

# Gaming the System: Tort Tradeoffs in Cases of Pesticide Drift

by

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(Under the Direction of Greg Colson)

## ABSTRACT

For many years, the risk posed to American farmers by pesticide drift was minor and incidents were sporadic. As a result, the few farmers who did suffer harm from drift sought recovery in state courts that handled their cases in very different ways. Depending on which torts were successfully advanced as causes of action, remedies ranged from awards of financial damages to injunctions against offending applicators to even nothing for the harmed farmer. Recent drift issues with dicamba have magnified these differences in states' approaches to drift lawsuits and further increased the demand for a judicial process that manages these incidents in a clear and efficient manner. To better understand these differences, this paper identifies the three torts commonly advanced as causes of actions in drift cases and creates theoretic-game models to evaluate each tort's impact on the decision-making of farmers and their economic outcomes.

INDEX WORDS: Pesticide drift, Torts, Nuisance, Negligence, Trespass, FIFRA

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- Nick

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## 1. Introduction

Farmers are notoriously anxious people, and rightfully so given the unpredictable nature of agricultural production. Depending on the time of the year, a farmer may be worried about the condition of his/her soil, the amount of rain that falls upon it, the weeds that grow in it, or the price of the crops that grow from it. For all of these concerns, the modern farmer through fertilizer, irrigation, pesticides, and crop insurance can protect his/her livelihood. Those aforementioned problems are nothing new for farmers, which has allowed time for their respective solutions to be developed and improved over the years. One problem that many farmers face today without an overwhelmingly clear solution is pesticide drift (Klass, 2005).

Though not an entirely new issue for farmers, recovering losses from pesticide drift involves the civil court system at the state level and states vary in their applicable causes of action. With minor exceptions, farmers usually need to assert that the pesticide drift was a trespass or the result of negligence (Centner, 2014). By legal definition, pesticide drift most resembles a nuisance (i.e., the substantial and unreasonable interference with the use and enjoyment of one's land) (*Johnson v. Paynesville Farmers Union Coop. Oil Co.*, 2012). However, in many circumstances, nuisance is not a successful argument as every states' right-to-farm act grants farmers some level of immunity from nuisance suits. Given different requirements for negligence, trespass, and nuisance, each state's unique treatment of pesticide drift by the judicial system can make the path to recovering losses a complicated maze for farmers (Klass, 2005).

Despite these differences in state approaches, one would expect that civil remedies are nonetheless available for farmers who have suffered economic losses from pesticide drift. Under certain circumstances, this expectation is not met (Mangrum v. Pigue, 2004). Furthermore, the once relatively rare nature of pesticide drift suits means that many states have yet to even address the issue (Satterfield v. JM Huber Corp., 1994). The ad hoc nature of drift suits in these states adds to the difficulty of farmers' attempts to recover losses. This patchwork system of state judicial remedies for drift cases results in a sheer lack of predictability for their outcomes. This unpredictability causes distress not just for the farmers who are uncertain how or if they will be able to recover their losses but also for the applicators in their pesticide-related decisions. Additionally, both parties are affected by the increased costs in litigating drift cases due to their relatively complex nature (Centner, 2014).

In order to gain a better understanding of pesticide drift lawsuits, this paper serves to illustrate and ultimately compare how each tort works in a trial setting when applied as a cause of action. The beginning of this paper provides a brief overview of the recent uptick in pesticide drift cases to indicate the growing need to evaluate the need for such a comparison. The section that follows this overview of drift discusses the three major torts that are applicable to pesticide drift cases and their various legal aspects. To formalize the tort comparison, a game-theoretic model of each tort is then developed to depict the decision-making process of the (1) pesticide applicator in their compliance decision and (2) the potentially harmed neighboring farmer in their decision to bring a lawsuit. By merging the results of each model with the legal characteristics of its respective tort, the final section concludes the paper with a discussion of the tradeoffs that various groups face under each tort model.

## 2. Pesticide Drift

Pesticide drift has become a much more scrutinized issue with the recent advent and subsequent mass adoption of dicamba-resistant crops (Goodis, 2018). Glyphosate-tolerant crops (i.e., ‘Roundup Ready’), the predecessor to dicamba-tolerant crops, were the first crop varieties to allow farmers to perform herbicide applications while the crop was in the field (Dodson et al., 2019). Due to this herbicide resistance, weed control became much less of an issue for farmers until glyphosate-tolerant weeds appeared. When faced with glyphosate-tolerant weeds, farmers needed a new herbicide to combat weed growth in their fields as well as a new seed that would be resistant to the new herbicide. Once used primarily as a preemergent, dicamba and dicamba-tolerant crops have now been implemented in soybean and cotton farming on a mass scale across the US.<sup>1</sup> Dicamba had a noted history of volatility issues when it was used just as a preemergent and its incorporation into dicamba-resistant crop systems only magnified this issue (Hartzler, 2017). In 2018, dicamba drift was responsible for damage to approximately 4% of all soybean fields in the US, with Nebraska reporting damage to 8% of their state’s soybean fields alone (Dodson et al., 2019). Dicamba drift damage also extends to other crops. Though data on crops other than soybeans is relatively sparse, Missouri listed over 700 acres of peaches and nearly 20,000 tomato plants in a long list of crops and residential plant life that had been damaged by dicamba drift in 2017 (Bradley et al., 2018).

In their amended registrations for several dicamba formulations, the EPA indicated that there is a “lack of scientific consensus regarding the cause of these [off-target dicamba

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<sup>1</sup> Notably, Monsanto released the first-ever dicamba-tolerant seeds in 2015. It took two years for BASF to release a dicamba formulation that corresponded to Monsanto’s dicamba-tolerant seeds. If a farmer had bought Monsanto’s dicamba-tolerant seeds in 2015 or 2016 and sprayed older versions of dicamba, they would have been committing a serious FIFRA violation. Such a violation is being alleged against many farmers in an ongoing series of court cases (Bader Farms, Inc. v. Monsanto Co., 2018).

movement] incidents” (Goodis, 2018). In this document released prior to the 2018 growing season, the EPA cited input from various entities that listed suspected causes of dicamba drift include lack of adherence to the label, tank contamination, temperature inversions, and volatility. As noted, dicamba drift still resulted in off-site damage in 2018, but it is important to note that damage estimates were lower in 2018 than in 2017 (Dodson et al., 2019). Much like the uncertainty regarding the cause in dicamba damage, the decrease in damage might be attributable to changes in federal and state regulations concerning dicamba and/or more farmers simply adopting dicamba-tolerant soybean varieties specifically to insure against potential drift-related losses. Regarding the latter possibility, it is interesting to point out the gap in the farmers who adopted both dicamba-tolerant seeds and dicamba and the farmers who only adopted dicamba-tolerant seeds. For example, 76% of soybean acres in Mississippi were planted with dicamba-tolerant seeds but dicamba was actually applied to only 54% of these soybean acres.

Regardless of the causes underlying fluctuations in dicamba drift, persistent losses from off-site dicamba movement demonstrate the need for an efficient system under which farmers can recover drift-related losses. For several decades, the interaction between FIFRA regulations, state case law, state right-to-farm acts, and the unique facts of each case have complicated the means of recovery for farmers. Further worsening matters, liability insurance policies for pesticide applications, which are often required for applicator licensure, are usually worded to avoid indemnification of third parties in instances of drift, regardless of whether the offending application violated any FIFRA-related regulations (Unglesbee, 2017). Additionally, crop insurance policies through the USDA Risk Management Agency will likely not help farmers suffering losses from drift (Lashmet, n.d.). These complicating factors have led farmers in states to use negligence, trespass, and nuisance as their primary options to seek legal remedy. Each

cause of action is treated differently in the judicial system with respect to different circumstantial requirements in the case, various remedy options, etc. As states potentially consider revamping their pesticide oversight in light of these dicamba issues, a comparison of how courts manage drift losses under each tort is essential. Not only does each system provide different remedy options and success rates for farmers pursuing recovery, each system also makes a different impact on decision-making of all pesticide applicators. This influence on farmer decision-making with respect to pesticide selection and application could reduce drift losses and thus provide a greater return to farmer property rights than lawsuits ever could.

### **3. Legal Discussion**

Before the economic models can be formed, a legal discussion of each tort theory with respect to its application in pesticide drift suits must take place. Regardless of the specific tort claim that is advanced in the trial, the harmed farmer must initially satisfy certain evidentiary requirements in order to maintain a viable cause of action (Centner, 2014). The first requirement is for a farmer to determine that pesticides have drifted onto his/her property. For this determination to suffice in a court case, the farmer will usually call on crop experts to physically inspect fields where drift is allegedly causing damage. The farmer will need to be prompt in calling on crop experts once any signs of drift-related damage are noticed due to the impending physical disappearance of the pesticide from the surface of the crops. Furthermore, many states require that farmers who have experienced losses due to pesticide drift notify their state agricultural agencies (Feitshans, 1999). In states with such notification statutes, a farmer that detects drift damage but does not notify their state agency in a timely manner is actually precluded from pursuing any action to recover their damages. As will be noted in the models,

state agencies that receive notification of drift damage will conduct their own investigation separate from the harmed farmer and can levy their own fees against the offending applicator if the application was deemed to be non-compliant. While the crop experts analyze the fields for any pesticide residue, the farmer also needs to secure the spray records of all neighboring farms (7 U.S.C. 136f). Once collected, these records will be compared with recorded weather data and the findings of the crop experts to pinpoint neighbors suspected of spraying the pesticides that drifted (Ferrell & Fishel, 2019). As the fields become ready for harvest, the farmer needs to accurately estimate losses in yield as a result of the drift. This estimation will require aerial photographs of the damaged fields as visual estimates from the farmer will not be considered reliable (Zollinger, 2017). Finally, the aggregation of this evidence will have to confirm that the losses incurred by the farmer are substantial, which is a requirement that itself varies from state to state.

The above process is only a simplified version of the process that a farmer experiencing losses from drift damage might experience. Additional steps might also involve collecting affidavits from the neighbor suspected of spraying the drifting pesticide and/or calling in additional crop experts to secure testimony on the extent of damage to the fields (Centner, 2014). A farmer also needs to consider whether the crops in question of drift damage might instead be suffering from another issue (e.g., poor soil conditions, disease, etc.). Clearly, there are numerous possibilities for transaction costs that could be incurred in a pesticide drift suit. The accumulation of these costs throughout a lawsuit highlights the need for a transparent and efficient judicial process that minimizes other sources of inefficiency and promotes pre-trial settlements.

Moving onto the differences in each system, all three torts vary in their requirements for an applicator to be charged as well as the remedy options that judges typically issue. Though states have competing views on trespass, negligence and nuisance carry their respective definitions from the Restatement of Torts across every state (The American Law Institute, 1965). As will be detailed later, only states with a certain interpretation of trespass can apply trespass to pesticide drift cases (Bradley v. Am. Smelting & Ref. Co., 1985). Therefore, states that allow the advancement of the same tort in cases of drift require similar burdens of proof and apply similar remedies for successful plaintiffs. Consequently, broadly classifying states according to one of these three torts does not compromise the ability to make economic comparisons between states.

### **3.1. Negligence**

Negligence is defined as the failure to do something that a reasonably careful person would do or the doing of something that a reasonably careful person would not do (Mangrum v. Pigue, 2004). For a plaintiff to succeed in a negligence suit, the plaintiff must show that the defendant had a duty of care that the defendant breached (The American Law Institute, 1965). The plaintiff must be able to prove that this breach in duty of care proximately caused damages to the plaintiff (Johnson v. Paynesville Farmers Union Coop. Oil Co., 2012). While applying duty of care and breaches poses difficulty in many court cases, mandatory pesticide labeling under FIFRA and any applicable regulations from the state and local governments establish a clear duty of care for applicators (7 U.S.C. 136j).

In order for a pesticide to make it to the marketplace, the EPA must determine during the registration process that applications of said pesticide that adhere to the label do not cause

“unreasonable adverse effects on the environment” (7 U.S.C. 136a(a)). This key and controversial phrase in FIFRA enables the EPA to use a cost-benefit analysis in their registration decisions (7 U.S.C. 136d(b)-(c)). This cost-benefit analysis considers economic, social, and environmental aspects of the pesticide, meaning that a pesticide may be approved in spite of certain costs if those costs are outweighed by other benefits (Pollinator Stewardship Council v. U.S. Environmental Protection Agency, 2015). Once a pesticide is registered under FIFRA, applicators are required to apply in strict accordance with the EPA-approved label (State Plant Board v. Bullock, 2001).

While states and local governments are preempted under FIFRA from enacting regulations concerning labeling and packaging, the Supreme Court in *Bates v. Dow Agrosciences LLC* (2005) confirmed the “State’s broad authority to regulate the sale and use of pesticides.” Prior to *Bates*, most state and local pesticide regulation was conservatively written as courts had historically struck down more expansive regulations from states and local governments. Courts justified these decisions on the grounds that such regulations ‘induced’ pesticide manufacturers to modify their labels and packaging. Those state and local regulations were thus preempted under FIFRA’s preemption clauses concerning labeling and packaging. In *Bates*, the Supreme Court ruled against the inducement test in use by lower courts, citing that “the inducement test is not supported by either text or the structure of the statute” (*Bates v. Dow Agrosciences LLC*, 2005). The Supreme Court’s ruling in *Bates* set forth a narrower definition of the preemption clause in FIFRA and opened the door for unprecedented state and local pesticide regulation. After the 2017 growing season in which dicamba drift became a widespread issue, many state agricultural agencies utilized their expanded regulatory capabilities with cutoff dates for dicamba applications among other actions (Dicamba Task Force, 2017; Bureau of Pesticide Control, n.d.;

Sommerfeld, 2018). State and local pesticide regulations such as these cutoff dates serve as the second half of the duty of care for pesticide applicators to follow.

States essentially default to a negligence system when they do not interpret trespass law as being applicable to drift and their right-to-farm act prohibits drift-related nuisance suits (Centner, 2014). This distinction means that states not classified as using a trespass or nuisance system require plaintiffs to prove that the applicator violated a regulation and subsequently caused the pesticide to drift. In cases where the applicator did violate the pesticide label, plaintiffs receive monetary damages equivalent to their losses (*Sullivan v. Voyles*, 1971). In cases where the applicator followed all regulations, negligence offers no means of recovery for farmers who have taken drift-related losses (*Mangrum v. Pigue*, 2004). With dicamba, the EPA followed up on the widespread drift issues with an amended registration that updated “labeling restrictions to further minimize the potential for off-site movement” (Goodis, 2018). The updated label implies that at least some of these 2017 drift incidents occurred even though the original applications were within regulation.

It also should be noted that even in states with a trespass or nuisance system negligence can still be applied in cases where the applicator failed to abide by all necessary regulations (*Herrin v. Opatut*, 1981). In these instances, plaintiffs can file both negligence and trespass/nuisance claims (O.C.G.A. § 41-1-7). While the plaintiff likely would not receive more than the amount of their damages, the defendant might be subject to additional fines levied by their state’s agricultural agency and other punishments related to their pesticide licensing (*State Plant Board v. Bullock*, 2001; O.C.G.A. § 2-7-102; *Babb v. Lee Cnty. Landfill S.C., LLC*, 2013).

### 3.2. Trespass

Trespass is defined as an invasion of the interest in the exclusive possession of another person's land, as by entry on it (*Babb v. Lee Cnty. Landfill S.C., LLC*, 2013). Trespass is not limited to a person physically stepping onto someone else's land as it can also be applied where a person caused the entry of an object onto another person's property. Historically, courts dealt with trespass in cases with tangible invasions (e.g., person wrongfully entering property, person wrongfully leaving vehicle on property) (*The American Law Institute*, 1965). Courts viewed tangible invasions through the dimensional test, which is the traditional common law rule that requires an invasion of land by a physical, tangible object (*Centner*, 2014).

While the dimensional test met the needs of courts throughout most of history, scientific advances that led to the discovery of microscopic particles led to court arguments that the invasion of particulate matter (e.g., smoke, dust, odors, etc.) onto other properties constituted a trespass (*Borland v. Sanders Lead Co., Inc.*, 1979). These arguments claimed that these 'intangible invasions' posed invasions of a landowner's exclusive possession of their property. Courts in several states accepted this argument but attached the requirement for the plaintiff to suffer substantial damages from the intangible invasion (*Bradley v. Am. Smelting & Ref. Co.*, 1985). Without the requirement for substantial damages, courts recognized the potential for trivial lawsuits as "every property in the State would have a cause of action against any neighboring industry which emitted particulate matter into the atmosphere, or even a passing motorist, whose exhaust emissions come to rest upon another's property" (*Borland v. Sanders Lead Co., Inc.*, 1979).

Other states rejected the application of trespass theory to intangible invasions. Courts in these states condemned the use of a substantial damages requirement in trespass cases. In *Adams*

*v. Cleveland-Cliffs Iron Co.* (1999), the Court of Appeals of Michigan stated that “the law should not require a property owner to justify exercising the right to exclude.” Likewise, the Supreme Court of Minnesota in *Johnson v. Paynesville Farmers Union Coop. Oil Co.* (2012) stated that the inclusion of intangible invasions under trespass theory “conflicts with our precedent defining the elements of trespass.” In the same case, the Supreme Court of Minnesota would go on to note that if an intangible invasion causes substantial damages as required in other states for trespass, then “the emission will also likely be an unreasonable interference with plaintiff’s use and enjoyment of his land, and therefore constitute a nuisance” (*Johnson v. Paynesville Farmers Union Coop. Oil Co.*, 2012).

For trespass, the measure of monetary damages is calculated as the value of the use of the property (*Borland v. Sanders Lead Co., Inc.*, 1979). In cases of pesticide drift, courts would likely use the value of expected future profits from the damaged crops (*Bader Farms, Inc. v. Monsanto Co.*, 2019). Furthermore, trespass theory places a sacred value on private property rights and injunctions are far more likely to be issued with trespass than with nuisance, even in circumstances involving a compliant applicator. In *Bradley v. American Smelting and Refining Co.* (1985), the Washington Supreme Court discussed the differences between nuisance and trespass and stated in part that “the principal difference in theories is that the tort of trespass is complete upon a tangible invasion of plaintiff’s property...the protection of the integrity of his possessory interests might justify the injunction.” Other courts that adopted the use of trespass theory in cases of pesticide drift have also displayed a willingness to enjoin applicators. In *Macalpine v. Hopper* (2012), a Colorado district court issued an injunction against a pesticide applicator who had been accused of performing applications resulting in drift. Here, the applicator had been given a brief explanation on how to apply the pesticides by local government

officials but there were gaps in their instruction to the applicator. Using what little instruction he was given, the applicator did perform non-compliant applications in the beginning but he later received the proper training and henceforth only applied the pesticide in a compliant fashion. Still, the court issued an injunction against the applicator, noting that “the public has a strong interest in protecting and preserving property rights from invasions by others” (Macalpine v. Hopper, 2012).

### **3.3. Nuisance**

With respect to the courts that refused to allow intangible invasions under trespass theory, the common justification was that doing so “blurs the line between trespass and nuisance” (Johnson v. Paynesville Farmers Union Coop. Oil Co., 2012). An individual can be held liable for a nuisance if his/her actions cause the invasion of another’s interest in the private use and enjoyment of their land (The American Law Institute, 1965). For this invasion to be actionable in court, the invasion must be either intentional and unreasonable or unintentional but due to negligent conduct or ultrahazardous activity. The Restatement (Second) of Torts also calls on courts to consider the utility of the offending activity versus the gravity of the harm that it is causing. Therefore, nuisance suits can be successful in court even if they pursue otherwise lawful activities. Dicamba applications that adhered to the label and other regulations but still drifted are thus the textbook example of a nuisance (Klass, 2005).

In one of the few drift cases that pursued nuisance without being defeated at summary judgment, the Supreme Court of Nebraska in *Hall v. Phillips* (1989) heard arguments concerning atrazine drift from a corn field to a bean field. The applicator was found to be free from negligence during the pesticide application and asserted that the drift resulting from severe winds

resulted as an Act of God. The Supreme Court of Nebraska overturned a lower court ruling that granted the applicator summary judgment on the grounds that the drift did not qualify as a nuisance. Regarding the lack of negligence during the application, the Supreme Court of Nebraska stated that “an invasion or interference which is substantial may result in equitable liability for a private nuisance and consequent damages, regardless of the reasonableness of the interference” (Hall v. Phillips, 1989). While Nebraska’s right-to-farm act was never addressed in *Hall*, it is worth noting that their act only protects farming practices that would not have been considered a nuisance when the farm commenced operations (Neb. Rev. Stat. §§ 2-4401 – 2-4404). Such language is relatively rare in other states’ right-to-farm acts (Miss. Code. Ann. § 95-3-29; O.C.G.A. § 41-1-7; S.C. Code Ann. §§ 46-45-10 – 46-45-80).

The payment of monetary damages is common in nuisance cases (Fifth Ave. Presbyterian Church v. City of N.Y., 2002). While injunctions are also permitted in nuisance cases, nuisance law’s standard of reasonableness should support applicators especially when they satisfied their duty of care in all applications (The American Law Institute, 1965). The Supreme Court of Minnesota reinforced this principle in *Johnson v. Paynesville Farmers Union Coop. Oil Co.* (2012) where they stated in part that “the defendant’s liability for nuisance is determined by balancing the social utility of the defendant’s actions with the harm to the plaintiff.” With modern agriculture being so pesticide-dependent, it would be incredibly difficult for a plaintiff to convince a judge that the reasonable solution to otherwise lawful pesticide applications that drift is to completely enjoin the applicator from further use of the pesticide. Instead, monetary damages would almost always be the end result in pesticide drift suits involving a compliant applicator which would allow the applicator to take on the true cost of their applications without completely shutting down their farm (Hall v. Phillips, 1989). In the case of a non-compliant

applicator, courts can no longer be assumed to exclude injunctions as a remedy (Macalpine v. Hopper, 2012).

The lack of other case law concerning nuisance's application in pesticide drift is no coincidence as right-to-farm acts prevent nuisance suits against farms (Centner, 2006). Though each state's right-to-farm act is different, they all share the overriding concept that a property owner's agricultural activities should not be considered a nuisance as locality changes. For historical context, legislatures adopted these laws in response to numerous nuisance suits that were filed against farms in the late 20<sup>th</sup> century. These farms, which had long been in operation in historically rural areas, now were being enveloped by urban sprawl. