THE EPA: SUCCESSES AND FAILURES IN IMPLEMENTING THE FOOD QUALITY PROTECTION ACT, Overview, at 2

It is precisely from these new, science-based reference points required by the Food Protection Act that one can begin to appreciate why organic agriculture may offer health-based, and not simply “market-based,” benefits. Several years after the Act’s passage, and after EPA had completed its reassessment of the first third of tolerances, both the U.S. General Accounting Office¹⁰⁴ and the Consumers Union of the United States¹⁰⁵ reported on EPA’s new-found conclusions regarding pesticide safety. Both reports noted that EPA had targeted especially the classes of organophosphate and carbamate insecticides because they were widely used on fruits and vegetables consumed by children¹⁰⁶ and because they operated as neurotoxins to which infants and children with developing nervous systems might be especially vulnerable.¹⁰⁷ Of 44 organophosphates registered for use in the United States, EPA tightened the chronic exposure limit in 20 cases, or 45 percent.¹⁰⁸ For most of these pesticides, moreover, it was expected that further data on aggregate and cumulative exposure might cause even further tolerance reductions.¹⁰⁹ After considering in June 2000 just such additional data on chlorpyrifos, the most widely used household insecticide in the United States, EPA announced “a need to substantially reduce

(2001), available at http://www.consumersunion.org/pdf/fqpa/ReportCard_final.pdf [hereinafter CONSUMERS UNION REPORT].

104. U.S. GEN. ACCOUNTING OFFICE, CHILDREN AND PESTICIDES: NEW APPROACH TO CONSIDERING RISK IS PARTLY IN PLACE (2000), available at <http://www.gao.gov/archive/2000/he00175.pdf> [hereinafter GAO REPORT].

105. See CONSUMERS UNION REPORT, *supra* note 103.

106. See, e.g., *id.*, pt. 2, at 2 (“Early in its FQPA implementation planning, EPA determined that the organophosphate (OP) and carbamate insecticides (two families of acutely neurotoxic chemicals, many of which are widely used on fruits and vegetables popular in children’s diets) should be top priorities.”); GAO REPORT, *supra* note 104, at 8 (“EPA has identified the organophosphates as a class of pesticides requiring cumulative assessment because they can impair nervous system function by inhibiting the enzyme cholinesterase.”).

107. See GAO REPORT, *supra* note 104, at 8; CONSUMERS UNION REPORT, *supra* note 103, pt. 3, at 1.

108. See CONSUMERS UNION REPORT, *supra* note 103, pt. 2, at 4–5. EPA’s conclusions as to these pesticides’ risks were interim in nature because cumulative data on exposure to this chemical class were not considered in this first wave, and they were expected to become even more unforgiving when cumulative data became available. See GAO REPORT, *supra* note 104, at 4 (“EPA has not completed aggregate exposure reviews for all 39 organophosphates individually, but when it does, a cumulative assessment will be required for the group, which may identify the need for additional changes.”).

109. See CONSUMERS UNION REPORT, *supra* note 103, pt. 2, at 4.

children's exposure to this pesticide by reducing its use on foods frequently eaten by children"¹¹⁰

The contrast between this reassessment of pesticide safety, on the one hand, and implementation of the Organic Food Production Act, on the other, is striking. Just as reports on EPA's first wave of reanalyses of pesticide tolerances were being reported, the USDA was announcing and implementing the "organic" label provisions of the National Organic Act.¹¹¹ Whatever would emerge as the final picture of pesticides' dangers to children and infants, there are data indicating that eating organic foods reduces those risks. In 2001, in a study reported in *Environmental Health Perspectives* (the journal of the National Institute of Environmental Health Science), a survey of pesticide exposure among 110 urban and suburban children in the Seattle area found what was then considered a surprising result—measurable levels of organophosphate pesticide metabolites were found in the urine of all children, "except for one child, whose parents reported buying exclusively organic produce."¹¹² To confirm the implications of this result, a more comprehensive study among young children in the Seattle area was conducted, complete with a carefully designed control group, which reached similar results: "eating organic produce can markedly lower children's exposures (to organophosphates) from possibly above the EPA's current safety

110. GAO REPORT, *supra* note 104, at 4. To be sure, EPA did not tighten the limits for most of the tolerances considered in this first wave of reassessment. EPA eliminated or cancelled nearly half of the 3,471 tolerances "counted as reassessed" in the first wave without even considering the new children-centered risk assessments in the Food Protection Act. *Id.* at 19. Some of these voluntary cancellations reflected manufacturers simply agreeing to eliminate tolerances for products that had been withdrawn from various uses in the past. *Id.* In other cases, manufacturers claimed that they were agreeing to withdrawal of tolerances due to "market conditions." *Id.* As to this latter group, however, the GAO reported that "[a]n EPA official told us that in a number of these cases, risk concerns that the agency expressed about the associated pesticide contributed to the manufacturer's decision to drop the tolerance." *Id.* As to those pesticides that did consider the new regulatory requirements of the Food Protection Act, most of those tolerances, 77.5 percent, resulted in no change. *Id.* However, as I note *infra* in the text accompanying notes 115–25, some of these decisions generated considerable controversy.

111. See National Organic Program, 65 Fed. Reg. 80,548 (Dec. 21, 2000) (codified at 7 C.F.R. pt. 205).

112. ORGANIC CTR., SUCCESSES AND LOST OPPORTUNITIES TO REDUCE CHILDREN'S EXPOSURE TO PESTICIDES SINCE THE MID-1990S, at 6 (2006) [hereinafter ORGANIC CTR.] (referencing Chensheng Lu et al., *Biological Monitoring Survey of Organophosphate Pesticide Exposure among Preschool Children in the Seattle Metropolitan Area*, 109 ENVTL. HEALTH PERSPECT. 299–303 (2001)).

guidelines, to negligible risk levels.”¹¹³ Even more recently, a third study, and the first to introduce longitudinal analysis, found that children switching from conventional to organic diets saw two organophosphate pesticide concentrations drop to nondetectable levels until the reintroduction of a diet using food grown conventionally.¹¹⁴ Although the quantifiable health benefits of eating organic produce would depend on many factors, including any negative factors stemming from the higher price of organic food, for the purposes of this analysis a final accounting need not be made. All that is necessary is that health benefits are not improbable. And further insights from EPA’s implementation of the Food Protection Act only contribute to that conclusion.

B. Organic Agriculture as Insurance Against Politicized Agency Decisions

It is possible that EPA’s reassessment of pesticide risks, despite the Agency’s early warnings on organophosphates, was actually even more generous toward pesticides than was—and may still be—justified by the available science. One reason for this may be the political pressure exerted on EPA. To the extent this is true, then purchasers of organic food are in fact making a second type of purchase. The premium they pay in price also includes a type of insurance payment made against the prospect that food grown conventionally contains risks that, for political reasons, escape EPA action.

Evidence of political pressure on EPA became evident as EPA went about implementing the Food Protection Act. The scientific flashpoint involved Congress’s specific concern, drawn from the National Academy report on infants and children, that pesticides could present special neurological and developmental risks to growing fetuses and children.¹¹⁵ The legal flashpoint was caught in Congress’s decision to require EPA to apply an extra ten-fold margin of safety to a pesticide’s tolerance (the *10-X* factor) unless “on the

113. *Id.* at 6 (referencing Cynthia L. Curl et al., *Organophosphorous Pesticide Exposure of Urban and Suburban Preschool Children with Organic and Conventional Diets*, 111 ENVTL. HEALTH PERSPECT. 377 (2003)).

114. See Chensheng Lu et al., *Organic Diets Significantly Lower Children’s Dietary Exposure to Organophosphorous Pesticides*, 114 ENVTL. HEALTH PERSPECT. 260, 260–63 (2006).

115. See *supra* text accompanying note 101.

basis of reliable data” a different margin of safety would lead, after consideration of “all anticipated dietary exposures and all other exposures for which there is reliable information,” to the conclusion of “reasonable certainty that no harm will result from aggregate exposure.”¹¹⁶ And the regulatory flashpoints were EPA’s decisions on the types of neurological/developmental data to require and on the type of data gap that would justify a departure from the default *10-X* factor.

In 1998, as the Agency was developing policies on reassessing the first third of tolerances, a political firefight erupted over application of the *10-X* factor. A memorandum from EPA Administrator Carol Browner on February 25 suggested one of the Agency’s judgments on how to proceed: “[w]here there is uncertainty about the need for additional studies to address child-specific concerns, then that uncertainty itself should mandate application of an additional safety factor.”¹¹⁷ Almost immediately, a representative of the American Crop Protection Association (ACPA) complained publicly that Browner’s position represented “political mischief”¹¹⁸ that abandoned “sound science”¹¹⁹ and that “could result in the loss of 90 percent of organophosphate uses allowed on food.”¹²⁰ Within the ensuing weeks, then-Vice President Al Gore issued a directive to EPA to “follow congressional intent in applying extra protection for children,” but to apply “sound science,” and to create an administrative process that would allow “interested parties” to provide feedback on agency implementation.¹²¹ Thereafter, a lobbying effort to “bring reason” to EPA’s implementation of the Food Protection Act was announced by the ACPA that sought to generate five million “postcards or letters sent to the president, members of Congress, and senior [EPA] officials.”¹²² Spokesmen for the ACPA and for a large pesticide registrant emphasized, respectively, that “science should drive public

116. See *supra* text accompanying note 102.

117. Bert McMeen, *Pesticides: Agency Stance on Children’s Protections under FQPA Criticized by Industry Official*, DAILY ENVT. REP. (BNA), Mar. 4, 1998.

118. *Id.*

119. *Id.*

120. *Id.*

121. See Bert McMeen, *Pesticides: Advisory Group Planned on FQPA in Response to Directive from Gore*, DAILY ENVT. REP. (BNA), Apr. 13, 1998.

122. See *APCA Launches Letter-Writing Campaign Urging Rational Implementation of FQPA*, DAILY ENVT. REP. (BNA), Apr. 24, 1998.

policy,”¹²³ and that missteps by EPA could result in “decreased food quality and increased numbers of insect parts in food [and] rises in insect-borne diseases, such as encephalitis and lyme disease.”¹²⁴ By the end of April 1998, a staff member of a House Agriculture Subcommittee was quoted as saying that hearings would soon be scheduled “that could lead to legislative changes if EPA does not change direction in the way it is implementing the law”; the staff member specifically emphasized the Subcommittee’s concern “that EPA is planning to use default assumptions in reassessments of organophosphates and a related insecticide class, carbamates, under [the Food Protection Act].”¹²⁵

Although EPA in some ways resisted the political pressure under which it was operating, in other ways the health-protective promises of the Food Protection Act never escaped the gravitational forces brought to bear by the pesticide industry and its political allies. In 1999, on the eve of EPA’s deadline covering the first third of tolerance reassessments, EPA announced a ban on 36 uses of methyl parathion, a major organophosphate pesticide, including its use on peaches, apples, pears, and grapes that were of special importance in the diets of infants and children.¹²⁶ And, as mentioned above, EPA tightened tolerances on almost two dozen other organophosphates, including especially chlorpyrifos, shortly thereafter.¹²⁷ But in these early decisions it was also evident that EPA was most likely to act only when it had specific affirmative data suggesting an increased risk to children—that is, “good science” showing that children faced a danger—rather than to apply the precautionary *10-X* factor whenever

123. Bert McMeen, *Environmental Groups Say Panel Could Stall Law's Implementation*, 22 CHEM. REG. REP. (BNA) 147 (Apr. 17, 1998) (quoting Christopher Klose, a spokesman for the American Crop Protection Association, regarding “concerns of growers, pesticide applicators and producers, and others that science should drive public policy”).

124. See Bert McMeen, *Pesticides: Results of “Rigid” EPA Policies Under FQPA Could Be Devastating, Industry Official Says*, DAILY ENVT. REP. (BNA), Apr. 24, 1998 (quoting Elin Miller, global director for government and public affairs at Dow Agrosiences, Inc.).

125. See Bert McMeen, *Pesticides: EPA's Implementation of FQPA Could Result in Changes to 1996 Law, House Staffer Says*, DAILY ENVT. REP. (BNA), Apr. 28, 1998 (claiming also that “[l]awmakers on three congressional committees, including the House and Senate agriculture committees, have warned EPA to use reliable data on exposure rather than default assumptions, and to use ‘sound science’ and consult with interested parties, before making decisions on allowable uses of pesticides”).

126. See CONSUMERS UNION REPORT, *supra* note 103, pt. 3, at 4.

127. See *supra* text accompanying notes 104–10. The Consumers Union, however, noted that EPA could have been much more aggressive in making even further restrictions on chlorpyrifos. See CONSUMERS UNION REPORT, *supra* note 103, pt. 3, at 6.

the evidence was incomplete. In its report to Congress in 2000, the GAO found that EPA was most likely to use a *10-X* safety factor when it “identified both toxicology data gaps *and* evidence of increased susceptibility in children.”¹²⁸ When the scientific record was incomplete, but the incomplete data did not contain any affirmative evidence of harm, a safety factor “less than” *10-X* was recommended, often a three-fold factor (*3-X*).¹²⁹ Apart from the (in)consistency of this practice with the *10-X* provisions of the Food Protection Act itself, it is hardly clear that the practice represented “good science.” In 2002, a majority of EPA’s Scientific Advisory Panel (SAP) who addressed the *10-X* issue “disagreed” with the Agency’s “selective application of a 3X safety factor” and concluded that the “available data was not sufficient to assure adequate protection with less than the 10X FQPA safety factor.”¹³⁰

But the long-term problem with the Agency’s decision not to apply the *10-X* margin of safety strictly was that it removed an underlying incentive for pesticide manufacturers to develop the full set of test data that might prove that lower tolerances were justified—the very sort of empirically grounded “good science” ostensibly being demanded. Even worse, in the absence of a *10-X* factor, the industry and its political allies actually had more maneuvering room from which they could *resist* calls to produce that data. The prospect of just such a possibility unfolded over developmental neurotoxicity tests (DNTs). DNTs can shed light especially on those pesticides (such as many organophosphates) that are designed to inhibit cholinesterase, an enzyme “needed for the proper functioning of the nervous systems of both humans and animals,” which presented special risks to younger animals whose developing bodies were often less able to detoxify them.¹³¹ In 2005, EPA’s Office of Research and Development (ORD), which is described by the Agency as its office with special

128. GAO REPORT, *supra* note 104, at 12 (emphasis added).

129. *See id.* at 12–13.

