

# Sanitary Homesteads and Maternal Responsibility

## Gendered Authorities Over Environmental Exposure to Pesticides in Indiana Agriculture

ELIZABETH GRENNAN BROWNING

**ABSTRACT:** Rural Hoosier homemakers have long negotiated the tensions of competing priorities and demands on their farms: clean and pure households, robust and profitable fields, and the health of their families. Agricultural experts have stressed the benefits of using pesticides to help achieve all three of these aspects of farm life, while public health advocates have warned of the potentially dire health consequences of large-scale, long-term pesticide use—particularly for children. This article analyzes gendered perceptions of risk-assessment regarding chronic exposure to pesticide residues from the turn of the twentieth century to the present day in Indiana.

**KEYWORDS:** Environmental history, agricultural history, history of gender, history of extension services, Purdue University, Purdue University Department of Entomology,

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Indiana Cooperative Extension Service, farming, pesticides, pesticide exposure, chlorpyrifos, Dursban, Paris green, Dow AgroSciences, Corteva Agriscience, Rachel Carson, *Silent Spring*, Earl Butz, Environmental Protection Agency (EPA), John V. Osmun, Scott Pruitt, climate change.

In November 1998, the *New York Times* reported that New York City appeared “to use more pesticides to kill its rats, roaches and other urban pests than the state’s major agricultural counties use to protect their apples, corn and potatoes from bores and bugs.” According to data collected by the state and analyzed by New York Public Interest Research Group and Environmental Advocates the year prior, ninety percent of the city’s pesticide usage consisted of neurotoxic insecticides which endangered infants’ and young children’s neurodevelopment. Of particular concern was chlorpyrifos—a broad-spectrum organophosphate found to be the most popular ingredient in home and lawn insecticides, and the main ingredient in many agricultural pesticides. Both pesticide defenders and opponents questioned the study’s data, noting that agricultural usage had been “likely understated” thanks to the efforts of pesticide industry executives to protect agricultural applicators from disclosing this information.<sup>1</sup> Setting aside the transparency of reported pesticide usage, the *Times*’s counterintuitive headline highlighted clear concerns about the porous boundaries between pesticides and human bodies, and the ways in which pesticides’ universal reach had collapsed the divide between city and countryside.

Debates about the report also flagged gendered concerns about the unique threats that pesticide exposure presented for youth. Children were exposed to pesticides in all aspects of their lives—from residues on their food to pest control measures within their homes, schools, and playgrounds. Walter Schroeder, executive director of New York’s Professional Applicators Coalition, slammed environmental advocates for their skepticism about insecticides. Drawing from his own experiences as an exterminator, he argued that damage caused by pests was far more serious than that caused by judicious pesticide use: “I’ve been in circumstances where I’ve cried. I’ve seen cockroaches in a crib.” At the other end of the spectrum, Dr. Marion

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<sup>1</sup> Douglas Martin, “City Said to Use More Pesticides Than Farm Counties,” *New York Times*, November 19, 1998, sec. B, p. 8. See also David Donaldson, Timothy Kiely, and Arthur Grube, “Pesticide Industry Sales and Usage: 1998 and 1999 Market Estimates,” Environmental Protection Agency Office of Prevention, Pesticides, and Toxic Substances, August 2002, 14–16; Carol M. Browner, “Dursban Announcement,” June 8, 2000, <https://archive.epa.gov/epa/aboutepa/dursban-announcement.html>.

Moss of the Pesticide Educator Center noted how children's health suffered when people relied on neurotoxic chemicals to treat roach-infested apartments, recommending instead the use of nontoxic poisons, traps, and "scrupulous housecleaning."<sup>2</sup> The domestic images of childrearing and housekeeping at the center of this discussion are indicative of the ways gendered understandings of pesticides' safety and efficacy played out in the regulatory arena and the popular imagination.<sup>3</sup>

While New York City was an important site in the developing controversy that linked pesticides, environmental health, and reproductive labor, Indiana held an equally key place. The broader national history of pesticide use, and the reproductive politics behind Americans' understandings of their health effects, is a story with a uniquely Hoosier inflection. Dr. Virginia Rauh's focus on the popular pesticide chlorpyrifos revealed Indiana's central role in pesticide research, production, and usage. Over the twentieth century, Indiana became the hub of major agrichemical producers, including Dow AgroSciences (now a subsidiary of Corteva Agriscience), the nation's leading producer of chlorpyrifos. Purdue University has occupied a prominent position in shaping the national landscape of pesticide research and regulatory practices. Purdue's technocratic expertise in agriculture and entomology, and the agrichemical industry's product development were married through the active role of Indiana's Cooperative Extension Service. Housed at the Purdue College of Agriculture, the Extension Service was a direct conduit between research laboratories (both academic and industrial) and Hoosier farmsteads. This applied research in pesticide usage in Indiana influenced national policy through the work of entomologist and pest control expert John V. Osmun—the third chair of Purdue's Department of Entomology, from 1956 to 1972, who joined the Environmental Protection Agency as its first director of the Office of Pesticide Programs in 1972. During his time

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<sup>2</sup> Douglas, "City Said to Use More Pesticides."

<sup>3</sup> The long-term impacts of chlorpyrifos exposure for children have been documented in longitudinal birth cohort studies by neuro-epidemiologists, led by Dr. Virginia Rauh, Deputy Director of Columbia University's Center for Children's Environmental Health. See Virginia Rauh et al., "Seven-Year Neurodevelopmental Scores and Prenatal Exposure to Chlorpyrifos, a Common Agricultural Pesticide," *Environmental Health Perspectives* 119, no. 8 (August 2011), 1196–1201; Rauh et al., "Impact of Prenatal Chlorpyrifos Exposure on Neurodevelopment in the First 3 Years of Life Among Inner-City Children," *Pediatrics* 118, no. 6 (December 2006), 1845–59; Rauh et al., "Brain Anomalies in Children Exposed Prenatally to a Common Organophosphate Pesticide," *Proceedings of the National Academy of Sciences of the United States of America* 109, no. 20 (May 15, 2012), 7871–76. See also Devra Davis and A. K. Ahmed, "Exposures from Indoor Spraying of Chlorpyrifos Pose Greater Health Risks to Children Than Currently Estimated," *Environmental Health Perspectives* 106, no. 6 (1998), 299–301.

at EPA, Osmun established an influential pesticide applicator training and certification model for state extension programs. He returned to Indiana in 1975 to lead the Purdue Extension Pesticide Programs, which continue to administer the state's applicator training curriculum.

If the technocratic expertise represented by Purdue Extension and Dow AgroSciences are critical to explaining Indiana's dominant role in guiding national pest control, these institutions cannot be understood without examining how they were in conversation with rural Hoosier homemakers, who considered both the virtues and dangers of pesticides as they worked to create healthy family environments while also ensuring their farms' economic productivity. This article recasts the historical narrative of pesticides' cultural reception and political regulation to situate such mothers, rather than scientists, as the drivers (though not necessarily the beneficiaries) of pest control measures—from the late nineteenth-century fear of disease-transmitting pests, through a post-*Silent Spring* anxiety over toxic pesticides, and finally into an anti-regulatory backlash in the 1970s and 1980s that signaled Hoosier farm wives' vital influence on national agricultural pesticide policymaking. Although the modern petrochemical industry took off in the wake of World War II, the political and regulatory systems that allowed synthetic chemicals to permeate all aspects of our lives began to take shape in the late nineteenth century. Arsenic-based pesticides rose in popularity during this period when scientists did not understand risks stemming from chronic exposure. As toxicologists began to devise ways to detect and measure these risks, the pesticide industry retained a firm grip—one that it would not easily relinquish—on agricultural practices.<sup>4</sup> Contemporary social and cultural perceptions of agrichemicals have deeper histories, as well. Understanding public responses to political pesticide regulation requires piecing together the evolution of gendered perceptions of the risk of long-term, chronic pesticide exposures.

The post-World War II proliferation of toxic chemicals, coupled with a surge of pro-business policies and gutting of environmental agencies under President Ronald Reagan in the early 1980s, created an environmental health crisis. These actions endangered citizens and drove them to manage their chemical exposures through "precautionary

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<sup>4</sup>Nancy Langston, "New Chemical Bodies: Synthetic Chemicals, Regulation, and Human Health," in *The Oxford Handbook of Environmental History*, ed. Andrew C. Isenberg (New York, 2014), 264.

consumption.”<sup>5</sup> If federal and state government agencies failed to apply the precautionary principle to pesticide regulation, it became the task of the consumer—particularly the maternal consumer—to read labels in order to circumvent the dangerous bioaccumulation of environmental chemicals in the human body. To restrict their children’s environmental exposure, homemakers began policing grocery purchases, cooking practices, and household management. The maternal body came to represent both a conduit for, and a bulwark against, children’s chemical exposure—first in the environment of the womb, later through breastfeeding’s effects on infants’ microbiomes, and ultimately via mothers’ control over young children’s diets.

Pesticides came to occupy a paradoxical role on Indiana’s family farms, as Purdue-affiliated agricultural experts balanced their advocacy of the use of agrichemicals to boost agricultural productivity against concern for farm families’ health and safety; farm mothers receiving this guidance were most intimately tied to the conflicting priorities inherent in Extension’s recommendations.<sup>6</sup> It fell to Hoosier homemakers to navigate the tensions between, on one hand, their mandate to support the farm’s

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<sup>5</sup> For “precautionary consumption” and reproductive labor, see Norah MacKendrick, *Better Safe Than Sorry: How Consumers Navigate Exposure to Everyday Toxics* (Oakland, Calif., 2018), 22; MacKendrick and Kate Cairns, “The Polluted Child and Maternal Responsibility in the US Environmental Health Movement,” *Signs: Journal of Women in Culture and Society* 44, no. 2 (January 2019), 307–32; Dayna Nadine Scott, ed., *Our Chemical Selves: Gender, Toxics, and Environmental Health* (Vancouver, Can., 2015); MacKendrick, “More Work for Mother: Chemical Body Burdens as a Maternal Responsibility,” *Gender & Society* 28, no. 5 (October 2014), 705–28; MacKendrick, “Media Framing of Body Burdens: Precautionary Consumption and the Individualization of Risk,” *Sociological Inquiry* 80, no. 1 (February 2010), 126–49; MacKendrick and Lindsay M. Stevens, “Taking Back a Little Bit of Control: Managing the Contaminated Body Through Consumption,” *Sociological Forum* 31, no. 2 (June 2016), 310–29. In Indiana, see for example Hugo Ochoa-Acuña et al., “Drinking-Water Herbicide Exposure in Indiana and Prevalence of Small-for-Gestational-Age and Preterm Delivery,” *Environmental Health Perspectives* 117, no. 10 (2009), 1619–24; S. Parvez et al., “Glyphosate Exposure in Pregnancy and Shortened Gestational Length: A Prospective Indiana Birth Cohort Study,” *Environmental Health* 17, no. 1 (March 9, 2018), 367. For neoliberalism and environmentalism, see Becky Mansfield, ed., *Privatization: Property and the Remaking of Nature-Society Relations*, (Oxford, U.K., 2008); Nik Heynen, ed., *Neoliberal Environments: False Promises and Unnatural Consequences* (New York, 2007).

<sup>6</sup> For the early history of Indiana’s family farms, see Paul Salstrom, *From Pioneering to Persevering: Family Farming in Indiana to 1880* (West Lafayette, Ind., 2007). For the significance of the family farm in U.S. history and the Midwest, see Ronald Jager, *The Fate of Family Farming: Variations on an American Idea* (Hanover, N.H., 2004); Carrie A. Meyer, *Days on the Family Farm: From the Golden Age through the Great Depression* (Minneapolis, Minn., 2007); Mary C. Neth, “Gender and the Family Labor System: Defining Work in the Rural Midwest,” *Journal of Social History* 27, no. 3 (Spring 1994), 563–77; Neth, *Preserving the Family Farm: Women, Community and the Foundations of Agribusiness in the Midwest, 1900–1940* (Baltimore, Md., 1995).

economic wellbeing and, on the other, their efforts to prize cleanliness and purity in the home, the agricultural field, and their children's diets. Chemicals were ever-present: they were in the produce and livestock that farmers raised, consumed, and sold; they were also convenient solutions for eliminating unwanted creatures in their homes. If Hoosiers came to see pesticides as integral to securing the world's food supply and ensuring the family farm's economic viability, how did they square this belief with growing concerns about pesticides' health effects, especially for children? Through generations of homemaking and childcare, maternal figures on the farm became naturalized as stewards of pure, clean environments, though they never adopted a singular, cohesive stance toward the use of chemicals in pursuing this sanitary imperative.<sup>7</sup>

In nineteenth-century agricultural journals, as in Extension guides from recent years, it is the women of the farm who raised concerns or were presumed to care about both whether pesticides enter the body, and what effects toxins might have on their families. Despite our tendency to conceptualize environmental concern about pesticides as a late twentieth- and twenty-first-century issue, inorganic pest-control "poisons" (including lead and arsenic) worried homemakers and medical experts alike as long ago as the 1800s. Later, with the rising use of DDT as a pesticide across the United States after World War II, women acquired the image of military personnel, adopting wartime technology in a battle against household pests to protect their families from disease. In 1962, Rachel Carson called DDT's safety into question with her landmark book, *Silent Spring*, which documented DDT's damage to ecosystems and human health, and subsequently catalyzed a generation of environmental activism. After Carson's manifesto, many women began to shift their protective maternal gaze from disease-ridden pests toward the myriad chemicals found in insecticides. While increasingly reorienting their domestic defense duties to the task of shielding children from pesticide chemicals, farm women focused on chemical residues that remained on fresh produce or in processed foods.<sup>8</sup>

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<sup>7</sup> Gender history offers new ways to view the intersection of Indiana environmental history and agricultural history. See Nancy Gabin and Anita Morgan, "Taking Indiana Women's History into the Twenty-First Century," *Indiana Magazine of History* 112 (December 2016), 283–88; Gabin, "Fallow Yet Fertile: The Field of Indiana Women's History," *Indiana Magazine of History* 96 (September 2000), 213–49.

<sup>8</sup> Women's magazine advertisements and feature articles indicate this shift. See, for example, Ruth Brecher and Edward Brecher, "PESTICIDE DANGERS: THE FEARS, THE FACTS: Chemical Sprays Protect Our Crops from Insects but They Also Can Harm Birds, Animals and Human Beings.

However, a renewed push by the agrichemical industry, coupled with the profound influence of U.S. Secretary of Agriculture and Indiana native Earl Butz soon stirred a backlash among Purdue Extension affiliates and farm women alike against Carson's environmental-health focus, and upheld the presumption that pesticides were necessary for the survival of American agriculture, the family farm, and the world's food supply.

CLEAN, SAFE, PROFITABLE FARMS: MATERNAL RESPONSIBILITY AND ACUTE  
POISONING BEFORE *SILENT SPRING*

From the agricultural fields to their kitchens, farm matriarchs were charged with cultivating a clean, pure environment that would reflect in both their children's good health and their farms' profits. Cleanliness and purity were paramount in ensuring a wholesome and uncontaminated diet for their children, as well as in maintaining pest-free households and agricultural fields. Agricultural journals throughout the nineteenth and twentieth centuries touted cleanliness on the farm as essential to both a farm family's wellbeing and the farm's economic efficiency. As the editors of the *Farmers' Review* noted in 1893, "the clean farm is the most profitable farm." Hygienic practices ensured both productivity and good health, the article went on to argue: "The man that keeps stables, yards and ponds clean, will keep his animals in good condition." Equally important was farm wives' role in maintaining a sanitary household: "If filth, which is only dirt and other stuff out of place, is kept away, disease will certainly not find a ready entrance."<sup>9</sup>

As historian Mary C. Neth has shown, studying the connections between capitalist development and patriarchal family structures in midwestern agriculture reveals the dense social webs of the family farm. Although "family farm" implies a singular and unified unit, Neth writes, "the individualistic farmer is dependent on women and children, and the family is a relational institution whose members do not always have identical interests."<sup>10</sup> Farms and families became interconnected through social relationships of shared expertise, cultural values, and economic interest. And women were catalysts in stitching these economic and cultural webs

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Here Are Some Little-Known Facts Concerning the Much-Discussed Problem of What Should Be Done to Safeguard Our Harvest and Ourselves," *Redbook*, November 1962, pp. 70–71, 137–42.

<sup>9</sup> "Farm Sanitation," *Farmers' Review* 24, no. 38 (September 20, 1893), 594.

<sup>10</sup> Neth, *Preserving the Family Farm*, 2–3.

together. This work extended into a household's methods of pest control. A 1916 issue of *The Farmer's Wife*, the only national farm journal that targeted a rural female audience, commented that "the farmer's wife reading this article may reflect with pride that her house, at least is rat-free and rat-proof. But in these years of grace no woman liveth unto herself—she is a neighbor." The author encouraged women to expand their vision of pest control as a form of self-interested neighborliness. As women helped neighbors exterminate pests, they channeled their household responsibilities as stewards of cleanliness to their larger community.<sup>11</sup> In so doing, they exercised social and political power akin to urban women's "municipal housekeeping" practices, which saw women capitalizing on essentialized gender norms to assert control over such issues as garbage removal and water contamination.<sup>12</sup>

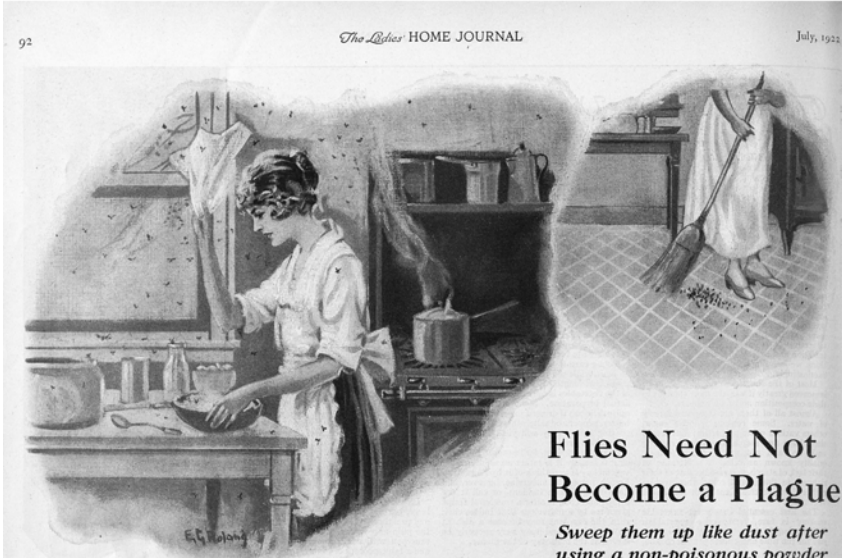
Agricultural journal commentators warned that a home troubled by pests signaled a lack of maternal care, and a deficiency in health, comfort, hygiene, and decency. "Today a good housekeeper feels disgraced if any insect or animal pest gets the better of her watchfulness," wrote a *Farmer's Wife* correspondent in 1916. To ensure the comprehensive elimination of pests, the writer continued, "the farmer out-of-doors and his wife within the home must co-operate in 'eternal vigilance.'" For the housewife's part, the overriding injunction for a pest-free farm was sanitation and persistence: "Sunlight, fresh air, order, plenty of soap and water, an intelligent use of traps, poisons and disinfectants *and* an unyielding determination not to be conquered—in the end these will bring victory."<sup>13</sup> When housewives brought insecticides inside the home in the late nineteenth century with the goal of protecting their children from disease-carrying pests, they often disregarded the potential dangers of the poisonous substances out of concern for the more immediate threat of diseases like diphtheria and typhoid. However, as awareness about accidental poisonings grew, mothers scrutinized their methods' safety. Asking "Is your baby worth saving?" one *Farmers' Review*

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<sup>11</sup> "Your Washington Library: Government Experts Tell You How to Rid the House and Barn of Pests," *Farmer's Wife: A Woman's Farm Journal* 18, no. 10 (March 1, 1916), 263. For communal approaches to pest control, see Dawn Day Biehler, *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats* (Seattle, Wash., 2013).

<sup>12</sup> Suellen M. Hoy, "Municipal Housekeeping: The Role of Women in Improving Urban Sanitation Practices, 1880–1917," in *Pollution and Reform in American Cities, 1870–1930*, ed. Martin V. Melosi (Austin, Tx., 1980), 173–98; Adam Rome, "Political Hermaphrodites: Gender and Environmental Reform in Progressive America," *Environmental History* 11, no. 3 (July 2006), 440–63.

<sup>13</sup> "Your Washington Library," *Farmer's Wife*, 263.



## Flies Need Not Become a Plague

*Sweep them up like dust after using a non-poisonous powder*

ARE YOU annoyed by flies even though your home is well-screened? Do you, too, appreciate the dangers of flies because they spread serious disease? Would you be done with sticky messes and dangerous poisons—ways of destroying flies which are old-fashioned, inefficient or dangerous? Try clean, non-poisonous, easy-to-use BLACK FLAG.

BLACK FLAG is a simple powder of vegetable origin. It is entirely non-poisonous to human beings and animals. But it is deadly to insects. A single teaspoonful of BLACK FLAG placed in a folded sheet of letter paper and blown (with one's breath) into the air of a room will kill all the flies in that room in twenty to thirty minutes. After the flies fall on the floor they may be swept up and burned. No dirt—no poison. The only other essential is that doors and windows be kept closed during the period of treatment. Or you can use BLACK FLAG in your kitchen after leaving it for the night. In the morning all the flies will be dead.

### Fleas easily killed

BLACK FLAG'S efficiency in killing insect vermin is proven by the ease with which it kills fleas. No insect is harder than the flea; none is less affected by common insecticides. But blow BLACK FLAG (with a powder gun) into the coat of a dog or a cat troubled by fleas and in seconds you can actually see the dead fleas drop off. Fleas annoy pets so greatly as to make them snappish and dangerous to children during

warm weather. Use BLACK FLAG and dogs and cats will be happy and good tempered. For fleas in houses, just scatter BLACK FLAG over and under rugs and matting. Repeat the application every few days until fleas disappear.

### Bedbugs dangerous

Probably you realize that recent medical investigation proves that bedbugs are one of the most dangerous insects in carrying disease. Typhus fever in Serbia was stamped out only when insect vermin was exterminated. Cleanliness is not a certain protection against bedbugs. They may be brought into the home on one's clothing; they may migrate from an adjoining house or apartment. BLACK FLAG kills bedbugs and also keeps them away. Bedbugs cannot live where beds are gone over once monthly with BLACK FLAG. Use a powder gun and blow the BLACK FLAG carefully into all cracks and crevices, over springs and tufting of mattresses. It will not injure fabrics.

### Why tolerate roaches?

Do you imagine roaches and waterbugs to be harmless? They, too, are disease and

bacteria carriers. And they leave a peculiarly nasty, sickening odor upon food which they have touched. BLACK FLAG kills them quickly and safely. Just scatter it about where roaches or waterbugs are seen. It is non-poisonous and there is no danger in using it around foods.

### Nothing like Black Flag

BLACK FLAG has been made for thirty years by secret processes known only to its makers. It has never been successfully imitated. Bugs do not eat it; they breathe it, and die! It is packed in sealed glass bottles because tests made by the U.S. Department of Agriculture prove that glass containers keep the powder fresh. Insecticides packed in "handy" pasteboard boxes are often worthless.

BLACK FLAG also is absolutely pure; note the phrase on the label: "Inert Ingredients—None." Any insecticide which admits a percentage of "Inert Ingredients" is NOT pure. Statement of the degree of purity must be placed on the label in compliance with the Food and Drugs Act.



### Kills Insects on Plants

Lack of success with plants is often due to insect pests so tiny that they can hardly be seen. Dust foliage with Black Flag while it is wet. This will kill insects. Dead insects and powder can be removed with clear water the following day. Black Flag is also effective for killing ants and is non-poisonous and safe to use around food stuffs.



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# BLACK FLAG

A pure, powerful powder deadly to flies, fleas, bedbugs, ants, roaches, waterbugs, moths, and lice on animals, birds or plants. Black Flag is non-poisonous to human beings and animals. Packed in sealed glass bottles that hold its strength for years. Look for the red-and-yellow wrapped glass bottle and the Black Flag trademark. Sold by drug, department, grocery and hardware stores, or sent direct-by-mail on receipt of price.

BLACK FLAG : : Baltimore, Md.

Black Flag pesticide advertisement, Ladies' Home Journal, July 1922. Advertisers emphasized the need for cleanliness in the homemaker's "war on insects."

contributor from 1917 noted the paradoxical dual dangers of flies and the popular insecticides that housewives used to battle them: “Flies and arsenical fly poisons are in the same dangerous class, so tolerate neither of them in your house nor in reach of your children.”<sup>14</sup>

Just as women were responsible for the domestic sphere’s safety from unwanted, disease-harboring pests, they also wielded responsibility for the safety of the food supply that entered their kitchens. In 1878, the *Indiana Farmer* published a circular from the Massachusetts Grange, congratulating farm families for being exempt from many food-related contamination problems because of the wholesomeness of their food sources. The circular encouraged agricultural families to continue their domestic production of products such as vinegar, pickles, “pure milk,” and “genuine cream,” and avoid store-bought, processed versions, which were often adulterated.<sup>15</sup> Rural women also took pride in the relative control they had over their families’ food sources as compared to their urban counterparts. One female contributor to a national farm journal claimed in 1915 that the “country housewife” was “fortunate because the bulk of her food supply is generally much superior in quality to the foodstuffs offered the city woman,” and, therefore, it was “not necessary for her to keep so close a watch on the food to see that it is not adulterated or artificially colored, since much of what is used in the country is raised at home, and the housewife herself puts up her own preserves and canned goods.”<sup>16</sup>

If farm publications granted rural mothers an advantage over urban mothers in safeguarding their children’s food supply, farm women were still held to exceptionally high standards. Criticizing farm mothers who packed their children’s lunchboxes with leftover breakfast or unhealthy options, one *Prairie Farmer* contributor from the University of Illinois lamented in 1919 the “lack of thought on the part of the mother.” Farm homemakers should monitor their children for malnutrition, the article went on to argue, both to improve their performance at school and to ensure that the child did not become “a fit subject for disease germs.” Healthy

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<sup>14</sup> “Are Babies Worth Saving?” *Farmers’ Review* 49, no. 15 (April 14, 1917), 418.

<sup>15</sup> “Public Caution,” *Indiana Farmer: A Weekly Journal of the Farm Home and Garden* 13, no. 29 (July 20, 1878), 7.

<sup>16</sup> Christine Frederick, “Take Care of the Ounces And the Pound and the Pennies Will Take Care of Themselves,” *Country Gentleman* 80, part 1 (February 20, 1915), 371. Rural women’s superior sense of food security in contrast to urban housewives continued during the World Wars and postwar years. See “Counting Our Blessings,” *Farm News of Carroll County*, March 26, 1943, p. 2.

bodies, nurtured by competent mothers, were necessary to defend against germs that manifested from unclean environments outside the purview of homemakers' control.<sup>17</sup>

Food preparation and sanitary measures were mainstays of home economics instruction, despite rural women's desire for access to more diverse cultural programming. Attending a conference put on by the Illinois State Horticultural Society, Nora Burt Dunlap (the wife of a wealthy fruit farmer and state senator from Savoy, Illinois) complained that the women participants' demand for classes in literature, music, and art overshadowed the practical need for studying housekeeping and food preparation. Dunlap claimed that women were only "worthy of the name of wife and mother" if they gained expertise in these more sensible subjects. "Would not the highest culture come to us," she argued, "if we started from the foundation of all that makes life and studied foods and the laws of our physical being, and so bring into existence healthy minds and bodies, from which could then be developed the highest form of culture?" She criticized farmers and their families for knowing so little about how the food they produced enriched human lives. According to Dunlap, farm wives in particular should take ownership over their children's nutrition. Comparing mothers' care for their children's diets to farmers' supervision over their crops and livestock, Dunlap advocated "scientific feeding," or striving for nutritional balance to ensure that the body did not become "diseased." Invoking farmers' roles as stewards of their crops, she argued that farm wives had a similar imperative to properly feed and care for their children.<sup>18</sup>

Hoosier farmwives' efforts to create hygienic homesteads and safeguard pure foods occasionally worked at cross-purposes. Cautionary tales published in late nineteenth-century farm journals were the most visible public record of the risks of pesticide use on the farm. Injuries and fatalities often occurred when children mistook pesticides for drinks or cooking ingredients. In June 1888, *Prairie Farmer* reported that a family in Elizaville, Indiana, was poisoned after drinking lemonade that a child had unintentionally tainted with Paris green (a copper acetoarsenite insecticide derived from an ingredient found in most green paints in the nineteenth

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<sup>17</sup> Mary Pack, "The Children's Lunch: An Appetizing Noon Meal Does Much to Keep Them Healthy," *Prairie Farmer* 91, no. 19 (September 20, 1919), 48.

<sup>18</sup> Mrs. H. M. Dunlap, "Better Foods and Better Methods in Our Homes," *Farmers' Review* 29, no. 2 (January 12, 1898), 30.

century). One child died as a result.<sup>19</sup> In September 1893, *Farmers' Review* reported that William Sager of Marion County lost all four of his children when the eldest accidentally added rat poison to a mixture of milk and bread that she had made as a snack for her siblings.<sup>20</sup>

Hoosier farm families and those who advised them deemed accidents resulting from pesticides that lay within reach of children to be more concerning than potential dangers from prolonged consumption of produce and processed foods tainted with pesticide residues. Women were more likely to flag these hazards as part of their responsibilities to keep young children safe on the farm. Mrs. R. W. wrote in 1921 in the *Indiana Farmer's Guide*, "On the farm, where insecticides and disinfectants are in frequent use," it was necessary to remain vigilant, and to keep them "under lock and key every moment they are not." During a recent move, she had been struck by how "shockingly careless" the previous tenant was with his chemical agents. Although her children were grown, Mrs. R. W. feared that if they had been any younger, they might have ingested the arsenic, formaldehyde, corrosive sublimate, carbonic acid, and Paris green found in the house. When it came to pesticides on the farm, she averred, "the greatest caution is none too great."<sup>21</sup>

Despite the regular reports of acute poisoning that circulated through Hoosier newspapers, the United States Department of Agriculture pledged that arsenical insecticides were harmless. The USDA issued a bulletin on fruit spraying in 1892, intending more to reassure consumers about the safety of insecticides than to instruct agriculturalists. The Secretary and Assistant Secretary of Agriculture emphasized, with a hint of exasperation, that inorganic pesticide residues were not jeopardizing public health: "The fact that the compounds as generally used are slightly poisonous in their character has led some persons to express apprehension lest their application should injure the fruit for consumption." Claiming that such

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<sup>19</sup> "The Week's News: Boiled Down for Busy People," *Prairie Farmer* 60, no. 26 (June 30, 1888), 423.

<sup>20</sup> "Poison should never be left within reach of children," *Farmers' Review* 24, no. 38 (September 20, 1893), 594.

<sup>21</sup> Mrs. R. W., "POISON!" *Indiana Farmer's Guide*, April 30, 1921, p. 15. See also "Don't Poison the Baby," *Wallace's Farmer* 42, no. 12 (March 23, 1917), 538; "Dangerous Fly Poison," *Wallace's Farmer* 41, no. 12 (March 24, 1916), 499; "Protect Children From Poisoning," *Wallace's Farmer* 59, no. 23 (November 10, 1934), 647; "WARNING AGAINST RAT BISKIT," *Wallace's Farmer* 30, no. 1 (January 6, 1905), 16; Essie M. Heyle, "House Insect Pests: 'Eternal Vigilance' Will Finally Banish The Most Persistent," *Farmer's Wife* 33, no. 1 (June 1, 1921), 480; Walter R. Ramsey, "When Accidents Happen," *Farmer's Wife* (May 1, 1938), 36.



