Protecting Pointless Premiums:Comparing Organic Certification Standards to Consumer Motivations for Purchasing Organics

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May 6, 2010
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Abstract

This paper seeks to compare the organic certification standards adopted and enforced by USDA against consumer motivations for buying organic foods. A well functioning certification system should ensure that organic foods exhibit the qualities that motivate consumers to pay premium prices for organic foods. This paper will show that in fact the current USDA organic certification program does little to ensure the presence of these characteristics. The paper is divided into five parts: first, a brief history of the use of the term "organic"; second, a brief history of the development of USDA standard for organic certification; third, a review of consumer surveys showing the type five reasons why consumer buy organic foods; fourth, an analysis of how well the USDA organic certification standards ensure the presence of the characteristics that motivate consumers to buy organic; and fifth, a brief conclusion section.

I. A Brief History of the Term "Organic"

The roots of today's organic movement can be traced to a group of farmers in England in the 1920s who rejected the modern trend towards industrialized farming and the use of chemical fertilizer.[1] These early practitioners saw "organic" farming as a mix of practice and philosophy, embracing a romantic "back to the soil" ideology along with "natural" methods such as

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[1] Samuel Formartz, Organic, Inc.: Natural Foods and How They Grew 7 (Harcourt Trade Publishers 2006).

composting of waste materials to fertilize crops.[2] The writings of Sir Albert Howard, an early leader in the movement, draw heavily on his experiences in India and evidence a quasi-spiritual commitment to natural farming methods.[3] Sir Albert Howard did not, however, use the term "organic" in his writings. The first person to apply the term "organic" to the production of food was Walter Northbourne, another pioneer in the early English movement.[4] For Northbourne, "organic" agriculture had a dual meaning: first, it meant using organic materials as fertilizer; and second, it meant designing and managing a farm "as an organic or whole system, integrating soil, crops, animals, and society."[5]

In the 1960s and 1970s, organic farming gained popularity as the American public became increasingly concerned with environmental causes.[6] Rachel Carson's book *Silent Spring*, published in 1962, increased public awareness of the potential environmental dangers presented

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[2] Joseph Heckman, *A History of Organic Farming: Transitions from Sir Albert Howard's War in the Soil to the USDA National Organic Program, in* Wise Traditions in Food, Farming and the Healing Arts 1, 2 (Weston A. Price Foundation, 2006).

[3] *Id. See also* Sir Albert Howard, An Agricultural Testament 7 (Oxford University Press, 1943). The following quotation is representative: "Instead of breaking up the subject [of soil fertility] into fragments and studying agriculture in piecemeal fashion by the analytical methods of science . . . we must adopt a synthetic approach and look at the wheel of life as one great subject."

[4] Donald W. Lotter, *Organic Agriculture*, 21 J. Sustain. Agric. 3 (2003).

[5] *Id.* at 3-4.

[6] Brian Baker, *Brief History of Organic Farming and the National Organic Program, in* Organic Farming Compliance Handbook (2005), *available at* http://www.sarep.ucdavis.edu/organic/complianceguide/.

by the use of certain chemical fertilizers. The 1970s also saw the first efforts by local and state authorities to establish organic certification standards (see next section).[7] Although these trends indicated a steady increase in the popularity of organic foods, by early and mid 1980s, organic food production in the United States remained small-scale, with sales remaining roughly constant at around $200 million per year.[8]

In 1989, a *Sixty Minutes* broadcast a report on Alar, a synthetic pesticide that at the time was sprayed on some apples.[9] Relying on a single private study in which mice that were fed extremely high doses of Alar developed tumors, the TV report warned consumers to refrain from consuming apples that had been treated with Alar. At one point in the broadcast, a speaker referred to Alar as "the most potent cancer-causing agent in the food supply today."[10] The public reaction was immediate and drastic. Sales of apples decreased dramatically across the country. An industry group estimated that apple growers lost $ 100 million in 1989 due to the Alar

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[7] *Id.*

[8] Jean M. Rawson, *Organic Foods and the Proposed Federal Certification and Labeling Program*, U.S. Congressional Research Service, No. 98-264 (Sept. 8, 1998), *available at* http://ncseonline.org/NLE/CRSreports/Agriculture/ag-54.cfm.

[9] Timothy Egan, *Apple Growers Bruised and Bitter After Alar Scare*, N.Y. Times, July 9, 1991, at A16.

[10] *Id.*

scare.[11] To make matters worse, the ban on Alar made apple production more expensive because of the increased proportion of apples damaged by insects.[12] Although the federal government issued a notice informing consumers that purchasing apples remained safe,[13] the damage was already done: the effect of the *60 Minutes* report on public perception could not be reversed, even though most scientists believed that Alar was safe in the small doses sprayed on apples and other produce. In 1990 a professor of food science at Rutgers published a popular article in *Issues in Science and Technology* concluding that the *60 Minutes* report had misread and exaggerated the scientific evidence to create a crisis where none was merited.[14] After examining the alleged evidence behind the *60 Minutes* Alar story, the article concluded, "There was never any legitimate scientific study to justify the Alar scare."[15]

Although the Alar incident created a crisis for the apple growing industry, it was a massive boon for organic foods. The year 1989 saw both a sharp upward jump in sales of

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[11] Philip Shabecoff, *Apple Chemical Being Removed in U.S. Market*, N.Y. Times, June 3, 1989, *available at* http://www.nytimes.com/1989/06/03/us/apple-chemical-being-removed-in-us-market.html?pagewanted=1.

[12] Howard Faber, *Apple Growers Hurt by Loss of Alar*, N.Y. Times, Sept. 17, 1989, *available at* http://www.nytimes.com/1989/09/17/nyregion/apple-growers-hurt-by-loss-of-alar.html?pagewanted=1.

[13] *Surgeon General Says Apples Safe*, Spokesman-Review Spokane Chronicle, March 18, 1989, at A16.

[14] Joseph D. Rosen, *Much Ado About Alar*, 4 Issues in Sci. & Tech. 85, 85-90 (Spring 1990).

[15] *Id.* at 89.

organically produced products and the beginning of a durable upward trend, with organic sales growing at an average rate of more than 20% over the next decade.[16] Retail organic sales reached $3.5 billion in 1996.[17]

Now, "organic" agriculture bears little resemblance to the quasi-spiritual efforts of the British farmers who first used the term. Today's organic farms would have been unrecognizable to the movement's founders. The organic food industry is now a massive commercial enterprise. Organic food production in the United States is dominated by a handful of huge industrial farming companies.[18] The total amount of organic food sales in the United States has shot up dramatically over the several years, rising from annual sales of just over $3 billion in 1997 to

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[16] *Id.*

[17] *Id.*

[18] *See* S. Grow & C. Greene, *The Structural Evolution of Organic Farms in the USA: The International Market Effect*, *in* International Marketing and Trade Quality of Food Products 239, 239 (Maurizio Canaveri ed., 2009) ("Rapid growth of the organic agricultural sector in the U.S. and implementation of the U.S. Department of Agriculture's national organic standards in 2002 have lead to concerns that organic production could become increasingly concentrated on larger U.S. and international farms, disrupting the market access of small domestic organic producers."); *see also* Diane Brady, *The Organic Myth: Pastoral Ideals are Getting Trampled as Organic Food Goes Mass Market*, Business Week, Oct. 26, 2006, available at http://www.businessweek.com/magazine/content/06_42/b4005001.htm ("What was once a cottage industry of family farms has become Big Business, with all that that implies, including pressure from Wall Street to scale up and boost profits.").

sales of nearly $14 billion in 2005[19] and $18.9 billion in 2007.[20] In 2008 U.S. food producers dedicated about 4.8 million acres of farmland to organic production, composed of 2.7 million for cropland and 2.1 million for pasturing.[21] This represents about 0.7 percent of all cropland and 0.5 percent of all pastureland in the U.S.[22] Currently, there are 27,000 USDA-accredited organic food producers and handlers worldwide, composed of 16,000 domestic and 11,000 foreign producers and handlers.[23]

Along with the explosive growth in the organic farming industry over the past 20 years came an increasing demand for standardized nationwide regulation of organic foods. The demand for regulation came primarily from the industry of organic food producers, who were motivated by two primary concerns: first, that the brand-value of the term "organic" might become diluted absent the imposition of uniform production standards; and second, that

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[19] Carl K. Winter and Sarah F. Davis, *Scientific Status Summary: Organic Foods*, 71 J. Food Sci. R117, R118 (2006).