130. Kristina Thayer & Jane Houlihan, *Pesticides, Human Health, and the Food Quality Protection Act*, 28 WM. & MARY ENVTL. L. & POL’Y REV. 257, 295–96 (2004) (citing FIFRA SCI. ADVISORY PANEL, ENVTL. PROT. AGENCY, TRANSMITTAL OF MEETING MINUTES OF THE FIFRA SCIENTIFIC ADVISORY PANEL MEETING HELD JUNE 26–27, 2002, at 10 (2002)). Some SAP members did accept EPA’s use of the *3-X* factor, albeit “with certain reservations.” *Id.* at 296.

131. OFFICE OF INSPECTOR GEN., ENVTL. PROT. AGENCY, EVALUATION REPORT: OPPORTUNITIES TO IMPROVE DATA QUALITY AND CHILDREN’S HEALTH THROUGH THE FOOD QUALITY PROTECTION ACT 8–9 (2006) [hereinafter INSPECTOR GENERAL REPORT I].

responsibility for “sound science,”¹³² “strongly recommended” that EPA “*require* a developmental neurotoxicity study for pesticide registration.”¹³³ But in January 2006, EPA’s Office of Inspector General reported that “[i]ndustry representatives have said that developmental neurotoxicity study results are difficult to interpret and expensive to conduct.”¹³⁴ Although the Agency originally proposed regulations that would nonetheless have implemented ORD’s recommendation for required DNTs,¹³⁵ the Inspector General reported that EPA retreated from this position after the White House’s Office of Management and Budget “expressed its concerns on the increasing amount of resources devoted to pesticide registration and the amount of data required to support a new registration”¹³⁶—concerns that the trade press described as “echo[ing] those expressed by the pesticide industry.”¹³⁷

In August 2006, EPA’s Office of Inspector General issued its final report on the Agency’s ten-year implementation of the Food Protection Act.¹³⁸ The results were mixed. On the one hand, the Report concluded that EPA’s actions had a measurable and positive impact especially on the dietary risk from pesticide residues faced by

132. See *Envtl. Prot. Agency, About EPA Research & Development*, <http://www.epa.gov/ord/htm/aboutord.htm> (last visited May 11, 2007) (“The U.S. Environmental Protection Agency (EPA) relies on sound science The Office of Research and Development (ORD) is the scientific research arm of EPA. ORD’s leading-edge research helps provide the solid underpinning of science . . . for the Agency.”).

133. See INSPECTOR GENERAL REPORT I, *supra* note 131, at 9 (emphasis added) (citing OFFICE OF RESEARCH AND DEV., ENVTL. PROT. AGENCY, BRIEFING BOOK AND POSTER ABSTRACT PROVIDED TO THE BOARD OF SCIENTIFIC COUNSELORS FOR REVIEW OF ORD’S HUMAN HEALTH RESEARCH PROGRAM ON FEB. 28, 2005, TO MAR. 2, 2005). At the time of ORD’s recommendation, EPA only “conditionally required” DNTs, typically only when other tests “indicate[d] the potential for adverse functional developmental effects.” See McGarity, *supra* note 100, at 142–43. As EPA’s required developmental toxicity tests did not require information about “functional deficits,” EPA as of mid-1998 had received DNTs for only six pesticides. *Id.* at 143.

134. INSPECTOR GENERAL REPORT I, *supra* note 131, at 9.

135. See *id.* at 12 (“EPA proposed adding new requirements for developmental neurotoxicity test data to the toxicity testing battery as part of the chemical registration process.”).

136. *Id.*

137. See Dean Scott, *Pesticides: EPA Should Weigh Cost-Effective Measures As It Revises Chemical Data Rule*, OMB Says, CHEM. REG. DAILY (Apr. 6, 2005) (“OMB’s cost concerns, which echo those expressed by the pesticide industry, probably will get close examination by the agency given OMB’s role in ultimately clearing any final version of the Part 158 revisions.”).

138. OFFICE OF INSPECTOR GEN., ENVTL. PROT. AGENCY, EVALUATION REPORT: MEASURING THE IMPACT OF THE FOOD QUALITY PROTECTION ACT: CHALLENGES AND OPPORTUNITIES (2006) [hereinafter INSPECTOR GENERAL REPORT II].

children eating *domestically* grown food.¹³⁹ On the other hand, the Report also found that “there [had] been a shift of risk to *imported* foods,”¹⁴⁰ such that “total pesticide residual risk for imported foods were nearly four-*times* higher than those of the domestic scores.”¹⁴¹ Although the Inspector General’s Report did not itself account for this shift, another report issued contemporaneously by a nonprofit organization explained that EPA had often reduced the increased risk profiles of pesticides by accepting “labeling” changes as to how pesticides were to be used, which apply principally to domestic growers, rather than actually changing many tolerances, which would apply to the food whether produced domestically or internationally.¹⁴² Although, on balance, both reports concurred that the total risk to children from pesticides had improved under the Food Protection Act,¹⁴³ the Inspector General’s Report found that “98 percent of the total impact of EPA actions to date” stemmed from EPA restrictions on the parathions and chlorpyrifos¹⁴⁴ and the nonprofit report found that EPA’s implementation “may simply further shift risks from U.S. grown produce to food imported from abroad.”¹⁴⁵ By August 2006, EPA had completed cumulative risk assessments on only one class of

139. *See id.* at 18 (“We found risks have declined by about two-thirds in domestically grown foods in 16 important children’s foods included in our analysis.”).

140. *Id.* at 17 (emphasis added).

141. *Id.* at 18 (emphasis added).

142. *See* ORGANIC CTR., *supra* note 112, at 28 (“The vast majority of FQPA-driven risk-reduction actions have entailed changes in U.S. pesticide product labels. . . . These label-driven changes in pesticide use patterns have in most cases not been accompanied by reductions in, or revocation of tolerances. Label changes impact only U.S. pesticide use; tolerance changes impact farmers here and abroad, since they apply equally to domestic and imported foods. For this reason, U.S. farmers have been forced to adopt lower-risk use patterns, while growers outside the U.S. have been able to continue using older, higher-risk pesticides in ways no longer permitted in the U.S.”).

143. *See id.* at 30 (“The FQPA has brought about a modest to moderate reduction in pesticide dietary risks.”); INSPECTOR GENERAL REPORT II, *supra* note 138, at 17 (“[T]he total dietary risk index amount (domestic and imported combined) decreased from 3,170 in 1994 to 1,532 in 2003.”).

144. INSPECTOR GENERAL REPORT II, *supra* note 138, at 21 (“Taken together, tolerance revocations and reductions imposed on 8 uses of the parathions and chlorpyrifos accounted for 98 percent of the total impact of EPA actions to date on a set of 30 of the most serious domestic ‘risk drivers.’”).

145. ORGANIC CTR., *supra* note 112, at 30–31 (“The lack of a significant number of [organophosphate] tolerance revocations and reductions, however, increases the chances that new risk drivers will periodically emerge in children’s foods, especially in imported foods. This risk is especially great during winter months when a significant share of fresh produce is imported.”).

pesticides,¹⁴⁶ and had not yet determined whether there would need to be additional cumulative analyses done involving multiple chemical families of pesticides that share “common mode[s] of action.”¹⁴⁷ As EPA approached the Food Protection Act’s August 2006 deadline, three public-employee labor unions claimed that “[i]n the rush to meet the August 2006 FQPA statutory deadline, many steps in the risk assessment and risk management process are being abbreviated or eliminated in violation of the principles of scientific integrity and objectivity by which we as public servants are bound.”¹⁴⁸

The plausibility of considering organic agriculture as a type of insurance against regulatory slippage is only reinforced when one considers the prospects of future political or special-interest distortions in the regulation of conventional pesticides. After EPA was well underway in its implementation of the Food Protection Act, Congress changed the general regulatory landscape by enacting in 2000 the Data Quality Act (DQA).¹⁴⁹ The DQA was a single-paragraph rider to a massive appropriations bill enacted “without any hearings or extensive legislative history.”¹⁵⁰ Yet it required, among other things, that regulatory agencies create administrative mechanisms by which “affected persons” could “seek and obtain correction of information” that is alleged not to comply with various data quality–related “guidelines.”¹⁵¹ William Kovacs, a vice president

146. *Id.* at 31 (noting that, although the cumulative risk assessment on the carbamates was “nearly complete,” by August 2006 “EPA [had] completed a cumulative risk assessment . . . on just one family of chemistry—the [organophosphates]”).

147. *Id.*; see also *supra* text accompanying note 100 (presenting the statutory requirement regarding pesticides that share a “common mechanism of toxicity”).

148. *Pesticides: Employees’ Unions Ask EPA to Regulate Organophosphates, Carbamates Strictly*, CHEM. REG. DAILY (May 26, 2006). More modestly, the EPA Inspector General concluded in August 2006 that, despite evidence of some public-health gains made under the statute, the Agency could not connect its actions with the broader, bottom-line question regarding the risk of food grown by conventional agricultural inputs: “Because it lacks measures on the impact of actions on the health of infants, children, and the overall human population, [EPA] cannot state the impact of its . . . efforts [under the Food Protection Act].” INSPECTOR GENERAL REPORT II, *supra* note 138, at 5.

149. See Consolidated Appropriations Act of 2001, Pub. L. No. 106-554, § 515, 114 Stat. 2763, 2763A-153 to -154 (2000).

150. Nat’l Acad. of Scis., *Ensuring the Quality of Data Disseminated by the Federal Government: Workshop #1*, at 9 (Mar. 11, 2002) (statement of Dr. John Graham, the OMB official later appointed to be in charge of administering the DQA); see also *id.* at 32 (statement of Alan Morrison, Visiting Professor of Law, Stanford Law School) (“The Data Quality Act is a statute that is quite short . . . It is only a couple of paragraphs, and the good news and the bad news about the legislative history is the same news. There isn’t any.”).

151. Pub. L. No. 106-554, § 515, 114 Stat. at 2763A-154.

of the U.S. Chamber of Commerce, might only have slightly exaggerated when he claimed in 2002 that the DQA “will have the most profound impact on federal regulations since the Administrative Procedure Act was enacted in 1946 . . . by ensuring that [the Environmental Protection Agency] uses better science, and by giving industry additional grounds to sue.”¹⁵²

The direct ramifications of the DQA for EPA’s pesticide programs soon became evident. The pesticide industry had successfully pressured EPA in the name of “good science” into abandoning blanket application of the precautionary *10-X* factor and then resisted EPA’s attempts to require unconditionally the DNT tests that EPA scientists had recommended. The combined effect of these two campaigns meant that EPA would become more dependent on information produced by third parties (especially academic researchers) about pesticides’ safety—and the DQA gave the pesticide industry a newfound leverage point to “seek and obtain correction of” scientific evidence with which they disagreed. The opportunity arose over atrazine, one of the most widely used herbicides in the country.¹⁵³ Atrazine was already a suspect chemical under the Food Protection Act. EPA’s Safety Factor Committee, in a November 2000 report, recommended that the Act’s full *10-X* safety factor be used in assessing atrazine’s risks,¹⁵⁴ in part because studies at EPA’s National Health and Environmental Effects Laboratory had found evidence that atrazine can cause neuroendocrine alterations in animals’ development, such as disruption of “critical reproductive processes including puberty.”¹⁵⁵ This was of special concern to atrazine’s manufacturer, Syngenta, which persuaded EPA in January 2003 to relax atrazine’s safety factor to *3-X* on the basis of new exposure data.¹⁵⁶

152. *OMB Guidelines on Quality of Information Seen As Having Profound Impact on Agencies*, 33 ENVT. REP. (BNA) 146 (Jan. 18, 2002), cited in Donald T. Hornstein, *Accounting for Science: The Independence of Public Research in the New, Subterranean Administrative Law*, 66 LAW & CONTEMP. PROBS. 227, 228 (Autumn 2003).

153. See Goldie Blumenstyk, *The Story of Syngenta and Tyrone Hayes at UC Berkeley: The Price of Research*, CHRON. HIGHER EDUC., Oct. 31, 2003, at A26.

154. See Memorandum from Brenda Tarplee, Executive Secretary, FQPA Safety Factor Committee to Catherine Eiden, Risk Assessor, Reregistration Branch 3, at 1 (Nov. 14, 2000) (on file with the *Duke Law Journal*) (“The [Safety Factor Committee] concluded that the FQPA safety factor should be retained at 10x when assessing parent atrazine and its chloro-metabolites . . .”).

155. *Id.* at 5.

156. See Thayer & Houlihan, *supra* note 130, at 311 tbl.6, 312 n.266.

The possibility of endocrine-disruption effects of atrazine became highlighted between 2000 and 2003. In part, this was because the Food Protection Act had required EPA to develop a special screening program specifically to test for pesticides' estrogenic and other endocrine-related effects, a program which the Agency had not yet implemented.¹⁵⁷ But in larger part, it was because a former Syngenta consultant, Dr. Tyrone Hayes of the University of California at Berkeley, had published a widely noted article in April 2002 in a prestigious peer-reviewed journal finding that atrazine, at levels a fraction of those allowed under federal drinking-water regulations, triggered the production of estrogen in the sex organs of male frogs, causing them to grow ovaries and eggs.¹⁵⁸ Contemporaneously, an EPA risk assessment on atrazine identified the potential endocrine-related effects of atrazine as "an endpoint that warrants additional study." By summer 2002, EPA faced a petition to withdraw atrazine from the market, citing Hayes's published work.¹⁵⁹

Enter the DQA. In November 2002, EPA received a "Request for Correction" under the Data Quality Act regarding its risk assessment of atrazine, filed by the Kansas Corn Growers Association and the Triazine Network, two organizations representing growers who used atrazine.¹⁶⁰ The Request was joined by the Center for Regulatory Effectiveness (CRE), an industrial lobbying group, and written by CRE's founder, Jim Tozzi,¹⁶¹ who has repeatedly been credited with having drafted the DQA itself.¹⁶² The Request vilified

157. *Id.* at 284 ("FQPA mandates that EPA develop a program to test for endocrine disrupting effects . . . to be implemented by 1999. EPA, however, is still years away from implementing an endocrine screening and testing program.").

158. *See* Blumenstyk, *supra* note 153 (referring to Hayes's first article appearing in the April 2002 Proceedings of the National Academy of Sciences and, two months later, being referenced in a petition by the Natural Resources Defense Council to EPA to withdraw atrazine from the market).

159. *Id.*

160. *See* Ctr. for Regulatory Effectiveness, Data Quality Act Request for Correction, Nov. 25, 2002 [hereinafter Request for Correction] (on file with the *Duke Law Journal*) (stating that "EPA's statements in the atrazine Environmental Risk Assessment regarding atrazine's purported endocrine effects violate government wide data quality standards") (italics omitted).

161. *Id.*

162. *See* Alexander Nathan Hecht, *Administrative Process in an Information Age: The Transformation of Agency Action Under the Data Quality Act*, 31 J. LEGIS. 233, 259 (2005) ("The DQA is commonly regarded as the brainchild of Jim Tozzi, an industry lobbyist with the Center for Regulatory Effectiveness, a pro-business think-tank located in Washington, D.C."); Michelle V. Lacko, *The Data Quality Act: Prologue to a Farce or a Tragedy?*, 53 EMORY L.J.

EPA for “bad science” for merely having *referenced* Hayes’s study,¹⁶³ even though EPA had referred only to Dr. Hayes’s findings as hypotheses and had only mildly credited those findings as warranting “additional testing with atrazine-treated tadpoles and adult frogs . . . to determine what, if any, effects occur on reproduction.”¹⁶⁴ The Request demanded that the risk assessment be reissued to “state that there is no reliable evidence that atrazine causes endocrine effects in the environment.”¹⁶⁵

In January 2003, the Agency conceded to the Requesters just enough for them to proclaim victory. To the Agency’s credit, the Agency refused to “reissue” its risk assessment, as the Requesters had demanded, to state affirmatively that there was “no reliable evidence” that atrazine causes environmental endocrine effects.¹⁶⁶ On the other hand, EPA promised that it would be “clarifying” its risk assessment “to avoid any future misunderstanding of the Agency’s

305, 307 (2004) (“Jim Tozzi, head of the corporate-sponsored Center for Regulatory Effectiveness (CRE) has boldly taken credit for the development and implementation of the DQA.”); *id.* at 307 n.14 (“Jim Tozzi . . . persuaded Representative Jo Ann Emerson to quietly insert the Act into [Pub. L. No. 106-554] . . .”); Wendy E. Wagner, *Science in the Regulatory Process: The “Bad Science” Fiction: Reclaiming the Debate Over the Role of Science in Public Health and Environmental Regulation*, 66 LAW & CONTEMP. PROBS. 63, 68 n.24 (Autumn 2003) (“It also appears from the oral history that it was an industrial lobbyist and not a congressional staffer that drafted and guided the rider through Congress.”); James T. O’Reilly, *The 411 on 515: How OIRA’s Expanded Information Roles in 2002 Will Impact Rule-Making and Agency Publicity Actions*, 54 ADMIN. L. REV. 835, 840 n.20 (2002) (“Discussion at the American Bar Association Fall Administrative Law Conference dinner . . . honoring past directors of the OIRA, suggested that Jim Tozzi, former OIRA director, had been the principal drafter of the 515 language . . .”).

163. See Request for Correction, *supra* note 160, at 3 (“This sub-section of the risk assessment first describes, without criticism, atrazine tests perform by Dr. Tyrone Hayes on frogs.”), 8 (“The Triazine Network’s goal is to ensure an outcome to EPA’s atrazine review based on sound science. The *Environmental Risk Assessment’s* statements regarding atrazine’s endocrine effects adversely affect this goal because they are not based on sound science.”); see also *id.* (“EPA’s *Environmental Risk Assessment’s* statements regarding atrazine’s endocrine effects fuel and encourage public misperceptions regarding atrazine . . . [and] must be corrected now in order to stop this flood of misinformation and bad science.”).

164. *Id.* at 3 (citing selected portions of EPA’s risk assessment and concluding, “[t]hus, EPA’s *Environmental Risk Assessment* accepts the endocrine effects allegedly shown by the Hayes Frog Tests as accurate and reliable . . . [and] the only remaining question is whether those endocrine effects affect frogs’ ability to reproduce”).

165. *Id.* at 1.

166. See Letter from Marcia E. Mulkey, Director, Office of Pesticide Programs to Jere White, Executive Director, Kansas Corn Growers Association (Jan. 30, 2003) (on file with the *Duke Law Journal*) (“We believe that it would be inappropriate to amend the Environmental Risk Assessment for atrazine as you suggested because it is premature to conclude that there is no reliable evidence that atrazine causes ‘endocrine effects’ in the environment.”).

position on the environmental effects of atrazine.”¹⁶⁷ In March 2003, the Agency reiterated that it could *not* state that “there is *no* reliable evidence that atrazine causes endocrine effects in the environment” but nonetheless revised the risk assessment so that it “does not suggest that endocrine disruption, or potential effects on endocrine-mediated pathways, be regarded as a legitimate regulatory endpoint at this time.”¹⁶⁸ Although the Agency subsequently summarized its actions as reflecting only “minor editorial changes,”¹⁶⁹ the Requesters thereafter crowed that “EPA in large part agreed with CRE’s Data Quality Act Petition”¹⁷⁰ And it is hard not to agree that the Requesters’ DQA petition had a significant effect. In June 2003, EPA’s Scientific Advisory Panel met specifically to evaluate the data on atrazine’s potential developmental effects on amphibians. Although the SAP found that Hayes’s and other experimenters’ data presented various procedural inconsistencies and uncertainties as to the underlying hypothesis, all of the SAP panel members “agreed that sufficient data existed to warrant concern.”¹⁷¹ Thus, precisely when the data were incomplete and the Food Protection Act might be thought to encourage the Agency to consider further precautionary margins of safety over and above those already in place, the DQA petition on atrazine resulted in the Agency delaying this possibility as a regulatory “endpoint.” At the very least, the DQA bought atrazine’s producers and users more time. The SAP is scheduled to reconsider atrazine’s environmental effects on amphibians in October

167. *Id.*

168. Env’tl. Prot. Agency, EPA Response to Comments from Syngenta and Its Contractors 18–19 (Mar. 26, 2003), http://www.epa.gov/quality/informationguidelines/documents/2807Response_03_27_03.pdf (emphasis added).

169. ENVTL. PROT. AGENCY, INFORMATION QUALITY FY03 ANNUAL REPORT 6 (2004), available at http://www.epa.gov/quality/informationguidelines/documents/EPA_IQG_FY03_Annual_Report.pdf.

170. Center for Regulatory Effectiveness, Comments by the Center for Regulatory Effectiveness on Docket OPP-2003-0024, at 2, http://www.thecre.com/pdf/20030811_frogsap.pdf.

171. See FIFRA SCIENTIFIC ADVISORY PANEL (SAP) REPORT, POTENTIAL DEVELOPMENTAL EFFECTS OF ATRAZINE ON AMPHIBIANS (Aug. 4, 2003), at 17–18, <http://www.epa.gov/scipoly/sap/meetings/2003/june/junemeetingreport.pdf> (“The Panel concurred with the Agency’s determination that the laboratory studies on the effects of atrazine on anuran gonadal development are sufficient to hypothesize that atrazine interferes with normal development . . . [f]ive studies detected abnormalities of gonadal development . . . [and] [t]he inability to detect gonadal development [in two unpublished studies] should not detract from the positive results noted in the majority of the studies.”).

2007;¹⁷² meanwhile, the Bush Administration's requested 2008 budget includes reductions in EPA's chemical-screening projects, with its "endocrine disruptors program" taking "the largest hit."¹⁷³

The point of the atrazine episode, of course, is not to claim that consumers of organic agriculture avoid a risk that can be, at this time, precisely quantified. Rather, it is to underscore the plausibility that the premium paid for organic food is rationally related to the danger that regulatory decisions on conventional agriculture, ostensibly grounded in "good science," in fact reflect political- and special-interest pressures. Indeed, the special dangers of the Data Quality Act continue to unfold. In January 2006, the White House Office of Management and Budget (OMB) cited the DQA as its principal statutory authority for a proposed "Risk Assessment Bulletin" that would regularize risk assessments across the federal government.¹⁷⁴ Immediately upon its publication, the proposed Bulletin was referred for scientific review to a panel of the National Academy of Sciences.¹⁷⁵ To be sure, it was unclear from the outset whether the Bulletin would affect EPA's regulation of pesticides: the proposed bulletin exempted risk assessments for individual permitting and licensing decisions,¹⁷⁶ which seemed to exclude individual pesticide registrations and re-registrations, but expressly was meant to apply to "risk assessments performed with respect to classes of products,"¹⁷⁷ which EPA understood to cover tolerance-setting under the Food Protection

172. See *Pesticides: EPA to Discuss Atrazine Studies with Panel, Asks for Submission of Additional Studies*, CHEM. REG. DAILY (Apr. 5, 2007).

173. See Pat Phibbs-Rizzuto, *Budget: EPA Endocrine Disruption Work Targeted for Funding Cut in FY 2008 Budget Proposal*, CHEM. REG. DAILY (Feb. 8, 2007) ("The endocrine program also would lose three full-time staff members" and "may postpone the validation of mammal assays, interlaboratory trials, and initial screening of the first set of potential endocrine-disrupting chemicals . . .").

174. Proposed Risk Assessment Bulletin, 71 Fed. Reg. 2,600 (proposed Jan. 17, 2006). OMB lists the "Information Quality Act" as the first of the statutory authorities claimed to support the proposed Bulletin. OMB BULLETIN, *supra* note 32, at 7.

175. Proposed Risk Assessment Bulletin, 71 Fed. Reg. at 2,600 (stating in the announcement of the proposed Bulletin that OMB "has referred [it] to the National Academy of Sciences (NAS), for their expert review").

176. OMB BULLETIN, *supra* note 32, at 10 ("This Bulletin does not apply to risk assessments that arise in the course of individual agency adjudications or permit proceedings, unless the agency determines that: (1) compliance with the Bulletin is practical and appropriate and (2) the risk assessment is scientifically or technically novel or likely to have precedent-setting influence on future adjudications and/or permit proceedings.").

177. *Id.*

Act.¹⁷⁸ To the extent this was true, OMB's proposed risk assessment standards would have undermined, in the name of data "quality," the very value judgments Congress had written into the Act. In early 2007, the NAS scientific review panel issued its report.¹⁷⁹ Generally, the NAS panel concluded that as a scientific matter the OMB Bulletin was "fundamentally flawed," possessed "the potential for negative impacts on the practice of risk assessment in the federal government," and "could not be rescued."¹⁸⁰ Specifically, among its findings that could have affected the safety of conventional agriculture, the NAS panel found that the OMB Bulletin would have downplayed what counted as an adverse health "effect" in such a way as to minimize the assessment of cholinesterase-inhibiting effects of organophosphate and carbamate insecticides.¹⁸¹ Worse, the NAS panel found that OMB's proposed Bulletin presented steps, in the name of science, that would understate risks presented to vulnerable subpopulations,¹⁸² including especially children, infants, and fetuses.¹⁸³ And perhaps most telling of all for the purposes of my argument, the proposed Bulletin would have insisted on the Agency communicating what OMB thought to be the relevant risk "comparisons," such as whether a risk was hypothetically akin to "being struck by lightning," whereas as to those risks presented by conventional agriculture, the proposed Bulletin would have ignored completely that there existed a real-life, market-based alternative to pesticide risks—federally certified organic foods—for which the comparative data suggest a much lower risk of pesticide residues.¹⁸⁴

178. See NAS REPORT, *supra* note 33, app. E, at 268 (citing EPA comments on the proposed Bulletin specifically objecting to the fact that "the proposed Bulletin did indicate that actions that involve assessment / reassessment of tolerances for pesticide residues on food would be subject to the Bulletin").

179. See *id.*

180. *Id.* at 7.

181. See *id.* at 57 ("Toxicologic risk assessment of these insecticides could be based on an end point related to the mode of action (for example, a drop in acetylcholinesterase to 70% of baseline) even if exposed people have no symptoms at that concentration.").

182. See, e.g., *id.* at 37–39 (criticizing the Bulletin's use of mean or "central" estimates of risk because they do not accurately reflect the risks posed to the most vulnerable populations).

183. See *id.* at 80 (speaking of the need to consider specially vulnerable populations such as infants and children and then noting, "[h]owever, if implemented literally and in the absence of clarifying language, the bulletin may be interpreted as requiring only quantitative analyses and only for the general population") (emphasis added).