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Hayes Hand Sprayer  
Hayes Triples Fruit-Fog Power Sprayer

**T**HOUSANDS of farmers and fruit growers are preparing now to rid their apples, pears, plums, peaches, citrus and other fruits of destructive San Jose Scale, Codling Moth, Scab, Blotch and other pests and diseases.

They are also preparing to rid their potatoes of destructive bugs, their hogs of torturing lice and their poultry of profit-stealing mites.

They know they cannot expect to make money so long as these ravenous, unseen pests are there. Government statistics and the terrible experiences of countless farmers and fruit growers positively *prove* this. Nature fines them heavily as sure as they try.

Send the coupon and learn how the Hayes System of Fruit-Fog spraying will turn your measly, sickly crops into mighty yields of clean, fine fruit. How it will bring almost unbelievable profits from every living thing on your place.

**HAYES PUMP & PLANTER CO., Dept. B, GALVA, ILLINOIS**

Hayes spraying is of fog-like, vapory fineness. It envelops everything like a mist, and has wonderful penetrating and adhering power.

That is why Hayes spraying kills, not only the *outside* pests but also the vicious *hidden* pests. It works its way into the microscopic niches, cracks and crevices, where no ordinary coarse spray can possibly reach.

This also accounts for the phenomenal success of Hayes Sprayers. They produce the most *thorough* form of spray known to science. Their use adds fortunes to farmers' and fruit growers' profits each year.

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Tell us what you want your sprayer to do, and we will tell you which of the Fifty Styles of Hayes Sprayers is best suited to your needs, and its price. We will also send the New Book of Hayes Sprayers and Valuable Spraying Guide **FREE**.

# HAYES

## FRUIT-FOG Sprayers

Hayes Pump & Planter Co., Dept. B, Galva, Ill.  
Please send **FREE** and without obligation, your Big New Sprayer Book and your Valuable Spraying Guide.

Number of trees \_\_\_\_\_ Average age \_\_\_\_\_  
 Other uses \_\_\_\_\_  
 Name \_\_\_\_\_  
 P. O. \_\_\_\_\_  
 State \_\_\_\_\_ R. F. D. \_\_\_\_\_

Hayes Fruit-Fog Sprayers advertisement, *Country Gentleman*, January 8, 1921. Equating pesticide use with farm profits, the Hayes Pump & Planter Co. appealed to farmers' economic sense. Use of pesticide spray promised "yields of clean, fine fruit." That Hayes touted the sprayers' ability to target microscopic pests in every crevice indicates the pervasive nature of the pesticide, and its wide-ranging impacts.

“apprehension has been shown over and over again to be ill founded,” the publication pleaded with both orchardists and consumers to recognize that “evil consequences” were utterly impossible when using the arsenical sprays.<sup>22</sup> The USDA’s late nineteenth-century approach to pesticide poisoning neglected to address concerns regarding slow arsenic poisoning over gradual, repeated exposure, which is parallel to the tendency of contemporary pesticide defenders to focus on acute poisoning over chronic chemical exposure. “The only danger” to arsenic compounds, the bulletin read, “lies in having the poison about a farm or plantation in bulk.” Fruit and vegetables treated with arsenic were harmless, the agency asserted, because consumers ingested only trace amounts of arsenic residue.<sup>23</sup>

Although early twentieth-century medical professionals were interested in the issue of chronic arsenicism, few agriculturalists consulted this literature. By prioritizing the threat of acute injury or death over potential long-term effects, agricultural experts assumed that chronic exposure to pesticide residues was harmless.<sup>24</sup> In 1883, the *American Agriculturalist* editor chastised farmers who hesitated to use Paris green on their crops. The editors urged these holdouts to be reasonable, stressing that the pesticide was “the most convenient and effectual [poison] for killing” agricultural pests; they vouched for the safety of Paris green “after using it for some years, and eating the cabbages thus raised.”<sup>25</sup> Indiana State Entomologist Benjamin Wallace Douglass admitted that the pesticide was a “violent poison,” but maintained that residues remaining on produce were not problematic because an individual “would have to eat an enormous quantity of fruit to get any effect from the arsenic.”<sup>26</sup>

As farm women sought both to preserve their family farm and protect their children’s wellbeing, they balanced the economic efficiencies of pesticide use in their surrounding fields (as well as in the more intimate spaces of the home) against their potential health hazards. Lead arsenate became

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<sup>22</sup> United States Department of Agriculture *Farmer’s Bulletin* 7, “Spraying Fruits for Insect Pests and Fungous Diseases: With a Special Consideration of the Subject in its Relation to the Public Health,” (Washington, D.C., 1892), 3.

<sup>23</sup> USDA *Farmer’s Bulletin* 7, “Spraying Fruits for Insect Pests,” 9.

<sup>24</sup> James C. Whorton, *Before Silent Spring: Pesticides and Public Health in Pre-DDT America* (Princeton, N.J., 1975), 34.

<sup>25</sup> “The Safety of Paris Green on Cabbages,” *American Agriculturalist* 42 (October 1883), 453.

<sup>26</sup> Benjamin W. Douglass, *First Annual Report of the State Entomologist of Indiana*, (Indianapolis, Ind., 1908), 32–33.

the most popular insecticide in the United States in the early 1900s, after its successful use against the gypsy moth in 1892 and the codling moth a few years later. Despite increased insect resistance, lead arsenate remained popular until the post-World War II rise of DDT for public use.<sup>27</sup> Douglass dispelled Hoosiers' concerns about the insecticide's effects on non-target species—and, by extension, young children—by countering claims from state beekeepers and the Audubon Society that lead arsenate had poisoned bees and killed birds that had eaten poisoned caterpillars. This could not be, he argued, because spraying never happened during full blossom when the bees were interested in the flowers, and “our feathered friends simply moved on to better hunting grounds.”<sup>28</sup> In technocratic reports by experts like Douglass, as in the articles that appeared in agricultural journals, male authors overwhelmingly lauded pesticides and minimized any hazards they presented to the environment, or the farm family.

With the rollout of the national Cooperative Extension Service established by the Smith-Lever Act of 1914, farm women demanded that funds benefit them by helping alleviate the drudgery of their labor and their social isolation. Experts presented sophisticated chemical insect control measures as a key part of the labor-saving technology that would increase farm income through higher quality crops. Chemical insecticides were also included in the suite of household management tools that might improve the household's quality of life and afford women more leisure time.<sup>29</sup> The Purdue Extension Annual Report from 1939 described the Entomology Department's work in training home demonstration agents “in the prevention and control of...clothes moths and carpet beetles, bed bugs, fleas, cockroaches, and houseflies.” Demonstration meetings in ten counties reached 4,000 women that year, with a focus on constructing fly traps and practicing moth control measures for closets and wardrobes. The 1939 State Fair Extension entomology exhibit, also aimed toward a female audience, featured household insect pest control.<sup>30</sup> Despite Extension's

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<sup>27</sup> Whorton, *Before Silent Spring*, 24.

<sup>28</sup> Douglass, *First Annual Report of the State Entomologist of Indiana*, 33.

<sup>29</sup> “Progressive Agriculture: What the Government is Doing for the Farmer's Business and Home,” *Country Gentleman* 80, no. 19 (May 8, 1915), 11.

<sup>30</sup> Purdue University Agricultural Extension Service, *Twenty-Eighth Annual Report of the Purdue University Department of Agricultural Extension: Report of the Director July 1, 1938 to June 30, 1939*, (Lafayette, Ind., 1939), 78, Purdue University Libraries and School of Information Studies E-Archives, online at [https://earchives.lib.purdue.edu/digital/collection/AES\\_AR/id/3251](https://earchives.lib.purdue.edu/digital/collection/AES_AR/id/3251).

embrace of chemical innovations in pest management, these new tools presented the same kinds of health hazards about which farm women had previously expressed concerns.

As part of the postwar uptick in toxic pest-control products, maternal responsibility for domestic sanitation required maintaining an even more stringently organized household, with toxins wielded intelligently but cautiously. In 1952, *The Farm News of Carroll County* equated clean farms with safe farms, extending the purview of safe farmsteads to the kitchen, and reminding readers that “insecticides should never be left where they may be mistaken for starch, baking powder, or other ingredients used in cooking.”<sup>31</sup> Mid-twentieth-century concerns about children’s exposure to toxic substances remained pinned to homemakers’ carelessness in storing farm and household chemicals, and did not focus on the dangers of pesticide drift or consumption of residues. In an effort to help homemakers recognize which household items needed safe storage, Indiana legislators enacted the 1957 Indiana Household Poison Registration Act, which mandated that household products list poisonous ingredients on their labels, and required manufacturers, distributors, and sellers of poisonous chemicals to be registered and licensed by the Indiana State Board of Health.<sup>32</sup>

Even with this precautionary legislation, the power of the tragic acute poisoning narrative continued after the advent of the environmental movement and served as a convenient device for pesticide defenders to deflect fears about chronic exposure. The *Indianapolis Star* garden editor C. G. Milne in 1972 attacked what he viewed as pesticide critics’ hypocrisy. Milne acerbically questioned the logic of Hoosiers who were “opposed violently to using any chemicals” for pest control: “It is certainly strange the ‘convictions’ folks live under,” he wrote. “Almost everyone against pesticide use (because of potential danger to humans) has a shelf full of dangerous chemicals (if misused) right inside his own home. There is never a harsh word raised in protest against ammonia, cleaning powders, drain cleaners and the like—all usually within the reach of children.”<sup>33</sup> Walter Weber, technical director of pesticides at the Indiana Farm Bureau Cooperative

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<sup>31</sup> “Clean Farm Is Safe Farm, Is May Safety Tip,” *Farm News of Carroll County*, May 28, 1952, p. 3. See also James W. Jackson, “An Ounce of Prevention: Killed by Carelessness,” *Farm News of Carroll County*, December 1, 1957, pp. 6–7.

<sup>32</sup> Joseph K. Shepard, “Poison...Where You Least Expect It,” *Indianapolis Star Magazine*, January 12, 1958, pp. 6–8.

<sup>33</sup> C. G. Milne, “Leaves, Bugs, Diseases Popping Out,” *Indianapolis Star*, May 14, 1972, sec. 9, p. 10.



Wretched pest, you have probably come direct from some hospital, garbage pail or stable, laden with filth and possibly disease germs. If I try to banish you by poison of any kind, you drop into the provisions and food, and I have made matters worse. There is only one way to get rid of you—**TO USE**

# TANGLEFOOT

## Sticky Fly Paper

It will catch and hold and cover you all over, and the germs and dirt that you are carrying, with a varnish from which you can never escape to trouble me **either living or dead.**

**TANGLEFOOT** is for sale everywhere and is absolutely the only safe protection against flies.

**THE O. & W. THUM CO., Mfrs.**  
GRAND RAPIDS, MICH.

Tanglefoot fly paper advertisement, *Ladies' Home Journal*, May 1902. Advertisers played on women's fears about the toxicity of pesticides to market alternative pest-control products.

Association, also downplayed critics' concerns and elevated the accidental poisoning narrative. "People who endeavor to create the 'hysteria' about pesticides," Weber wrote in 1969, "usually cite cases where a child has taken a large quantity direct from a container, or where an adult has been careless." Weber echoed his Purdue entomologist colleagues in arguing that "there are no harmless materials," but only "harmless ways of using them." With every pesticide, Weber argued, there is "a safety side."<sup>34</sup>

JOHN V. OSMUN AND PURDUE EXTENSION'S GENDERED INTERPRETATIONS  
OF PEST CONTROL AFTER *SILENT SPRING*

Pest management experts in entomology have looked to the 1962 publication of *Silent Spring* as a watershed moment in the industry. Purdue entomologist and pest control industry leader John V. Osmun significantly shaped pesticide management policies at the EPA when he served as inaugural director of the Office of Pesticide Programs in the early 1970s. Osmun recalled in 2008 that Carson's message "was difficult to swallow for a while, but we began to realize that she had a very fundamental premise upon which she built it, and that was that the environment was a sacred thing that we must take care of. She simply used pesticides as an example of the fact that the so-called contaminants in our environment were jeopardizing our lives and our environment. So it was a plus, as it turned out."<sup>35</sup>

Just over thirty years earlier, Osmun had expressed a different opinion on Carson's environmentalist legacy. In a 1978 conference presentation, "Chemicals in Agriculture and Food," Osmun conveyed his impatience with environmentalists who advocated against pesticides:

Today, the use of chemicals, especially pesticides, in agriculture... is characterized by hazy public understanding, unrealistic administrative policy, and a certain unwillingness to accept and adjust to emerging facts. The confounding situation is one of heterogeneous mixes of influences: an irate congress, an unreal administering agency, strong-willed environmentalists, pseudo-health experts, opportunist lawyers, industry proponents, beneficiaries of good

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<sup>34</sup>Walter Weber, "Pesticides: Friend or Foe?" *Farm News of Carroll County*, July 25, 1969, p. 3.

<sup>35</sup>"Oral History Interview with John Osmun," transcript, p. 19, conducted March 26, 2008 by Kathryn Markee, Purdue University Oral History Program Collection, Karnes Archives and Special Collections, Purdue University Libraries.

chemical use, and a constant and conflicting flow of information and opinions on the subject of chemicals in our society.<sup>36</sup>

Osmun advocated for a common-sense approach to pesticide regulation. The EPA's Office of Pesticide Programs, he wrote, had struck the "best balance between supporting pesticide use while expressing strong environmental and health concerns." At the opposite end of the spectrum, he continued, EPA's General Counsel "has operated in a strict constructionist sense, thus influencing tight regulations and advocating cancellation where possible. Its adversary role in matters relating to cancellation of pesticides has bordered on the notorious." Frustrated with the inner workings of his own agency, Osmun bemoaned EPA's regulatory approach of emphasizing "risk to the near exclusion of benefits." He countered that the law was "clear that determination of unreasonable adverse effect must at the same time take into account economic, social, and environmental costs and benefits of the use of any pesticides."<sup>37</sup> To Osmun, precaution in the public arena had shifted too far toward discrediting pesticides. He was wary that the post-*Silent Spring* blossoming of environmentalism had jeopardized pesticides' utility for agriculturalists and consumers.

Osmun's respect for the pesticide industry stemmed in part from a close working relationship between the Cooperative Extension Service and Indiana agribusinesses. In 1969, Osmun contributed to a working group charged with bringing Extension agents and Indiana agribusiness into "optimum working relationships and agreement on agricultural production, management, and marketing recommendations." That year's annual Extension report listed a "good working relationship" between industry and Extension, with chemical companies finding it "beneficial to make their own recommendations agree, as nearly as possible" with those put forth by Extension.<sup>38</sup>

Regarding public safety announcements, Osmun's Extension working group on safe pesticide use maintained a firm separation between media

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<sup>36</sup> John V. Osmun, "Chemicals in Agriculture and Food," 1978, p. 82, John Osmun Papers, Karnes Archives and Special Collections, Purdue University Libraries.

<sup>37</sup> *Ibid.*, 85–86.

<sup>38</sup> Purdue University Cooperative Extension Service, *Indiana Cooperative Extension Service Annual Report for Calendar Year 1969* (Lafayette, Ind., 1969), 11, Purdue University Libraries and School of Information Studies E-Archives, online at [https://earchives.lib.purdue.edu/digital/collection/AES\\_AR/id/3579](https://earchives.lib.purdue.edu/digital/collection/AES_AR/id/3579).



Purdue University Professor of Entomology John Osmun researching insecticides' characteristics with undergraduate and graduate students in 1955.

Courtesy Karnes Archives and Special Collections, Purdue University Libraries

directed toward farmers and advertisements for the broader public. Worried that detailed recommendations given farmers for preventing chemical residues on crops would create unnecessary anxiety for the average consumer, the Extension group tailored such information for trade journals, and avoided mentioning chemical residues in mass media venues. The working group reported in 1969 that “only 5% of our population is engaged in agriculture. To reach this small percentage via radio, TV and news articles creates a possibility of unduly alarming the other 95%....The farmers and their suppliers and applicators are the only people anyway who are in a position to do anything about the problem as it relates to commercial agriculture.”<sup>39</sup> To reach the broader public who utilized pesticides around their homes and gardens, the Extension Service instead enlisted the charismatic

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<sup>39</sup> *Ibid.*, 48.

character “Larry the Label,” who debuted in USDA television public service announcements about pesticide safety in 1965. Larry lectured viewers that “pesticides contribute greatly to the continuing abundance of crops our nation needs.” Without them, he continued, many families would be unable to afford healthy foods.<sup>40</sup>

Rachel Carson’s detractors commonly invoked the argument that pesticides were a pillar of the global food supply. Just after the release of *Silent Spring*, the *Farm News of Carroll County* reported that “trouble may be brewing for farmers” because Carson “reportedly dredges up plenty of evidence about the misuse of agricultural chemicals. Unfortunately, it leaves the impression that dangerous misuse is commonplace among farmers....It is never made clear that farmers could not produce enough to feed our nation without the use of modern chemicals.” Anticipating that the book would bring agriculturalists under strict scrutiny, the editors advised that farmers should “react by being extra careful to follow directions on chemical containers to the letter.” Following the label was “the best way to silence *Silent Spring*.”<sup>41</sup> Six months later, the same paper continued its attack against Carson. The editors quoted Dr. F. J. Stare of the Harvard School of Public Health’s Department of Nutrition, who claimed that “Indiana farmers deserve as much credit” as any other group for preventing “starvation, disease, and social and political unrest in many parts of the world” through “the wide use of agricultural chemicals.”<sup>42</sup> The newspaper also published a letter from C. G. King, president of the Nutrition Foundation, Inc., who regretted that *Silent Spring* was treated as “a reliable and ‘scientific’ document,” and that its sales were benefitting special interest groups that “gull and frighten Americans about our food and our health.” Agricultural chemicals, King asserted, were necessary for food security, and were in no way responsible for polluting the environment, poisoning humans, or “damaging the heredity of the human race.”<sup>43</sup>

As *Silent Spring* offered a touchstone for pesticide critics and defenders alike, Purdue agrichemical experts engaged the public with a wary eye toward laypeople’s wholesale embrace of Carson’s principles. This caution

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<sup>40</sup> Ibid., 49. For “Larry the Label” videos, see Larry the Label Jr., Facebook, August 14, 2015, <https://www.facebook.com/larrythelabel/videos/1624618117796835/>.

<sup>41</sup> “Book Brews Trouble,” *Farm News of Carroll County*, October 26, 1962, p. 2.

<sup>42</sup> “Farmers’ Obligation,” *Farm News of Carroll County*, April 26, 1963, p. 2.

<sup>43</sup> “Scientist Defends Use of Farm Chemicals,” letter to the editor by C. G. King, *Farm News of Carroll County*, April 26, 1963, p. 2.

was evident in correspondence between Osmun and a Battle Ground, Indiana, resident, Cheryl Irwin, who wrote to the *Lafayette Journal & Courier* to lambast the scientist in April 1981. Irwin took issue with an article Osmun had written in defense of Counter 15G, an organophosphate pesticide widely used for rootworm control. Osmun had condemned Associated Press reporters for linking an Illinois farmer's death from leukemia to his use of Counter 15G. The farmer's widow had reached an out-of-court settlement for \$3 million damages against the pesticide manufacturer. The story, Osmun alleged, was a scare article that unfairly singled out Counter 15G. Hazardous pesticides "don't need to be toxic as long as they are handled as specified by the instructions," he asserted. "There can be a problem whenever you use chemicals.... But if they are used correctly, then the chances of exposure are almost nil."<sup>44</sup> Echoing U.S. pesticide regulators' repeated emphasis on following label instructions, Osmun worked to undercut the precautionary principle as a relevant mechanism for managing toxic pesticides. Irwin's letter to the editor questioned Osmun's conceptualization of toxicity and safe practice:

Those chemicals are toxic regardless of how they are used and handled....I seriously question the desirability of using substances that pose such a health hazard to human beings: hazards resulting from accidental contamination of the environment, hazards for the farmer who works closely with the chemicals, hazards for area residents exposed to varying degrees of chemical contamination, and hazards that are still to be discovered as scientists study the one-quarter of a million substances entering our world each year.<sup>45</sup>

A few weeks later, Irwin followed up with another letter, this one sent directly to Osmun. She identified her conflict with him but also expressed understanding of his background and concerns as an entomologist: "Although I don't agree that we could 'make it so safe to live that we'd all starve to death,' I do realize the enormity of the problem of raising enough food without chemicals to feed our population. Unfortunately, I

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<sup>44</sup>John V. Osmun, quoted in Tom Campbell, "Purdue Expert Says Counter Story Unfair," *Lafayette Journal & Courier*, March 17, 1981, sec. A, p. 8.

<sup>45</sup>Cheryl Irwin, Letter to the Editor, "Learn More About Chemical Hazards," *Lafayette Journal & Courier*, April 2, 1981, sec. A, p. 10.

do not have the solution to that problem. I do hope someone will come up with answers, because chemicals are a problem for me and many like me.” Irwin had been in poor health for years, she explained; countless consultations with doctors had revealed that the problem seemed to stem from chemical exposures. “It took me a long time to accept this because it actually sounded insane,” she wrote. Irwin wanted to introduce Osmun to the field of chemical sensitivity: “You may say that it’s surely only a handful of people affected adversely, but it seems that more and more people are developing sensitivities as we continue to use more and more chemicals.”<sup>46</sup>

The archive does not contain record of any response from Osmun, but his files do include a note forwarding Irwin’s letter to Purdue entomologist Bob Hollingsworth. Hollingsworth responded that it was a “good letter—well-written. She’s quite right that this area of ‘hypersensitivity to chemicals’ is taken seriously in some quarters.” He went on to question Irwin’s credibility while simultaneously admitting that her views might be valid. Noting that Irwin’s lack of distinction between natural and synthetic chemicals was typical of someone with little knowledge of environmental chemistry, Hollingsworth nevertheless admitted that, “as with many new things there may be a core of truth at the center of her claims.”<sup>47</sup>

Irwin’s striking effort to cite medical literature on chemical sensitivity, and to reassure Osmun that it had taken her time to accept her sensitivity to chemicals, seems to reflect the gender-based attacks that Carson herself received in the aftermath of *Silent Spring*, as pesticide industry representatives and other opponents tried to paint her as a hysterical or overly emotional woman, unfit to evaluate pesticide science in a rational way.<sup>48</sup>

Irwin’s caution toward pesticides ran counter to the mainstream opinion found within Indiana’s media from the mid-1960s through the 1980s. Despite the nationwide backlash against pesticides that followed *Silent Spring*, Indiana news outlets carried a steady stream of reporting that

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<sup>46</sup> Cheryl Irwin to John V. Osmun, n.d., John Osmun Papers, Karnes Archives and Special Collections, Purdue University Libraries.

<sup>47</sup> Bob Hollingsworth to John V. Osmun, n.d., John Osmun Papers, Karnes Archives and Special Collections, Purdue University Libraries.

<sup>48</sup> See Linda J. Lear, *Rachel Carson: Witness for Nature* (New York, 1997), 429–30; Maril Hazlett, “Woman vs. Man vs. Bugs: Gender and Popular Ecology in Early Reactions to *Silent Spring*,” *Environmental History* 9, no. 4 (2004), 701–29; Michael B. Smith, “‘Silence, Miss Carson!’ Science, Gender, and the Reception of *Silent Spring*,” *Feminist Studies* 27, no. 3 (2001), 733–52; Doris Z. Fleischer, “*Silent Spring*: Personal Synthesis of Two Cultures,” *Bulletin of Science, Technology, and Society* 13, no. 4 (1993), 200–202; Vera Norwood, *Made From This Earth: American Women and Nature* (Chapel Hill, N.C., 1993), 143.

defended the merits and safety of pesticides in midwestern agriculture. In January 1972, the *Indianapolis Star* editors included an "Ecology Note" that critiqued "a number of ecology-minded but evidently uninformed persons [who] have condemned every insecticide, pesticide and fertilizer used today in United States agriculture, calling for a 'return to nature' in the husbanding of crops." The editors cited a Young Farmer Association experiment in Nebraska contrasting corn cultivation "left to nature" with farming using "the recommended amounts of fertilizer, herbicides, insecticides and irrigation." The treated acre, the editors seemed to revel in reporting, yielded over three times the harvest of "Nature's acre."<sup>49</sup>

L. O. Nelson, pesticide administrator in the office of the Indiana state chemist, located at Purdue, cautioned environmentalists and policymakers about stringent pesticide regulation in the late 1980s. Claiming that DDT "was not all that bad," Nelson disputed concerns that pesticides placed farmers at an increased risk of cancer. Nelson came out against several Indiana organizations—including the Citizens Action Coalition of Indiana, the Indiana Farmers Union, and the state chapter of the National Farmers Organization—that had called for further pesticide restrictions to stem environmental contamination. Concerned about chemical contamination of the groundwater, this coalition believed that pesticide reduction could be accomplished through eliminating particularly dangerous pesticides and through federal crop production regulations that would end surpluses and boost farmers' profits by increasing crop prices. Nelson, however, still refused to "jump on the bandwagon" of pesticide fears, stressing the importance of proper labeling and reasoning that food costs would skyrocket without pesticides. Most pesticide complaints, he continued, related not to farmers, but to "homeowners using chemicals on shrubs and lawns."<sup>50</sup>

In the 1970s and 1980s, the Women's Committee of the Indiana Farm Bureau came out in vehement defense of pesticides repeatedly, signaling the regulatory backlash against environmentalists' concerns about pesticide toxins. Indiana media documented the increased political power of farm women. And, more often than not, women's political and social organizations embraced the agrichemical industry as a tool that facilitated their farms' economic productivity. In 1977, the members of the Farm Bureau's Women's Committee stood in solidarity with their counterparts at the

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<sup>49</sup> "Ecology Note," *Indianapolis Star*, January 24, 1972, p. 18.

<sup>50</sup> Ernest A. Wilkinson, "Expert calls pesticide fear a bugaboo," *Indianapolis Star*, September 27, 1987, p. B-13.

Illinois Farm Bureau, whose female leaders had asked their members of Congress to amend the Federal Insecticide, Fungicide, and Rodenticide Act in an effort to curb “excessive” EPA regulations that threatened “the development of needed new pesticides for agriculture.”<sup>51</sup> In 1978, Indiana Women’s Committee chairwoman and second vice president, Mary Lois Gross of Churubusco, asserted that farm women possessed political power and influenced their husbands’ political thinking: “That’s why [women are] involved in rural politics, because they control their own votes and to a great extent, [the votes of] their husbands. And the politicians know it!” Women’s Committee Director Judith Carley similarly noted that women had become more engaged in politics and were often better informed than their husbands on everything from pesticides to price controls.<sup>52</sup>

Other prominent women in the Hoosier farm circuit underscored the importance of pesticides for agricultural productivity. In 1970, the chairwoman of the American Farm Bureau Women’s Committee, Virginia Dodd Smith of Chappell, Nebraska, addressed two thousand Indiana women at the annual conference of the Indiana Farm Bureau. Smith, a wheat farmer, stressed that pesticides were necessary for keeping food costs down and downplayed the problem of food contamination: “We Farm Bureau people are just as eager as anyone on earth that the foods be healthful. We support a continuous educational program on safe use of agricultural chemicals. But we also are eager for the urban consumer to realize that these pesticides have played a key role in bringing the most abundant and wholesome food supply to the American kitchen.” Smith presumed a clear divide between the urban consumer and the agricultural producer. Pesticides, she argued, were “our one hope to win the battle against 10,000 species of food-destroying insects. We think that every consumer should realize that without these chemicals our food quality would deteriorate and food prices would skyrocket.”<sup>53</sup>

Local leaders echoed this concern about food affordability. In February 1979, the Indiana Farm Bureau’s “Farm Wife of the Year,” Susie Warner

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<sup>51</sup> “Farm Bureau women ask changes in legislation,” *Farmers’ Weekly Review*, October 13, 1977.

<sup>52</sup> Mrs. Guy Gross, quoted in Bonnie Britton, “State Farm Women’s Roles Widening from Homestead to Hoosier Politics,” *Indianapolis Star*, July 9, 1978. For Midwestern farm women’s interest in agricultural technology, see Carrie A. Meyer, “Farm Women and Gas Engines: The New Technology in the Barnyard,” *Indiana Magazine of History* 114 (June 2018), 115–44.

<sup>53</sup> Mary Anne Butters, “Show Concern, Act Now, Women Told,” *Indianapolis Star*, February 11, 1970, p. 8.

of Goshen, spoke to the organization's Women's Conference on "How as a Farm Wife, I Can Help the Farmer Tell the Story of Agriculture." Warner claimed that farm women needed to "speak up for the farmer and agriculture" when faced with misconceptions about farmers' responsibility for the high cost of food. While engaging with the public, Warner argued, farm wives should also take interest in agricultural legislation. "The government wants to control food prices, how much land the farmer can have and pesticides," she explained. Quoting U.S. Secretary of Agriculture Earl Butz, she proclaimed, "If we can't use pesticides, we will have to decide which 50 million people to feed—and let the rest go hungry."<sup>54</sup>

In his 1972 address to the National 4-H Congress, Butz had declared that the family farm was stronger than it had ever been, and that the Department of Agriculture was doing more than ever to serve the nation's farmers.<sup>55</sup> Butz paired his celebration of the family farm with a paradoxical commitment to agricultural industrialization and farm consolidation. As secretary of agriculture, Butz famously advised farmers to plow "fencerow to fencerow," and "get big or get out." Writer, farmer, and environmental activist Wendell Berry regretted that Butz's hegemonic view made agriculture "not only not a concern of culture, but not even a concern of science," because it signaled that government regulators had "abandoned interest in the health of the farming communities on the one hand and in the health of the land on the other." Berry argued that agriculture had become "purely a commercial concern; its purpose is to provide as much food as quickly and cheaply and with as few man-hours as possible and to be a market for machines and chemicals."<sup>56</sup> Butz proudly referred to himself as Indiana's "Mr. Agriculture." As dean of Purdue's College of Agriculture from 1957 to 1967, he described his ambition to serve as a "nursemaid to his profession throughout the state," and made it his goal to visit and connect with farmers in all ninety-two Indiana counties. In more ways than one, Butz succeeded in exerting a strong influence upon Hoosier agriculture.<sup>57</sup>

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<sup>54</sup> "Wives Urged to Speak Out for Farmers," *Indianapolis Star*, February 15, 1979, p. 19.

<sup>55</sup> Earl Butz, keynote speech at the Fifty-First National 4-H Congress, quoted in *Chicago Sun-Times*, November 27, 1972.

<sup>56</sup> Wendell Berry, *The Unsettling of America: Culture and Agriculture* (Berkeley, Calif., 1977), 92.

<sup>57</sup> Earl L. Butz interview, conducted by Robert B. Eckles, July 14, 1970, MSO 2, Purdue University Office of Publications Oral History Program Collection, Karnes Archives and Special Collections, Purdue University Libraries, online at <http://e-archives.lib.purdue.edu/cdm/compoundobject/collection/mso2/id/4494/rec/35>

As Warner's 1979 speech suggested, Butz's influence was evident in women's defense of agrichemicals as necessary to ensure the viability of family farming, and to prevent food scarcity. By 1980, farm women frustrated with the regulatory curtailing of pesticide use voiced their concerns at the national level. In 1980 American Agri-Women—a national coalition of farm and ranch women's organizations formed in 1974 to "preserve family farming as a business for profit"—sent spokeswoman Carolyn Leavens across the country on a speaking tour funded by the National Agricultural Chemicals Association.<sup>58</sup> Leavens, a citrus grower from Ventura, California, cautioned urban audiences about what she saw as the over-regulation of agricultural chemicals. Federal adoption of California's stringent pesticide policies, Leavens warned, would leave the farmer powerless to respond to pest outbreaks. In 1984, Barbara Brookshire, an Indiana dairy farmer who had worked with American Agri-Women, reaffirmed the national organization's talking points in her platform for a newly created affiliate, Indiana Women for Agriculture. Addressing anxieties over agricultural chemicals in the food supply, Brookshire cited Butz's well-worn equation of agricultural chemicals with food security. "We do like to have our apples free of worms and cereals free of bugs," Brookshire declared. American policymakers should uphold chemical usage, she concluded, because "we have become accustomed to that kind of living."<sup>59</sup>

#### PURDUE EXTENSION AND GENDERED READINGS OF PESTICIDE EXPOSURE IN THE 2000s

As the central node for agricultural extension work across Indiana, Purdue University remains highly influential among farmers for determining best practices—a position that it has held since Indiana's Stahl-Yarling Act of 1913. In recent decades, however, agribusiness has gained more power by serving as a direct source of information for farmers. A Purdue Extension bulletin from 2007, *Farm Family Exposure to Pesticides: A Discussion with Farm Families*, shows this recalibration of agricultural expertise within the state. The bulletin's editors include a broad institutional spectrum of expertise, including representatives from the Purdue Pesticide Program, EPA, Monsanto, and Dow Chemical.

