RECONCILING AGRICULTURAL PRODUCTION AND PROPERTY RIGHTS WITH THE USE OF DICAMBA HERBICIDES

by
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The production of food and fiber by our nation's farmers is often dependent on using herbicides to control weed growth that can reduce crop yields. After several decades of herbicide usage, some weed species developed resistance to glyphosate and were decreasing yields. Seed and pesticide manufacturers responded to weed resistance by developing genetically engineered soybean and cotton seeds and specially formulated over-the-top (OTT) dicamba products. Commencing in 2017, OTT dicamba products were used to successfully kill glyphosate-resistant weeds. However, dicamba is a volatile herbicide, and applications of the new OTT products were accompanied by spray drift and volatilization that injured offsite vegetation, including non-dicamba-resistant soybeans. In the National Family Farm Coalition v. Environmental Protection Agency *lawsuit, the Ninth Circuit found that the Environmental Protection Agency (EPA) had understated some of the products' risks and failed to acknowledge other risks. An analysis of 2020 OTT dicamba registrations supports a conclusion that the EPA again failed to adequately account for the costs associated with the use of the OTT products.*

This Article proposes a government-sponsored dicamba compensation program to insure neighboring property owners who suffer injuries from dicamba spray applications. The program would collect occupational fees from persons purchasing dicamba products and place the monies in a fund that would be used to compensate proven offsite dicamba damages. By compensating property owners for the destruction of property rights, the program places injury costs on applicators. Such a program would acknowledge property owners' right to exclude harmful pesticides from their properties and provide an alternative to litigation, thereby reducing tensions between applicators and community members.

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INTRODUCTION

With the formation of the Environmental Protection Agency (EPA) in 1970, federal responsibility for regulating pesticides transferred from the U.S. Department of Agriculture (USDA) to the new agency.[1] The USDA had been lethargic in prosecuting manufacturing firms for serious and repeated violations of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).[2] Four years after the transfer of responsibility, the U.S. General Accounting Office reported to Congress that the

[1] Reorganization Plan No. 3 of 1970, Pub. L. No. 91-191, § 2, 84 Stat. 2086, 2087–2088 (codified as amended at 5 U.S.C.). The change was argued to have "transformed an ineffective, parochial regime, renowned for its capture by the agricultural industry, into a clear rule-based interface." Keith Bradley, *The Design of Agency Interactions*, 111 COLUM. L. REV. 745, 766 (2011).

[2] *See* U.S. GEN. ACCT. OFF., B-122192, PESTICIDES: ACTIONS NEEDED TO PROTECT THE CONSUMER FROM DEFECTIVE PRODUCTS 2 (1974) (reporting that from 1959–1968, "no manufacturers were referred to the Department of Justice for prosecution").

EPA had not "effectively used the enforcement alternatives of canceling registrations and recalling products to prevent marketing of repeatedly ineffective pesticides."[3]

Today, nearly a half century later, pesticide manufacturers continue to exert immeasurable influence over the EPA.[4] For some pesticide registrations, it is unclear whether the agency has substantial evidence to support its registration decisions.[5] In

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[3] *Id.*

[4] *See, e.g.*, Terence J. Centner, *Pesticide Registration Fails to Protect Human Health: Damages from Exposure to Glyphosate-Based Herbicides*, 36 J. ENV'T L. & LITIG. 69, 125–26 (2021) (discussing how health damages accompanying uses of glyphosate may not be fully considered); Terence J. Centner, Brady Brewer & Isaac Leal, *Reducing Damages from Sulfoxaflor Use Through Mitigation Measures to Increase the Protection of Pollinator Species*, 75 LAND USE POL'Y 70, 75 (2018) [hereinafter Centner et al., *Reducing Damages*] (arguing that governments should initiate measures to reduce the excessive social costs associated with uses of sulfoxaflor); Katherine Drabiak, *Roundup Litigation: Using Discovery to Dissolve Doubt*, 31 GEO. ENV'T L. REV. 697, 707 (2019) (noting the EPA's review of industry-sponsored data and studies injects corporate bias into the decision-making process); Kate Z. Graham, *Federal Regulation of Pesticide Residues: A Brief History and Analysis*, 15 J. FOOD L. & POL'Y 98, 125 (2019) (arguing that in establishing pesticide food tolerances, the industry-sponsored studies are more likely to provide results favorable to industry); John Frank Knox, *Sowing the Seeds of Controversy: What the Dicamba Debacle Reveals About the Modern Pesticide Registration Process and Why the EPA Must Act*, 48 ENV'T L. 835, 858 (2018) (noting that a pesticide manufacturer can limit testing under contracts with persons conducting scientific studies to avoid potentially contrasting or unfavorable results); Steven L. Levine, Jeffrey Giddings, Theodore Valenti, George P. Cobb, Danesha Seth Carley & Laura L. McConnell, *Overcoming Challenges of Incorporating Higher Tier Data in Ecological Risk Assessments and Risk Management of Pesticides in the United States: Findings and Recommendations from the 2017 Workshop on Regulation and Innovation in Agriculture*, 15 INTEGRATED ENV'T ASSESSMENT & MGMT. 714, 721–722 (2019) (recommending more effective communications among registrants, EPA officials, and risk managers, as well as greater transparency in assessing risks and benefits for pesticide registration); Axel Mie, Christina Rudén & Philippe Grandjean, *Safety of Safety Evaluation of Pesticides: Developmental Neurotoxicity of Chlorpyrifos and Chlorpyrifos-methyl*, 17 ENV'T HEALTH, Nov. 16, 2018, at 1, 4 (finding a bias in the reporting of industry-sponsored toxicity studies that facilitates harm to human health); Olga V. Naidenko, *Application of the Food Quality Protection Act Children's Health Safety Factor in the U.S. EPA Pesticide Risk Assessments*, 19 ENV'T HEALTH, Feb. 10, 2020, at 1 (advancing research on children under six years of age and risk assessments incorporating toxicity pathways related to elevated risk of disease); Fabio Sgolastra, Piotr Medrzyckib, Laura Bortolottib, Stefano Mainia, Claudio Porrinia, Noa Simon-Delsoc & Jordi Boschd, *Bees and Pesticide Regulation: Lessons from the Neonicotinoid Experience*, 241 BIOL. CONSERVATION., Jan. 2020, at 1, 2 (arguing that when neonicotinoids were registered, some risks were unknown, and regulators have been reluctant to react to the new information).

[5] *See, e.g.*, Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 966 F.3d 893, 921 (9th Cir. 2020) (finding that substantial evidence supported the EPA's conclusion of no unreasonable adverse effects on the environment); Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1133 (9th Cir. 2020) (concluding that the EPA lacked substantial evidence supporting its conclusion of pesticide registrations due to unreasonable risks); Nat. Res. Def. Council v. Env't Prot. Agency, 857 F.3d 1030, 1040 (9th Cir. 2017) (failing to find substantial evidence to support the EPA's public interest finding); Californians for Alts. to Toxics v. Cal. Dep't of Pesticide Reg., 39 Cal.

other cases, a review of relevant data suggests the agency lacked a "rational connection between the facts found and the choice made."[6] Pesticide registrations are being approved for products that have significant negative externalities adversely affecting people's health, property interests, and the environment.[7] Documented damages from pesticide usage suggest that the EPA is undervaluing costs, resulting in the approval of products that have unreasonable adverse effects on the environment contrary to FIFRA's registration requirements.[8]

Pesticides have become critical to the economical production of many agricultural crops.[9] Producers are dependent on pesticides to control insect, fungal, and

Rptr. 3d 393, 408, 410 (Cal. Ct. App. 2006) (concluding the California Department of Pesticide Regulation had substantial evidence for its decisions renewing pesticide registrations).

[6] *See* Pollinator Stewardship Council v. Env't Prot. Agency, 806 F.3d 520, 532 (9th Cir. 2015) (Smith, J., concurring) (quoting Burlington Truck Lines, Inc. v. United States, 371 U.S. 156, 168 (1962)) (finding that the registration of sulfoxaflor did not meet the arbitrary and capricious standard).

[7] *See, e.g.*, Thomas Colnot & Wolfgang Dekant, *Approaches for Grouping of Pesticides into Cumulative Assessment Groups for Risk Assessment of Pesticide Residues in Food*, 83 REGUL. TOXICOLOGY & PHARMACOLOGY 89, 97 (2017) (calling for a more detailed assessment of toxicity data to evaluate risk of health damages from pesticide mixtures); Sanne H. Knudsen, *Regulating Cumulative Risk*, 101 MINN. L. REV. 2313, 2395 (2017) (observing that the evaluation of pesticide safety may ignore existing studies and institutions devoted to health and safety); James R. Roberts, Catherine J. Karr & Council on Environmental Health, *Pesticide Exposure in Children*, 130 PEDIATRICS 1765, 1773, 1781 (2012) (noting "a growing body of literature that suggests that pesticides may induce chronic health complications in children, including neurodevelopmental or behavioral problems, birth defects, asthma, and cancer").

[8] FIFRA requires the balancing of benefits and costs. 7 U.S.C. § 136(bb) (2018). "The term 'unreasonable adverse effects on the environment' means (1) . . . or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 346a of title 21." *Id. See* Save Our Ecosystems v. Clark, 747 F.2d 1240, 1248 (9th Cir. 1984) (considering whether the federal government's use of herbicides met the requirements of the National Environmental Policy Act).

[9] Under economic theory, the producers of food products will use pesticides if it is financially beneficial. Jay A. Rosenheim, Bodil N. Cass, Hanna Kahl & Kimberly P. Steinmann, *Variation in Pesticide Use Across Crops in California Agriculture: Economic and Ecological Drivers*, 733 SCI. TOTAL ENV'T, Sept. 2020, at 1, 2. *See* József Popp, Károly Pető & János Nagy, *Pesticide Productivity and Food Security: A Review*, 33 AGRONOMY SUSTAIN. DEV. 243, 249 (2013) (estimating that the benefits to U.S. agriculture from the use of pesticides is $40 billion). Another estimate suggests there would be an annual farm income loss of $6.76 billion if the herbicide glyphosate was banned worldwide. Graham Brookes, Farzad Taheripour & Wallace E. Tyner, *The Contribution of Glyphosate to Agriculture and Potential Impact of Restrictions on Use at the Global Level*, 8 GM CROPS & FOOD 216, 218–19 (2017). "Profitable crop production starts with a weed control program . . . ." Amit Jhala, *Burndown and Pre-emergence Herbicides for Weed Control in Corn and Soybean*, UNIV. OF NEB., INST. OF AGRIC. & NAT. RES. (Apr. 2, 2020).

weed pests that can markedly reduce yields and product quality.[10] Producers embrace applications of pesticides to reduce crop damages in management decisions tailored to maximize financial returns.[11]

In the United States, herbicides are the most widely used group of pesticides.[12] Their use has been spurred by the development of genetically engineered (GE) crops[13] that are resistant to one or more herbicides, so applicators can spray post-emergent plants to kill weeds.[14] The familiar herbicide glyphosate, some of which is marketed as Roundup, is the most heavily used herbicide in the world.[15] Atrazine is the most widely used herbicide in corn production with approximately 58% of field corn treated with this herbicide.[16] Dicamba, an herbicide initially registered in

[10] Insect pests need to be controlled to control damages to food products. *See* Annika Agatz, Roman Ashauer, Paul Sweeney & Colin D. Brown, *A Knowledge-based Approach to Designing Control Strategies for Agricultural Pests*, 183 AGRIC. SYSTEMS, Aug. 2020, at 1 (observing yield losses of major crops including corn, rice, wheat, potato, soybean, barley, and sugar beet). Weeds have to be controlled to garner reasonable crop yields, and the inefficiency of hand weeding means herbicides are needed. *See* Leonard P. Gianessi, *The Increasing Importance of Herbicides in Worldwide Crop Production*, 69 PEST MGMT. SCI. 1099, 1099–1100, 1103 (2013). The increased usage of pesticides has been accompanied by increases in food supplies. E.-C. Oerke, *Crop Losses to Pests*, 144 J. AGRIC. SCI. 31, 41–42 (2006). Another benefit of pesticide usage is its contribution to food quality. Popp et al., *supra* note 9, at 246–47.

[11] *See* Rosenheim et al., *supra* note 9, at 6–7 (observing that distinctions between annual and perennial crops contribute to decisions on whether to use pesticides).

[12] *See* DONALD ATWOOD & CLAIRE PAISLEY-JONES, ENV'T PROT. AGENCY, OFFICE OF PESTICIDE PROGRAMS, PESTICIDES INDUSTRY SALES AND USAGE: 2008–2012 MARKET ESTIMATES 9 (2017) (reporting usage in 2012).

[13] The key GE crops include soybeans, maize, cotton, canola, and sugar beets. *See* Charles M. Benbrook, *Trends in Glyphosate Herbicide Use in the United States and Globally*, 28 ENV'T SCIS. EUR., Feb. 2016, at 1, 3, 6. The first herbicide-resistant field crop was soybeans. Graham Brookes, *Weed Control Changes and Genetically Modified Herbicide Tolerant Crops in the USA 1996-2012*, 5 GM CROPS & FOOD 321, 321 (2014).

[14] *See* Nader Soltani, Christy Shropshire & Peter H. Sikkema, *Weed Control in Dicamba-Resistant Soybean with Glyphosate/Dicamba Applied at Various Doses and Timings*, INT'L J. AGRONOMY, Feb. 2020, at 1, 2 (examining post-emergence usage rates of a glyphosate/dicamba herbicide on dicamba-resistant soybeans).

[15] INT'L AGENCY FOR RSCH. ON CANCER, WORLD HEALTH ORG., SOME ORGANOPHOSPHATE INSECTICIDES AND HERBICIDES 323 (2017). Glyphosate formulations are manufactured by more than 90 producers in 20 countries. *Id.*

[16] This figure is for the United States. Atrazine: Interim Registration Review Decision, Case No. 0062, PESTICIDE RE-EVALUATION DIV., EPA 25 (Sept. 14, 2020) [hereinafter EPA, Atrazine Registration Decision]. Atrazine is also used to control weeds in wheat, grasses, ornamentals, Christmas trees, sod, golf courses, parks, and school grounds. *Id.* at 5.

1967,[17] is used widely on GE soybeans, GE cotton, corn, small grains, and pastures.[18] Specially-formulated dicamba products that would kill glyphosate-resistant weeds were introduced for commercial use in 2017.[19] Due to the ability to apply these products after crops have sprouted, they are known as over-the-top (OTT) dicamba products.[20] Glyphosate is also used as a post-emergent spray on GE crops, but references to OTT products in this Article are limited to dicamba products.

All herbicides need to be applied correctly so that they do not harm offsite vegetation.[21] Commencing in 2017, thousands of property owners alleged that applications of OTT products had been accompanied by significant offsite injuries to crops and vegetation.[22] Injuries continued in 2018 and subsequent years.[23] The uncompensated injuries led a coalition of farm, food, health, and environmental groups to challenge the 2018 registrations of three OTT products in the *National Family Farm Coalition v. Environmental Protection Agency* lawsuit.[24] In 2020, the Ninth Circuit Court of Appeals concluded that the EPA's issuance of registrations for three OTT products violated FIFRA.[25] Due to fundamental flaws in the EPA's analysis, the registrations were vacated, and the EPA canceled the registrations.[26]

The legitimacy of the OTT-product registrations is part of a larger debate about governmental actions regarding approvals of new pesticide products and

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[17] *See* OFF. OF PESTICIDE PROGRAMS, ENV'T PROT. AGENCY, OVER-THE-TOP DICAMBA PRODUCTS FOR GENETICALLY MODIFIED COTTON AND SOYBEANS: BENEFITS AND IMPACTS 4 (Oct. 31, 2018) [hereinafter EPA, OVER-THE-TOP DICAMBA PRODUCTS].

[18] *See* J. Franklin Egan & David A. Mortensen, *Qualifying Vapor Drift of Dicamba Herbicides Applied to Soybean*, 31 ENV'T TOX. & CHEM. 1023, 1023 (2012) (noting five decades of use); Registration Decision for the Continuation of Uses of Dicamba on Dicamba Tolerant Cotton and Soybean, REGISTRATION DIV., EPA 14 (Oct. 31, 2018) [hereinafter EPA, 2018 Dicamba Registration Decision] (evaluating OTT uses but noting other pre-emergence uses); *Dicamba - General Information*, MINN. DEP'T OF AGRIC., https://www.mda.state.mn.us/dicamba-general-information (last visited Dec. 27, 2021).

[19] Final Registration of Dicamba on Dicamba-Tolerant Cotton and Soybean, OFF. OF PESTICIDE PROGRAMS, EPA 2 (Nov. 9, 2016) [hereinafter EPA, 2016 Final Dicamba Registration].

[20] EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 11.

[21] Registrations enumerate details on crops, rates, and timing, and more. Applicators failing to follow the directions of a registration are violating the law. 7 U.S.C. § 136j(a)(2)(G) (2018).

[22] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 10–11.

[23] Kevin Bradley, *July 15 Dicamba Injury Update. Different Year, Same Questions*, UNIV. OF MO. INTEGRATED PEST MGMT. (July 19, 2018), https://ipm.missouri.edu/IPCM/2018/7/July-15-Dicamba-injury-update-different-year-same-questions/; *see also* Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1137–38 (9th Cir. 2020).

[24] 960 F.3d 1120.

[25] *Id.* at 1124.

[26] *Id.* at 1144–45; ENV'T PROT. AGENCY, FINAL CANCELLATION ORDER FOR THREE DICAMBA PRODUCTS (XTENDIMAX WITH VAPORGRIP TECHNOLOGY, ENGENIA, AND FEXAPAN) 3–4 (June 8, 2020) [hereinafter EPA, 2020 FINAL CANCELLATION ORDER].

the propriety of selected pesticide uses.[27] The EPA has approved several pesticide registrations for uses that are accompanied by significant human health costs, environmental degradation, or property losses.[28] The registration decisions

[27] A major issue is the health of farmworkers who are in areas where pesticides have been applied. *See, e.g.*, Stephanie H. Jones, *Greater Than the Sum of Its Parts: The Integration of Environmental Justice Advocacy and Economic Policy Analysis*, 26 N.Y.U. ENV'T L.J. 402, 431–40 (2018) (discussing how the cost-benefit analysis under pesticide law may disadvantage migrant farmworkers).