184. See *supra* text accompanying notes 112–14.

C. *Organic Agriculture as a Hedge in a Genetically- and Carbon-Modified World*

Because it is increasingly legitimate to claim in policy debates that there exists value in organic food vis-à-vis the still-uncertain risks of pesticide residues, those who belittle organic farming find it necessary to shift the reference point from which they argue. They now claim that the proper comparative reference point is not the conventional, pesticide-based agriculture of the “past,” but new systems of agriculture that integrate advances in biotechnology. Using the new technologies of genetic engineering, the argument goes, “is actually good for humans and the environment, because it allows farmers to spray less of the toxic chemicals required to foil pests and weeds.”¹⁸⁵ Before addressing this argument on its merits, it is worth noting at the outset the sleight-of-hand embedded in the new framing: pesticides, which in the past were heralded mainly for their benefits by opponents of organic agriculture are now to be counted as costs from which we can be delivered by genetic engineering.

That said, however, the new line of argumentation does not entirely lack plausibility. The two most common applications of bioengineering can at least stake a claim that they might offer health and environmental improvements over conventional agriculture. The first, so-called “Bt crops,” involves genetically modified seeds that replicate within the plants grown from them a naturally occurring bacterium, *Bacillus thuringiensis* (Bt), that produces a protein which can kill pests who ingest it—thereby reducing the need to spray insecticides broadly over agricultural fields.¹⁸⁶ The second, so-called “Roundup Ready crops,” involves crops that are genetically engineered to be resistant to Monsanto’s herbicide, Roundup, which can in turn be sprayed more freely over both weeds and crops alike—thereby increasing the ability to use herbicides in “no-till” programs

185. Sophia Kolehmainen, *Genetically Engineered Agriculture: Precaution Before Profits: An Overview of Issues in Genetically Engineered Food and Crops*, 20 VA. ENVTL. L.J. 267, 285 (2001) (“Another common claim is that genetic engineering of crops is actually good for humans and the environment, because it allows farmers to spray less of the toxic chemicals required to foil pests and weeds.”); see also Matthew Rich, Note, *The Debate Over Genetically Modified Crops in the United States: Reassessment of Notions of Harm, Difference, and Choice*, 54 CASE W. RES. L. REV. 889, 893 (2004) (“[S]upporters argue that genetically modified crops feed starving populations, reduce pesticide and herbicide use, and conserve environmental resources.”); Bailey, *supra* note 73 (“Finally, no-till farmers use less insecticide, since genetically enhanced crops can protect themselves against pests.”).

186. Kolehmainen, *supra* note 185, at 273.

that can, among other things, reduce soil erosion and the pollution of nearby surface streams from farm run-off.¹⁸⁷ The advent of genetic engineering in agriculture has been described as “the fastest growing agricultural development in history.”¹⁸⁸ Bt-corn alone accounts for one-third of all corn grown in the United States¹⁸⁹ and Roundup Ready soybeans account for eighty-five percent of the country’s soybean plantings.¹⁹⁰ Thus, in terms of modern trends in agriculture, genetic engineering and organic agriculture, as different as they may be, have both emerged as especially strong, competing agricultural paradigms¹⁹¹ and therefore it is hardly implausible to compare them.

But for the purposes of my argument, it is neither necessary nor desirable to compare the two as either-or propositions. Indeed, too often policy debates over agriculture are framed as if the world must be either an all-organic or all-bioengineered place.¹⁹² Yet there is an important middle ground that justifies organic agriculture—and indeed justifies its expansion beyond (and perhaps even significantly beyond) the relatively small amount of total acreage currently under organic management. In addition to its other benefits, organic agriculture is justified as a form of social insurance—a hedge—against the prospect that bioengineered agriculture will fail.¹⁹³

And, at least as to the claim of overall pesticide reduction, there is evidence that genetically engineered crops are not living up to their

187. See, e.g., Thomas P. Redick, *The Cartagena Protocol on Biosafety: Precautionary Priority in Biotech Crop Approvals and Containment of Commodities Shipments*, 18 COLO. J. INT’L ENVTL. L. & POL’Y 51, 83–84 (Winter 2007) (arguing that Roundup Ready soybeans “and no-till practices made possible through use of this soybean have increased soil conservation measurably”).

188. Holly Beth Frompovicz, Comment, *A Growing Controversy: Genetic Engineering in Agriculture*, 17 VILL. ENVTL. L.J. 265, 267 (2006).

189. *Id.* at 267.

190. *Id.*

191. See *supra* text accompanying notes 29–31 (noting that organic foods constitute the fastest growing segment of the agricultural market).

192. See, e.g., Ronald Bailey, *Billions Served: Norman Borlaug Interviewed by Ronald Bailey*, REASONONLINE, Apr. 2000, <http://www.reason.com/news/show/27665.html> (“[I]f all agriculture were organic, you would have to increase cropland area dramatically, spreading out into marginal areas and cutting down millions of acres of forests.”).

193. This justification for organic agriculture is complementary to, but distinct from, the more commonly made arguments that genetically engineered agriculture is bad. See, e.g., Frompovicz, *supra* note 188, at 271 (“If the Roundup resistance trait spread to wild grasses, it could result in weeds that would be resistant to the most widely used weed killer.”); Rich, *supra* note 185, at 896–97 (describing the genetic contamination of endangered varieties of Mexican corn).

promise: although Bt crops have reduced insecticide use in many crops, herbicide-tolerant (HT) crops, such as those that are “Roundup Ready,” have *increased* it by *greater* amounts. The reason for the increase in HT crop treatments involves the advent of weeds that are increasingly tolerant and/or resistant to glyphosate, the active ingredient in Roundup which could otherwise be sprayed on fields planted with Roundup Ready crops.¹⁹⁴ A recent report on long-term experience with HT crops finds a predictable pattern: “[i]n the first two years of commercial use, each acre planted to HT cotton reduced herbicide use by about one-third pound[; e]fficiency slipped in years three and four . . . [and] [b]y year five, weed shifts, tolerance, and resistance had pushed total herbicide use on HT acres to a level 0.23 pounds above total herbicide use on conventional acres.”¹⁹⁵ Across all crops, genetically engineered varieties reduced pesticide use an aggregate 20.6 million pounds from 1996 through 1998, “but from 1999 through 2004, pesticide use rose 143 million pounds, for a net increase of 122 million pounds over the full nine-year period.”¹⁹⁶ Although it is possible that this resistance problem might be addressed with active resistance-management programs,¹⁹⁷ there have been other complications for bioengineered crops. In 2006, a university study of Bt cotton in China found that the emergence of secondary pests (those not targeted by the Bt insecticide) has

194. See, e.g., Paul L. Hollis, *Herbicide Resistance Major Concern in Cotton*, DELTA FARM PRESS, Mar. 2, 2007, at 43 (quoting Stanley Culpepper, a University of Georgia weed specialist, “As farmers continue to plant successive seasons of Roundup Ready cotton, Roundup Ready soybeans and Roundup Ready corn, it’s only a matter of time before glyphosate resistance occurs”); Jim Langcuster, *Herbicide Resistance Haunts Growers*, SE. FARM PRESS, Feb. 14, 2007, at 14 (“With mounting concern, weed scientists throughout the region—and the world—are cataloguing a growing list of weeds that have developed resistance to glyphosate, which comprises the cornerstone of crop planting systems throughout the Southeast.”); David Howe, *Sizing Up Glyphosate Complaints*, CORN & SOYBEAN DIG., Jan. 1, 2007, at 19 (indicating that Indiana and Illinois are among states where glyphosate resistance has been documented).