[20] *Organic Markets Overview*, Nutrition Bus. J., Penton Media, Inc. (Mar. 1, 2008).

[21] Economic Research Service, United States Department of Agriculture, *Organic Production: Overview*, updated March 30, 2010, *available at* http://www.ers.usda.gov/Data/organic/

[22] *Id.*

[23] Catherine Greene et al., *Emerging Issues in the U.S. Organic Industry*, Economic Research Service, USDA, June 2009, *available at* www.ers.usda.gov/Publications/EIB55/EIB55_ReportSummary.pdf

variations in the organic regulations imposed by state governments and local trade associations would hinder inter-state export of organic foods.

II. History of the USDA Standards for "Organic" Classification

Before 1990, government regulation of organic foods occurred at the level of state governments or trade associations. In 1973 Oregon became the first state to regulate the production of organic food.[24] California quickly followed suit in 1979.[25] By 1990, twenty-two states had adopted some form of regulation of organic food production.[26] Each state embraced a slightly different regulatory scheme. Some states operated their own state-run certification programs.[27] Others cooperated with existing self-regulating trade associations.[28] In a majority of the twenty-two states, the state defined the term "organic" in terms of permitted production techniques but did not create or embrace an existing certification process.[29] In most of the remaining twenty-eight states, local or statewide trade groups offered private organic

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[24] Gordon G. Bones, *State and Federal Organic Food Certification Laws: Coming of Age?*, 68 N.D. L. Rev. 405, 407 (1992); *see* Or.Rev.Stat. § 616.406 (1991) (repealed 2001).
[25] *Id.*; *see* Cal.Health & Safety Code § 26569.13 (1979) (repealed 1990).
[26] Kyle W. Lanthrop*, Pre-Empting Apples with Oranges: Federal Regulation of Organic Food Labeling*, 16 J. Corp. L. 885, 888 (1992).
[27] *Id.* at 892 (explaining that Colorado, Texas, and Washington operated their own organic certification programs).
[28] *Id.* at 892 n. 60 (Minnesota, New Hampshire, Ohio, and Vermont).
[29] *Id.* at 893.

certification, but without official state involvement there was scant protection against spurious or misleading labeling of conventionally produced food.[30]

The variation in substantive standards, processes for certification, and commitment to enforcement of organic standards between states led to confusion for both consumers and producers. Consumers who paid the premium for organic foods could not be certain what they were getting for their money.[31] Organic producers who sought to export their products to other states faced the daunting tasks of complying with at least two regulatory regimes.[32]

The USDA made one abortive foray into the field of organic foods in 1980. On its own initiative, USDA published a document entitled *Report and Recommendations on Organic*

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[30] *See* Kenneth C. Amaditz, *The Organic Foods Production Act of 1990 and Its Impending Regulations: A Big Zero for Organic Food?*, 52 Food & Drug L.J. 537 , 539 (1997).

[31] *Id.* at 539:

> Even when organic foods did make it to the supermarket, "consumers [were] left to decipher a confusing array of private and State labels." Food that was labeled "organic" could have contained anywhere from twenty to 100% organically-grown ingredients, making it difficult for "even the most sophisticated consumer" to know what the term "organic" really meant. False and deliberately misleading labels exacerbated consumer uncertainty and created a "sea of counterfeit and pseudo-organic products." As a result, some consumers and food merchandisers doubted the veracity of legitimate organic producers' claims and hesitated to buy their products.

(*quoting* S. Rep. No. 356, *reprinted in* 1990 U.S.C.C.A.N. at 4944).

[32] *Id.* ("Organic farmers and food processors faced both the burden of labeling food to meet conflicting standards and the possibility that food deemed organic in their home state would not qualify as organic across the state border.").

Farming.[33] One section of the report recommended the creation of the Office of Organic Resources Coordinator, which USDA did in the same year.[34] However, the Reagan administration abolished the agency in 1981 and the USDA ceased all official research on the topic of organic food standards.[35] Reagan left office in 1989. That same year USDA received petitions from several organizations calling for the creation of national certification standards for organic foods. Among those who filed petitions were the National Association of State Departments of Agriculture, the American Farm Bureau Federation, the Center for Science in the Public Interest, and several organic industry groups.[36]

In response to these and other requests from state governments, food producers, and others for the creation of national organic standards, Congress passed the Organic Foods Production Act of 1990, which directed the USDA to establish national certification standards for organic foods.[37] The stated purpose of the act was to establish national standards governing

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[33] Report and Recommendations on Organic Farming, USDA Study Team on Organic Farming, 1980, *available at* http://naldr.nal.usda.gov/NALWeb/Agricola_Link.asp?Accession=CAT80742660; *see also* Jean M. Rawson, *Organic Foods and the Proposed Federal Certification and Labeling Program*, U.S. Congressional Research Service, No. 98-264, 1 (Sept. 8, 1998), *available at* http://ncseonline.org/NLE/CRSreports/Agriculture/ag-54.cfm (describing the writing and publication of the 1980 report).
[34] Rawson, *supra* at 1.
[35] *Id.*
[36] *Id.*
[37] 7 U.S.C. §§ 6501-6523 (1990).

organic foods, to assure customers that organic products meet consistent standards, and to facilitate interstate commerce in organic food products.[38] The act did not itself define the term "organic," but instead delegated that task to USDA.[39] The Act did, however, provide some guidance to USDA. Most importantly, the Act required USDA to establish a "National List" detailing which synthetic substances (most importantly chemical fertilizers) were approved and which were prohibited for use in organic food production.[40] The Act mandated the creation of a National Organic Standards Board (NOSB), composed of 15 members including owners of organic farming operations, experts in environmental conservation, representatives of consumer interest groups, a scientific expert and an organic certifying agent.[41] The NOSB's task is to make recommendations regarding regulations to USDA, including making rolling recommendations regarding synthetic substances that should be placed on or taken off the National List.[42]

Between 1990 and 1996, the NOSB produced a large number of recommendations.[43] In 1997 the USDA, after reviewing the recommendations of the NOSB, presented proposed

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[38] 7 U.S.C. § 6501.

[39] *See* 7 U.S.C. §§ 6517 & 6518; *see also* S. Rep. No. 357, *reprinted in* 1990 U.S.C.C.A.N. at 4946 ("[o]rganically produced food defies simple definition.").

[40] 7 U.S.C. § 6517.

[41] 7 U.S.C. § 6518.

[42] 7 U.S.C. § 6518(k) & (l).

[43] For a chronological list of all NOSB recommendations, *see* National Organic Program: NOSB Recommendations, *available at* http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?

regulations that would establish national organic standards as directed by the Organic Foods Production Act of 1990. The proposed regulations elicited a storm of comments and criticism from industry and consumer advocacy groups, most of whom felt that the proposed standards were not stringent enough.[44] In particular, the Organic Trade Association submitted a report that underlined as major weaknesses the fact that the proposed regulations allowed the use of genetically engineered crops, permitted irradiation as a method of killing pathogens on produce, and permitted the use of municipal sewage sludge as fertilizer.[45] In response to this flurry of negative comments, USDA withdrew the proposed regulations and went back to the drawing board.[46]

In 2000, USDA proposed a new set of regulations, which were subsequently adopted as a permanent rule and established the National Organic Program.[47] The National Organic Program Standards create a three-tiered classification system for labeling of "organic" food products.[48]

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startIndex=6&startIndex=5&template=TemplateN&navID=NationalOrganicProgram&leftNav=NationalOrganicProgram&page=NOSBFinalRecommendations&description=NOSB%20Final%20Recommendations

[44] Rawson, *supra* n. 33 at 2.

[45] *Id.*

[46] *Id.*

[47] Baker, *supra* n. 6.

[48] 7 C.F.R. §§ 205.1–205.699 (2000); *see also* Carl K. Winter and Sarah F. Davis, *Scientific Status Summary: Organic Foods*, 71 J. Food Sci. R117, R118 (2006) (explaining the USDA classification system in plain English).

Products labeled “100% organic” must contain only organically produced ingredients.[49] Products labeled “organic” may contain up to 5% inorganically produced ingredients.[50] A product that claims to have been “made with organic ingredients” may contain up to 30% inorganically produced ingredients.[51] Products with less than 70% organic ingredients may not claim any level of organic status with respect to the product as a whole, although the label may identify individual organically produced ingredients.[52] Products that are “100% organic” or “organic” may display the USDA organic seal on their packaging, while products that are merely “made with organic ingredients” may not display the seal.[53]

In 2008, Congress passed the Farm Act, which provides a variety of financial incentives to Organic Farmers. Among the incentives granted by the Act are low cost loans for farmers seeking to establish organic-compliant procedures, increased funding for a program that pays a portion of the costs associated with organic certification, and research funding for the

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[49] 7 C.F.R. § 205.301(a).
[50] *Id.* § 205.301(b).
[51] *Id.* § 205.301(c).
[52] *Id.* §§ 205.301(d) & 205.305.
[53] *Id.* § 205.303 (permitting use of USDA seal for products that are “100% organic” or “organic”); § 205.304 (prohibiting use of USDA seal for products that are “made with organic ingredients” but providing that such products may include the seal of a local certifying agent).

development of new seed varieties that will grow well in organic-complaint conditions.[54] The 2008 Farm Act demonstrates that the U.S. government is more than a disinterested regulator in the field of organic foods; the U.S. government actively promotes the organic industry.

III. Why Consumers buy Foods Labeled "Organic"

Organic foods are expensive. American consumers regularly pay premiums ranging between 25% and 175% for organic produce.[55] Data recently gathered by the USDA from supermarkets in Boston and San Francisco show that shoppers who buy organic are likely to pay about one-and-a-half times conventional price for apples, one-and-a-third times conventional price for carrots, and more than two-and-a-half times the conventional price for eggs.[56] Despite

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[54] Pub.L. 110-234, 122 Stat. 923, H.R. 2419 (2008); *see also* Economic Research Service, United States Department of Agriculture, *Organic Agriculture: 2008 Farm Act Provisions*, Updated December 1, 2009, *available at* http://www.ers.usda.gov/Briefing/Organic/ProgramProvisions.htm (summarizing the provisions of the 2008 Farm Act).

[55] *See* Timothy A. Park and Luanne Lohr, *Supply and Demand Factors for Organic Produce*, 78 Am. J. Agr. Econ. 647, 647 (August 1996) (stating that average consumer premiums range between 25% and 30%); Gary D. Thompson and Julia Kidwell, *Explaining the Choice of Organic Produce: Cosmetic Defects, Prices, and Consumer Preferences*, 80 Am. J. Agr. Econ. 277, 280 (May 1998) (finding price premiums as high as 175% for produce in an Arizona grocery store).

[56] Economic Research Service, United States Department of Agriculture, *Data Price: Organic Prices*, updated May 18, 2009, *available at* http://www.ers.usda.gov/Data/OrganicPrices/

these steep premiums, in 2008 consumers spent $22.9 billion on organic foods, representing 3.5% of total food sales in the U.S.[57]

Many consumer surveys have addressed the question of why some food shoppers are willing to pay such steep premiums for organically certified food. A survey of customers at an Ohio grocery chain specializing in organic foods found that consumers' strongest motivation for buying organic foods was the belief that such foods were "pesticide free," with 51% of respondents listing this as their primary motivation for buying organic.[58] The other customer motivations were, in order of relative importance across the group surveyed: the belief that organic foods offered better "nutrition"; the belief that organic farming methods were "environmentally friendly"; and enhanced "taste" as compared to inorganic foods.[59]

A 2006 survey conducted by Whole Foods Market found a similar list of customer motivations, albeit in a slightly different average order of preference.[60] Among the survey respondents, 70% listed "avoidance of pesticides" as a main reason they buy organic, while 68%

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[57] *Organic Food/Bev Sales Up by 17.1%*, EnvironmentalLeader.com, posted May 6, 2009 *available at* http://www.environmentalleader.com/2009/05/06/us-organic-sales-up-by-171/

[58] Neal H. Hooker, Marvin T. Batte & Jeremy Beaverson, *A Consumer Survey of Specialty Food Shoppers: Understanding of the National Organic Food Program and Willingness to Pay*, Ohio State University Department of Agricultural, Environmental, and Development Economics, May 2004, *available at* http://aede.osu.edu/programs/VanBuren/OrganicFoods.htm.

[59] *Id.* at pg. 7.

[60] Carl K. Winter and Sarah F. Davis, *Scientific Status Summary: Organic Foods*, 71 J. Food Sci. R117, R117 (2006) (quoting survey performed by Whole Foods Market in 2005).

cited "freshness," 67% cited "health and nutrition," and 55% cited "avoidance of genetically modified foods."[61]

The data contained in these and other similar surveys[62] can be synthesized as follows. Consumers who buy organic are motivated by the following considerations, organized in rough order of strength: (1) lower amounts of pesticide residues; (2) enhanced nutritional content; (3) better taste or freshness; (4) decreased adverse impact on the environment; (5) avoidance of genetically modified foods. In the next section of this paper, I compare each of these motivations against the provisions of the National Organic Program, examining the extent to which the NOP standards promote the five attributes that motivate organic food purchasers. Ultimately I seek to answer the following question: do foods certified by USDA as "100%

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[61] *Id.*

[62] *See, e.g.* Organic Trade Association, *Consumer Profile Facts*, August 2008, *available at* http://www.ota.com/organic/mt/consumer.html (summarizing a study by The Hartman Group entitled *Organic 2006: Consumer Attitudes & Behavior, Five Years Later & into the Future*, which found that organic food purchasers are motivated by avoidance of pesticides, avoidance of growth hormones, nutrition, environmental concerns, avoidance of GMOs, taste, and support for sustainable agriculture); Maryellen Molyneaux, *Consumer Pathways and Bariers to Usage for Organic Food Products*, Organic Processing Magazine, Jan/Feb 2008 (consumers motivated by "overall health," avoidance of "additives, pesticides, toxins," because organics are "less processed," and because organics are of "higher quality"); Harris Interactive, *Two Thirds of U.S. Adults Consider Themselves to be Healthy Eaters*, March 1, 2006, *available at* http://www.marketshare.com.hk/news/allnewsbydate.asp?NewsID=1026 (quoting a study by Harris Interactive entitled *Healthy Eating: Impact on the Consumer Packaged Goods Industry*, which found that organic food purchasers are motivated by avoidance of pesticides, general health concerns, "taste", impact on the environment, and "freshness.").

organic", "organic", and "made with organic ingredients," actually exhibit the characteristics for which consumers purchase them?