[28] For examples of human health costs, see Verdict Form at 2, Hardeman v. Monsanto Co., No. 16-cv-00525-VC (N.D. Cal. Mar. 27, 2019); Court Reporter's Transcript of Proceedings at 5748, 5750–51, Pilliod v. Monsanto Co. (Cal. App. Dep't Super. Ct. May 13, 2019) (JCCP No. 4953, Case No. RG17862702); Verdict Form, Johnson v. Monsanto Co., No. CGC-16-550128 (Cal. App. Dep't Super. Ct. Aug. 10, 2018); *see also* Petition for Review at 2, Rural Coal. v. Env't Prot. Agency, No. 20-73220 (9th Cir. Oct. 30, 2020) (challenging interim registration review decisions for atrazine, propazine, and simazine); Kirsten S. Almberg, Mary E. Turyk, Rachael M. Jones, Kristin Rankin, Sally Freels & Leslie T. Stayner, *Atrazine Contamination of Drinking Water and Adverse Birth Outcomes in Community Water Systems with Elevated Atrazine in Ohio, 2006–2008*, 15 INT'L J. ENV'T RSCH. & PUB. HEALTH, Aug. 31, 2018, at 1, 9–10 (suggesting the herbicide atrazine in drinking water is associated with reduced birth weights of infants); Leslie Thomas Stayner, Kirsten Almberg, Rachael Jones, Judith Graber, Marie Pedersen & Mary Turyk, *Atrazine and Nitrate in Drinking Water and the Risk of Preterm Delivery and Low Birth Weight in Four Midwestern States*, 152 ENV'T RSCH. 294, 297 (2017) (observing a statistical interaction between exposure to nitrate and atrazine for preterm delivery in humans). For examples of environmental degradation, see Samuel Boff, Ricarda Scheiner, Josué Raizer & Daniela Lupi, *Survival Rate and Changes in Foraging Performances of Solitary Bees Exposed to a Novel Insecticide*, 211 EXOTOXICOLOGY & ENV'T SAFETY, Jan. 12, 2021, at 1, 2 (finding that long-term exposure to sulfoxaflor reduces the survival of bees); Centner et al., *Reducing Damages*, *supra* note 4, at 70–71 (discussing the harm to pollinator species from uses of sulfoxaflor); Priyadarshini Chakrabarti, Emily A. Carlson, Hannah M. Lucas, Andony P. Melathopoulus & Ramesh R. Sagill, *Field Rates of Sivanto™ (flupyradifurone) and Transform® (sulfoxaflor) Increase Oxidative Stress and Induce Apoptosis in Honey Bees (Apis mellifera L.)*, PLOS ONE, May 21, 2020, at 1, 9 (finding increased oxidative stress and onset of apoptosis in honey bees exposed to two insecticides); Lennard Pisa, Dave Goulson, En-Cheng Yang, David Gibbons, Francisco Sánchez-Bayo, Edward Mitchell, Alexandre Aebi, Jeroen van der Sluijs, Chris J. K. MacQuarriel, Chiara Giorio, Elizabeth Yim Long, Melanie McField, Maarten Bijleveld van Lexmond & Jean-Marc Bonmatin, *An Update of the Worldwide Integrated Assessment (WIA) on Systemic Insecticides. Part 2: Impacts on Organisms and Ecosystems*, ENV'T SCI. POLLUTION RSCH., Nov. 9, 2017, at 11,749–50 (maintaining that the negative impacts of systemic insecticides affect entire ecosystems); Francisco Sánchez-Bayo, Hanae Yamashita, Ryu Osaka, Masahiro Yoneda & Kouichi Goka, *Ecological Effects of Imidacloprid on Arthropod Communities in and Around a Vegetable Crop*, 42 J. ENV'T SCI. & HEALTH PT. B 279, 285 (2007) (finding that the use of insecticides is not restricted to application areas but also affects animal life outside); Jingliang Shi, Heyan Yang, Longtao Yu, Chunhua Liao, Yao Liu, Mengjie Jin, Weiyu Yan & Xiao Bo Wu, *Sublethal Acetamiprid Doses Negatively Affect the Lifespans and Foraging Behaviors of Honey Bee (Apis mellifera L.) Workers*, 738 SCI. TOTAL ENV'T 2, 4–5 (2020) (finding that exposure to an insecticide had significant negative effects on worker bees and shortened their lifespans); Clauvis Nji Tizi Taning, Adinda Vanommeslaeghe & Guy Smagghe, *With or Without Foraging for Food, Field-realistic Concentrations of Sulfoxaflor are Equally Toxic to*

have been based mainly on the profitability of pesticide usage.[29] As required by law, the EPA has considered costs, but discounted or ignored potential injuries and damages.[30] Reviewing some of the registration documentation suggests the EPA may be

Bumblebees (Bombus terrestris), 39 ENTOMOLOGIA GENERALIS 151, 154 (2019) (reporting mortalities of bees from the use of insecticides). Regarding property losses, Bayer, the manufacturer of a dicamba product, entered a settlement agreement to pay up to $400 million for crop losses occurring in the 2015–2020 crop years resulting from injuries from the use of dicamba products. *Bayer Reaches a Series of Agreements*, BAYER (June 24, 2020), https://www.bayer.com/en/bayer-reaches-series-agreements [https://web.archive.org/web/20201108182559/https://www.bayer.com/en/bayer-reaches-series-agreements]; *see also* Bader Farms, Inc. v. Monsanto Co., 431 F. Supp. 3d 1084, 1088 (E.D. Mo. 2019) (arguing that use of dicamba herbicides damaged peach trees).

[29] This was shown in the examination of the pesticide chlorpyrifos. In 2014, the EPA found that applications of chlorpyrifos to tart cherries resulted in concentrations that exceeded the drinking water level of comparison. Memorandum from Env't Prot. Agency, Off. of Chem. Safety & Pollution Prevention to Joel Wolf, Tom Myers & Kevin Costello, Risk Mgmt. & Implementation Branch II Pesticide Re-evaluation Div., at 2 (Dec. 23, 2014). Furthermore, "up to 3% of the watersheds may have chlorpyrifos concentrations" that would cause community water systems to have chlorpyrifos concentrations higher than the designated drinking water level of comparison. *Id.* at 28. In 2016, the EPA found "sufficient evidence that there are neurodevelopmental effects occurring at chlorpyrifos exposure levels below that required for AChE inhibition" which suggested current regulations might not provide a sufficiently protective human health risk assessment. Memorandum from Env't Prot. Agency, Off. of Chem. Safety & Pollution Prevention to Dana Friedman, Chem. Rev. Manager, Risk Mgmt. & Implementation Branch II Pesticide Re-evaluation Div., at 13 (Nov. 3, 2016). Despite this information, in 2017 the EPA opined "that there continue to be considerable areas of uncertainty with regard to what the epidemiology data show and deep disagreement over how those data should be considered in EPA's risk assessment." Chlorpyrifos; Order Denying PANNA and NRDC's Petition to Revoke Tolerances, 82 Fed. Reg. 16,581, 16,590 (Apr. 5, 2017) [hereafter EPA, Chlorpyrifos Order]. This order meant that the scientific documentation recommending buffer distances and protections from potential neurological effects to keep people safe were disregarded so chlorpyrifos could continue to be used in agricultural production. *Id.* Disagreeing with the EPA's registration of chlorpyrifos products, the states of California and Hawaii took action in 2019 to ban the insecticide. *Chlorpyrifos Cancellation*, CAL. DEP'T OF PESTICIDE REG. (2019), https://www.cdpr.ca.gov/docs/chlorpyrifos/index.htm [https://web.archive.org/web/20190830163219/]; HAW. REV. STAT. § 149A-31(7) (2018). A major manufacturer, Corteva, decided to cancel production of the product in 2020. Lisa M. Campbell, Timothy D. Backstrom & James V. Aidala, *Corteva Announces It Will Cease Production of Embattled Insecticide Chlorpyrifos*, NAT. L. REV. (Feb. 14, 2020), https://www.natlawreview.com/article/corteva-announces-it-will-cease-production-embattled-insecticide-chlorpyrifos.

[30] The agency has considerable flexibility in analyzing the evidence submitted for a registration and claimed that uncertainties in epidemiological data mean they were not weighty. *See* EPA, Chlorpyrifos Order, *supra* note 29. In other situations, the EPA claims that new mitigation efforts will reduce damages so that the pesticide product qualifies for registration. *See* EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 18. In its decision approving the herbicide atrazine, the EPA admitted that it did not have a complete environmental assessment for endangered species but expected that mitigation measures would sufficiently reduce risk, so

presuming that pesticide products profitable for agricultural production should be approved despite costs to society.[31]

Congress did not intend profitability to be more important than health and environmental considerations.[32] FIFRA includes a provision stating that no pesticide can be registered unless it performs its intended function without "unreasonable adverse effects on the environment."[33] A determination of whether there are unreasonable adverse effects on the environment requires consideration of two risk categories. First, the EPA must consider whether the use of a pesticide creates any unreasonable risk to humans or the environment based on economic, social, or environmental costs.[34] Under this consideration, a cost-benefit analysis is used to determine whether a pesticide product qualifies for registration.[35] Second, the EPA examines the human dietary risk from pesticide residues.[36] This consideration relies

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the pesticide qualified for registration. EPA, Atrazine Registration Decision, *supra* note 16, at 10; *see also* Thomas O. McGarity & Wendy E. Wagner, *Deregulation Using Stealth "Science" Strategies*, 68 DUKE L.J. 1719, 1739 (2019) (documenting the EPA's refusal to base a decision to ban chlorpyrifos on scientific evidence); Mie et al., *supra* note 4, at 1, 4 (suggesting biased industry-sponsored toxicity studies).

[31] *See, e.g.*, EPA, Chlorpyrifos Order, *supra* note 29, at 16,584, 16,591 (finding that chlorpyrifos is the "only cost-effective choice for control of certain insect pests" and concluding that uncertainties about the neurodevelopmental risks in children could be considered at a later time). Costs to society may be ignored in emergency situations where the lack of an economically feasible alternative to control pests allows pesticides to be used despite adverse health effects. 7 U.S.C. § 136p (2018); 40 C.F.R. § 166.3 (2020). *See* Petition from Ctr. for Biological Diversity for Rulemaking to Andrew R. Wheeler, Adm'r, Env't Prot. Agency & Rick Keigwin, Dir., Env't Prot. Agency (Feb. 20, 2020), https://www.biologicaldiversity.org/campaigns/pesticides_reduction/pdfs/Petition-w-Enclosures-for-Posting-2020-2-20.pdf.

[32] This is expressed in the registration of pesticides. 7 U.S.C. § 136a(a). "To the extent necessary to prevent unreasonable adverse effects on the environment, the Administrator may by regulation limit the distribution, sale, or use in any State of any pesticide that is not registered under this [Act] . . . ." *Id.*

[33] *Id.* § 136a(c)(5).

[34] *Id.* § 136(bb).

[35] This is established in the definition of "[u]nreasonable adverse effects on the environment." *Id. See* Pollinator Stewardship Council v. Env't Prot. Agency, 806 F.3d 520, 532 (9th Cir. 2015) (finding the evidence considered for the EPA's cost-benefit analysis was insufficient in overcoming risk, so the registration was not supported by substantial evidence); Nat'l Coal. Against the Misuse of Pesticides v. Env't Prot. Agency, 867 F.2d 636, 638 (D.C. Cir. 1989) (examining the application of the statutory requirement).

[36] *Nat'l Coal. Against the Misuse of Pesticides*, 867 F.2d at 638. "The term 'unreasonable adverse effects on the environment' means (1) . . . or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 346a of title 21." 7 U.S.C. § 136(bb). *See Setting Tolerances for Pesticide Residues in Foods*, ENV'T PROT. AGENCY (May 13, 2020), https://www.epa.gov/pesticide-tolerances/setting-tolerances-pesticide-residues-foods#food-safety [https://web.archive.org/web/20201222025022/https://www.epa.gov/pesticide-tolerances/setting-tolerances-pesticide-residues-foods].

on maximum residue limits in or on food products called "tolerances."[37] Tolerances are established under the Federal Food, Drug, and Cosmetic Act[38] and are set at levels for which there is "a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue . . . ."[39]

In 2020, the EPA issued new OTT-product registrations with additional labeling requirements that allow the products to be sold during the 2021–2024 growing seasons.[40] Not surprisingly, the registrations have been challenged by environmental groups.[41] In addition, these registrations are being challenged by soybean and cotton trade associations due to spray application requirements that increase production costs.[42] Like the 2018 registrations, the 2020 registrations pose the question of whether the EPA has authorized pesticide uses despite evidence they will injure offsite vegetation in violation of FIFRA's prerequisite of no significant increase in

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[37] 21 U.S.C. § 346a (2018).

[38] *Id.* §§ 301–399i.

[39] *Id.* § 346a(b)(2)(A)(ii). For specific tolerances, see 40 C.F.R. pt. 180 (2020). Tolerances apply to both raw agricultural commodities and processed food. 21 U.S.C. § 346a(a)(1)(B). To reduce adverse effects from the use of a pesticide, pesticide products are labeled with restrictions concerning concentrations, crops, pests, applicators, and locations for use. ENV'T PROT. AGENCY, OFF. OF PESTICIDE PROGRAMS, LABEL REVIEW MANUAL 11-1 (2013); *see* 40 C.F.R. § 152.50 (2020) (delineating items needed in registrations). Additional provisions incorporated in directions for use further restrict usage to prevent injury and harm. *Id.* § 156.10(i).

[40] Notice of Pesticide Registration for BASF Engenia Herbicide, EPA Reg. No. 7969-472 (Nov. 5, 2020) [hereinafter EPA, 2020 BASF Engenia Registration]; Notice of Pesticide Registration for Bayer XtendiMax with VaporGrip Technology, EPA Reg. No. 264-1210 (Oct. 27, 2020) [hereinafter EPA, 2020 Bayer XtendiMax Registration]; Notice of Pesticide Registration for Syngenta Tavium Plus VaporGrip Technology, EPA Reg. No. 100-1623 (Oct. 27, 2020) [hereinafter EPA, 2020 Syngenta Tavium Registration]. These registrations did not include FeXapan, and Corteva has announced it is discontinuing selling this dicamba product. Gil Gullickson, *Corteva Agriscience Discontinues FeXapan Herbicide*, SUCCESSFUL FARMING (Feb. 23, 2021), https://www.agriculture.com/news/crops/corteva-agriscience-discontinues-fexapan-herbicide.

[41] *See* Complaint for Declaratory and Equitable Relief at 3, Ctr. for Biological Diversity v. Env't Prot. Agency, No. 4:20-cv-00555 (D. Ariz. Dec. 23, 2020) (claiming that the EPA failed to follow the Ninth Circuit's order and did not comply with FIFRA); Petition for Review at 1–2, Nat'l Fam. Farm Coal. v. Env't Prot. Agency, No. 20-73750 (9th Cir. filed Dec. 21, 2020), *transferred to* No. 21-01043 (D.C. Cir. Jan. 26, 2021).

[42] *See* Complaint for Declaratory and Injunctive Relief, Am. Soybean Ass'n v. Wheeler, No. 20-cv-03190 (D.D.C. Nov. 4, 2020) (challenging limitations on dicamba usage that reduce producers' profitability); *see also* Plains Cotton Growers, Inc. v. Regan, No. 20-1484 (D.C. Cir. filed Dec. 4, 2020); Plains Cotton Growers, Inc. v. Env't Prot. Agency, No. 20-61055 (5th Cir. filed Nov. 13, 2020); Am. Soybean Ass'n v. Regan, No. 20-1441 (D.C. Cir. filed Nov. 5, 2020). The circuit court cases have been consolidated in the D.C. Circuit.

"the risk of any unreasonable adverse effect on the environment."[43] While profitability is important to agricultural producers and supply firms, FIFRA also requires consideration of injuries to flora and fauna affected by spray drift and volatilization.[44] Moreover, the agency needs to consider alternative pesticide products that are available for use.[45] In a 2020 memorandum, the EPA reported that there were at least twenty different active ingredients with ten mechanisms of action that provide control of glyphosate-resistant Palmer amaranth for cotton and soybeans.[46] The unavailability of OTT products would not preclude agricultural production because other products and technologies would sustain production.[47] While production might become more costly, the United States would be able to produce sufficient soybean and cotton crops without dicamba products for domestic needs.[48]

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[43] 7 U.S.C. § 136a(c)(7)(B) (2018).

[44] *Id.* § 136(bb). *See* Pollinator Stewardship Council v. Env't Prot. Agency, 806 F.3d 520, 532 (9th Cir. 2015) (finding a registration for the insecticide sulfoxaflor was not based on evidence that it would not cause unreasonable adverse effects on bees, so it should be vacated); Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 966 F.3d 893, 923–24 (9th Cir. 2020) (reviewing the EPA's assessment of risks to plants and animals from exposure to the herbicide Enlist Duo to find the agency applied a methodology that met the legal standard); Ellis v. Bradbury, No. C-13-1266 MMC, 2014 WL 1569271 (N.D. Cal. Apr. 18, 2014) (concluding that new evidence that pesticide usage causes a substantial likelihood of serious harm to bees was sufficient to maintain a petition to cancel or suspend a pesticide registration); Nat. Res. Def. Council v. Env't Prot. Agency, 676 F. Supp. 2d 307 (S.D.N.Y. 2009) (vacating registrations of an insecticide due to uncertainties in the data concerning a potential adverse effect on bees).

[45] 7 U.S.C. § 136a(c)(1)(F)(ii)(I).

[46] Memorandum from Bill Chism, Jonathan Becker, Kelly Tindall, John Orlowski & Brad Kells, Env't Prot. Agency, Biological Analysis Branch & Econ. Analysis Branch, to Dan Kenny and Margaret Hathaway, Env't Prot. Agency, Herbicide Branch, Registration Div., at 11, 43 (Oct. 26, 2020) [hereinafter Chism Memorandum] (noting anecdotal reports of defensive planting and the possibility of companies obtaining monopoly power).

[47] Glyphosate is used to control weeds in soybeans, and integrated pest management strategies can abate the problem of glyphosate-resistant weeds. A simulation model predicted that weed resistance could be delayed by 50% by rotating other crops with glyphosate-resistant cotton. Paul Neve, Jason K. Norsworthy, Kenneth L. Smith & Ian A. Zelaya, *Modeling Glyphosate Resistance Management Strategies for Palmer Amaranth (Amaranthus palmeri) in Cotton*, 25 WEED TECH. 335, 340 (2011); *see also* Matthew G. Underwood, Nader Soltani, Darren E. Robinson, David C. Hooker, Clarence J. Swanton, Joseph P. Vink & Peter H. Sikkema, *Weed Control, Environmental Impact, and Net Revenue of Two-Pass Weed Management Strategies in Dicamba-Resistant Soybean*, 98 CAN. J. PLANT SCI. 370, 378–79 (2018) (concluding that "there are several herbicide options available that provide excellent control of a wide range of broadleaf and grass weed species in no-till dicamba-resistant soybean[s]").

[48] The United States produces many more soybeans than needed domestically, exporting 39 million tons of soybeans in 2020. FOREIGN AGRIC. SERV., U.S. DEP'T OF AGRIC., OILSEEDS: WORLD MARKETS AND TRADE 6 (Jan. 2021). The United States has more than enough cotton for domestic use as the county exports about 15 million bales of cotton each year. *Cotton Sector at*

The 2020 registrations were unconditional even though the offsite injuries of the previous four years disclosed failures in interpreting data used to justify the previous conditional registrations.[49] The EPA again maintained that a change in labeling requirements governing spray applications would reduce offsite injuries.[50] However, given that previous labeling changes had been unsuccessful in preventing unacceptable offsite injuries, it appears dubious that the revisions incorporated in the labels of the 2020 registrations will be enough to prevent injuries from spray drift and volatilization.[51] Opponents to the registration advance two major substantive arguments concerning the registrations.[52] First, do relevant data and field studies show a rational connection between the facts found and the choices made?[53] Second, as raised in the *National Family Farm Coalition* lawsuit, did the EPA have substantial evidence to support the 2020 registration decisions?[54]

To determine the merits of these arguments, Part I of this Article provides an accounting of what dicamba applications have meant for producers and their communities. Producers welcomed the use of dicamba to control glyphosate-resistant weeds, but neighbors worried about losing crops and vegetation from herbicide spray drift. With this background, Part II reviews the Ninth Circuit's decision that vacated the 2018 OTT-product registrations. The court found that the EPA had understated some of the acknowledged risks and completely failed to acknowledge other risks. Part III analyzes the new 2020 registrations. The EPA delineated four major changes to the products labels that it felt would stop offsite injuries.

However, an examination of the documentation for the agency's actions reveals a lack of evidence and deficiencies in the choices made. The EPA lacked substantial evidence showing that offsite injuries would not occur. With four years of documented offsite injuries and challenges to the 2020 registrations, the registrants and

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a Glance, U.S. DEP'T OF AGRIC., ECON. RSCH. SERV., https://www.ers.usda.gov/topics/crops/cotton-wool/cotton-sector-at-a-glance/ (Nov. 3, 2020).

[49] Conditional registration is appropriate when more or better data is needed to support registration. 7 U.S.C. § 136a(c)(7)(B). With the history of offsite injuries, the data relied upon for the earlier registrations had incorrectly predicted there would not be injuries. New data is needed to support a finding of no offsite injuries to support the new registrations. *See infra* Part II for a discussion of the short-comings of the earlier registrations.

[50] *See infra* Part III for a discussion of label changes incorporated in the 2020 registrations.

[51] *See* Complaint for Declaratory and Equitable Relief, Ctr. for Biological Diversity v. Env't Prot. Agency, No. 20-cv-00555 (D. Ariz. Dec. 23, 2020).

[52] There are additional arguments on qualifying for unconditional registration and failures in not providing notice and comment as required by FIFRA and the Administrative Procedure Act. *Id.* at 90–94.

[53] *See* Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (citing Burlington Truck Lines, Inc. v. United States, 371 U.S. 156, 168 (1962) to find the absence of a rational connection was arbitrary and capricious).

[54] *See infra* Part II.

crop producers might look for an alternative strategy for maintaining weed management. Part IV of this Article proposes a government-sponsored program to facilitate the use of dicamba products while compensating persons for injuries.[55] A dicamba compensation program would insure neighboring property owners who suffer injuries from dicamba spray applications. Proven damages related to injuries from dicamba would be compensated. By providing compensation for injuries, the program would reduce tensions among neighbors and obviate the issue of uncompensated losses. This could facilitate the continued use of OTT products that are beneficial to agricultural producers.

I. DICAMBA AND ITS REGISTRATION

A. Dicamba Can Cause Offsite Injuries

Dicamba products are known for their volatility.[56] It is also known that spray applications of dicamba during windy conditions can cause injury to offsite vegetation.[57] Furthermore, after an application, some of the dicamba spray changes to a gas and vapors may be carried offsite to adversely affect non-resistant vegetation.[58] The OTT formulations used on GE soybeans and cotton introduced in 2017 are not as volatile as former dicamba products and enable producers to apply herbicides on dicamba-resistant soybeans and cotton to control weed growth after the seeds

[55] *See infra* Part IV. The U.S. Department of Agriculture already offers crop insurance for many agricultural products. *Summary of Changes for the Common Crop Insurance Policy Basic Provisions – Reinsured Version (21.1-BR)*, U.S. DEP'T OF AGRIC. (Nov. 2020), https://www.rma.usda.gov/-/media/RMA/Policies/Basic-Provisions/2021/Basic-Provisions-21-1-BR.ashx.

[56] *See* Erik D. Sall, Keguo Huang, Naresh Pai, Adam W. Schapaugh, Joy L. Honneger, Thomas B. Orr & Leah S. Riter, *Quantifying Dicamba Volatility Under Field Conditions: Part II, Comparative Analysis of 23 Dicamba Volatility Field Trials*, 68 J. AGRIC. FOOD CHEM. 2286, 2295 (2020) (conducting field trials involving applications of dicamba sprays with post-application volatility being observed in all cases).

[57] *See* Stephen D. Strachan, Nancy M. Ferry & Tracy L. Cooper, *Vapor Movement of Aminocyclopyrachlor, Aminopyralid, and Dicamba in the Field*, 27 WEED TECH. 143, 153 (2013) (finding that dicamba spray applications cause phytotoxic responses to soybeans at greater distances than a synthetic auxin herbicide).

[58] The OTT-product registration for XtendiMax approved in 2016 explained that the product's formulation was expected to "further reduce the potential off site movement of generic dicamba formulation," acknowledging that there may be spray drift and volatilization. EPA, 2016 Final Dicamba Registration, *supra* note 19, at 2; *see, e.g.*, Letter from Daniel Kenny, Chief, Herbicide Branch, Registration Division, Office of Pesticide Programs, Env't Prot. Agency, to James Nyangulu, Manager, U.S. Agency Reg. Affs., Monsanto Co. 20 (Nov. 9, 2016) (noting that "[f]ailure to follow the requirements in this label could result in severe injury or destruction to [non-target] sensitive broadleaf crops and trees"). In addition, the Worker Protection Standard, which incorporates requirements for training, is applicable to the dicamba products. *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 4.

have germinated.[59] The products were introduced as amendments to existing dicamba registrations, and previously submitted quantitative spray-drift assessments justified the registrations.[60] Since the introduction of OTT products, substantial evidence has shown that they have caused significant offsite injuries to non-resistant crops and vegetation.[61] Prior to the use of dicamba-resistant soybeans and cotton, the EPA "received no more than 40 dicamba incident reports in a single year under the Adverse Effects Reporting [requirement set forth] in Section 6(a)(2) of FIFRA."[62] After OTT products were used by producers in 2017, reported incidents increased to 1,400 in 2017, 2,600 in 2018, and nearly 3,000 in 2019.[63]

These uncompensated injuries were considered by the Ninth Circuit in the *National Family Farm Coalition* lawsuit.[64] The court found there was substantial noncompliance with label restrictions and unacknowledged economic, social, and environmental costs.[65] Five days after the court's judgment, the EPA canceled the registrations of three OTT products—XtendiMax, FeXapan, and Engenia.[66] In the absence of a registration, it was illegal to distribute and sell these herbicides in the United States.[67] Since the cancellation order resulted in many producers and commercial pesticide applicators having stocks of the OTT products for use during the 2020 growing season, the EPA allowed producers and commercial applicators to use their stocks until July 31, 2020, or to return them to the registrant.[68] In addition, the cancellation order mandated that uses of the herbicides had to comply with the previously approved labeling that applied to each product.[69]

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[59] The applicator needs to acknowledge whether uses are preemergence or postemergence. *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 4.

[60] *See* EPA, 2016 Final Dicamba Registration, *supra* note 19, at 13. The EPA used a previous assessment of a safe margin of exposure for dicamba applications on turf. *Id.*

[61] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 11.

[62] EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 7; *see* 7 U.S.C. § 136d(a)(2) (2018) (requiring registrants to report additional "factual information regarding unreasonable adverse effects on the environment of [a] pesticide" to the Administrator); *see also* 40 C.F.R. § 159.152(a) (2020) (repeating the requirement stated in the law).

[63] Memorandum from the Env't Prot. Agency, Off. of Pesticide Programs, Supporting Decision to Approve Registration for the Uses of Dicamba on Dicamba Tolerant Cotton and Soybean 7, 9 (Oct. 27, 2020) [hereinafter EPA, 2020 Dicamba Memorandum].

[64] 960 F.3d 1120 (9th Cir. 2020).

[65] *Id.* at 1144.

[66] EPA, 2020 FINAL CANCELLATION ORDER, *supra* note 26.

[67] *See* 7 U.S.C. § 136a(a).

[68] EPA, 2020 FINAL CANCELLATION ORDER, *supra* note 26; *see also EPA Responds to Ninth Circuit Vacatur of Dicamba Registrations*, ENV'T PROT. AGENCY (June 5, 2020), https://www.epa.gov/newsreleases/epa-responds-ninth-circuit-vacatur-dicamba-registrations.

[69] EPA, 2020 FINAL CANCELLATION ORDER, *supra* note 26.

Despite the findings and conclusions set forth in the *National Family Farm Coalition* decision, the EPA granted new registrations five months later for three OTT products.[70] The EPA found that "a suite of mandatory control measures that address[es] the potential for spray drift, volatile emissions and runoff" was sufficient to control offsite damages.[71] Justification for approving new registrations of products similar to those that had been canceled was based mainly on changes to the products' labels that the EPA claimed would reduce offsite damages.[72] Yet, the documentation relied upon for the registrations seems to be insufficient to support a conclusion that the registered products will not be accompanied by offsite injuries.

The EPA's conclusion on expected offsite movement of dicamba was based on research examining a single application of the herbicide.[73] However, the approved labels allow two applications of dicamba products.[74] By declining to examine offsite dicamba movement from two applications, the EPA failed to examine the actual conditions affecting offsite vegetation from spray drift, so its calculations of distances are defective.[75] The EPA does not know whether the selected distances will be sufficient to prevent injury to offsite vegetation from two applications.[76]

Another documentation issue involves the reliability of the field tests for volatilization. Rainfall events after the OTT-product applications compromised the results.[77] This means the studies did not provide a legitimate accounting of volatility. Next, the validity of the data from all the studies is questionable because the test plots were considerably smaller than actual field sizes where OTT products are applied.[78] The drift and volatile emissions from small plots would be less than actual

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[70] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 19; EPA, 2020 Bayer XtendiMax Registration, *supra* note 40; EPA, 2020 BASF Engenia Registration, *supra* note 40; EPA, 2020 Syngenta Tavium Registration, *supra* note 40.

[71] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 3.

[72] The EPA also listed some other minor changes on recordkeeping, management plans, training, and testing. *Id.* at 3–4. These changes may help reduce offsite injuries but do not address the problem of applicator noncompliance.

[73] The EPA published documents on benefits and an ecological memorandum. Memorandum from Michael Wagman, Frank T. Farruggia, Ed Odenkirchen & Jennifer Connolly, Env't Prot. Agency, Env't Fate and Effects Div., to Margaret Hathaway, Emily Schmid & Daniel Kenny, Env't Prot. Agency, Herbicide Branch, Registration Div. 52 (Oct. 26, 2020) [hereinafter Wagman Memorandum] (analyzing off-field movement of dicamba from a single application).

[74] *Id.* at 7 (approving labels that allow two applications of dicamba). It was estimated that 8–10% of the soybean acres treated postemergence with dicamba receive two applications. Chism Memorandum, *supra* note 46, at 16, 18.

[75] *See* Wagman Memorandum, *supra* note 73, at 54 tbl.1.20.

[76] *See id.* at 8. The products have multiple buffer requirements related to spray drift, volatility, and endangered species. *Id.*

[77] *See id.* at 230–61.

[78] The studies used field sizes ranging from less than 1 acre to 24 acres. *Id.*

droplets and vapors from producers' larger fields.[79] All the field tests failed to account for multiple fields being sprayed with dicamba products. Moreover, the EPA never considered three applicator factors that affect offsite injuries. Applicators often have a narrow time frame for spraying large acreages, are challenged by changes in the weather during applications, and must make decisions to stop spraying in downwind buffer areas.[80] Considered as a whole, the studies examined by the EPA in support of its conclusions do not seem to constitute substantial evidence supporting the registrations.

Furthermore, in concluding that its slightly adjusted labeling requirements would reduce offsite damages, the agency ignored the fact that the registrants had asserted their products would not be accompanied by offsite injuries under four previous labeling regimes. When approving OTT products for the 2017 crop year, the EPA initially concluded that the "formulations and labeling requirements are expected to eliminate any offsite exposures and effectively prevent risk potential to people and non-target species."[81] However, this conclusion was incorrect, so the labels for the 2018 crop year were amended to include additional limitations.[82] A major change was that only certified applicators could apply OTT products and the EPA felt this would reduce label violations, citing data on violations from Indiana.[83] However, the EPA neglected to acknowledge that approximately 90% of the applicators reporting in Indiana were already certified.[84] This means the EPA's cited data did not support a conclusion that certification will reduce label violations.

Because the 2018 labels did not stop offsite injuries, the EPA issued revised labeling requirements for the 2019 crop year.[85] The 2019 labels failed to reduce offsite damages, so another round of revised labels was adopted for the 2020 crop

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[79] Typically, soybean fields are greater in size. *See* Bruce Johnson, Christopher Thompson, Anil Giri & Sara Van NewKirk, *Nebraska Irrigation Fact Sheet*, DEP'T OF AGRIC. ECON., UNIV. OF NEB. (Sept. 2011), https://agecon.unl.edu/a9fcd902-4da9-4c3f-9e04-c8b56a9b22c7.pdf (reporting that in Nebraska an estimated 55,000 center pivot irrigation systems irrigate about 6.7 million acres, suggesting field sizes of more than 120 acres).

[80] *See* ILL. FERTILIZER & CHEM. ASS'N, 2018 IFCA DICAMBA MANAGEMENT SURVEY RESULTS 15 (Aug. 8, 2018) (reporting comments on difficulties experienced by applicators).

[81] *See* EPA, 2016 Final Dicamba Registration, *supra* note 19, at 29.

[82] Letter from Kathryn Montague, Prod. Manager 23, Herbicide Branch, Registration Div., Off. of Pesticide Programs, to Thomas Marvin, Dir., Fed. Regul. Affs., Monsanto Co. 1 (Oct. 12, 2017) [hereinafter Montague Letter].

[83] *See* EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 20 n.7 (citing the Indiana State Chemist's documentation that 94% of injuries were label violations); Dave Scott, *2017-18 Dicamba Review*, IND. PESTICIDE REV. BD. 153D MEETING 18, 20 (Mar. 16, 2018).

[84] *See* EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 20; Scott, *supra* note 83, at 13.

[85] *See* Notice of Pesticide Registration for Bayer XtendiMax Registration, EPA Reg. No. 524-617, at 1 (Nov. 1, 2018) [hereinafter EPA, 2018 Bayer XtendiMax Registration].

year.[86] Yet, again in 2020, substantial offsite injuries were reported.[87] Each of these four sets of labels was supposed to stop offsite injuries, but failed.[88] The evaluation of the 2018 registrations set forth by the *National Family Farm Coalition* court suggests that something more than another labeling regime is needed to respond to the risks accompanying the use of these OTT products.[89] The field studies employed by the EPA for justifying its 2020 registrations omitted accounting for how producers apply the products and actual weather and geographic conditions.[90] The data and evidence used by the EPA to justify issuance of the OTT-product registrations fail to show that applications will not be accompanied by offsite injuries.

B. Evidence for Registration

Under the jurisprudence of the United States, a pesticide registration decision by the EPA is unlawful if it is not supported by substantial evidence.[91] To justify the conditional amendment of the OTT-product registrations in 2018, the EPA needed to consider the economic, social, and environmental costs that would accompany use of the OTT products.[92] The *National Family Farm Coalition* court found that the EPA failed to consider these costs because it did not consider all risks

[86] ENV'T PROT. AGENCY, DICAMBA OVER-THE-TOP USE IN COTTON AND SOYBEANS UPDATE: MAY 8-9, 2019 PESTICIDE PROGRAM DIALOGUE COMMITTEE MEETING 1–2 (2019) [hereinafter EPA, 2019 DIALOGUE COMM.] (delineating new labeling requirements to reduce offsite injuries).

[87] *See, e.g.*, Bob Hartzler & Prashant Jha, *Dicamba 2020: What Went Wrong in Iowa?* IOWA ST. UNIV. EXTENSION & OUTREACH (July 8, 2020, 7:00 AM), https://crops.extension.iastate.edu/blog/bob-hartzler-prashant-jha/dicamba-2020-what-went-wrong-iowa (reporting that Iowa had more dicamba injury than any time since the 1960s); Paul Mohr, *Minnesota Investigates Rise in Dicamba Damage Complaints*, FARMER (July 22, 2020), https://www.farmprogress.com/herbicide/minnesota-investigates-rise-dicamba-damage-complaints (reporting that Minnesota had more complaints in 2020 than in 2019 and 2018).

[88] The agency had adopted or revised the labels for OTT products in 2016, 2017, 2018, and 2019. However, unacceptable offsite injuries continued after each label change.

[89] The court found that substantial evidence did not support the registrations. Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1144 (9th Cir. 2020).

[90] One of the weather issues is the short time available for applicators to apply dicamba products in conformance with the labeling requirements. *See* Letter from Robert D. Waltz, St. Chemist & Seed Comm'r, Off. of Ind. St. Chemist, to Richard P. Keigwin, Dir. of Pesticide Programs, Env't Prot. Agency 3 (Aug. 29, 2018) [hereinafter Waltz Letter] (commenting that producers have very few hours during which they can apply OTT products in compliance with the label). A significant topographic limitation is that the EPA never had data from any study analyzing a large field. *See* Johnson et al., *supra* note 79.

[91] 7 U.S.C. § 136n(b) (2018). This applies to controversies under review by courts of appeals. *Id.*

[92] *Id.* § 136(bb); *see also id.* § 136a(c) (delineating requirements for registration).

accompanying spray applications.[93] By not considering all risks, the EPA lacked substantial evidence concerning damage costs to support its decisions in issuing the registrations.[94]

The OTT-product applicants needed to submit satisfactory data and establish that their unconditional amendments would not "significantly increase the risk of any unreasonable adverse effect on the environment."[95] The applicants relied on assessments that had been completed in 2016[96] as well as research conducted by several universities in 2018.[97] The 2016 assessments maintained that dicamba exposure from drift could be estimated based on a single application at the maximum rate for a particular use and further assumed that subsequent exposures do not contribute to the toxic effects.[98] The modeling on volatilization only considered a single day[99] even though dicamba remains volatile for three or four days.[100] With these assumptions, the "labeling requirements [we]re expected to eliminate any offsite exposures and effectively prevent risk potential to people and non-target species."[101] The EPA's assumptions were entirely based on evidence supplied by Monsanto, and it was later acknowledged that Monsanto had precluded weed scientists who were conducting other scientific studies with Monsanto's product from any testing concerning volatility.[102]

Significantly, the EPA's documentation for the 2018 registrations admitted the 2016 conclusions on offsite damages were invalid:[103]

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[93] 960 F.3d at 1142.

[94] *Id.* at 1144.

[95] 7 U.S.C. § 136a(c)(7)(B)(ii). The OTT-product registrations were considered as amendments to existing dicamba registrations.

[96] *See* EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 8–10.

[97] *See* EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 14–16.

[98] EPA, 2016 Final Dicamba Registration, *supra* note 19, at 22.

[99] *Id.* at 12.

[100] *See* LEE VAN WYCHEN, ROBERT NICHOLS, GREG KRUGER, PHIL BANKS & SCOTT SENSEMAN, WEED SCI. SOC'Y OF AM., WSSA RESEARCH WORKSHOP FOR MANAGING DICAMBA OFF-TARGET MOVEMENT: FINAL REPORT 3 (2018), http://wssa.net/wp-content/uploads/Dicamba-Report_6_30_2018.pdf (reporting three days); Aaron Hager, *Reports of Dicamba Damage Higher than Last Year*, NO-TILL FARMER (Aug. 12, 2019), https://www.no-tillfarmer.com/articles/9035-reports-of-dicamba-damage-higher-than-last-year (reporting four days).

[101] EPA, 2016 Final Dicamba Registration, *supra* note 19, at 29. The EPA stated "that non-target plant biomass and yield will not be affected by use of the M1768 formulation." *Id.* at 17. By establishing buffer requirements, the EPA felt that exposure would remain in the treated field. *Id.* at 25.

[102] *See* Knox, *supra* note 4, at 858 (noting that Monsanto precluded researchers from analyzing volatilization of its dicamba product being considered for registration).

[103] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 9–11. The EPA reported that state lead agencies had reported high numbers of alleged dicamba-related incidents in 2017 and 2018 involving dicamba usage under the 2016 dicamba registrations. EPA, 2018 Bayer

> Given the high number of alleged dicamba-related adverse incidents reported to EPA in 2017 and 2018 by state lead agencies (SLAs) as well as registrants under FIFRA section 6(a)(2), it is an Agency priority to work with registrants to better understand potential risks and impacts from the use of dicamba on dicamba-tolerant soybean and dicamba-tolerant cotton.[104]

By acknowledging injuries from product usage in the 2018 registrations, the EPA conceded that the anticipated elimination of offsite exposure projected by its 2016 registration decision had not materialized.[105] This meant the assessments conducted for the 2016 registrations had led to false conclusions. The data from the 2016 assessments was flawed as the assessments had failed to evaluate realistic conditions that applicators would face in applying OTT products.[106] Given the flawed data from the 2016 assessments, they should not be used as support for the 2018 registrations.[107]

In approving the conditional registrations in 2018 for using OTT products during the 2019–2020 crop years, the EPA noted that the 2018 university studies showed that volatilization and drift accompanying applications of the dicamba products could result in visual injury to offsite plants.[108] With extensive

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XtendiMax Registration, *supra* note 85; Notice of Pesticide Registration for BASF Engenia Herbicide, EPA Reg. No. 7969-345 (Nov. 2, 2018) [hereinafter EPA, 2018 BASF Engenia Registration]; Notice of Pesticide Registration for DuPont FeXapan Herbicide, EPA Reg. No. 352-913 (Nov. 5, 2018) [hereinafter EPA, 2018 DuPont FeXapan Registration]. Furthermore, the 2016 registrations were not accompanied by meaningful studies of offside drift and volatilization as they relied on earlier studies of turf. EPA, 2016 Final Dicamba Registration, *supra* note 19, at 12–13.

[104] Each of the three 2018 OTT-product registrations contained this statement. EPA, 2018 Bayer XtendiMax Registration, *supra* note 85, at 5; EPA, 2018 BASF Engenia Registration, *supra* note 103, at 5; EPA, 2018 DuPont FeXapan Registration, *supra* note 103, at 5.

[105] *See* sources cited *supra* note 104.

[106] Realistic conditions include the volatility occurring after one day, the effects of a second dicamba application, the changing wind conditions during an application, and the brevity of the time period for applying dicamba in conformance with the label requirements.

[107] *See* EPA, 2016 Final Dicamba Registration, *supra* note 19, at 22 ("Only a single application at the maximum rate for a particular use and compound-specific solubility information is considered, because it is assumed that for plants, toxic effects are likely to manifest shortly after the initial exposure, and that subsequent exposures do not contribute to the response."); *id.* at 29 ("After weighing all the risks of concerns against the benefits of the new uses, the EPA finds that when the mitigation measures for these uses are applied, the benefits of the use of the pesticide outweighs any remaining minimal risks, if they exist at all.").

[108] OFF. OF PESTICIDE PROGRAMS, ENV'T PROT. AGENCY, SUMMARY OF NEW INFORMATION AND ANALYSIS OF DICAMBA USE ON DICAMBA-TOLERANT (DT) COTTON AND SOYBEAN INCLUDING UPDATED EFFECTS DETERMINATIONS FOR FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES 69 (2018) [hereinafter EPA, 2018 SUMMARY OF NEW INFORMATION].

offsite exposure occurring in 2017 and 2018 and corresponding damages,[109] the *National Family Farm Coalition* court found that the EPA had understated some risks.[110] For other risks, the EPA had failed entirely to acknowledge them.[111] In the absence of meaningful consideration of the risks, the court opined the EPA could not find that the registrants had met the requirements for issuance of the 2018 OTT-product registrations.[112]

C. Injuries and Changes in Labeling

For the 2017 crop year, the EPA pesticide program dialogue committee summarized some of the injury information.[113] State agencies in charge of administering FIFRA had received 2,708 official complaints of injury to crops.[114] From conversations with stakeholders, state lead agencies, and university weed scientists, the experts assumed that only one in five cases were reported.[115] University extension personnel estimated that 3.6 million acres of non-dicamba-resistant soybeans were damaged.[116] These injury problems led the registrants and the EPA to adopt more stringent labels for the OTT products for the 2018 growing season.[117] For 2018, the OTT products were reclassified as restricted use pesticides.[118] Applicators needed to be certified in pesticide usage or a worker under the supervision of a certified applicator.[119] Producers were required to maintain specific records regarding

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[109] *See* Bob Hartzler, *Dicamba 2018 - The Iowa Experience*, IOWA ST. UNIV. EXTENSION & OUTREACH (Aug. 15, 2018), https://crops.extension.iastate.edu/cropnews/2018/08/dicamba-2018-iowa-experience (estimating that volatility was involved with 75% of incidences); VAN WYCHEN ET AL., *supra* note 100, at 3 (explaining that volatilization of dicamba from treated areas can continue for three days under atmospheric conditions likely to occur in fields during summer months).

[110] 960 F.3d 1120, 1124, 1136–39 (9th Cir. 2020).

[111] *Id.* at 1124–25, 1139–42.

[112] *Id.* at 1144–45.

[113] Transcript of Committee Meeting at 103, ENV'T PROT. AGENCY, PESTICIDE PROGRAM DIALOGUE COMM. (Nov. 1, 2017) [hereinafter EPA, 2017 DIALOGUE COMM.].

[114] Kevin Bradley, *A Final Report on Dicamba-Injured Soybean Acres*, UNIV. OF MO. INTEGRATED PEST MGMT. (Oct. 30, 2017), https://ipm.missouri.edu/ipcm/2017/10/final_report_dicamba_injured_soybean/.

[115] EPA, 2017 DIALOGUE COMM., *supra* note 113, at 103.

[116] Bradley, *supra* note 114.

[117] *See* Montague Letter, *supra* note 82, at 2; EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 5; EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 17–18.

[118] *See* EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 5; EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 20.

[119] *See* Montague Letter, *supra* note 82, at 4 (noting that OTT products are restricted use pesticide that can only be applied by certified applicators); 40 C.F.R. § 171.201 (2020) (delineating direct supervision of noncertified applicators by certified applicators).

the use of these products to improve compliance with label restrictions.[120] To reduce spray drift, the products could only be applied when the maximum wind speed was not greater than ten miles per hour.[121] Producers needed to apply the dicamba products between sunrise and sunset, and new directions on tank clean-out were added to prevent cross contamination.[122]

The 2018 labeling changes did not end the complaints. In Indiana, despite the mandatory training of applicators in 2018, the numbers of complaints in 2017 and 2018 remained steady.[123] Complaints increased in Illinois in 2018.[124] The Association of American Pesticide Control Officials, an organization of pesticide regulatory officials, informed the EPA that state regulatory agencies continued to report significant complaints involving dicamba injuries in 2018.[125] The offsite exposures occurred on a wide array of agricultural, horticultural, and homeowner sites. Moreover, the OTT products were imposing a financial burden on state regulatory agencies that was unsustainable.[126]

Despite the documentation of offsite exposures in 2017 and 2018, the EPA issued amended conditional registrations in November 2018 for these OTT herbicides so they could be used in 2019 and 2020.[127] Each registration contained new label requirements that were intended to preclude offsite injuries.[128] Only certified applicators could apply OTT products, as opposed to the earlier requirement that persons working under the supervision of a certified applicator could make applications.[129] Applicators were prohibited from making OTT applications on soybeans more than 45 days after planting and more than 60 days after planting cotton.[130]

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[120] *See* EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 5.

[121] *See id.* Previously, it had been set at 15 miles per hour. *Id.*

[122] *See id.*

[123] *See* Waltz Letter, *supra* note 90, at 3 (concluding that mandatory training did not reduce drift complaints from dicamba applications).

[124] *See* Letter from Jean Payne, President, Ill. Fertilizer & Chem. Ass'n to Reubin Baris, Off. of Pesticide Programs, Env't Prot. Agency (Aug. 16, 2018) [hereinafter Payne Letter].

[125] *See* Letter from Tony L. Cofer, President, Assn. of Am. Pesticide Control Offs., to Andrew Wheeler, Adm'r, Env't Prot. Agency (Aug. 29, 2018) [hereinafter Cofer Letter] (reporting on information garnered from weekly surveys of states).

[126] *Id.* at 3; *see also* Waltz Letter, *supra* note 90, at 2.

[127] EPA, 2018 Dicamba Registration Decision, *supra* note 18; *see also* registrations listed *supra* note 40.

[128] EPA, 2019 DIALOGUE COMM., *supra* note 86, at 1.

[129] *Id.*

[130] *Id.* This limitation responded to research that showed magnified secondary drift associated with applications to soybeans with more foliage. *See* Gordon T. Jones, Jason K. Norsworthy & Tom Barber, *Off-Target Movement of Diglycolamine Dicamba to Non-dicamba Soybean Using Practices to Minimize Primary Drift*, 33 WEED TECH. 24, 25 (2019) (noting that when soybeans start to flower, exposure to dicamba is more likely to cause yield reductions, meaning early-season applications are more likely to minimize injury). Moreover, increased

The number of OTT applications allowed for cotton was reduced from four to two.[131] Applications of OTT could only occur during the period of one hour after sunrise to two hours before sunset.[132] The spray tank clean-out instructions were strengthened, and pH information was added to labels.[133] Although these new limitations addressed spray drift, the labeling changes generally ignored evidence that many injuries were the result of volatilization.[134] Many damages resulting from the volatility of dicamba are not due to applicator error or failure to follow label instructions but rather arise from a defect in the product.[135]

The label requirements in 2019 reduced incidents in some locations and the reductions might be attributed to three reasons. First, the labels reduced application practices that were contributing to injuries.[136] Second, after witnessing losses in 2017 and 2018, many producers felt compelled to plant dicamba-tolerant soybeans to avoid offsite injury so there were fewer neighboring acreages that might be adversely affected.[137] Third, experts felt that persons suffering injuries were not filing incident reports.[138] A Missouri survey in 2019 found that more than 73% of injuries were not reported.[139] Despite the more stringent provisions of the 2019 labels, Illinois, Iowa, Indiana, Missouri, and Nebraska had more complaints in 2019 than 2018.[140] The lack of success of the 2019 labels to reduce injuries led the Association

temperatures during applications increases drift damages, thereby recommending a cutoff date. *Id.* at 32.

[131] EPA, 2019 DIALOGUE COMM., *supra* note 86, at 1.

[132] *Id.* This would avoid applications during times of day when dicamba vapors can be carried offsite by temperature inversions. EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 10.

[133] EPA, 2019 DIALOGUE COMM., *supra* note 86, at 1.

[134] *See* Hager, *supra* note 100.

[135] *See In re* Dicamba Herbicides Litig., 359 F. Supp. 3d 711, 741–42 (E.D. Mo. 2019) (declining to dismiss a cause of action for a design defect); Dan Charles, *Monsanto Attacks Scientists After Studies Show Trouble for Weedkiller Dicamba*, NPR: THE SALT (Oct. 26, 2017, 4:57 AM), https://www.npr.org/sections/thesalt/2017/10/26/559733837/monsanto-and-the-weed-scientists-not-a-love-story (noting the natural volatility of dicamba).

[136] These included limitations on wind speeds, reduction in times during the day, and tank-cleanout directions. *See* EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 5.

[137] *See* Alayna DeMartini, *Dicamba Complaints Slowly Filtering In*, OHIO ST. UNIV. COLL. OF FOOD, AGRIC., & ENV'T SCIS. (Aug. 11, 2017), https://cfaes.osu.edu/news/articles/dicamba-complaints-slowly-filtering-in.

[138] *Id.*

[139] KEVIN BRADLEY, YOUR DICAMBA REPORT CARD THEN… OUR DICAMBA REPORT CARD, UNIV. OF MO. WEED SCI. 11 (2019), https://plantsciencesweb.missouri.edu/cmc/pdf/2019/bradley-dicamba.pdf [https://web.archive.org/web/20200709102901/https://plantsciencesweb.missouri.edu/cmc/pdf/2019/bradley-dicamba.pdf].

[140] *April 2020 Dicamba Survey*, ASSN. OF AM. PESTICIDE CONTROL OFFS. 8–9 (2020), https://aapco.files.wordpress.com/2020/04/pdf-all-data-dicamba-april-2020.pdf.

of American Pesticide Control Officials to recommend that the EPA prohibit post-emergent soybean applications in future registrations of OTT products.[141]

D. Property Rights of Neighbors

American property ownership is often characterized as a malleable bundle of rights.[142] The bundle includes the right to exclude others from one's private property, as without the right to exclude, owners are not free and have little incentive to develop their properties.[143] State tort law recognizes that property owners have a right to be free from offsite pesticide drift, including volatilization, that adversely affects their property.[144] Offsite injuries from pesticide drift and volatilization constitute nuisances and may be trespasses in states recognizing intangible invasions as trespasses.[145]

While injured landowners have a legal remedy against persons causing offsite injuries under longstanding legal principles, the remedies are impractical for property owners suffering damages from applications of OTT products.[146] Injured property owners do not want to offend neighbors and do not want to sue their neighbors.[147] Evidence suggests that property owners suffering injuries will not even

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[141] Letter from Leo A. Reed, President, Assn. of Am. Pesticide Control Offs., to Andrew Wheeler, Adm'r, Env't Prot. Agency (Apr. 28, 2020) [hereinafter Reed Letter].

[142] *See, e.g.*, David A. Dana & Nadav Shoked, *Property's Edges*, 60 B.C. LAW REV. 753, 763 (2019) (observing that bundles of rights need not include all rights); Anna di Robilant, *Property: A Bundle of Sticks or a Tree?*, 66 VAND. L. REV. 869, 871 (2013) (suggesting malleability due to the ability of private actors, courts, and lawmakers to add or remove sticks).

[143] *See* Dana & Shoked, *supra* note 142, at 780–81 (noting that private rights are needed to prevent others from reaping benefits); G. Alex Sinha, *A Real-Property Model of Privacy*, 68 DEPAUL L. REV. 567, 589 (2019) (enunciating the right to exclude).

[144] *See* Jacobs Farm/Del Cabo, Inc. v. West. Farm Serv., Inc., 119 Cal. Rptr. 3d 529, 549 (Cal. Ct. App. 2010) (finding that applicators who should know that an injury may reasonably be the result of applying a pesticide in a particular place can incur liability).

[145] *See* Terence J. Centner, *Damages from Pesticide Spray Drift Under Trespass Law*, 41 ECOLOGY L. CURRENTS 1, 4–10 (2014) (describing trespass and nuisance causes of action for offsite pesticide injuries). Other state common law theories of liability may be used but are less common. *See* Daniel L. Moeller, *Superfund, Pesticide Regulation, and Spray Drift: Rethinking the Federal Pesticide Regulatory Framework to Provide Alternative Remedies for Pesticide Damage*, 104 IOWA L. REV. 1523, 1535 (2019) (adding negligence and strict liability).

[146] *See* Moeller, *supra* note 145, at 1540 (noting that most states lack adequate remedies for pesticide violations).

[147] *See* DeMartini, *supra* note 137; EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 6 (observing that property owners suffering injuries fail to report injuries due to "a desire to maintain good relationships with neighbors"); Moeller, *supra* note 145, at 1540 (noting that injured property owners are hesitant to sue large operations with significant resources or a neighbor who is a significant participant in the local community); EPA, 2018 Dicamba

bother to file formal complaints as they feel filing will not do any good and will not result in the recovery of damages.[148] Also, the discovery of injuries takes time as symptoms become visible only after plants develop misshapen foliage. By the time landowners realize their plants have suffered damage, it may be too late to gather samples for testing to show the presence of dicamba, as the half-life of this chemical is about 31 days under aerobic conditions.[149] Moreover, even if a test shows dicamba-related damages, ascribing them to a particular applicator or landowner to establish causation presents an additional challenge.[150] Securing evidence, testing, and meeting the burden of proof are so time-consuming, costly, and illusive that litigation is not cost-effective.[151] Most injuries will not be compensated.[152]

In the absence of a realistic avenue to garner relief for damages related to offsite exposure from OTT products, traditional property ownership rights have been altered.[153] Applicators of OTT products are spraying properties with impunity as neighbors are not collecting damages related to injuries to crops, gardens, shrubbery, and trees.[154] Uncertainties in knowing whether a crop will suffer injuries, angst of

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Registration Decision, *supra* note 18, at 6 (noting that persons suffering injuries may fear their damaged crop is adulterated and that a neighbor may lose organic certification).

[148] Dan Charles, *Pesticide Police, Overwhelmed by Dicamba Complaints, Ask EPA for Help*, NPR: THE SALT (Feb. 6, 2020, 7:19 AM), https://www.npr.org/transcripts/800397488 (reporting that many injuries are not reported because the property owners feel is would not do any good).

[149] T.R. Bunch, K. Buhl & D. Stone, *Dicamba Technical Fact Sheet*, NAT'L PESTICIDE INFO. CTR., OR. ST. UNIV. (2012), http://npic.orst.edu/factsheets/archive/dicamba_tech.html.

[150] The Indiana State Chemist and Seed Commissioner reported that the state was unsuccessful in identifying the source or cause of the off-target pesticide movement in over 75% of its investigations. Waltz Letter, *supra* note 90, at 2.

[151] *See* Moeller, *supra* note 145, at 1541 n.133; Emily Unglesbee, *Dicamba Drift Injury: Can Property Owners Recover?* AGFAX (July 23, 2018), https://agfax.com/2018/07/23/dicamba-drift-injury-can-property-owners-recover-dtn/.

[152] *See* Moeller, *supra* note 145, at 1541 n.133; Unglesbee, *supra* note 151. Insurance companies can decline to insure situations involving damages because the applicator was not negligent. Rather the damages arose from a defective product which is not covered by most insurance policies. Unglesbee, *supra* note 151. However, Bayer has entered an agreement to compensate many injured property owners. *Bayer Reaches a Series of Agreements*, *supra* note 28.

[153] Property owners are being denied the right to exclude pesticides that damage their properties. The right to exclude others from property has recently been affirmed in *Cedar Point Nursery v. Hassid*, 141 S. Ct. 2063, 2073 (2021). *See also* Dana & Shoked, *supra* note 142, at 780 (addressing a property owner's right to exclude others).

[154] This occurs when a complaint is handled through a state agency and when injured property owners do not commence a legal action for damages. *See* Tiffany Dowell Lashmet, *Spray Drift Damage: What Injured Landowners Need to Know*, TEX. ROW CROPS NEWSL., TEX. A&M AGRILIFE EXTENSION SERV. (July 10, 2017), https://agrilife.org/texasrowcrops/2017/07/10/spray-drift-damage-what-injured-landowners-need-to-know/ (noting that state enforcement actions do not include payments of damages to landowners).

confronting neighbors about injuries, and difficulties of collecting damages create stressful situations for persons and landowners near fields where OTT products may be used.[155] These are some of the social costs noted by the *National Family Farm Coalition* court that need to be reduced before an OTT product qualifies for registration under FIFRA.[156] EPA scientists also noted that some soybean producers might adopt defensive planting, choosing to forgo planting non-dicamba-resistant soybeans to select a dicamba-tolerant variety.[157] These producers are being deprived of their "right to plant the seed of their choice."[158]

In regulating pesticides, governments have a responsibility not to facilitate the destruction of private property, and if an action causes property to be damaged, remuneration should be provided to those whose properties were harmed. While some off-target movement of pesticides occurs with many products, the incidents related to OTT products were at a scale completely different to any other widely used ground-applied agricultural herbicide.[159]

II. PROBLEMS WITH THE 2018 REGISTRATIONS

In analyzing whether the 2018 OTT product registrations significantly increased the risk of unreasonable adverse effects on the environment, the *National Family Farm Coalition* court identified two major problems with the EPA's documentation that meant the agency understated risks.[160] First, the EPA underestimated acreage planted to dicamba-resistant crops and corresponding injuries associated with complaints, thereby under-reporting damages.[161] Second, the EPA declined to quantify damages as it characterized the spray drift damages as "potential" and "alleged" despite evidence in the record that showed dicamba causing "enormous and unprecedented damage."[162]

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[155] Unglesbee, *supra* note 151; DeMartini, *supra* note 137. This is why some soybean producers have decided to engage in defensive planting and changed varieties to grow a dicamba-resistant variety.

[156] Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1143 (9th Cir. 2020).

[157] *See* Chism Memorandum, *supra* note 46, at 43; Bill Freese, *Comments on the Arkansas State Plant Board's Proposal to Restrict Dicamba Use*, CTR. FOR FOOD SAFETY 3 (Oct. 30, 2017) (opining that many farmers were feeling compelled to grow dicamba-resistant soybeans to protect their crops against drift damage).

[158] *See* Freese, *supra* note 157, at 3, 35 (discussing the problem of organic poultry growers obtaining non-genetically modified soybeans for feeding their birds).

[159] Robert D. Waltz, *Analysis of Off-Target Movement of Dicamba Herbicides in Indiana*, OFF. OF IND. STATE CHEMIST & SEED COMM'R 1 (Oct. 30, 2019) (recording the highest number of offsite damage complaints since OTT products were introduced in 2017).

[160] 960 F.3d at 1124.

[161] *Id.* at 1136–38.

[162] *Id.* at 1144.

A. Understating Acknowledged Risks

1. Under-Reporting Damages

In its documentation for the registration approvals of the OTT products in 2018, the EPA concluded that the number of incidents of dicamba-related damage might be under- or over-reported.[163] The agency claimed that uncertainties in the reports forwarded by states and others precluded a determination on the extent of the damages.[164] However, the *National Family Farm Coalition* court analyzed materials in the record and found that they clearly showed that the filed complaints understated damages.[165] The court found that the agency had declined to acknowledge the marked rise of complaints after OTT products were marketed in 2017 and overwhelming evidence that the number of filed complaints under-reported the number of acres adversely affected by dicamba applications.[166]

Persons suffering injuries from pesticide drift and volatilization can file a complaint with the designated state agency administering FIFRA.[167] Data collected by 16 states showed that, before dicamba-resistant crops were grown, fewer than 1,000 complaints per year for herbicide drift damages were reported.[168] After producers commenced using OTT products, pesticide complaints in these states jumped to more than 3,000 in 2017 and more than 2,000 in 2018.[169] In addition, the EPA had information on offsite injuries from the Association of American Pesticide Control Officials.[170] No explanation other than the use of OTT products explains the

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[163] EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 6–7 (citing the manufacturer of an OTT product).

[164] The EPA said, "[D]ata provided by the Association of American Pesticide Control Officials [] did not specify which states performed on-site investigations of the complaints, how many of those incidents were investigated, the conclusions of those investigations, the acreage of the crops actually damaged by off-target movement, or ultimate impact to crop yield." *Id.* at 6 (citation omitted). The EPA did not explain how or why this omitted information meant that reported incidents were over-reported as the information does not concern under or over-reporting.

[165] 960 F.3d at 1144.

[166] *Id.*

[167] *See, e.g.*, *Dicamba – Damage & Complaints*, MINN. DEP'T OF AGRIC. (2021), https://www.mda.state.mn.us/dicamba-damage-complaints.

[168] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 12 (showing figures for all herbicide complaints filed during the 2013–2015 growing seasons, which are the seasons before the introduction of dicamba-resistant cotton and soybean seeds, for the sixteen states where OTT products were applied).

[169] *Id.* These figures disagree with the EPA's figures in a 2020 report. *See* Chism Memorandum, *supra* note 46, at 28 (reporting "1,400 incidents in 2017, 3,000 in 2018, and 3,300 in 2019").

[170] Cofer Letter, *supra* note 125, at 2–3.

marked increase in filed complaints.[171] The EPA also had ignored evidence collected by researchers showing that a considerable acreage of non-dicamba-resistant soybeans was adversely impacted.[172]

In addition to not recognizing the increases in numbers of complaints, the EPA also failed to acknowledge that the number of complaints was under-reported.[173] Weed experts from three major soybean-producing states attested to the under-reporting of damages.[174] Officials from Indiana felt only 20% of injury cases were being reported,[175] while in Iowa it was estimated that the state agency was contacted for only one-fourth of the cases.[176] An extension scientist opined that the Illinois Department of Agriculture received a lot of phone calls reporting damage incidents, but the callers were unwilling to file an official complaint as they did not want to get their neighbors in trouble.[177] Basically, all the state regulatory officials, university scientists, and producers supported the conclusion that the complaints significantly under-reported damages.[178]

Moreover, personnel at the EPA had previously subscribed to the conclusion that damages were under-reported out of a desire to maintain good relationships with neighbors, fear of losing organic certification, and perceptions that no action would be taken.[179] At a pesticide program dialogue meeting in 2017, the acting chief of the Herbicides Branch of the EPA related that reported complaints underesti-

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[171] The EPA and manufacturers argued that applications of older formulations of dicamba on pastures, small grains, and corn could have accounted for the rise in offsite incident reports but offered no evidence of increased usage that would explain the increased incidents recorded after the introduction of OTT products. *See* EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 7.

[172] *See* Bradley, *supra* note 114 (reporting that more than 3.6 million acres of non-resistant soybeans were adversely affected in 2017 by OTT applications); Bradley, *supra* note 23 (reporting that, as of July 25, 2018, 1.1 million acres of non-resistant soybeans had been adversely affected in 2018 by OTT applications).

[173] *See* DeMartini, *supra* note 137 (concluding there are likely three or four times as many offsite incidences than reported); Hager, *supra* note 100 (reporting that people were unwilling to file complaints); Hartzler, *supra* note 109 (concluding that the reported incidences are a very small fraction of the offsite drift cases).

[174] *See* Hartzler, *supra* note 109.

[175] *See* Unglesbee, *supra* note 151 (citing Purdue University weed scientist Bill Johnson for the unreported incident estimate).

[176] *See* Hartzler, *supra* note 109.

[177] *See* Hager, *supra* note 100.

[178] *See* EPA, 2017 DIALOGUE COMM., *supra* note 113, at 103 (summarizing information from multiple states).

[179] *See* EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 7; EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 11.

mated crop damages since only one in five cases were properly reported and documented.[180] Yet, ignoring the documentation, the EPA decided in 2018 that the states' reported information might not accurately represent the extent of dicamba-related damage to non-target plants due to a propensity of landowners to attribute any crop damage to OTT products.[181] Subsequently, in 2021, the EPA reported it did not follow normal protocol in approving the 2018 registrations.[182] Senior-level officials changed or omitted conclusions from scientific documents in issuing the registrations, including assessments of stakeholder risk.[183]

2. Declining to Quantify Damages

For acknowledged risks, the EPA claimed it lacked information to quantify damages caused by the OTT products and, as such, declined to do so.[184] The *National Family Farm Coalition* court disagreed as significant information existed from which some sort of quantification could be calculated.[185] The agency had evidence that 3.6 million acres of non-resistant soybeans had been damaged in 2017.[186] For 2017, Indiana reported that 88% of reported offsite injuries involved OTT products while Iowa concluded that 67% of the damage complaints involved OTT products.[187] State extension specialists and professional consultants had provided information for estimated damages on other crops and trees.[188] The EPA's conclusion that it could not estimate damages dismissed a wealth of information available from state agencies, state extension specialists, and weed scientists.[189]

In addition, field trials and results of university research on dicamba drift and projected yield losses were available.[190] In a 2018 report, the EPA noted several re-

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[180] EPA, 2017 DIALOGUE COMM., *supra* note 113, at 103. The Weed Science Society of America agrees with this figure. VAN WYCHEN ET AL., *supra* note 100, at 17.

[181] EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 6.

[182] OFF. INSPECTOR GEN., ENV'T PROT. AGENCY, REP. NO. 21-E-0146, EPA DEVIATED FROM TYPICAL PROCEDURES IN ITS 2018 DICAMBA PESTICIDE REGISTRATION DECISION 9–10 (2021).

[183] *Id.*

[184] EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 19.

[185] 960 F.3d 1120, 1138 (9th Cir. 2020). Rather, the EPA decided that incidents of injuries involved soybeans that "may *potentially* be damaged." *Id.*

[186] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 5 (citing Bradley, *supra* note 114).

[187] EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 9.

[188] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 9 (listing some sensitive crops reported in offsite injury incidents).

[189] *See supra* Section II.A.1.

[190] *See* Estevam Matheus Costa, Adriano Jakelaitis, Jason Zuchi, Leandro Spíndola Pereira, Matheus Vinícius Abadia Ventura, Gustavo Silva de Oliveira, Gustavo Dorneles de Sousa & Jeovane Nascimento Silva, *Simulated Drift of Dicamba and 2,4-D on Soybeans: Effects of*

search projects that projected soybean yield losses from non-target dicamba exposure.[191] Some research related rates of visual signs of injury to yield losses.[192] While the state reports of visual injury may not have documented degrees of injury to yields, economists are proficient in developing models to estimate damages.[193] Considerable research exists on calculating losses in crop yields.[194] Data were available that would facilitate distinguishing non-target yield losses from exposure to OTT products as opposed to other causes.[195] For injuries in 2018, the OTT products were restricted-use pesticides, so state pesticide agencies had sales and spray application information available to relate injured areas to fields upon which OTT products

Application Dose and Time, 36 BIOSCIENCE J. 857, 857–62 (2020) (reporting increasing yield losses with increasing doses of auxin herbicides on non-resistant soybeans); Andrew P. Robinson, David M. Simpson & William G. Johnson, *Response of Glyphosate-Tolerant Soybean Yield Components to Dicamba Exposure*, 61 WEED SCI. 526, 528 (2013) (employing regression analysis of estimated visual soybean injury to calculate yield loss); Jones et al., *supra* note 130, at 35 (claiming a 5% yield loss of non-resistant soybeans from drift beyond the required buffer distance); Gordon T. Jones, Jason K. Norsworthy, Tom Barber, Edward Gbur & Greg R. Kruger, *Off-Target Movement of DGA and BAPMA Dicamba to Sensitive Soybean*, 33 WEED TECH. 51, 63 (2019) (finding 1–5% potential yield losses from secondary drift).

[191] *See* EPA, 2018 SUMMARY OF NEW INFORMATION, *supra* note 108, at 65–75 (describing studies for estimating visual injuries to yield losses).

[192] *See id.*

[193] *See, e.g.*, Anna Budka, Agnieszka Łacka, Renata Gaj, Ewa Jajor & Marek Korbas, *Predicting Winter Wheat Yields by Comparing Regression Equations*, 78 CROP PROT. 84, 87–90 (2015) (using a general regression equation to analyze the degree of damage to leaves of winter wheat); N. Mujica & J. Kroschel, *Pest Intensity-Crop Loss Relationships for the Leafminer Fly Liriomyza huidobrensis (Blanchard) in Different Potato (Solanum tuberosum L.) Varieties*, 47 CROP PROT. 6, 15 (2013) (analyzing foliar injury-crop loss relationships for potatoes); Serge Savary, Andrew D. Nelson, Annika Djurle, Paul D. Esker, Adam Sparks, Lilian Amorim, Armando Bergamin Filho, Tito Caffi, Nancy Castilla, Karen Garrett, Neil McRoberts, Vittorio Rossi, Jonathan Yuen & Laetitia Willocquet, *Concepts, Approaches, and Avenues for Modelling Crop Health and Crop Losses*, 100 EURO. J. AGRONOMY, 2018, at 1, 13 (discussing agrophysiological models accounting for damage mechanisms to translate injury into crop loss).

[194] *See, e.g.*, O. Adewale Osipitan, Jon Scott, & Stevan Knezevic, *Glyphosate-Resistant Soybean Response to Micro-Rates of Three Dicamba-Based Herbicides*, 2 AGROSYSTEMS, GEOSCICIENCES & ENV'T, Jan. 10, 2019, at 1, 8 (concluding from field tests that the "reduction in plant height was a good early indicator of severity of dicamba injury"); O. Adewale Osipitan, Jon Scott & Stevan Knezevic, *Effects of Dicamba Micro-Rates on Yields of Non-Dicamba Soybeans*, UNIV. OF NEB. INST. OF AGRIC. & NAT. RES. CROPWATCH (Jan. 9, 2019), https://cropwatch.unl.edu/2019/effects-dicamba-micro-rates-yields-non-dicamba-soybeans (observing visual injuries from micro applications of dicamba on non-resistant soybeans and yield losses); *c.f.*, Robinson et al., *supra* note 190, at 534 (concluding that soybean yield loss can be estimated by visual observations but it tends to be unreliable).

[195] *See, e.g.*, EPA, OVER-THE-TOP DICAMBA PRODUCTS, *supra* note 17, at 9 (noting figures reported by the EPA from Indiana and Iowa on percentages of damages from OTT products).

had been applied.[196] Adding this information with visual injury data meant calculations of estimated losses were possible.

In claiming the lack of evidence to quantify damage losses, the EPA ignored a meta-analysis of 11 previously published field studies that estimated the dose of dicamba likely to cause measurable soybean yield loss under field conditions.[197] The published studies used for the meta-analysis reported soybean yield data in response to dicamba treatment from replicated field studies, "included a zero-dose (non-treated control)," and "included at least three dicamba doses greater than zero."[198] The research showed that yields and losses varied depending on the stage of the crop and concluded that a 5% reduction in yields could be expected when exposed at the flowering stage.[199]

B. Failure to Acknowledge Risks

Turning to risks that were not acknowledged by the EPA, the *National Family Farm Coalition* court focused on three shortcomings. An initial deficiency involved declining to acknowledge that restrictions on dicamba post-emergence spray applications imposed by the 2018 label would not be followed.[200] A second risk not considered involved the social and anticompetitive economic effects in the soybean and cotton industries created by the use of OTT products.[201] The court also cited evidence of social costs ignored by the EPA. Offsite injuries from the OTT products were tearing the social fabric of farming communities and imposing costs on state agencies.[202] An examination of these risks led the court to conclude that there was no substantial evidence supporting the EPA's issuance of the three 2018 OTT-product registrations.[203]

1. Disregarding Label Restrictions

Due to the excessive numbers of injuries allegedly related to OTT applications, the EPA changed the labels for the OTT products in 2017, 2018, and 2019 to limit

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[196] *See id.* at 5; EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 20.

[197] Andrew R. Kniss, *Soybean Response to Dicamba: A Meta-Analysis*, 32 WEED TECH. 507 (2018) (analyzing different soybean cultivars and losses from dicamba).

[198] *Id.* at 508.

[199] *Id.* at 510.

[200] Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1124 (9th Cir. 2020). The Association of American Pesticide Control Officials had advised the EPA that its label instructions were not enforceable, meaning applicators seeking greater profits by controlling weeds would cause offsite injuries. Cofer Letter, *supra* note 125, at 3.

[201] *Nat'l Fam. Farm Coal.*, 960 F.3d at 1144.

[202] *Id.* at 1143–44; *see also* Cofer Letter, *supra* note 125, at 2–3.

[203] *Id.* at 1144–45.

application practices that likely contributed to offsite injuries.[204] Yet the increased restrictions failed to adequately mitigate incidences of off-target movement in many major soybean producing states.[205] Information gathered by state pesticide regulators showed applicators having great difficulty in following the application requirements set forth in the label.[206] Although applicator training was mandated, it did not always reduce the number of complaints because it was not technically feasible or practical for applicators to follow the label requirements.[207] A survey from Illinois disclosed that 30% of commercial applicators had not been able to always follow the label requirements in 2018.[208] Other research suggested that pesticide applicators lacked an understanding of temperature inversions and vapor pressure influences on volatility.[209]

By ignoring evidence that producers were disregarding label requirements or unable to sufficiently limit drift and volatilization, the EPA entirely failed to acknowledge known risks that were contributing to injuries.[210] Due to windy conditions, temperature inversions, and restricted daily application hours, applicators had too few hours consistent with the label requirements to legally apply OTT

[204] *See, e.g.*, Letter from Daniel Kenny, Chief, Herbicide Branch Registration Div., Off. Of Pesticide Programs, to Rebecca M. Ashley, U.S. Registration Manager, E.I. du Pont de Nemours & Co. 2 (Feb. 7, 2017) (delineating new label requirements applicable in 2017); Montague Letter, *supra* note 82, at 1–2 (requiring a new label for 2018 with additional application requirements); EPA, 2019 DIALOGUE COMM., *supra* note 86, at 1 (delineating new label requirements applicable in 2019).

[205] *See* Waltz Letter, *supra* note 90, at 2 (reporting that there was a 2,660% increase in annual dicamba drift complaints in 2017 and 2018).

[206] *See* Scott, *supra* note 83, at 20 (reporting as an employee of the Office of the Indiana State Chemist that applicators were not following the labels); Waltz Letter, *supra* note 90, at 2 (reporting that 93% of incident investigations involve label violations); *see also* Melody M. Bomgardner, *Widespread Crop Damage from Dicamba Herbicide Fuels Controversy*, CHEM. & ENG'G NEWS (Aug. 16, 2017), https://cen.acsa.org/articles/95/i33/Widespread-crop-damage-dicamba-herbicide.html (noting that "even the most conscientious farmers will have difficulty following the unusually stringent [label requirements]").

[207] *See* Reed Letter, *supra* note 141 (commenting on the impracticality of various drift management requirements); Waltz Letter, *supra* note 90, at 3 (commenting that producers may only have about 47 hours during the month of June to apply OTT products in compliance with the label).

[208] ILL. FERTILIZER & CHEM. ASS'N, *supra* note 80, at 15 (including a summary of comments about weather conditions limiting following directions).

[209] *See* Mandy D. Bish & Kevin W. Bradley, *Survey of Missouri Pesticide Applicator Practices, Knowledge, and Perceptions*, 31 WEED TECH. 165, 165 (2017) (reporting survey results that less than one-half of the applicators understood the influences of vapor pressure).

[210] Nat'l Fam. Farm Coal. V. Env't Prot. Agency, 960 F.3d 1120, 1139–42, 1145 (9th Cir. 2020).

products.[211] With substantial investments in growing crops and the need to control weeds, applicators ignored the problem of unfavorable weather conditions.[212] They violated the law resulting in drift and volatilization injuries.[213] The EPA's registration decisions incorrectly assumed that more stringent label requirements would be followed.[214] Moreover, the buffer distances were insufficient to preclude damages from volatilization.[215] The registration decisions also ignored the fact that injuries from volatilization can occur without applicator misuse.[216] Misuse and volatilization meant the label restrictions could not stop offsite injuries.

2. Anti-Competitive Economic Effects

One of the registration requirements embedded in FIFRA's risk-benefit analysis is to account for economic and social costs when determining whether there is any unreasonable risk to man or the environment.[217] The *National Family Farm Coalition* court found that the EPA failed to consider these costs.[218] A major issue was that soybean producers were being compelled to change from producing non-dicamba-resistant soybeans to dicamba-resistant soybeans.[219] Due to the extensive injury to crops in 2017 and 2018, economic necessity led soybean producers to

[211] *See* Jackie Pucci, *Daily Dicamba Update: Q&A with Heartland Co-Op's Dave Coppess*, CROPLIFE (Apr. 17, 2018), https://www.croplife.com/dicamba/talking-dicamba-qa-with-heartland-co-ops-dave-coppess/ (reporting that applicators may only have about 44 hours in 2017 during which they could apply dicamba according to the label requirements).

[212] To control weeds, applicators might misjudge wind speeds or ignore them so they could control weeds, meaning training was not a guarantee for reducing offsite injuries. *See* ILL. FERTILIZER & CHEM. ASS'N, *supra* note 80, at 15 (commenting on wind speed requirements).

[213] A comment from Illinois noted that an application to a field could start out following the label but, before the field was completely sprayed, weather conditions could change and the label directions would no longer be followed. *Id.*

[214] Instead, the agency concluded that limiting applications to persons with the highest level of pesticide application training would increase compliance. EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 20.