195. Charles M. Benbrook, *Genetically Engineered Crops and Pesticide Use in the United States: The First Nine Years* 26 (BioTech InfoNet Technical Paper No. 7, 2004), available at <http://www.biotech-info.net/technicalpaper7.html> (emphasis added) (adding that, even after the five-year mark, the rapid rise of glyphosate-resistant marestail triggered, in 2004, “an estimated 10 percent increase in the average pounds of herbicides applied per acre”).

196. *Id.* at 35 (emphasis added).

197. See *Monsanto Launches Online Weed Resistance Program*, DELTA FARM PRESS, Mar. 30, 2007, at 20 (“Monsanto is launching an online Weed Resistance Risk Assessment Program for growers who use Roundup Ready weed control technology.”).

required farmers, after seven years, “to use just as much pesticide as they did with conventional crops.”¹⁹⁸

Against the possibility that bioengineered agriculture might not fully live up to its environmental claims, the possibility of sustainable gains from organic agriculture is especially noteworthy. In 2005, a 22-year longitudinal study in the United States comparing conventional and organic farming of corn and soybeans found that yields were generally identical even though the organic fields used 30 percent less energy, less water, and no pesticides.¹⁹⁹ Although these results are not generalizable to all crops,²⁰⁰ even modest decreases in yield in organic systems might be offset by environmental gains elsewhere. Thus, a Swiss study that also compared (different) organic and conventional farming systems across a 20-year period found that, despite decreases in yield for some crops, organic farms produced their crops more “efficiently”: with less energy, greater water retention by the soil, and a higher presence of beneficial insects.²⁰¹ The existence of an agricultural production system such as organic farming may be an

198. See, e.g., Steve Connor, *Farmers Use As Much Pesticide With GM Crops, US Study Finds*, INDEP., July 27, 2006, at 23 (“Secondary pests, such as a type of leaf bug called mirids, are not normally a problem in cotton fields because bollworm, and sprays against bollworm, tend to keep them in check. However, because Bt cotton is targeted mainly against bollworm, other pests are able to exploit the relatively low use of pesticide that such fields need.”); Clive Cookson, *GM Cotton Crop Develops New Pests*, FIN. TIMES, July 28, 2006, at 7 (citing a joint study by Cornell University and the Centre for Chinese Agricultural Policy that found that “[m]ost of the benefits of growing genetically modified cotton, the only commercial GM crop in China, have disappeared after seven years”); Molly McElroy, *Pest Concerns Raised in Modified-Seed Study Chinese Cotton Farmers Using Monsanto Product Face Secondary Pests*, ST. LOUIS POST-DISPATCH, July 26, 2006, at A10 (“The researchers found that in the first three years of using Bt cotton, the Chinese farmers cut pesticide use by 70 percent and earned 36 percent more income than farmers using traditional cotton. But the environmental and economic benefits did not last. After seven years, the Bt cotton farmers were using as much pesticide as non-Bt users, even as they were paying for seeds that cost two to three times as much . . .”).

199. See Susan S. Lang, *Organic Farming Produces Same Corn and Soybean Yields as Conventional Farms, but Consumes Less Energy and no Pesticides, Study Finds*, CORNELL UNIV. NEWS SERVICE, July 13, 2005, <http://www.news.cornell.edu/stories/July05/organic.farm.vs.other.ssl.html> (reporting on research published in the journal *Bioscience* by Dr. David Pimentel).

200. *Id.* (“Organic farming can compete effectively in growing corn, soybeans, wheat, barley and other grains, Pimentel said, but it might not be as favorable for growing such crops as grapes, apples, cherries and potatoes, which have greater pest problems.”).

201. See Bailey, *supra* note 73, at 2–4 (describing a study by Swiss scientists at the Research Institute for Organic Agriculture finding that organic plots were “on average 20 percent less productive than conventional plots” with some mineral depletion but that the organic plots were more “efficient” due to the lesser amount of energy used to produce the crops, greater water retention by the soil, and “higher presence of beneficial insects”).

especially valuable asset in an age of global warming, when both temperatures and drought are expected to increase due to the cumulative effects of such greenhouse gases as carbon dioxide.²⁰² In such a carbon-modified world, organic systems could be expected to deliver “higher yields [than conventional systems], especially under drought conditions [because] wind and water erosion degraded the soil on the conventional farm while the soil on the organic farm steadily improved in organic matter, moisture, microbial activity and other soil quality indicators.”²⁰³ Moreover, the more energy-efficient organic systems could reduce in the first place emissions of greenhouse gases into the atmosphere from lower, farm-related fossil fuel use.²⁰⁴

The point of the comparison, although modest, is important. Even when measured against the newer worlds of genetically engineered crops and global warming, the existence of a vibrant organic agricultural sector is an important national (indeed, global) asset that is justified on policy, and not simply “marketing,” grounds.

CONCLUSION

When Congress enacted the Organic Food Production Act in 1990 it stepped onto the “other road” suggested by Rachel Carson several decades earlier. With the relatively simple expedient of a certification regime, the OFPA is perhaps one of our best examples of cause-based environmental reforms that support fundamental change in production systems toward more ecological and sustainable ends. Organic agriculture, whether measured against conventional or bioengineered agricultural systems, is more than an idea whose time

202. See, e.g., Caroline Patton, *An Environmentalist's Unlikely Foe: The Use of Hypothetical Jurisdiction in Massachusetts v. EPA*, 30 ENVIRONS ENVTL. L. & POL'Y J. 173, 182 (2006) (“Most scientists expect global warming to result in rising sea levels, increased storms and drought, and a general disruption of the earth’s ecosystems.”); Bradford C. Monk, *Standing and Global Warming: Is Injury to All Injury to None?*, 35 ENVTL. L. 1, 15 (2005) (“Global warming would also likely produce erratic and severe weather patterns that would increase both the duration and intensity of droughts . . .”).

203. Lang, *supra* note 199 (reporting on actual results from a U.S. study on yields from organic fields during drought conditions).

204. DAVID PIMENTEL, IMPACTS OF ORGANIC FARMING ON EFFICIENCY OF ENERGY USE IN AGRICULTURE 8, available at http://www.organic-center.org/reportfiles/ENERGY_SSR.pdf (“A comparison of the model organic and conventional system suggests a 31 percent energy saving in the organic system . . .”).

has come. It is an effective, proven policy alternative whose day should be just beginning.