Before proceeding, it is worth mentioning one other possible consumer motivation that might not be captured by consumer surveys. The decision to buy organic foods is often associated in the public mind with a certain lifestyle. Regardless of whether the stereotype is correct, buyers of organic foods are perceived as affluent, professional, concerned about healthy living, and environmentally and socially conscious.[63] Specialty food stores such as Whole Foods

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[63] *See* Travis A. Smith, Chung L. Huan & Biing-Hwan Lin, *Does Price or Income Affect Organic Choice? Analysis of U.S. Fresh Produce Users*, 41 J. Agric. & Applied Econ. 731, 731 (2009) ("A traditional and popular perception suggests that most organic consumers are white, female, young, wealthy, and well-educated."); *see also* J.C. Buzby and J.R. Skees, *Consumers Want Reduced Exposure to Pesticides in Food– Charting the Costs of Food Safety*, 17 Food Rev. 19, 19-22 (1994).

Some studies have found no statistically significant correlation between income and organic food purchases, suggesting that the stereotype associating affluence with organic purchases is inaccurate. C. Durham, *Organic Purchase Dedication: A Fractional Probit Model*, 36 Agric. & Resources Econ. Rev. 304 (2007) (finding that income is not correlated with organic purchase habits); L. Zepada & J. Li, *Characteristics of Organic Food Shoppers*, 39 J. Agric. & Applied Econ. 17 (2007) (same). Other studies have found that education levels and income are positively correlated with organic food purchases. R. Dettman and C. Dimitri, *Who's Buying Organic Vegetables? Demographic Characteristics of U.S. Consumers*, 16 J. Food Prod. Marketing 79 (2010) (finding a positive correlation between education levels and organic purchases); F. Zhang et al., *Modeling Fresh Organic Produce Consumption with Scanner Data: A Generalized Double Hurdle Model Approach*, 24 Inter. J. Agribusiness 510 (2008) (finding a positive correlation between income and organic purchases). *See also* Travis A. Smith, Chung L. Huan & Biing-Hwan Lin, *Does Price or Income Affect Organic Choice? Analysis of U.S. Fresh Produce Users*, 41 J. Agric. & Applied Econ. 731, 732 (2009) (suggesting that these seemingly

Market and Trader Joes that sell a high proportion of organic foods cater to this perception by offering pleasant interiors and promotions and advertising related to health and the environment.[64] Many food shoppers may choose to buy organic in part because they identify or wish to identify with this lifestyle. However, this consumer motivation is difficult to capture in consumer surveys because it often operates on a subconscious or partially subconscious level in the mind of the consumer. Furthermore, this motivation has nothing to do either with the physical attributes of organic food or the manner in which organic food is produced, and is therefore outside the scope of the certification standards contained in the NOP.

IV. The Gap Between USDA Standards and Consumer Expectations

1. Avoidance of Pesticide Residues

Across all the consumer surveys cited above, the most popular consumer motivation for buying organic is the same: the belief that organic foods contain fewer synthetic pesticide

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inconsistent results may be explained by the changing profile of organic consumers over time). Regardless of its accuracy, the stereotype associating organic food purchases with high levels of income and education exists and undoubtedly influences consumer behavior.

[64] Whole Foods, Google, Trader Joe's Among Consumers' Greenest Brands, GreenBiz.com (Feb. 16, 2009), *available at* http://www.greenbiz.com/news/2009/02/16/whole-foods-google-trader-joes-among-consumers-greenest-brands-report; John Moore, *The Winning Ways of Whole Foods Market*, Brand Autopsy Marketing Practice (2009), *available at* http://brandautopsy.typepad.com/brandautopsy/2005/10/the_winning_way.html ("[Whole Foods Market] emotionalizes the shopping experience by appealing to the five senses. Its stores are spotless and the merchandising displays are beautiful to the eyes.").

residues. My analysis of the consumer motivation breaks into four parts. First, I examine the NOP to highlight those provisions of the NOP that are intended to reduce the presence of pesticide residues on certified organic foods. Second, I examine available empirical evidence to determine whether foods certified organic by the USDA in fact have fewer pesticides residues than inorganic foods. Third, and most fundamentally, the belief that organics have lower pesticide residues will affect consumer-purchasing habits only if consumers also believe that synthetic pesticide residues present some risk to health. I examine whether there is scientific evidence to support the widely held consumer belief that synthetic pesticide residues on foods present a health risk. Finally, I examine other health risks unique to organic foods that must be weighed against any health benefit derived from fewer pesticide residues.

a. Regulation of Pesticide Use under the NOP

The USDA National Organic Standards contain a broad prohibition on the use of synthetic substances and ingredients, with some exceptions.[65] The regulations provide that to obtain any of the three levels of organic classification, a food product must be "produced and handled without the use of. . . synthetic substances and ingredients, except as provided in § 205.601 or § 205.603".[66] In the case of farmland, the land must be free from prohibited synthetic

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[65] 7 C.F.R. § 205.105 (2000)
[66] *Id.*

substances for at least three years immediately prior to the harvesting of a crop that will be certified organic.[67]

The exceptions to this general rule are contained in the so-called National List. The Organic Foods Production Act of 1990 requires the Secretary of Agriculture to establish a National List of synthetic substances that may be used in organic farming.[68] The National Organic Standards Board is tasked with making recommendations to the Secretary regarding which substances ought to be added to or removed from the list.[69] The National List of allowed synthetic substances appears in the Code of Federal Regulations as 7 C.F.R. §§ 205.601 & 205.603 for crop production and livestock production, respectively. The List may include only substances that cannot be produced from a natural source and for which there are no organic substitutes.[70] Currently, the National List allows for the use of close to a hundred synthetic substances in organic food production, including copper sulfate, sulfur dioxide, hydrogen peroxide, and lime sulfur, all of which are toxic to humans in sufficiently large doses.[71] The

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[67] 7 C.F.R. § 205.202 (2000).
[68] 7 U.S.C. § 6517.
[69] 7 U.S.C. § 6518.
[70] 7 C.F.R. § 205.600.
[71] 7 C.F.R. § 205.601.

National Organic Standards Board may and often does recommend new synthetic substances for inclusion on the National List.[72]

In addition to restricting the synthetic substances that may be used during the food production process, the National Organic Program also provides for post-production testing by the certifying agent.[73] However, compliance standards for organic foods are no more stringent than those for conventional foods, at least with respect to substances that are regulated because they may be dangerous to human health. (By contrast, for substances that are regulated because they present risks to the environment, the National Organic Program imposes threshold that is 5% of the tolerance level for conventional foods established by the Environmental Protection Agency.[74]) As provided in 7 C.F.R. § 205.670(e), the agent who performs an inspection will test the level of pesticide residues against the tolerance levels set by the Food and Drug

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[72] Kenneth C. Amaditz, *The Organic Foods Production Act of 1990 and Its Impending Regulations: A Big Zero for Organic Food?*, 52 Food & Drug L.J. 537 , 546 (1997) ("To date, the Board has proposed dozens of synthetics for inclusion on the National List.").