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<sup>58</sup> Ernest A. Wilkinson, "Farm Women Elect," *Indianapolis Star*, September 6, 1984, p. 17.

<sup>59</sup> Ernest A. Wilkinson, "State Women in Farming Organize," *Indianapolis Star*, July 27, 1984, p. 23.

*Farm Family Exposure* underscored the agrichemical industry's argument that pesticides were vital for combatting the insects, weeds, and diseases that harm agricultural productivity by damaging fruit and vegetable crops, lowering market prices, and contributing to food contamination from naturally occurring toxins. The publication inferred a strong connection among pesticides, wholesome food, and resilient farming communities: "Healthy food requires a healthy crop. . . . Neighbors [of livestock producers] may complain about livestock operations drawing flies to their properties. Pesticides protect livestock and help maintain good community relations while increasing farm productivity and profitability." The bulletin authors recognized that Indiana farmers had embraced sustainable agriculture in response to consumers' demands. In order to build ecologically sound farming practices, the bulletin maintains, farmers have cut back on pesticide use and turned to environmentally friendly agricultural practices such as integrated pest management, insect-resistant and disease-resistant crop selection, crop rotation, and maintenance of buffer strips to protect waterways.<sup>60</sup> In spite of these practices, the authors insisted, "pesticides continue to play an important role in managing pests," since pests "always have been and always will be a threat to the food supply and farmers' profit." Pesticides, the bulletin ultimately implied, are an inevitable fact of farm life.<sup>61</sup>

If *Farm Family Exposure* highlighted the ascent of agribusinesses' technocratic expertise, it proved even more significant for its elucidation of continued gendered approaches to agricultural health concerns and farmer subjectivities. In a section titled "Personal Concerns About Using Pesticides on the Farm: What farm women want to know about pesticides," the bulletin persisted in its conversational tone: "As a farmer, you are well aware of the benefits of pesticides; but you may be less knowledgeable on the human health effects pesticide use can impose. Consider these questions: Do pesticides get on or into our bodies? Are pesticides harmful to us? Can we prevent pesticide exposure?" Acknowledging that experts remained divided over the risk of using pesticides, the authors reasoned that some risk was inevitable. "It is unsettling to recognize the need to use pesticides despite your uncertainty about possible effects on your family's

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<sup>60</sup> Purdue Agricultural Extension, *Farm Family Exposure to Pesticides: A Discussion with Farm Families*, PPP-72, December 2006, Cooperative Extension Services, Purdue Pesticide Programs, pp. 7–9, online at <https://www.extension.purdue.edu/extmedia/ppp/ppp-72.pdf>.

<sup>61</sup> *Ibid.*, p. 8.

health,” the authors sympathized.<sup>62</sup> In contrast to the other portions of the publication, the images in this section exclusively featured women and children, as if to reinforce the notion that the embodied experience of pesticides was primarily the purview of rural mothers. Extension records even portray children as more conscientious than some of their fathers about pesticide dangers. In 2006, Fred Whitford, an Extension agent with the Purdue Pesticide Program, recalled that a farmer only began to wear gloves during pesticide application when his young daughter implored him to do so after she had participated in an Extension safety day program for children.<sup>63</sup>

Noting children’s unique susceptibility to chemicals, Extension authors behind the *Family Farm Exposure* bulletin emphasized that farmers did not need to curtail pesticide use so much as they needed to train children to respect chemicals, and to ensure that young people remained at a safe distance from sites where pesticides were prepared or applied. Pesticides were in the best interest of the family, because they were crucial for material gain: “Ultimately, your farm records confirm that your productivity and profit are increased through the use of pesticides. They boost your profit margin. Health concerns are not as easily measured.”<sup>64</sup>

The authors’ insinuation that women were chiefly responsible for children’s safety around the farm and home echoed earlier Extension appeals to maternal responsibility. Nineteenth-century farm mothers had been tasked with keeping toxins out of the home, and away from children in particular, by thoroughly washing clothes worn during the agrochemical application process. In 1879, the *Indiana Farmer* reported that a woman from Burlington, Vermont, died after laundering a pair of trousers that a farmer had worn “while applying Paris green to his potato vines.” The woman was exposed to the pesticide through a cut in her hand.<sup>65</sup> The statewide Extension Homemakers Association, founded in 1913, sponsored a “Home Nursing” farm safety program that regularly reviewed pesticide safety strategies with female members who considered pesticide use a routine part of farming. “There is no place like home for accidents to happen,”

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<sup>62</sup> *Ibid.*, pp. 10–11.

<sup>63</sup> Fred Whitford excerpt, “Purdue University Stories of the Extension Service: Alpha Lambda Chapter, Epsilon Sigma Phi, 2006,” pp. 64–65, folder 7, box 1, Eva Goble Papers, Karnes Archives and Special Collections, Purdue University Libraries.

<sup>64</sup> Purdue Agricultural Extension, *Farm Family Exposure to Pesticides*, p. 31.

<sup>65</sup> “General News,” *Indiana Farmer* 14, no. 30 (July 26, 1879), p. 4.



Bug Scout cartoon, "Avoid Clothing Contamination," January 19, 1980. The cartoon, drawn by Natalie Brown, accompanied the "Pest Management Tip," a regular feature written by Purdue entomologist Tom Turpin in the *Indiana Prairie Farmer*.

explained Butler Happy Homemakers home demonstration agent Marian Weaver in 1958.<sup>66</sup>

Such assumptions of maternal responsibility reflect the persistence of what social scientists have identified as a "pesticide treadmill," with farmers continuously adopting the latest pesticide technology—despite compromises to their families' and neighbors' health—in order to remain competitive.<sup>67</sup> Farmers then develop a sense of inevitability about the use

<sup>66</sup> "Butler HDC Discusses State-Wide Farm Safety Program," in Home Demonstration Club of Miami County 1958 scrapbook, Karnes Archives and Special Collections, Purdue University Libraries. See also Eleanor Arnold, ed., *Going to Club: Seventy-five Years with Extension Homemakers (Memories of Hoosier Homemakers)* (Indianapolis, Ind., 1988). Discussion of agrichemicals were absent from the six volumes of oral histories conducted by Eleanor Arnold with members of the Indiana Extension Homemakers Association in celebration of the association's seventy-fifth anniversary in 1988. See Indiana Extension Homemakers Association Oral History Project, 1980–1990, M 0820, Smith Memorial Library, Indiana Historical Society. This is a notable omission in a post-*Silent Spring* political landscape and suggests that farm women largely took pesticide exposures to be inevitable in their daily lives.

<sup>67</sup> Ryan E. Galt, "From *Homo Economicus* to Complex Subjectivities: Reconceptualizing Farmers as Pesticide Users," *Antipode* 45, no. 2 (March 2013), 336–56. For the counterpoint definition of

of hazardous pesticides.<sup>68</sup> Geographer Ryan Galt has analyzed the pesticide treadmill to understand the manner in which contemporary pesticide users' subjectivities inform farmers' decisions about their use of protective gear. Galt identifies three such subjectivities. The first, subjective immunity, or "optimistic bias," relates to farmers' tendency to believe that they are less susceptible than others to health risks. At the opposite end of the subjectivity spectrum is fatalism—the notion that a farmer's exposure to hazardous chemicals is unavoidable, and that protective equipment is not effective at preventing harm. Finally, heroic sacrifice—a product of what Galt calls "masculinity discourses"—is the subjectivity by which farmers believe that their hazardous occupations are performed for the good of their family, community, and nation.<sup>69</sup>

Galt argues that farmers are not rational actors who adapt their behavior in response to "safe use" training. Rather, the complex sources of farmers' identities have often contributed to a sense of ambivalence about agrichemicals, and ultimately resignation to their routine use. As oral historian Studs Terkel found in his interview of Evansville, Indiana, farmer Pierce Walker, even as agricultural chemicals became more expensive, it seemed as though farmers could not produce a crop without them. "They're tryin' to outlaw a lot of 'em, but I don't know," Walker told Terkel. "From my end of it, I'd hate to be without 'em. Seems as though if we didn't have chemicals, we wouldn't have crops. It seems like the bugs and the weeds would just about take care of 'em if we didn't have the chemicals. But I don't know... on the other end, either...whether it's good for our country or not."<sup>70</sup>

#### CLIMATE CHANGE AND CONTINUED IDEALS OF MATERNAL RESPONSIBILITY FOR ENVIRONMENTAL EXPOSURE

In 1987, U.S. Congressman Lee Hamilton, from Indiana's Ninth District, reported to his constituents on the persistence of food safety concerns. "We do not know the extent to which pesticides are actually in our foods, and we do not know how dangerous most of the pesticides really are," Hamilton

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farmers as "rational actors," see Willard Wesley Cochrane, *The Development of American Agriculture: A Historical Analysis*, 2nd ed. (Minneapolis, Minn., 1993), 239–40.

<sup>68</sup> Galt, "From *Homo Economicus* to Complex Subjectivities," 347.

<sup>69</sup> *Ibid.*, 349–50. See also Martin O'Connor, "Is Sustainable Capitalism Possible?" in *Is Capitalism Sustainable? Political Economy and the Politics of Ecology* (New York, 1994), 165.

<sup>70</sup> Pierce Walker, quoted in Studs Terkel, *Working: People Talk About What They Do All Day and How They Feel About What They Do* (New York, 1972), 5.

admitted in his newsletter. “As the production of our food becomes more complicated—with increased pesticide use, more of our food coming from abroad, and more refined methods of toxicity testing—we will have to be increasingly vigilant about our food supply.”<sup>71</sup> Hamilton’s apprehension reveals the complex interconnections among international agriculture, globalized foodways, and environmental health. These concerns have only intensified in recent years with increasing scientific knowledge about anthropogenic climate change.