[215] *See* ILL. FERTILIZER & CHEM. ASS'N, *supra* note 80, at 15 (commenting the buffer restrictions are insufficient to prevent offsite damages); Hartzler, *supra* note 109 (recommending that 360-degree buffers are needed rather that downwind buffers due to volatilization occurring after spray applications).

[216] *See* Aaron Hager, *Dicamba: What is Success or Failure in 2018?,* UNIV. OF ILLINOIS: FARMDOCDAILY (Mar. 23, 2018), http://farmdocdaily.illinois.edu/2018/03/dicamba-what-is-success-or-failure-in-2018.html (commenting that the modifications to the label do nothing to relieve offsite injuries arising from temperature inversions).

[217] 7 U.S.C. § 136(bb) (2018).

[218] Nat'l Fam. Farm Coal. V. Env't Prot. Agency, 960 F.3d 1120, 1144 (9th Cir. 2020).

[219] *Id.* at 1142. *See* Bomgardner, *supra* note 206 (observing that farmers would protect their crops by foregoing non-dicamba resistant soybeans and buying Monsanto's modified seeds).

change to growing dicamba-resistant soybeans.[220] The court noted a prediction that the likely result of renewing the cotton and soybean registrations would be 100% dicamba-resistant soybeans.[221] The registration of the OTT herbicides fostered monopoly power and the demise of other seed companies.[222]

3. Social Costs

The court acknowledged that the EPA had not considered extensive evidence showing dicamba injuries tearing apart the social fabric of many farming communities.[223] Property owners injured by uses of OTT products lacked a good choice in responding to damages. If they filed a complaint, it would be public information and others would know, yet the damaged property owner would not collect damages.[224] If they chose to bring legal action, there would be obvious animosity. Dicamba injuries to trees and shrubs were particularly upsetting as the vegetation had taken years to become established. The offsite injuries from dicamba applications were straining the social relations of people living in rural communities.[225]

Another cost was the imposition of significant expenses on state agencies.[226]

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[220] Producers of non-resistant dicamba soybeans experiencing an uncompensated loss due to dicamba injury could not afford another year of losses. *See* Larry Steckel, *Dicamba Drift Problems Not an Aberration: A Veteran Tennessee Weed Scientist's Perspective*, FARM PROGRESS (Aug. 8, 2018), https://www.farmprogress.com/weeds/dicamba-drift-problems-not-aberration (reporting that producers were giving up trying to grow dicamba non-resistant soybeans).

[221] *Nat'l Fam. Farm Coal.*, 960 F.3d at 1143.

[222] This concern is not consistent with more current information on recent commercial seed introductions. Soybean producers have several different soybean herbicide resistant traits to choose from in managing weeds. These include Sulfonylurea tolerant, Roundup Ready, Roundup Ready 2 Yield, Roundup Ready 2 Xtend, XtendFlex, LibertyLink, LibertyLink GT27, and Enlist E3. Larry Steckel, Virginia Sykes & Angela McClure, *Soybean Herbicide Trait Summary*, UNIV. OF TENN. INST. OF AGRIC. UTCROPS NEWS BLOG (Jan 21, 2021), https://news.utcrops.com/author/lsteckel/.

[223] *Nat'l Fam. Farm Coal.*, 960 F.3d at 1124–25. *See* EPA, 2018 Dicamba Registration Decision, *supra* note 18 (failing to consider social costs).

[224] *See, e.g.*, NEB. DEP'T OF AGRIC., THE PESTICIDE ENFORCEMENT PROCESS 3, https://nda.nebraska.gov/pesticide/enforcement_process.pdf (acknowledging that a damaged party does not collect compensation for their damage) (last visited Dec. 27, 2021); *Filing an Ag Pesticide Complaint*, TEX. DEP'T OF AGRIC. (2021), https://www.texasagriculture.gov/RegulatoryPrograms/Pesticides/AgriculturalApplicators/AgPesticideComplaintInvestigationProcedures.aspx (investigating complaints leading to a report is subject to the provisions of the Texas Public Information Act with monetary penalties being deposited to the State's General Revenue Fund).

[225] *See* Unglesbee, *supra* note 151 (quoting a weed scientist that the use of dicamba is "pitting neighbor against neighbor").

[226] *See* Cofer Letter, *supra* note 125, at 2 (noting costs for overtime, laboratory analysis and travel costs).

With the marked numbers of complaints filed with state agencies charged with overseeing the use of pesticides, the agencies lacked personnel to fully address all the filed complaints.[227] Due to complaints of injuries, two states ordered sales of OTT products to stop.[228] The actions by Arkansas to prohibit the use of XtendiMax between April 15 and September 15, 2017 and to prohibit any in-crop use of dicamba herbicides between April 16 and October 31, 2018, led Monsanto to sue the Arkansas Plant Board and its members.[229] To curb reports of offsite damages, Monsanto attacked the credibility of state university scientists reporting disparaging research findings.[230]

Other social costs involve controversies among crop producers, neighbors, commercial applicators, and insurers.[231] Neighbors reporting dicamba injuries and incidents of misuse faced wrathful producers.[232] Applicators confronted with weather conditions that precluded lawful applications had to contend with enraged producers.[233] Commercial applicators who did not spray when requested were threatened with the loss of future business.[234] Commercial applicators required by state law to have insurance were faced with higher insurance premiums if their activities resulted in incident claims.[235] Crop producers with general liability insurance

[227] *See id.* at 3 (noting the great difficulty of state enforcement); Waltz Letter, *supra* note 90, at 2 (noting that responding to dicamba incidents precluded staff from engaging in other compliance monitoring and educational activities).

[228] Letter from Terry Walker, Dir., Ark. Plant Bd. To Mark Martin, Sec'y of State, Ark. (July 11, 2017) (transmitting the "Emergency Rule" that instituted a ban on the sale and use of dicamba); Press Release, Mo. Dep't of Agric., Missouri Department of Agriculture Temporarily Issues Stop Sale, Use or Removal Order on all Dicamba Products in Missouri (July 7, 2017) (ordering pesticide distributors, retailers, applicators, and users to stop sales of dicamba products).

[229] Monsanto Co. v. Arkansas State Plant Bd., 576 S.W.3d 8, 8–10 (Ark. 2019) (arguing that the state was involved with ultra vires conduct).

[230] *See* Charles, *supra* note 135 (reporting that Monsanto called supervisors of weed scientists who were reporting unfavorable data).

[231] *See* Dan Charles, *In Arkansas, Backlash Against Pesticide Regulation Gets Personal*, NPR (Sept. 22, 2020, 10:00 AM), https://www.npr.org/2020/09/22/915354187/in-arkansas-backlash-against-pesticide-regulation-gets-personal (reporting incidents of vandalism against a producer who assisted regulators in investigations of dicamba misuse); Payne Letter, *supra* note 124, at 2 (reporting that farmers want commercial applicators to treat their fields regardless of weather conditions); Ray Massey, *Dicamba Injury and Insurance*, *in* PROCEEDINGS OF THE 29TH ANNUAL INTEGRATED CROP MANAGEMENT CONFERENCE 69 (Iowa St. Univ. 2017) (evaluating the ability of producers to collect damage claims for crop losses related to dicamba under general liability insurance policies).

[232] *See, e.g.*, Charles, *supra* note 231; Unglesbee, *supra* note 151.

[233] *See* Payne Letter, *supra* note 124, at 2.

[234] *Id.*

[235] For example, this is required for commercial applicators by the Illinois Pesticide Act, 415 ILL. COMP. STAT. 60/10(3) (2020). *See* Payne Letter, *supra* note 124, at 2 (acknowledging higher insurance premiums and deductibles for applicators if they violate labeling requirements).

policies learned to their dismay that some losses were not covered.[236] Injuries from tank contamination and spray drift were usually covered.[237] However, injuries from volatility or from product failure did not involve negligence so were not covered by most insurance policies.[238] Federal crop insurance did not cover herbicide damage.[239]

III. ANALYZING THE 2020 REGISTRATIONS

With challenges from environmental and agricultural trade associations, courts will be examining the validity of the 2020 OTT-product registrations.[240] The EPA highlighted four modifications on the products' labels in support of the registrations. First, a qualified volatility reduction agent must be mixed with the OTT product in the spray tank to reduce volatility.[241] Second, applicators are precluded from applying OTT products after June 30 for soybeans and July 30 for cotton.[242] Third, a larger infield downwind buffer is included as a requirement to curtail drift damages.[243] Fourth, the registrations provide that non-certified persons cannot apply OTT products under the supervision of a certified operator.[244] However, this restriction is not an addition as it had already applied for the 2019 and 2020 production years.[245]

Also significant are the omissions in the analysis of the registrations. Rather surprisingly, no new requirement was incorporated into product labels on a buffer distance for volatilization other than protection for endangered species.[246] Moreo-

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[236] *See* Massey, *supra* note 231, at 69.

[237] *Id.*

[238] *See id.* A product problem precluding insurance coverage exists when there is no wrongful application. VAN WYCHEN ET AL., *supra* note 100, at 15 (discussing insurers denying claims for damages from dicamba injuries).

[239] The Federal Crop Insurance Act only authorizes coverage for losses due to drought, flood or other natural disasters. 7 U.S.C. § 1508(a)(1) (2018).

[240] *See supra* notes 43–44.

[241] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 4.

[242] *Id.* at 3–4.

[243] *Id.*

[244] *Id.*

[245] EPA, 2019 DIALOGUE COMM., *supra* note 86; *see also Changes to Labeling for Three Herbicides in 2019*, CORN+SOYBEAN DIGEST (Jan. 23, 2019), https://www.farmprogress.com/herbicide/changes-labeling-three-herbicides-2019; *2019 Engenia® Herbicide Label Update*, BASF (Nov. 2, 2018), https://ifca.com/files/Engenia_Herbicide_Label-Update_2019.pdf.

[246] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 4. Moreover, the EPA approved the products despite the projection that the in-field omnidirectional setback would be accompanied by an 11% failure rate. Wagman Memorandum, *supra* note 73, at 325.

ver, while training is required, in some states there is no testing of persons completing training sessions.[247] Training may also be completed online in many states.[248] Furthermore, after noting the potential misuse of the products, there was no acknowledgment of how the new labeling provisions would impact anticipated misuse that contributes to offsite injuries.

A. Volatility Reduction Agent

The 2020 registrations require every OTT product to be tank-mixed with an approved volatility reduction agent prior to application.[249] Applicators consult the manufacturer's website and follow the directions to comply with the product's label.[250] Registrant-manufacturers maintain the websites and can add and delete acceptable agents.[251] Mandatory recordkeeping requirements require applicators to list the agent that was tank-mixed with the OTT product and its use rate.[252] The EPA concluded that the use of a drift-reduction agent together with other label changes would preclude offsite injuries with an 89% degree of certainty without elaborating on how it reached this conclusion.[253] Yet, in an appendix, the EPA acknowledged that most of the studies relied upon for volatility-reduction agents had not used any of the "then-registered dicamba formulations."[254] Moreover, the EPA's ecological assessment acknowledged that "the exact impact that the formulation used might have on the nature and extent of toxicity or on the ratio of [visual signs of injury] to apical endpoint" was unknown.[255]

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[247] *See Dicamba - Frequently Asked Questions*, MINN. DEP'T OF AGRIC. (2020), https://www.mda.state.mn.us/dicamba-frequently-asked-questions-faq (not requiring testing for certification of applicators in Minnesota).

[248] *See, e.g.*, *Dicamba Training*, BASF (2021), https://www.engeniaherbicide.com/training.html#state-links [https://web.archive.org/web/20210123072400/https://www.engeniaherbicide.com/training.html] (providing online training for applicators in most states).

[249] *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 3–4. Volatility reduction agents may also be referred to as drift-reduction agents or pH buffering agents.

[250] Failure to follow the label's directions is a violation of law. 7 U.S.C. § 136j(a)(2)(G) (2018).

[251] *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 3–4; *Engenia Herbicide Tank Mix*, BASF, https://www.engeniaherbicide.com/tank-mix.html (last updated Oct. 28, 2021) (describing what applicators need to do in using a volatility reduction agent).

[252] EPA, 2020 BASF Engenia Registration, *supra* note 40, at 4. Failure to keep records would be a violation of the label and a state's pesticide law. *See, e.g.*, Orkin Exterminating Co. v. Carder, 575 S.E.2d 664, 667 (Ga. Ct. App. 2002) (finding that Georgia law required an applicator to keep records showing amounts of pesticides applied).

[253] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 14.

[254] Wagman Memorandum, *supra* note 73, at 189.

[255] *Id.*

The EPA's calculations of the extent that drift-reduction agents would reduce volatility to non-target plants were based on measurements of visual signs of injury resulting from dicamba disruption of "normal cell function, cell growth and tissue development."[256] It was assumed that a 10% visual sign of injury could serve as a protective threshold to protect against 5% reductions in plant height and yield.[257] Yet the EPA also admitted that other factors are important to the ultimate plant growth and yield relationship so that the 10% visual sign of injury "is not predictive of significant yield loss or growth impairment in non-target plants."[258]

With respect to potential injuries to non-resistant soybeans, the EPA found that the levels of visual signs of injury that correspond to a 5% reduction in height or a 5% reduction in yield are variable across the available data.[259] Finally, some of the data relied upon by the EPA for its conclusion were collected from studies in greenhouses, which are not very representative of field conditions where dicamba products are used.[260]

With this documentation, it is not clear that the agency articulated a satisfactory explanation for its conclusion that volatility reduction agents would prevent offsite injuries.[261] First, the ecological study acknowledged it could not predict toxicity of dicamba carried offsite.[262] Second, the EPA admitted that some dicamba would be expected to travel offsite.[263] Third, the testing relied upon did not use the OTT products in realistic field settings.[264] Given that the registrants' laboratory and field studies submitted to justify the registrations of OTT products in 2016 and 2018 had falsely projected no offsite injuries,[265] the testing relied upon for volatility reduction agents does not offer persuasive evidence justifying the registrations.

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[256] *Id.* at 48, 189–208, 265–96.

[257] *Id.* at 10.

[258] *Id.*

[259] *Id.* at 11. Variability depends on soybean variety and field and agronomic factors. *Id.*

[260] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 14.

[261] *See* Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (requiring a rational connection of relevant data to the choice made by an agency); *see also* Pollinator Stewardship Council v. Env't Prot. Agency, 806 F.3d 520, 530–31 (9th Cir. 2015) (observing that studies of an insecticide's effect on bees failed to provide substantial evidence to support the agency's conclusion of an application rate).

[262] Wagman Memorandum, *supra* note 73, at 189.

[263] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 14.

[264] Wagman Memorandum, *supra* note 73, at 230–61. Testing substitute products in carefully controlled conditions with personnel who are available when weather conditions are favorable for applications may not be a good substitute for actual OTT use in field situations.

[265] For example, the EPA reached its scientific conclusion for the 2018 dicamba registrations using 2016 data from which it adopted Monsanto's documentation that "(1) vapor drift occurring due to volatilization should not result in impacts off the treated field; and (2) spray drift will not occur past the label's required buffer distances in amounts that would have an adverse effect on plant height." *The Scientific Basis for Understanding the Off-Target Movement Potential of*

B. Cut-Off Dates

The EPA required the OTT-product labels to prohibit the use of products on soybeans after June 30 and on cotton after July 30.[266] The EPA selected these dates after considering research and historical meteorological data showing that air temperatures after these dates are warmer which tend to increase volatility.[267] However, the EPA admitted that using the same cut-off date in 34 states was problematic, as states have dissimilar temperatures during the late spring and early summer.[268] The American Soybean Association is challenging these cut-off dates in the 2020 registrations.[269] Because extreme weather conditions can delay soybean and cotton production planting dates, the cut-off dates for OTT spray applications are unduly restrictive and would preclude producers from effectively controlling weeds.[270]

More problematic was the omission by the EPA that Illinois, Minnesota, Indiana, South Dakota, and Ohio had already employed June cut-off dates during 2019 and 2020 growing seasons.[271] Arkansas had been using a May 25 cut-off date.[272] Yet, some of these states still reported significant offsite injuries.[273] Evidence from Arkansas, Indiana, and Minnesota showed a cut-off date requirement had not

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Xtendimax, MONSANTO (2018), https://beta.regulations.gov/document/EPA-HQ-OPP-2016-0187-0973. The projection was wrong.

[266] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 14.

[267] *Id.*

[268] *Id.* The agency simply said that "in no state [is] the probability of avoiding a threshold temperature on the day of application zero." *Id.*

[269] Complaint for Declaratory and Injunctive Relief at 21, 22, Am. Soybean Ass'n v. Wheeler, No. 20-cv-03190 (D.D.C. Nov. 4, 2020).

[270] *Id.* at 22–23.

[271] *See* BRADLEY, *supra* note 139, at 30 (observing that Illinois, Minnesota, and Indiana had set June 20 as the cutoff date for 2020 while South Dakota set June 30); Sarah Noggle & Sam Custer, *ODA Statement on Dicamba - Official Statement Regarding the Use of Over-the-Top Dicamba Products*, OHIO ST. UNIV., C.O.R.N. NEWSL.: 2020-17 (June 11, 2020) https://agcrops.osu.edu/newsletter/corn-newsletter/2020-17/full (noting that the Ohio Department of Agriculture adopted a June 30 cut-off for 2020).

[272] *See* Stephen Steed, *Arkansas Plant Board Sets May 25 Dicamba Cutoff*, ARK. DEMOCRAT GAZETTE (Dec. 12, 2019), https://www.arkansasonline.com/news/2019/dec/12/board-sets-may-25-dicamba-cutoff-201912/ (reporting Arkansas 2020 cut-off date).

[273] *See, e.g.*, Mohr, *supra* note 87 (reporting that Minnesota had more complaints of offsite injury in 2020 than 2019 and 2018); Emily Unglesbee, *Off-Target, Once Again: Amid Legal Limbo, Dicamba Injuries on the Rise Once Again*, PROGRESSIVE FARMER (July 9, 2020, 11:43 AM), https://www.dtnpf.com/agriculture/web/ag/crops/article/2020/07/09/amid-legal-limbo-dicamba-injury-rise (reporting significant injuries from dicamba in Arkansas and Indiana in 2020 despite the cut-off dates); *April 2020 Dicamba Survey*, *supra* note 140, at 8–9 (reporting that incident complaints rose in 2019 despite the June 30 cut-off date).

stopped increased offsite injuries in 2020.[274] Thus, the EPA's claim that the cut-off dates were new was not true and the conclusion that cut-off dates would markedly reduce offsite injuries was inaccurate. The EPA's conclusion about the helpfulness of dates in reducing offsite movement from volatility is uncorroborated.[275]

Furthermore, in late 2020 the EPA announced that it would no longer allow states to request a FIFRA section 24(c) exemption, thereby removing an instrument states had been using to impose additional restrictions related to local concerns.[276] The EPA concluded that state limitations restricting pesticide usage "are beyond the scope of FIFRA section 24(c), and that such registrations should be disapproved."[277] Thus, state limitations will need to be made under FIFRA's section 24(a) involving a procedure that introduces confusion on whether existing limitations granted under section 24(c) remain valid.[278] It is unclear that the EPA complied with the requirements of the Administrative Procedure Act in its abrupt change of a longstanding interpretation of section 24(c).[279] If it is a new rule, then the agency needed to provide comment opportunities to the public before adopting a rule.[280]

States are expected to continue to restrict dicamba application practices that are accompanied by unreasonable risk. Indiana classified dicamba as a highly volatile herbicide and the state chemist established a no-spray period from June 21 through August 31.[281] Illinois imposed an earlier cut-off date of June 20, 2021, prohibited applications of dicamba when the temperature is greater than 85ºF, and prohibited

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[274] *See* BRADLEY, *supra* note 139, at 30 (reporting Minnesota and Indiana 2020 cut-off dates); Steed, *supra* note 272 (reporting Arkansas cut-off date); Mohr, *supra* note 87 (reporting that Minnesota had more complaints in 2020 than 2019 and 2018); Unglesbee, *supra* note 273 (reporting significant injuries from dicamba in Arkansas and Indiana in 2020 despite the cut-off dates).