[73] 7 C.F.R. § 205.670(a) ("All agricultural products that are to be sold, labeled, or represented as '100 percent organic,' 'organic,' or 'made with organic (specified ingredients or food group(s))' must be made accessible by certified organic production or handling operations for examination by the Administrator, the applicable State organic program's governing State official, or the certifying agent.").

[74] 7 C.F.R. § 205.671 ("When residue testing detects prohibited substances at levels that are greater than 5 percent of the Environmental Protection Agency's tolerance for the specific residue detected or unavoidable residual environmental contamination, the agricultural product must not be sold, labeled, or represented as organically produced.").

Administration.[75] Only if the level of residue exceeds the FDA tolerance level-- the same tolerance level imposed on conventional foods-- must the agent report the test results to the FDA.[76]

Despite the fairly extensive list of exceptions contained in the National List and the fact that tolerance levels for post production inspection of organics are no different than those for conventional foods, organic food producers do use a substantially smaller volume of synthetic pesticides and other synthetic substances than conventional food producers. The three active ingredients most commonly found in synthetic pesticides used in conventional farming are glyphosate, atrazine, and metam sodium,[77] all of which are not permitted in organic farming practices under the NOP.[78] This brings us to the second major question to be answered in this section: to what extent does the fact that organic farmers may use only a restricted set of

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[75] The regulations containing the tolerance levels set by the Food and Drug Administration may be found at 40 C.F.R. § 180.1 *et seq*.

[76] 7 C.F.R. § 205.670(e) ("If test results indicate a specific agricultural product contains pesticide residues or environmental contaminants that exceed the Food and Drug Administration's or the Environmental Protection Agency's regulatory tolerances, the certifying agent must promptly report such data to the Federal health agency whose regulatory tolerance or action level has been exceeded.")

[77] Timothy Kiely, David Donaldson, & Arthur Grube, *Pesticides Industry Sales and Usage*, Biological and Economic Analysis Division, Office of Pesticide Programs, U.S. Environmental Protection Agency, May 2004, pg. 16 Table 3.6.

[78] *See* 7 C.F.R. §§ 205.601 & 205.603 (2000) (glypohsate, atrazine and metam sodium not included in the National List of synthetic substances that may be used in organic farming).

synthetic pesticides translate into lower pesticide residues for organic foods when those foods reach the supermarket shelves?

b. Pesticide Residues on Organic vs. Conventional Produce

Organic produce does tend to have fewer pesticide residues than conventional produce, although most organic produce does contain some pesticide residue. One article examined data compiled from three sources (the USDA Pesticide Data Program, California Department of Pesticide Regulation, and Consumers Union), finding that roughly 75% of conventionally grown produced tested positive for pesticide residues, as opposed to 25% for organic produce.[79] The study also found that organically grown foods were less likely to test positive for residues of more than one pesticide.[80] It should be noted that these data are averages across large sample sizes of organic and traditionally-grown produce. The level of pesticide residues on organic produce varies greatly, and for any given comparison of an organic product versus an inorganic product, the organically grown product may in fact contain higher levels of pesticide residue. In fact, studies have found many such instances.[81]

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[79] Brian P. Baker et al., *Pesticide Residues in Conventional, IPM-Grown and Organic Foods: Insights from Three U.S. Data Sets*, Food Additives and Contaminants, Vol. 19 No. 5, 427-446 (May 2002).
[80] *Id.*
[81] *Id.* at 430.

The presence of pesticide residues on some organic food products is explained in part by the fact that the National List allows the list of some synthetic substances in organic production. Another primary cause is pesticide drift. Organic crops are often grown in fields adjacent to fields in which conventional crops are grown. Some of the pesticides applied to conventional fields drift on to crops growing in adjacent organic fields.[82]

The present regulatory scheme has led to a world in which produce that has been certified "organic" by USDA is significantly less likely to contain pesticide residues than conventionally grown produce. However, a significant proportion of organic produce does contain detectable levels of pesticide residue: namely, around one quarter. Consumers who purchase organic foods because they believe organics contain *absolutely no* pesticide residues are not getting their money's worth.

Furthermore, even those consumers who would still pay a premium in order to enjoy the relative decrease in the frequency and amount of pesticide exposure are willing to do so only because they believe that chronic exposure to synthetic pesticides represents a significant health risk. This brings us to the third question in this section: to what extent do pesticide residues on food present a danger to human health?

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[82] *See* David Pimentel & Lois Levitan, *Pesticides: Amounts Applied and Amounts Reaching Pests*, 36 BioScience 86, 86-91 (Feb. 1996) (describing in detail the phenomenon of pesticide drift in American agriculture and its effect on the environment).

c. Scientific evidence on the health effects of pesticide residues.

The term "synthetic" has a certain amount of scare-value, but the term means simply, "man-made."[83] In the context of chemistry, a "synthetic" chemical is one that does not occur in the natural world, but is instead produced through a series of chemical reactions designed and controlled by humans. There is nothing inherently dangerous about synthetic substances, just as there is nothing inherently safe about chemicals that occur naturally in food.[84] Humans regularly ingest a wide array of synthetically produced substances, none of which have produced adverse health consequences, and some of which are indeed essential to health and good hygiene. Examples include toothpaste, Tylenol, vitamin supplements, and most antibiotics and medicines. Conversely, many substances that occur naturally in food are known to produce adverse health consequences. The most obvious examples are biological pathogens such as E. coli and salmonella, which may occur in a wide variety of foods. Other examples are trace amounts of cyanide present in almonds[85] and mercury found in tuna.[86]

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[83] WordNetWeb, definition of "synthetic", *available at* http://wordnetweb.princeton.edu/perl/webwn?s=synthetic

[84] Joseph D. Rosen, *Much Ado About Alar*, 4 Issues in Sci. & Tech. 85, 89 (Spring 1990) ("After 40 years of widespread pesticide use, there is no evidence of increased cancer linked to pesticide residues on food. Many naturally occurring chemicals in food are carcinogenic and are found at levels 100 to 1,000 times higher than even the most heavily-applied synthetic chemicals.").

[85] *See* T.A. Shragg, T.E. Albertson & C.J. Fisher, Jr., *Cyanide Poisoning after Better Almond Ingestion*, 136 West J. Med. 65 (January 1982).

Nearly all substances, whether natural or synthetic, are toxic when ingested in sufficient quantity.[87] This fact is reflected in the general approach to regulation of pesticide residues in food. The regulation of pesticides implicates the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. § 136 *et seq*, and the Food Drug and Cosmetic Act (FD&C). [88] Administration of FIFRA and the FD&C Act is under the joint jurisdiction of the FDA and EPA.[89] EPA establishes tolerances for the presence of pesticides and recommends action levels under § 408 of the FD&C Act.[90] The FDA adopts action levels based on the recommendations of the EPA and is responsible for enforcement of those action levels.[91] Understanding this split in authority requires a brief explanation of "tolerances" and "action levels." Both tolerances and

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[86] *See* R.B. Voegborio, A.M. El-Methnani & M.Z. Abedin, *Mercury, Cadmium and Lead Content of Canned Tuna Fish*, 67 Food Chemistry 4 (December 1999).

[87] Lois Swirsky Gold, Thomas H. Slone, & Bruce N. Ames, *Pesticide Residues in Food and Cancer Risk: A Critical Analysis*, Handbook of Pesticide Toxicology, Second Edition (R. Krieger, ed.), Academic Press 799, 799 (2001) ("Whereas public perceptions tend to identify chemicals as being only synthetic and only synthetic chemicals as being toxic, every natural chemical is also toxic at some dose, and the vast proportion of chemicals to which humans are exposed are naturally occurring.").

[88] Peter Barton Hutt, Richard A. Merrill & Lewis A. Grossman, *Food and Drug Law: Cases and Materials*, 384 (Foundation Press 2007).

[89] *See* 36 Fed. Reg. 24234 (1971), 38 Fed. Reg. 24233 (1973) & 40 Fed. Reg. 25078 (describing the division of responsibility between FDA and EPA in the regulation of pesticide residues); *see also* Peter Barton Hutt, Richard A. Merrill & Lewis A. Grossman, *Food and Drug Law: Cases and Materials*, 384 (Foundation Press 2007).

[90] *See* 21 U.S.C. § 346(a); Hutt, *supra* at 384.

[91] *Id.*

action levels represent thresholds, usually expressed in parts per billion, for the presence of particular substances in foodstuffs.[92] Food substances that contain trace amounts of pesticide that fall below these thresholds are considered safe for human consumption. Conversely, producers whose food contains more than the established threshold level of pesticide residue risk being subject to an FDA enforcement action. The difference between tolerances and action levels is largely a matter of administrative law. "Tolerances" are established after full notice-and-comment procedures, and as such are binding on both the agencies and industry (subject to arbitrary and capricious review).[93] If the level of pesticide residue in a food exceeds the tolerance for that pesticide, the producer may fight a subsequent enforcement proceeding only by arguing that the residue level did not actually exceed the established tolerance. "Action levels," by contrast, are binding on neither the agency nor industry. They function more or less as warning signs to the industry, indicating that FDA is likely to bring an enforcement action should the level of pesticide residue on a particular food exceed the corresponding action level.[94] If the

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[92] *See Seefoood Safety*, Institute of Medicine Food and Nutrition Board, Farid E. Ahmed, ed., 289 (National Academy of Sciences 1991).

[93] *Id.*

[94] *Id.* at 290 ("Although FDA has established a formal mechanism for creating regulatory limits for unavoidable deleterious or poisonous contaminants, the agency also recognizes that it will maintain action levels. However, FDA has stressed that action levels are not binding on the agency or industry.") (*citing* 55 Fed. Reg. 20,782 (May 21, 1990)); *see also Community Nutrition Institute v. Young*, 818 F.2d 943, 949 (D.C. Cir. 1987) (holding that action levels may

level of pesticide residue in a food exceeds the action level for that pesticide, the producer may fight a subsequent enforcement proceeding not only by arguing that the residue level did not actually exceed the action level, but may also argue that the action level adopted by FDA is too stringent and does not strike the appropriate balance between protecting consumer health and allowing for the economical production of food.

The FD&C provides the general standard that guides both EPA and FDA in establishing action levels and tolerances with regard to pesticide residues in food. The Act provides that actions levels and tolerances must be set at a level 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 al other exposures for which there is reliable information."[95] When establishing, modifying, or revoking tolerances, EPA and FDA must consider a wide variety of factors, including the availability, validity and completeness of scientific studies that address the safety of the residue for human consumption; the nature of any potential toxic effect shown by such studies; available information about relevant consumption patterns of consumers;

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not be treated by FDA as substantive rules absent notice-and-comment procedures: "Our limited holding is that the current action levels are treated as substantive rules by FDA and, as such, can only be permitted if notice-and-comment procedures are employed. If it so chooses, FDA could proceed by action levels that are pure policy statements. But in order to do so, FDA must avoid giving action levels the kind of substantive significance that it now so plainly attaches to them.").

[95] 21 U.S.C. § 346a(b)(2).

information concerning the cumulative effects of residues and other substances that have a common toxicity mechanism; information regarding the aggregate exposure levels of consumers to the substance from other sources; and information regarding variability of sensitivities to the substance in major subgroups of consumers.[96]

FIFRA imposes more specific requirements concerning the extent of animal testing that must be performed before a new pesticide is approved for general use. Under FIFRA, new pesticides must undergo a battery of tests including acute and long-term oral, dermal, and inhalation toxicity tests on rats; eye irritation studies on rabbits; neurotoxicity studies; tumor studies on rats and mice; gene mutation tests; and general metabolism tests on various plants and animals.[97]

In sum, FIFRA and the FD&C Act together provide a rigorous regulatory scheme intended to insure that pesticide residues do not occur in foods sold in the United States at levels unsafe for human consumption. There is ample evidence to indicate that this scheme is working. As one survey of the scientific literature stated, "the levels of exposure to synthetic pollutants or pesticide residues are low and rarely seem toxicologically plausible as a causal factors when

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[96] 21 U.S.C. § 346a(b)(2)(D).

[97] Joseph D. Waldrum et al., *Pesticide Residues in Food: The Safety Issue* (March 1996), *available at* ipm.ncsu.edu/safety/factsheets/residues.pdf.

compared to the wide variety of naturally occurring chemicals to which all people are exposed."[98]

Although there have been studies linking the consumption of pesticides with the incidence of cancer,[99] most of these studies involve exposing rats to acute doses of the studied pesticide at levels much higher than a human would consume under current EPA/FDA tolerances.[100] As such their relevance to the question of the risks of pesticide residues in the normal American diet is limited.

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[98] Lois Swirsky Gold, Thomas H. Slone, & Bruce N. Ames, *Pesticide Residues in Food and Cancer Risk: A Critical Analysis*, Handbook of Pesticide Toxicology, Second Edition (R. Krieger, ed.), Academic Press, pp. 799-843, 799 (2001); *see also* Carol S. Kramer, *Food Safety: The Consumer Side of the Environmental Issue*, 22 Southern Journal of Argic. Econ. No.1, 33 (1990) (stating that although consumers consistently rank pesticide residues near the top of their concerns about food safety, most experts in the filed agree that "pesticide residues are generally viewed as presenting negligible risks to the food-consuming public in the United States when the products are used legally according to the label instructions.").

[99] *See, e.g.* Jan Dich et al., *Pesticides and Cancer*, 8 J. Cancer Causes and Control No. 3 (May 1997); David Pimentel et al., *Environmental and Economic Costs of Pesticide Use*, 42 BioScience No. 10, pp. 750-760 (Nov. 1992)

[100] Lois Swirsky Gold, Thomas H. Slone, & Bruce N. Ames, *Pesticide Residues in Food and Cancer Risk: A Critical Analysis*, Handbook of Pesticide Toxicology, Second Edition (R. Krieger, ed.), Academic Press, pp. 799-843, 799-800 (2001) ("[E]pidemiological studies do not support the idea that synthetic pesticide residues are important for human cancer. . . [P]ublic policy with respect to pesticide has relied on the results of high-dose, rodent cancer tests as the major source of information for assessing potential cancer risks to humans."); *see also* Lean Ritter, Exposure *to Pesticides and Cancer*, 80 Cancer No. 10, pp. 2019-2033, 2019 (November 15, 1997) (report on panel discussion) ("The Panel concluded that it was not aware of any

In addition, in any evaluation of the health consequences of pesticide residues on foods, it is important to compare the health risks associated with synthetic pesticides against the proportionally much greater health risks posed by other natural substances that are ubiquitous in all foods, both organic and conventional. Most plants naturally produce chemicals intended to deter insects from eating the plant. Many of these natural pesticides are known to have carcinogenic effects on rodents when ingested in sufficiently high doses, just as synthetic pesticides do.[101] Natural pesticides are present in food, both organic and conventional, in much greater concentrations than synthetic pesticides.[102] To the extent that carcinogenic effects at large doses for rodents translate into a health risk for humans who ingest minute residues of the same substance on a daily basis, the marginal cost associated with a slightly larger risk of exposure to pesticide residues in conventional as opposed to organic foods is dwarfed by the much larger effect of natural pesticides present in both conventional and organic foods.

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definitive evidence to suggest that synthetic pesticides contribute significantly to overall cancer mortality.").

[101] Gold, *supra* at 801 ("It is probable that almost every fruit and vegetable in the supermarket contains natural pesticides that are rodent carcinogens. Even though only a tiny proportion of natural pesticides have been tested for carcinogenicity, 37 of 71 that have been tested are rodent carcinogens.").

[102] *Id.* at 800-801 ("Concentrations of natural pesticides in plants are usually found at parts per thousand or million rather than parts per billion, which is the usual concentration of synthetic pesticide residues.").

d. Unique health risks presented by organics

Even if consumers gain some minimal benefit from the marginally smaller average amount of pesticides found in organic foods, there are other health risks associated with organic produce that aren't necessarily present in traditionally grown produce. These risks must be weighed against whatever benefit is gained from a marginal decrease in pesticide exposure if we are to fairly evaluate the net effect that organics have on consumer health.

First, the NOP prohibits producers from using irradiation on organically produced foods.[103] Irradiation is an increasingly popular technique used to improve food safety and extend shelf-life.[104] Produce is exposed to low levels of radiation, which prevents potentially harmful bacteria and other microorganisms from reproducing or growing on the treated produce.[105]

Second, because the use of synthetic fertilizers is partially restricted, organic farmers rely more heavily on natural fertilizers than do conventional farmers. In practical terms, this means that organic farmers use more manure on their fields. Because pathogens like salmonella and E. coli thrive on manure, the greater use of manure in organic farming suggests that organic

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[103] 7 C.F.R. § 205.105(f).

[104] Xuetong Fan, Brendan A. Niemira, & Anuradha Prakash, *Irradiation of Fresh Fruits and Vegetables*, Food Technology, March 1, 2008, 36-43.

[105] *Id.*

produce might be more likely to carry these pathogens, even before irradiation is taken into account. A six-year-old study published in the Journal of Food Protection suggests that organic produce is indeed more likely to carry E. coli than conventional produce, although the results are not conclusive.[106] The study found that 9.7% of organically grown produce tested positive for E. coli, as compared to 1.6% in conventional produce.[107] However, the percentage of produce testing positive for E. coli fell to 4.3% when the authors restricted their sample size to organic foods that had been *certified* organic under the USDA National Organic Program standards.[108] Although this represents a nearly three-fold difference in the risk for E. coli contamination between conventional and *certified* organically grown produce, because of the relatively small sample size used in the study, the authors caution that this difference in risk is not statistically significant.[109] The authors conclude that "the observation that the prevalence of *E. coli* was significantly higher in organic produce supports the idea that organic produce is more susceptible

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[106] *See* Mukherjee et al., *Preharvest Evaluation of Coliforms, Eschericia coli, Salmonella, and Escherichia coli in Organic and Conventional Produce Grown by Minnesota Farmers*, 67 Journal of Food Protection No.5, 894-900 (2004).
[107] *Id.* at 894.
[108] *Id.* at 898.
[109] *Id.*

to fecal contamination."[110] The authors suggest that further studies are needed to confirm the correlation.[111]

Taken together, the ban on irradiation and greater use of manure as fertilizer mean that organic foods may present a higher risk of exposure to biological pathogens such as E. Coli and Salmonella. E. coli and salmonella represent a serious health risk in the United States. From 1982 to 2002, there were 350 separate outbreaks of E. coli contamination in the United States, resulting in forty deaths.[112] Experts estimate that contaminated fresh produce is responsible for approximately 9% of all food-borne pathogen outbreaks in the United States-- a category that includes E. coli and salmonella outbreaks.[113]

In sum, the evidence suggests that consumers are not getting what they pay for when they purchase organics in order to ingest fewer pesticide residues. Organics contain fewer, not zero, pesticide residues, and this result holds only in the aggregate; that is, any particular article of organic produce may in fact contain more pesticide residues than its conventional cousin in the adjacent supermarket display. A comprehensive regulatory scheme administered by the FDA and EPA regulates pesticide residues and protects consumer safety for both organics and

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[110] *Id.* at 900.
[111] *Id.*
[112] Josefa M. Rangel et al., *Epidemilogy o E. Coli Outbreaks, United States, 1982-2002*, 11 Emerging Infectious Diseases No. 4, pp. 603-609 (April 2005)
[113] Mukherjee, *supra* n. 105, at 894-95.

conventional foods, and there is no convincing scientific evidence to indicate that the extra level of regulation imposed by the National Organic Program results in a health benefit to consumers who buy organic. Finally, any health benefit caused by the marginally reduced exposure to synthetic pesticides must be compared against both the ubiquity of natural pesticides in all foods and the possibility that organic foods are more likely to transmit biological pathogens including E. coli and salmonella.

2. Nutritional Content

Studies on the nutritional content of organic versus conventional foods have reached a variety of sometimes inconsistent conclusions, although the bulk have concluded either that there is no statistically significant difference in nutritional content, or that organics contain higher levels of some nutrients while conventional foods have the edge in others.

A few representative examples will give a sense of the degree of variation in conclusions reached by studies on the topic. One study found that while organics contain significantly more vitamin C, iron, magnesium and phosphorus, organics also contain less protein, nitrates, and lower amounts of nutritional heavy metals than conventional crops.[114] Another study added calcium and potassium to the positive side of the list, but confirmed that organics had lower

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[114] V. Worthington, *Nutritional Quality of Organic Versus Conventional Fruits, Vegetables and Grains*, 7 J. Alt. Complem. Med. 161, 161-173 (2001).

amounts of protein and nitrates.[115] A third found no statistically significant different in vitamin content, mineral content, or heavy metals, but did confirm the lower amount of protein in organic crops.[116] All studies on the topic have found a wide degree of variation in nutritional content of produce, both conventional and organic. That is, any particular article of produce, organic or conventional, may contain a much larger or smaller amount of a particular nutrient in question than a similar article sitting next to it in the supermarket.[117] This is not surprising given the number of unpredictable factors involved in farming. Any correlation between organic production methods and nutritional content speaks only to average across a wide sample of produce.

Because of the wide variation in results found by particular studies, the most useful data may be found in reviews that seek to compile results across many studies. A recent article in *The American Journal of Clinical Nutrition* presented a systematic review of published articles on the

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[115] E. Rembialkowska, *Organic Farming as a System to Provide Better Vegetable Quality*, 604 Acta Hort. 473, 473-479 (2003).

[116] F. Magkos et al., *Organic Food: Nutritious Food or Food for Thought? A Review of the Evidence*, 54 Intl. J. Food Sci. Nutri. 357, 357-371 (2003).

[117] *See, e.g.* Virginia Worthington, *Nutritional Quality of Organic Versus Conventional Fruits, Vegetables and Grains*, 7 J. Alt. Complem. Med. 161, 166 (2001) (showing vitamin C content in particular articles of organic produce as ranging from one half to five times that of the average for conventional produce; similarly large variability is shown for iron, magnesium, phosphorus and nitrates).

topic of nutritional content in nutritional foods.[118] The authors searched for every English-language article or study published over the last 50 years that compared the nutritional content of organic versus inorganic foods. After excluding studies that were not peer-reviewed, had no statistically significant data, or suffered from one of several other defects, the authors arrived at a pool of 55 studies.[119] After compiling the data from the selected studies, the authors found that organically produced crops had a slightly higher phosphorus content (8.1% over conventional crops) and higher titratable acidity (6.8% over conventional crops).[120] Conversely, conventional crops had slightly higher levels of nitrogen (6.7% over organic crops).[121] The review found no statistically significant different in Vitamin C, magnesium, calcium, potassium, zinc, or copper.[122]

Even if we consider only studies that do find some statistically significant difference in the levels of a particular nutrient between organics and conventional produce, the observed differences must be compared against the total amount of the nutrient present in both the conventional and organic versions of the food. Whatever marginal nutritional benefit exists from

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[118] Alan D. Dangour et al., *Nutritional Quality of Organic Foods: a Systematic Review*, 90 Am. J. Clin. Nutr. 680, 680-85 (2009).
[119] *See id.* at 683 (flowchart explaining how many studies were excluded and why).
[120] *Id.* at 685.
[121] *Id.*
[122] *Id.*

eating an organic apple over a conventional one would be dwarfed by the nutritional benefit of taking one more bite out of another conventional apple.[123] In a world where the nutritional benefit of eating an all-organic diet is vastly outweighed by the benefit of eating a single extra serving of conventional vegetables per day, it appears that consumers are not getting their money worth when they pay a substantial premium in order to enjoy the "enhanced nutrition" provided by organic foods.

3. Taste

A review of scientific studies examining claims that organic foods taste better than conventional foods yields an overall picture similar to that found on the nutrition question: numerous studies have reached conflicting results, and none have found more than a slight benefit in taste for organic foods.[124]

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[123] *See* Gene E. Lester, *Organic Versus Conventionally Grown Produce: Quality Differences, and Guidelines for Comparison Studies*, 41 Hort. Sci. 296, 296 (2006) ("[E]ven when differences between the content of certain nutrients are statistically significant, they are only of minor nutritional importance."); V. Worthington, *Nutritional Quality of Organic Versus Conventional Fruits, Vegetables and Grains*, 7 J. Alt. Complem. Med. 161, 166 (2001) (finding average nutrient differences in the range of 10 to 30%); Dangour et al, *supra* (difference in nutritional content all recorded in single digit percentages).

[124] Diane Bourn & John Prescott, *A Comparison of the Nutritional Value, Sensory Qualities, and Food Safety of Organically and Conventionally Produced Foods*, 42 Critical Reviews in Food Science and Nutrition No. 1, pp. 1-34, 1 (January 2002) ("While there are reports indicating that organic and conventional fruits and vegetables may differ on a variety of sensory qualities, the

Even if there is a marginal benefit in taste for organic produce, the taste benefit is most likely caused by factors not directly related to the conditions producers must meet in order to acquire organic certification. Any enhanced taste in organic produce is most likely caused by lower crop yields in organic fields, which in turn yield higher nutrient content per article crop.[125] Relatively lower crop yields occur in organic fields because the use of synthetic materials in conventional farming allows for higher crop yields in conventional fields. There is no necessary relationship between the certification requirements imposed by the NOP and low crop yields. Farmers could obtain the same low crop yields using conventional growing methods by simply planting fewer crops per field, thus capturing whatever marginal taste benefit exists for organics without incurring the extra costs associated with full-blown organic production methods.

4. Impact on the Environment

As discussed above, organic production techniques do use a smaller volume and different types of synthetic pesticides than conventional food production. The National Organic Program

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findings are inconsistent."); *see also* U. Kopke, *Organic Foods: Do They Have a Role?*, published in: Diet Diversification and Health Promotion, ed. Elmadfa, I., pp. 62-72, 65 (Karger 2005) (noting that while some studies had found slight benefits in taste for some types of organic produce, when all studies on the topic are considered, "no clear trend can be detected concerning differences in organoleptic properties between organically and conventionally grown vegetables.").

[125] Richard C. Theuer, *Do Organic Fruits and Vegetables Taste Better than Conventional Produce?*

imposes threshold for environmentally harmful pesticides that is 5% of the tolerance level for conventional foods established by the Environmental Protection Agency.[126] In contrast to the data concerning the effects of pesticide residue on human health, most studies agree that pesticide runoff does have measurable adverse effects for the environment.[127] The phenomenon of pesticide runoff is irrelevant to the discussion of the environmental (as opposed to human health) impacts of synthetic pesticide use, because the fact that some pesticides may drift on to organic fields from conventional fields does not change the fact that the presence of the organic field equates to a reduced overall use of pesticides per unit of food produced.

However, the environmental benefits stemming from the reduced use of pesticides in organic agriculture must be weighed against the significant environmental costs associated with organic production methods. Organic production techniques often require much greater land use and expenditure of energy per of food produced. For instance, the production of organic milk requires 80% more land and produces nearly double the amount of substances that might lead to

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[126] 7 C.F.R. § 205.671 ("When residue testing detects prohibited substances at levels that are greater than 5 percent of the Environmental Protection Agency's tolerance for the specific residue detected or unavoidable residual environmental contamination, the agricultural product must not be sold, labeled, or represented as organically produced.").

[127] *See, e.g.* Hayo van der Werf, *Assessing the Impact of Pesticides on the Environment*, 60 Agri. Ecosystems & Environment, pp. 81-96 (December 1996); Pimentel et al., *Environmental and Economic Impacts of Reducing U.S. Agricultural Pesticide Use*, published in: The Pesticide Question, ed. David Pimentel & Hugh Lehman (Springer 1993).

increased soil acidity and the pollution of water with excess nutrients.[128] Similarly, organic tomatoes require more than six times as much land and nearly twice the energy compared to their conventional counterparts.[129] A recent study funded by the British government concluded that environment impact of organics must be evaluated on a food-by-food basis: for some foodstuffs, the decreased use of pesticides in organic foods has a strong enough effect that the purchase of organics represents a net environmental gain; while for other foodstuffs, the increased land and energy demands associated with organic production mean that conventional foods are the more environmentally friendly choice.[130] The report concludes "[t]here is certainly insufficient evidence available to state that organic agriculture overall would have less of an environmental impact than conventional agriculture."[131]

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[128] Cahal Milmo, *Organic Farming "No Better for the Environment"*, The Independent, Feb. 19, 2007, *available at* http://www.independent.co.uk/environment/green-living/organic-farming-no-better-for-the-environment-436949.html

[129] *Id.*

[130] *See The Environmental Impact of Food Production and Consumption*, Department for Environment, Farming and Rural Affairs [DEFRA], project director Ken Green (December 2006) *see also id.* (*quoting* Ken Green, project director and co-author of the DEFRA report: "You cannot say that all organic food is better for the environment than all food grown conventionally. If you look carefully at the amount of energy required to produce these foods you get a complicated picture. In some cases, the carbon footprint for organics is larger.").

[131] *Environmental Impact*, *supra,* at 1.

The overall impact of organic production on the environment is therefore unclear, and must be evaluated on a food-by-food basis.

5. Avoidance of Genetically Modified Foods

The NOP prohibits the presence of any genetically modified foods for all three levels of organic certification. The issues of safety, ethics, and economics surrounding the use of genetically foods have engendered considerable debate, and lie outside the scope of this paper. For purposes of this paper it is sufficient to note that conventional foods may also be produced using non-GMO techniques. If the federal government wished to preserve the ability of consumers to pay a premium for non-GMO foods, this result could be accomplished simply by creating a regulatory and labeling scheme that focused on genetic modification of foodstuffs.

V. Conclusion

This paper has sought to compare consumer motivations in purchasing organic foods against the regulatory standards for organic certification. The available evidence indicates that the organic certification standards do a poor job of ensuring the presence of the attributes that motivate consumers who purchase organic foods. These results suggest that there is a fundamental mismatch between consumer beliefs regarding what "organic" means and the meaning of "organic" as defined by the USDA standards.