In 2014, Olivier De Schutter, the United Nations Special Rapporteur on the right to food, reflected on the legacy of the twentieth-century Green Revolution in light of climate change and the contemporary challenges facing industrial agriculture. Green Revolution proponents, De Schutter noted, had framed the combination of high-yielding plant varieties, increased irrigation, mechanized agricultural production, and the use of pesticides and nitrogen-based fertilizers as essential to ensuring increased agricultural productivity to meet the needs of a growing world population. However, this formula ultimately led to a loss of agrobiodiversity through the spread of monocultures, as well as water pollution and eutrophication. Yet the most potentially harmful impact of industrial agriculture, he continued, was its contribution to global warming: “Fertilizers, herbicides and pesticides, the tillage, irrigation and fertilization, and the transport, packaging and conservation of food require considerable amounts of energy, resulting in an additional 15 to 17 per cent of total man-made greenhouse gas emissions attributable to food systems.”<sup>72</sup>

Ideals of cleanliness and purity continue to shape perceptions of agricultural and household pest control, as well as women’s reproductive work in creating optimal environments for their children’s development in an era of heightened awareness about climate change. As mothers seek to curb the pollution of children’s bodies through precautionary consumption and toxin-free household environments, more refined measurements of toxicity have pushed further anxieties about environmental exposures.

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<sup>71</sup> Lee Hamilton, “Pesticides and Food Safety,” *Washington Report*, vol. 22 (July 22, 1987), Lee H. Hamilton Congressional Papers, 1965–1998, MPP 2, Modern Political Papers Collection, Indiana University Libraries, Bloomington, Indiana.

<sup>72</sup> Olivier De Schutter, “Final Report: The Transformative Potential of the Right to Food,” *Report of the Special Rapporteur on the Right to Food*, United Nations Human Rights Council (January 24, 2014), 3–5.

The ongoing national debate over chlorpyrifos—the broad-spectrum organophosphate neurotoxic insecticide which was one of Indianapolis-based Dow AgroSciences’ bestselling products—encapsulates the continued linkages among maternal responsibilities for clean household environments, pure food, and healthy children’s bodies. The Environmental Protection Agency has paid close attention to chlorpyrifos over the past decade as scientific studies have showed that low levels of exposure in early life have harmful effects on children’s neurodevelopment, including attention deficit problems, disorders on the autism spectrum, intelligence deficits, and motor problems. In November 2016, EPA’s revised health risk assessment of chlorpyrifos revealed that infants and children faced “dangerous levels of exposure through diet alone”—levels which the agency admitted were up to 140 times the safety limit. All signs pointed to EPA revoking chlorpyrifos tolerances (the legal limit set for pesticide residues on raw and processed foods), which would amount to a full ban. However, in March 2017 EPA’s new director, Scott Pruitt, countered the findings of his agency’s own scientists in order to deny a ten-year-old petition requesting that EPA revoke chlorpyrifos’s tolerances and cancel its registrations because of its effects on children’s neurodevelopment. In rejecting the petition, Pruitt stated that the agency was “returning to using sound science in decision-making—rather than predetermined results.”<sup>73</sup> Attacking the scientific consensus of his own department, Pruitt pushed back the agency’s final determination on chlorpyrifos until 2022.

Perhaps the most intriguing aspect of the ongoing chlorpyrifos saga is its revelation of the fluid definition that regulators have applied to environmental exposure in children’s encounters with the pesticide. Chlorpyrifos is not only a leading insecticide in agriculture—it was also, under its common trade name, Dursban, one of the most common active ingredient in home, lawn, and garden bug killers for more than thirty years. After EPA’s 2000 reassessment of the chemical showed negative health effects on children, the agency signed an agreement with Dow AgroSciences to eliminate Dursban’s use in areas where children might be exposed, including homes, day care centers, schools, parks, and hospitals. The agreement also stipulated the restriction of the chemical’s use on apples, grapes, and tomatoes, which would limit children’s dietary exposure from residues

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<sup>73</sup> Scott Pruitt, quoted in Roni Caryn Rabin, “A Strong Case Against a Pesticide Does Not Faze E.P.A. Under Trump,” *New York Times*, May 15, 2017.

found in fruit, juices, and processed foods like tomato sauce.<sup>74</sup> Beyond this, however, the agreement did not extensively address dietary ingestion of residues.<sup>75</sup> Precautionary consumption constitutes the best method for avoiding exposure to the pesticide, but cannot prevent other exposures resulting from drift—an issue that farm families and agricultural workers are particularly concerned about.

As scientists learn more about global warming's impacts on agriculture, the chlorpyrifos case study highlights the importance of monitoring the health effects of pesticide exposure in a warming climate, particularly for vulnerable populations such as children. Projected environmental change will affect the spatial and temporal distribution of weeds and pests, leading to farmers' increased use of pesticides. Purdue University's recent Climate Change Impacts Assessment has found that warmer winters will create conditions conducive to the northward spread of pests and will intensify disease pressures. Indiana has warmed 1.2 degrees Fahrenheit since 1895; experts predict temperatures will rise 5 to 6 degrees by the middle of this century, and 6 to 10 degrees by century's end. Furthermore, since 1895, Indiana's frost-free season has increased by 9 days, and is projected to lengthen by 3.5 to 4.5 weeks by mid-century.<sup>76</sup> Experts also anticipate that pests will develop resistance to chemical control agents more rapidly than before, due to the "increased genotypical diversity that comes with pest insects' range expansion and greater numbers of generations of particular pests undergoing selection for resistant forms each year."<sup>77</sup> The Fourth National Climate Assessment by the U.S. Global Change Research Program reported in 2018 that "increases in temperatures during the growing season

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<sup>74</sup> Andrew C. Revkin, "E.P.A., Citing Risks to Children, Signs Accord to Limit Insecticide," *New York Times*, June 9, 2000, sec. A, p. 1.

<sup>75</sup> Dow had previously signed a 1997 agreement with EPA to reduce consumer exposure to chlorpyrifos by eliminating its use in pet products such as shampoos, and in broadcast pesticide products including foggers. However, studies of chlorpyrifos's volatilization after fumigant application showed lingering toxins that threatened children's health. See Devra Lee Davis and A. Karim Ahmed, "Exposures from Indoor Spraying of Chlorpyrifos Pose Greater Health Risks to Children than Currently Estimated," *Environmental Health Perspectives* 106, no. 6 (June 1998), 299–301.

<sup>76</sup> Melissa Widhalm et al., *Indiana's Past & Future Climate: A Report from the Indiana Climate Change Impacts Assessment* (West Lafayette, Ind., 2018), 1–3, 8, online at <https://docs.lib.purdue.edu/climate/2/>.

<sup>77</sup> Charles Walthall et al., *Climate Change and Agriculture in the United States: Effects and Adaptation*, USDA Technical Bulletin 1935 (2013), 48. See also Robert M. May and Andrew P. Dobson, "Population Dynamics and the Rate of Evolution of Pesticide Resistance," in *Pesticide Resistance: Strategies and Tactics for Management*, ed. National Research Council (Washington, D.C., 1986).

in the Midwest are projected to be the largest contributing factor to declines in the productivity of U.S. agriculture.”<sup>78</sup> As global warming contributes to farmers’ expanded use of pesticides, this adaptive strategy will amplify humans’ environmental exposure to chemicals via both pesticide drift and dietary intake of residues.<sup>79</sup>

In Indiana as elsewhere, climate change’s effect on toxic materials remains an urgent problem. Scientists have recently begun to study how climate change will influence chemical toxicants’ health impacts, emphasizing the importance of identifying vulnerable ecosystems and human populations. Of particular interest are pesticides like chlorpyrifos, atrazine, and aldicarb because farmers apply them in large quantities over vast areas, resulting in varied toxicological effects.<sup>80</sup> One outcome of chemical toxicant exposure is altered homeostatic temperature regulation in humans and other endotherms. Organophosphate and carbamate insecticides can elicit fevers in humans, and can hinder humans’ ability to maintain normal core temperatures, especially during heat waves.<sup>81</sup> Compounding the complexities surrounding the environmental health effects of pesticide exposure are new findings about transgenerational epigenetics, or humans’ transmission of acquired epigenetic modifications to their offspring and future generations.<sup>82</sup>

Maternal governance over environmental health thus endures in ways that history cannot entirely predict. Eva L. Goble, Dean of Purdue

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<sup>78</sup>U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (Washington, D.C., 2018). See also Walthall et al., *Climate Change and Agriculture in the United States*, 45.

<sup>79</sup>Agricultural workers are the population most significantly impacted by pesticide drift. Scientific studies have shown that heat waves—an extreme weather event stemming from global warming—also potentially impact workers’ susceptibility to pesticides absorption. See Maria Pia Gatto, Renato Cabella, and Monica Gherardi, “Climate Change: The Potential Impact on Occupational Exposure to Pesticides,” *Annali Dell’Istituto Superiore Di Sanità* 52, no. 3 (July 2016); Ilse Delcour, Pieter Spanoghe, and Mieke Uyttendaele, “Literature Review: Impact of Climate Change on Pesticide Use,” *Food Research International* 68 (February 2015), 7–15; J. P. Bloomfield et al., “Impacts of Climate Change on the Fate and Behaviour of Pesticides in Surface and Groundwater: A UK Perspective,” *The Science of the Total Environment* 369 (2006), 163–77; M. Miraglia et al., “Climate Change and Food Safety: An Emerging Issue with Special Focus on Europe,” *Food and Chemical Toxicology* 47, no. 5 (2009), 1009–21.

<sup>80</sup>Pamela D. Noyes et al., “The Toxicology of Climate Change: Environmental Contaminants in a Warming World,” *Environment International* 35, no. 6 (2009), 971.

<sup>81</sup>*Ibid.*, 978.

<sup>82</sup>Mark A. Rothstein, Heather L. Harrell, and Gary E. Marchant, “Transgenerational Epigenetics and Environmental Justice,” *Environmental Epigenetics* 3, no. 3 (July 2017), 1–12.

University's School of Home Economics, captured the significance of this maternal authority when she addressed a group of rural Indiana women in 1972. The household "deals in processes, in consumption and the allocation of resources," she explained, and "is where human capital is developed." As managers of the farm family household, Goble argued, rural women were uniquely positioned to respond to environmental problems. "We will turn to conserving our natural resources through every household and community," she told her audience. "Now our concerns will be for where we live. In a way we'll be turning to what each homemaker knows—that there are limits to energy because there are limits to fuel; there are limits to food because there are limits to fertilizer. Conservation of goods, of air, water, and land will become a prominent goal." Despite Hoosier farm women's and Purdue entomologists' many divisions over pesticides since the late nineteenth century, Goble's words capture a shared goal that has seen more continuity than change over time. Localized approaches to addressing environmental crises began in tending one's immediate environment—the farm, the household, and the community—and instilling future generations with a respect for the environment. "Parents are today's teachers," Goble declared, "and the effects last forever, even from one generation to the next."<sup>83</sup>

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<sup>83</sup> "Family Termed Focal Point for Change," *Farm News of Carroll County*, September 22, 1972, pp. 3, 6.