[275] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 18.

[276] *Id.* at 20; *Guidance on FIFRA 24(c) Registrations*, ENV'T PROT. AGENCY (Nov. 2020), https://www.epa.gov/pesticide-registration/guidance-fifra-24c-registrations; 7 U.S.C. § 136v(c) (2018).

[277] *Guidance on FIFRA 24(c) Registrations*, *supra* note 276.

[278] 7 U.S.C. § 136v(a).

[279] 5 U.S.C. § 706(2)(A) (2018); *see* Make the Rd. N.Y. v. McAleenan, 405 F. Supp. 3d 1, 11 (D.D.C. 2019) (finding an abrupt change in official policies failed to consider the potential impact of the new policy so was arbitrary and capricious) *rev'd sub. nom. on other grounds*, Make the Rd. N.Y. v. Wolf, 962 F.3d 612, 635 (D.C. Cir. 2020).

[280] 5 U.S.C. § 553(b), (c).

[281] Marcelo Zimmer and Bill Johnson, *Dicamba Application Dates for 2021 and Alternatives for Control of Herbicide-Resistant Weeds on Soybean*, PURDUE UNIV. PEST & CROP NEWSLETTER (May 6, 2021), https://extension.entm.purdue.edu/newsletters/pestandcrop/article/dicamba-application-dates-for-2021-and-alternatives-for-control-of-herbicide-resistant-weeds-on-soybean/.

applications when the wind is blowing toward an adjacent residential area.[282] Arkansas approved a May 25, 2021 cut-off date for the state, the state plant board voted to change this to June 30, but a court restrained the board's revised date.[283] Given the disparate topographical and climatic features of states using OTT products, limiting state actions that have the potential to reduce offsite injuries is counterproductive.[284] Given the unacknowledged existence of cut-off dates in some states and the efforts to discourage additional protective measures by states, the EPA's cut-off date labeling requirement is helpful but may have limited success in precluding offsite injuries.

C. Sensitive Plants and Buffer Distances

The labels for OTT products under the 2020 registrations contain a limitation that they should not be applied to fields next to a downwind area planted with sensitive plants.[285] To eliminate spray applications near sensitive plants, the registrants agreed to develop an educational program.[286] A registrant's label must include a phone number for inquiries about sensitive crop registries.[287] The mandatory recordkeeping requirements for applicators require them to record the "name of the sensitive crop registry/specialty crop registry the applicator consulted" and document their efforts in complying with the sensitive plant requirements.[288]

Multiple studies were used by the EPA to establish buffer distances for spray drift and volatility in the 2020 registrations.[289] The ecological report delineated several studies of OTT products conducted prior to 2018.[290] However, since the pre-2018 studies wrongly predicted there would be negligible offsite injuries, it should

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[282] Press Release, Ill. Dep't of Agric., IDOA Announces Dicamba Decision for 2021 Growing Season (Dec. 23, 2020).

[283] *See* Meghan Grebner, *Ward Provides an Update on Arkansas Dicamba Cutoff Date*, BROWNFIELD AG NEWS FOR AM. (Jan. 4, 2021), https://brownfieldagnews.com/news/ward-provides-an-update-on-arkansas-dicamba-cutoff-date/; Emily Unglesbee, *State Dicamba Rule Updates: Dicamba Use Halted in Arkansas Due to Judicial Restraining Order*, PROGRESSIVE FARMER (May 26, 2021, 3:50 PM), https://www.dtnpf.com/agriculture/web/ag/crops/article/2021/05/26/dicamba-use-halted-arkansas-due.

[284] By reducing state limitations on OTT usage, the 2020 changes may increase the number of injuries.

[285] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 24. For product registrations, see *supra* note 40.

[286] *See, e.g.*, EPA, 2020 Syngenta Tavium Registration, *supra* note 40, at 14.

[287] *See, e.g.*, EPA, 2020 Bayer XtendiMax Registration, *supra* note 40, at 8 (noting that "[i]f you have questions regarding sensitive crop registries contact Bayer at 1-844-RRXTEND . . . prior to application").

[288] *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 4.

[289] Wagman Memorandum, *supra* note 73, at 208–61.

[290] *Id.* at 208–30.

be concluded that the studies failed in accurately predicting buffer distances needed to prevent unreasonable offsite injuries.[291] The discredited pre-2018 studies are not appropriate for establishing buffer distances for the 2020 OTT products.[292]

The 2020 registrations require a 240-foot downwind buffer for spray applications, compared to the earlier requirement of a 110-foot buffer.[293] Yet, if an applicator uses a hooded-sprayer, only a 110-foot buffer is required.[294] The spray-drift buffer distances were determined by reviewing "multiple field-level and laboratory studies from a variety of sources."[295] However, a review of the post-2018 studies relied upon for determining buffer distances discloses that the studies failed to replicate actual field conditions where OTT products would be applied. This raises a concern whether the EPA had well-founded data from which to delineate credible buffer distances.[296]

Turning to the reported ecological studies employed to establish buffer distances, a registrant submitted one set of field studies involving applications of an OTT product.[297] Test plots of 19 to 24 acres were planted with dicamba-resistant soybeans surrounded by non-resistant soybeans in Illinois and Mississippi.[298] For the Illinois study conducted in July, only a single application of dicamba was applied and two inches of rain fell during the five days after the application.[299] The scientific report submitted to the EPA cautioned that the study may not reflect actual exposure that would occur during the typical vegetative growing season, yet the EPA considered this study in its calculations.[300] The Mississippi study involved one application of dicamba followed by a heavy thunderstorm between hours 24 and 48

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[291] The EPA had found that the studies justified the registrations, yet the registrations were subsequently vacated due to excessive offsite injuries. *See* Section I.B.

[292] The results of the studies had led the EPA to set buffer distances that failed to prevent substantial injuries to neighboring vegetation. It is not clear whether the design of the studies was faulty, or the EPA incorrectly interpreted the results.

[293] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 4. If an endangered species is present, a larger buffer is required. *Id.*

[294] *See id.* at 5.

[295] *See id.* at 13. The EPA cited its ecological study. *See* Wagman Memorandum, *supra* note 73.

[296] *See* Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (requiring a rational connection of relevant data to the choice made); Portland Cement Ass'n v. Env't Prot. Agency, 665 F.3d 177, 187 (D.C. Cir. 2011) (finding that reasoned decision making requires an examination of relevant data).

[297] Wagman Memorandum, *supra* note 73, at 230–37.

[298] *Id.* A study was also conducted in Missouri but was not considered in establishing field setbacks.

[299] *Id.* at 234–35. Some producers apply two applications and rain events markedly reduce volatilization. Thus, the Illinois study was not persuasive evidence. *Id.* at 235, 298.

[300] *Id.* at 235.

of the study.[301] Given that the rainfall event reduced volatility, the scientific report concluded that the study "may underestimate distances under conditions of no rainfall," yet the EPA decided to use the results of this study.[302] For both studies, the size of the fields is not very representative of actual situations where larger soybean fields would be releasing more spray and greater amounts of volatile particles would be available to enter the air and cause offsite injuries.[303]

The EPA also relied on a set of academic studies conducted by five universities.[304] All these studies had field sizes of ten acres or less, and some were less than one acre.[305] Given the small acreages, the results are inappropriate for calculating buffer distances.[306] A third set of six registrant-sponsored studies involved three studies that were determined to be inappropriate for evaluating the protectiveness of in-field application setbacks.[307] The fourth study, in Illinois, had a significant rain event compromising the flux estimates,[308] while the last two studies had small field sizes that were not representative of normal growing conditions.[309]

Two separate studies were conducted in Mississippi and Illinois with applications of the Engenia OTT product.[310] Field sizes of 19 and 23 acres were used and a single application of OTT was applied.[311] Both studies reported storm events and involved compromised controls, yet their results were considered by the EPA in establishing buffer distances.[312] Registrant studies were also conducted on the Tavium dicamba product.[313] Only one registrant study, conducted by the University of Nebraska on two 9.4-acre plots, generated data, but no results relating to buffer distances were reported.[314]

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[301] *Id.* at 231.

[302] *Id.* at 233.

[303] *See supra* note 79.

[304] Wagman Memorandum, *supra* note 73, at 238–41 (Auburn University, University of Tennessee, University of Arkansas, University of Nebraska, and University of Georgia).

[305] *Id.*

[306] Most dicamba applications will be on fields that are considerably larger, so they would be expected to be accompanied by greater quantities of spray that would migrate offsite.

[307] Wagman Memorandum, *supra* note 73, at 241–47.

[308] *Id.* at 242–44.

[309] *Id.* at 244–46. The studies were conducted on plots of eight and ten acres. *Id.*; *see supra* note 79.

[310] Wagman Memorandum, *supra* note 73, at 248–55. A third study on Engenia in Missouri was compromised by a dicamba exposure event and was not used in evaluating the protectiveness of in-field application setbacks. *Id.* at 255.

[311] *Id.* at 248–53.

[312] *Id.*

[313] *Id.* at 255–61.

[314] *Id.* at 255–56.

The summaries of these reported post-2018 studies disclose difficulties in conducting field studies that can generate meaningful results. All the studies were compromised by various factors, including only involving a single spray application even though producers may make two applications, small fields, and rain events. While the EPA proceeded to calculate a downwind buffer distance, there were no compelling data that led to the selection of a 240-foot buffer. This suggests that the agency lacked relevant data from which to articulate a satisfactory explanation for its 240-foot buffer. The selection of this distance appears to be arbitrary.[315]

D. Omissions

When analyzing the 2018 OTT-product registrations, the *National Family Farm Coalition* court noted the failure of the EPA to acknowledge risks that applicators were disregarding label restrictions and social costs related to the products' use.[316] The documentation for the 2020 registrations shows the EPA again failed to fully consider volatilization injuries and social problems that would accompany applicator misuse of the products.

1. Volatilization Setbacks

Evidence suggests that the studies relied upon by the EPA for the 2020 OTT-product registrations did not meaningfully account for potential temperature inversions and multidirectional transfers of dicamba vapors through volatilization. Volatilization may occur after a spray is applied, so it is not dependent on the wind direction at the time of spray application.[317] Dicamba molecules may be carried in any direction and volatilization can occur a few days after a pesticide's application.[318] Since rain occurred within days of spray applications in many of the field trials, the studies could not predict the absence of volatilization injury.

For counties where endangered species are present, the EPA's ecological studies postulated that an in-field omnidirectional 57-foot setback was needed to control

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[315] *See* Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (finding the failure to "articulate a satisfactory explanation for its action including a 'rational connection between the facts found and the choice made'" is arbitrary and capricious).

[316] Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1139–44 (9th Cir. 2020).

[317] *See* Richard Behrens & W. E. Lueschen, *Dicamba Volatility*, 27 WEED SCI. 486, 488 (1979) (reporting that volatile dicamba herbicides may be volatile for three days).

[318] *See* Stephen D. Strachan, Nancy M. Ferry & Tracy L. Cooper, *Vapor Movement of Aminocyclopyrachlor, Aminopyralid, and Dicamba in the Field*, 27 WEED TECH. 143, 150–51 (2017) (testing vapor movement of dicamba and other herbicides); Jason K. Norsworthy, *Summary of Presentation Given to the Arkansas State Plant Board*, AUDUBON ARK. (Dec. 3, 2019), https://ar.audubon.org/sites/default/files/static_pages/attachments/dicamba_research_findings_2019.pdf (reporting volatility for up to 96 hours after application).

volatilization.[319] Applicators would check the Endangered Species Protection Bulletin for their area to determine whether this restriction applied.[320] The EPA estimated that by using a volatility-reduction agent and a 57-foot buffer there would be a failure rate of 11% in preventing volatility-related adverse effects.[321] No explanation was given for allowing such a significant failure rate for volatilization.

The 2020 registrations also list a site for listings of sensitive crop and specialty crop registries.[322] Registrants must document compliance with a survey of adjacent fields for sensitive areas, sensitive crops, or residential areas.[323] However, the 2020 registrations failed to enumerate any omnidirectional volatilization buffer to address offsite movement of particles after dicamba sprays are applied for counties where endangered species are not present. This includes counties where a majority of soybeans are grown.[324]

A survey in Illinois in 2018 found that applicators felt volatility was the primary factor for offsite injuries.[325] Approximately 70% of commercial applicators responding felt that injuries to adjacent non-resistant soybeans occurred in fields that were not downwind from the spray application.[326] Given that the *National Family Farm Coalition* court found the 2018 registrations offended FIFRA, the failure of the 2020 registrations to address volatilization compromises any conclusion that the labels will prevent offsite injuries. In the absence of a required omnidirectional volatilization buffer for most areas, the 2020 registrations failed to consider the risk of volatilization accompanying use of OTT products.

2. Applicator Misuse

The EPA felt that potential applicator misuse would be prevented by simpler labels.[327] With label requirements necessitating consultation beyond the printed label for endangered species and sensitive areas, it is not clear the labels are simpler.[328] Moreover, making labels easier to comprehend can reduce misuse only if applicators

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[319] Wagman Memorandum, *supra* note 73, at 325.

[320] *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 7. A telephone number is also listed. *Id.* The registration directs applicators to http://www.epa.gov/espp/ to learn whether a field is in an area with endangered species, *id.*, requiring the 57-foot omnidirectional buffer.

[321] Wagman Memorandum, *supra* note 73, at 325.

[322] *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40, at 14 (listing www.driftwatch.org).

[323] *See, e.g.*, *id.* at 4.

[324] *See Protecting Endangered Species. Bulletin Live Two!,* ENV'T PROT. AGENCY (2021), https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins (map of areas with endangered species).

[325] ILL. FERTILIZER & CHEM. ASS'N, *supra* note 80, at 19.

[326] *Id.* at 17.

[327] EPA, 2020 Dicamba Memorandum, *supra* note 63, at 21.

[328] *See, e.g.*, EPA, 2020 BASF Engenia Registration, *supra* note 40.

subsequently choose to follow the requirements. The EPA seems to have ignored evidence that misuse occurs because applicators want to control weeds and so proceed even when their applications are not in conformance with a label's instructions.[329] Responses to a survey conducted in Illinois showed that approximately 30% of commercial applicators felt dicamba products had been applied contrary to the product label.[330] Ten categories of factors were noted for noncompliance with the largest involving applications near sensitive plants.[331]

The EPA had considerable evidence gathered by state weed scientists from previous years attesting to the misuse of products by applicators.[332] In the documentation decisions for the 2018 registrations, the agency acknowledged that 1,400 official complaints in 2018 may have been from misuse and a "large proportion of cases of off-site movement reported to state departments of agriculture were attributed to off-site movement of OTT applications."[333] This knowledge implied it was foreseeable that misuse of the products approved by the 2020 registrations would cause offsite damages. Yet the EPA disregarded the knowledge and ignored risks of injuries associated with misuse. This raises the question whether the omission of damages arising from misuse caused the agency to fail "to protect the environment and the public from the misuse of unnecessary or dangerous pesticides" as intended by Congress in adopting FIFRA.[334] It also creates an argument that because it is known that applicators will misuse the products and injure offsite vegetation and this risk was not considered, the EPA failed to consider all the costs associated with uses of the OTT products.[335]

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[329] ILL. FERTILIZER & CHEM. ASS'N, *supra* note 80, at 15.

[330] *Id.*

[331] *Id.* at 16 (including in order of difficulty of compliance: do not apply near sensitive plants, "wind speed requirements, identifying nearby sensitive crops, inversions, in-field buffers, clean-out procedures, soybean growth cut-off stage, recordkeeping, no pre-sunrise or post-sunset applications, and nozzles.").

[332] *See, e.g.*, EPA, 2017 DIALOGUE COMM., *supra* note 113, at 105; EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 10.

[333] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 11.

[334] *See* 118 CONG. REC. 32,260 (1972) (testimony accompanying the adoption of FIFRA); Dow Chemical Co. v. Blum, 469 F. Supp. 892, 900 (E.D. Mich. 1979) (citing the Congressional Record).

[335] The objectively foreseeable misuse of OTT products also raises an issue of whether the manufacturers should be liable for damages. *See* Indian Brand Farms, Inc. v. Novartis Crop Prot., Inc., 617 F.3d 207, 226–27 (3d Cir. 2010) (looking at a defective design claim involving a pesticide to determine a manufacturer's responsibility); Lewis v. Am. Cyanamid Co., 715 A.2d 967, 997 (N.J. 1998) (considering liability if a product's design fails to envisage objectively foreseeable misuse of the product).

IV. DEVISING A DICAMBA COMPENSATION PROGRAM

Applications of dicamba herbicides during 2017 and 2018 have injured vegetation on millions of acres of land.[336] Due to the lack of an enforcement mechanism, the negative externalities associated with the denigration of property rights reveals governments forgoing responsibilities in protecting property.[337] The uncompensated property damages constitute a market failure that merits a governmental response.[338] To uphold the sanctity of private property rights, governments may want to curtail the injuries that are damaging offsite properties. While this could involve precluding uses of dicamba, another strategy could involve placing a fee on sales of dicamba products that would be used to pay injured property owners and regulatory costs.

Bayer entered a settlement agreement to pay up to $400 million for crop losses occurring in the 2015–2020 crop years for injuries from the use of dicamba products.[339] Yet, the damage payments cannot compensate for the interferences foisted on neighbors that caused them to cease growing traditional crops and alter business strategies.[340] More significantly, the settlement monies do not cover injuries that may arise commencing in 2021. While a future class action suit could address some of these uncompensated damages, the burdens placed on injured property owners recommend a more proactive approach.[341] In addition, it would be advantageous to obviate the financial burden currently borne by state pesticide regulatory agencies in responding to complaints of offsite injuries.[342] Given the interferences with landowners' property rights and costs on state agencies, dicamba uses might be precluded

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[336] EPA, 2018 Dicamba Registration Decision, *supra* note 18, at 11.

[337] Negative environmental externalities result in inefficient allocations of resources causing market failures that government may address. Adam D.K. Abelkop, *Tort Law as an Environmental Policy Instrument*, 92 OR. L. REV. 381, 386 (2013).

[338] *See* Vanessa Casado-Pérez, *Missing Water Markets: A Cautionary Tale of Governmental Failure*, 23 N.Y.U. ENV'T L.J. 157, 165 (2015) (discussing the roles governments play to ensure that water markets operate efficiently); Kenneth M. Murchison, *Liability Under the Oil Pollution Act: Current Law and Needed Revisions*, 71 LA. L. REV. 917, 938 (2011) (discussing oil spill liability and the unfairness of the federal government not compensating victims).

[339] *See Bayer Reaches a Series of Agreements*, *supra* note 28; *see also* Bader Farms v. Monsanto Co., No. 16-CV-299, 2020 WL 6939364, at *13 (E.D. Mo. Nov. 25, 2020) (discussing standards for damage to fruit trees).

[340] Injured owners might not be compensated for lost profits. For example, damages to trees from pesticide injury to fruit may be limited to "the differential value of the land just before and just after the injury." Frank v. Loftus, 2014 IL App (1st) 130622-U ¶ 23; *see also* Kerr v. Lambert, No. 03-19-00359-CV, at 23 (Tex. Ct. App. Oct. 23, 2020) (finding damages from pesticide injury to trees "was the amount necessary to put the land in the condition it was in at the time preceding the injury").

[341] *See In re* Dicamba Herbicides Litig., 359 F. Supp. 3d 711 (E.D. Mo. 2019).

[342] *See* Cofer Letter, *supra* note 125; Waltz Letter, *supra* note 90, at 2.

unless a strategy is adopted to compensate property owners injured by dicamba applications.[343] One approach would be to enact a dicamba compensation program to compensate injured property owners. A program could draw upon mechanisms that already are employed in crop insurance and state workers' compensation programs.[344] The program could require participation by all applicators of dicamba products and collect an occupational fee to pay for offsite injuries related to dicamba spray applications (Figure 1).

A dicamba compensation program would be initiated by a state legislature and be grounded on the requirement that all dicamba products sold in the state need to be registered as restricted use pesticides.[345] This category of pesticides requires applicators to maintain records showing the product's name, amount applied, date applied, location of application, and the applicator's name.[346] For an administrative structure, the program would have a board of directors with appropriate powers to employ personnel and adopt rules to govern the operations of the program.[347] The personnel would be under a state agency subdivision created to oversee the collection of funds, proof of claims, evaluation of offsite injuries, payouts to property owners suffering injuries, and enforcement.[348] The authorizing legislation would include the power to collect funds from applicators using dicamba products as an occupational fee.[349] In this manner, it would be a service fee and avoids constitutional issues of property taxation.[350] With dicamba injuries being insured, persons suffering damages would file claims under the program. Neighbors would not be feuding with

[343] While a state program is proposed, it may be noted that the registrations for dicamba products could contain a requirement for participation in a compensation program.

[344] *See* Travis J. Foels, *Rescuing the Rescuer: Reforming How Florida's Workers' Compensation Law Treats Mental Injury of First Responders*, 69 FLA. L. REV. 1439, 1448 (2017) (discussing workers' compensation coverage as a "'no-fault' system where employers are shielded from excessive liability").

[345] 7 U.S.C. § 136a(d) (2018) (prescribing classes of pesticides). The OTT dicamba products are already restricted use pesticides so this requirement would only affect non-OTT dicamba pesticides.

[346] *See* 7 C.F.R. § 110.3 (2020) (delineating recordkeeping requirements for restricted use pesticides).

[347] *See* NEB. REV. STAT. § 2-3213 (2021) (delineating a Nebraska program that provides a board of directors for governing the program).

[348] Presumably, it would be a part of the state agency already administering the use of pesticides. The provisions authorizing Nebraska's Natural Resources Districts might serve as a model for establishing the administrative unit. *Id.* § 2-3201 *et seq*.

[349] State agencies lack authority to assess fees without legislative authorization. *See* CAL. WATER CODE § 10730 (West 2016) (authorizing groundwater sustainability agencies to impose fees); NEB. REV. STAT. § 2-3226.05 (2021) (authorizing an occupation tax).

[350] A service fee is "a charge for a direct public service rendered to the particular consumer, while a tax is a forced contribution by the public at large to meet public needs." N. Idaho Bldg. Contractors Ass'n v. City of Hayden, 432 P.3d 976, 983–84 (Idaho 2018) (quoting Brewster v.

each other, and private lawsuits would not be needed. The administrative unit would handle all complaints and would make payouts when injuries from dicamba were established.

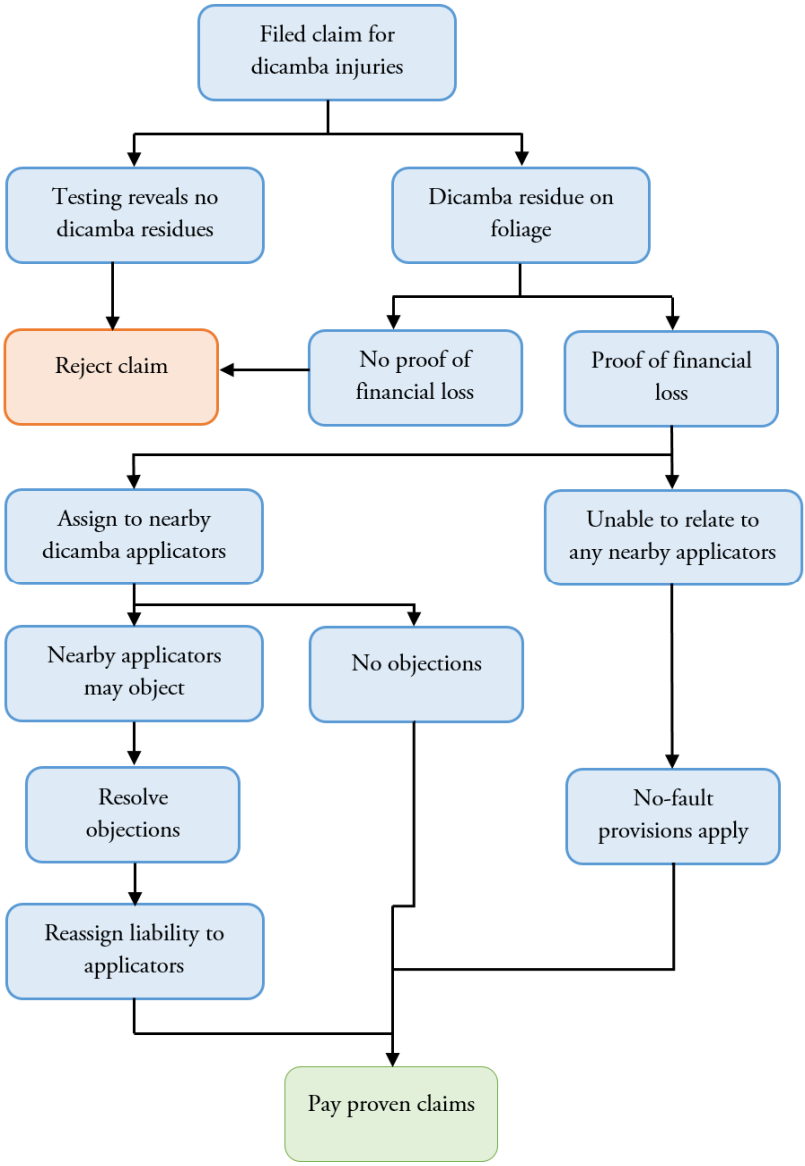

Figure 1. Regulatory framework for dicamba compensation payments.

City of Pocatello, 768 P.2d 765, 768 (Idaho 1988)). The consumers are users of dicamba, and the service is compensating injuries arising from uses of dicamba products. Generally, a "government imposes a tax for general revenue purposes, but it imposes a fee in the exercise of its police powers." Watson v. City of Blytheville, 593 S.W.3d 18, 23 (Ark. 2020).

A. Proof of Damage Claims

Under a dicamba compensation program, injured property owners would be required to establish their claims. Owners would submit evidence of injury and claims for damages to the program. Evidence of injury would consist of proof established by a lab test of soil or plant materials that confirms the presence of dicamba residues from an offsite source. Various chromatographic testing methods would be used to establish the presence of dicamba residues.[351] Alternatively, an indirect competitive chemiluminescent enzyme immunoassay offers a test with good accuracy.[352] Whenever a sample shows the presence of dicamba, the records of dicamba spray applications on properties near the injured vegetation would be analyzed.[353] Appropriately trained personnel would match an application to the damages. The suspect applicators would be notified and could rebut an assignment-of-claim determination. For claims in which no obvious applicator could be identified, no-fault insurance provisions would internalize costs to all persons purchasing dicamba products.

The claimant also would submit evidence of yield or amenity losses to establish proof of damages. For injured crops such as non-dicamba-resistant soybeans, yield and weather data could be used to calculate damages. The claimant would need to present proof that the yield of the injured crop was less than past yields. The comparison would include a factor for the anticipated yield for the year compared to historic yields for the area to arrive at the estimated loss. For other vegetation, calculation of losses would be more difficult. However, market price, contingent valuation, and value transfer approaches have long been employed in establishing damages involving landscape amenities.[354] By presenting evidence of dicamba residues and damage losses, the claimant would establish a claim for compensation. This

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[351] *See, e.g.*, Aristeidis S. Tsagkaris, Jana Pulkrabova & Jana Hajslova, *Optical Screening Methods for Pesticide Residue Detection in Food Matrices: Advances and Emerging Analytical Trends*, 10 FOODS, July 2021, at 1, 10 (discussing point-of-care options for reducing costs of testing).

[352] *See* Jingqian Huo, Bogdan Barnych, Zhenfeng Li, Debin Wan, Dongyang Li, Natalia Vasylieva, Stevan Z. Knezevic, O. Adewale Osipitan, Jon E. Scott, Jinlin Zhang & Bruce D. Hammock, *Hapten Synthesis, Antibody Development, and a Highly Sensitive Indirect Competitive Chemiluminescent Enzyme Immunoassay for Detection of Dicamba*, 67 J. AGRIC. FOOD CHEM. 5711, 5718 (2019) (advocating an assay that is rapid and simple yet accurate in detecting and quantifying pesticide levels).

[353] *See* Gail Ruhl, Fred Whitford, Steve Weller & Mike Dana, *Diagnosing Herbicide Injury on Garden and Landscape Plants*, *in* PURDUE EXTENSION (2008) (Purdue Plant & Pest Diagnostic Lab'y, ID-184-W) (discussing the identification of herbicide injury).

[354] *See, e.g.*, Jérôme Dupras, Jérémy Laurent-Lucchetti, Jean-Pierre Revéret & Laurent DaSilva, *Using Contingent Valuation and Choice Experiment to Value the Impacts of Agri-Environmental Practices on Landscapes Aesthetics*, 43 LANDSCAPE RSCH. 679 (2018) (examining contingent valuation to value landscape aesthetics); Ting Zhou, Erin Kennedy, Eric Koomen & Eveline S. van Leeuwen, *Valuing the Effect of Land Use Change on Landscape Services on the Urban–Rural Fringe*, 63 J. ENV'T PLAN. & MGMT. 2425, 2427, 2440 (2020) (discussing factors that may be used for valuing landscape services to identify advantages and disadvantages).

documentation would create a rebuttable presumption that the claimant is entitled to compensation for damages.[355] Anyone objecting to the claim could establish a falsehood or an inaccuracy that overcomes the showing of injuries or the presumption of damages. The administration of the program would include an adjudicatory committee to evaluate written objections and determine final amounts of damages.

B. Providing Compensation for Injuries

A dicamba compensation program would adopt the workers' compensation principle that all valid injury claims need to be compensated[356] with an added stipulation that full compensation is required.[357] Without full compensation, the program would continue to sanction the uncompensated destruction of property rights. Under insurance law principles, the program would delineate property owners that are covered by the compensation program and a no-fault payment scheme for damages. All nearby property owners would be insured and all persons submitting proven claims for damages would be compensated.

To provide funds for payment for valid claims, the program would require all applicators to insure themselves by paying fees to a dicamba compensation fund established under the program. The fees would be an occupational fee related to the volume of dicamba products purchased. Monies collected from sales of dicamba products would be used to make payouts for damage claims. The program's board of directors would develop a fee schedule for raising funds for payouts and program administration. Initially, the fee per unit of dicamba product would be the same for all applicators. However, the fee schedule would consist of a progressive schedule under which applicators with more than an average number of claims would pay higher fees. By using a progressive schedule, applicators who seldom or never cause injuries would be rewarded. Each year, the agency would adjust the fee schedule based on applicator culpability. In this manner, applicators causing inordinate amounts of damages would pay higher fees.

Despite the information on applications of dicamba products, there will be issues concerning proof of claims and petitions for which no obvious applicator can

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[355] By having a rebuttable presumption, the evidence gathered and the decision by the agency would be presumed valid, but anyone could prove otherwise.

[356] Workers' compensation programs delineate a strict liability scheme under which all injured workers are compensated regardless of fault. *See* Gerhard Wagner, *Tort, Social Security, and No-Fault Schemes: Lessons from Real-World Experiments*, 23 DUKE J. COMP. & INT'L L. 1, 5, 7, 8 (2012). However, full compensation is not required. *Id.*; *see, e.g.*, NEB. REV. STAT. § 48-101 (2021) (providing compensation for personal injuries to employees from accident or occupational diseases arising out of and in the course of employment if the employee was not willfully negligent at the time of injury).

[357] Under most workers' compensation programs, only partial payments of damages are required. *See, e.g.*, NEB REV. STAT. § 48-121 (2021) (providing two-thirds payment for many situations).

be identified. Following no-fault insurance, the program would pay valid claims even when no applicator can be assigned to the injuries. Placing costs on dicamba applicators through a dicamba compensation program is superior to not compensating innocent landowners suffering injuries from dicamba drift and volatilization. Moreover, by internalizing costs to dicamba applicators, incentives exist for applicators to refrain from practices causing injuries or to adopt a different weed-control program. With these safeguards, the program adheres to principles already in use for workers' compensation claims and no-fault insurance that have long been used to compensate injured persons and property owners.

C. Producer Management and Reducing Social Costs

Agricultural producers make management decisions based on input costs, harvested outputs, and other factors. One decision is whether more expensive seed and OTT products are needed to control resistant weeds. The fee on dicamba products would alter the cost of production to allow greater acreages to adopt weed-management strategies not dependent on a dicamba spray program. Producers with fields containing few resistant weeds could decide they do not need to use dicamba. Fields that are far enough away to avoid dicamba drift and volatilization from neighbors might be planted with non-dicamba-resistant soybeans. With an option to collect compensation for damages, the program would encourage the reduction in the use of dicamba products and allow property owners to be more secure about investing in crops and vegetation that might be damaged by neighbors using dicamba.

The use of a dicamba compensation program to insure crops or foster reduced damages has correlations. The USDA has long maintained a crop insurance program to provide funds for qualifying losses.[358] Other governments foster reduced damages from wastes through extended producer responsibility requirements. The premise of extended producer responsibility is that when a producer delivers a good to the market, it should pay for the costs of its end-of-life disposal.[359] Correspondingly, when dicamba products are sold, the manufacturer or user should pay for the anticipated injuries.[360] Through a progressive fee structure, a dicamba compensation program would spur pesticide applicators to use greater care when using their products

[358] *See Summary of Changes*, *supra* note 55.

[359] *See* João F.D. Rodrigues, António Lorena, Inês Costa, Paulo Ribeiro & Paulo Ferrão, *An Input-Output Model of Extended Producer Responsibility*, 20 J. INDUS. ECOL. 1273, 1281 (2016) (discussing the policy justification for developing policies to consider environmental and socio-economic impacts).

[360] The object is to create an incentive for reducing activities placing costs on others. *See* Juergen Morlok, Harald Schoenberger, David Styles, Jose-Luis Galvez-Martos & Barbara Zeschmar-Lahl, *The Impact of Pay-As-You-Throw Schemes on Municipal Solid Waste Management: The Exemplar Case of the County of Aschaffenburg, Germany*, RESOURCES, 2017, at 1, 4, 14 (discussing recycling incentive schemes to reduce residual waste).

to avoid offsite injuries.[361] In addition, a compensation program would mediate community disputes involving alleged injuries from dicamba applications. This would replace resentment by persons who otherwise would be uncompensated for their injuries. It would also avoid direct confrontation by litigants that occurs in legal disputes. In this manner, the program should reduce tension and animosity that currently exists in many areas where dicamba is being used.

CONCLUSION

Producers of food crops need to control weeds that reduce crop yields. With the registration of OTT products, soybean and cotton producers have a pesticide that can control glyphosate-resistant weeds. In areas where these resistant weeds are common, many producers adopted a weed-management program that included the use of OTT products to reduce crop losses. Unfortunately, the use of the products was accompanied by pesticide drift and volatilization that harmed nearby vegetation. Over a four-year period (2017–2020), the registrants and the EPA attempted to moderate the injuries being foisted on neighboring property owners by OTT spray applications. The labels of OTT products were revised yearly to incorporate additional restrictions governing the use of the products. With each new iteration of revised labeling requirements, the EPA claimed the added restrictions would prevent unreasonable drift and volatilization injuries. However, by the end of each growing season, significant offsite injuries proved that the revised labeling requirements did not prevent neighboring property owners from suffering significant damages.

The offsite injuries are an externality creating an unfair situation where others were being subjected to damages without compensation.[362] FIFRA says that no pesticide can be registered unless it performs its intended function without "unreasonable adverse effects on the environment."[363] The evidence showed that the OTT products were having unreasonable effects.[364] In 2020, a federal circuit court found three 2018 OTT-product registrations violated FIFRA.[365] The EPA canceled the registrations, but five months later issued new 2020 registrations that enabled OTT

[361] While extended producer responsibility systems often seek to reduce waste, the dicamba compensation program would seek to reduce applicator misuse. *See* Antonio Massarutto, *The Long and Winding Road to Resource Efficiency – An Interdisciplinary Perspective on Extended Producer Responsibility*, 85 RES. CONSERV. & RECYCLING 11, 19 (2014) (noting how extended producer responsibility spurred long-term waste prevention).

[362] Negative environmental externalities result in inefficient allocations of resources causing market failures that government may address. Abelkop, *supra* note 337, at 386.

[363] 7 U.S.C. § 136a(c)(5)(C) (2018).

[364] *Id.* § 136(bb); Nat'l Fam. Farm Coal. v. Env't Prot. Agency, 960 F.3d 1120, 1136, 1145 (9th Cir. 2020).

[365] *Nat'l Fam. Farm Coal.*, 960 F.3d 1120.

products to be sold and used.[366] Additional labeling requirements for applying the products were cited as sufficient to stop offsite injuries.

An analysis of the labeling additions to the 2020 registrations shows they are unlikely to end offsite injuries. The labeling changes did not sufficiently respond to injuries from volatilization and misuse. The field studies relied upon for estimating offsite movement of dicamba failed to represent realistic conditions facing persons applying the products. This means the data do not constitute substantial evidence supporting the 2020 registration decisions. There is no rational connection between the facts found and the decision that labeling would control offsite injuries. Without controlling offsite injuries, the EPA failed to show that the OTT products can perform their "intended function without unreasonable adverse effects on the environment."[367]

In a democratic society, governments enact laws and regulations to provide mechanisms for resolving disputes and recovering damages in situations where persons injure others.[368] FIFRA was intended "to protect the environment and the public from the misuse of unnecessary or dangerous pesticides."[369] The approval of the OTT-product registrations, as well as choices sanctioning uses of atrazine, glyphosate, sulfoxaflor, chlorpyrifos, and neonicotinoids,[370] suggest that the EPA is disregarding this policy and proceeding to support contemporary production practices that provide the greatest economic returns to crop producers.

While enabling producers to use new technologies that enhance the production of food products is important, the EPA's decisions allowing pesticide uses to denigrate people's health, injure neighboring properties, and compromise environmental quality are short-sighted. Pesticide registration decisions need to account for secure property rights, healthy populations, and the preservation of environmental resources. If the EPA cannot administer FIFRA to protect people and the environment, the public needs to advance proposals for change. A dicamba compensation program enabling property owners suffering injuries to collect damages offers a mechanism for overcoming an unfair situation occurring with current registrations of OTT products. If governments want to facilitate use of this herbicide, they should relate its costs to those benefitting from its use.

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366 *See* sources cited *supra* note 40.

367 7 U.S.C. § 136a(c)(5)(C).

368 *See* Barry R. Schaller, *A Legal Prescription for Bioethical Ills*, 21 QLR 183, 280 (2002) ("Maintaining a society in which democratic processes and institutions can flourish is an essential ingredient of a democratic society.").

369 118 CONG. REC. 32,260 (1972).

370 *See* sources cited *supra* note 4.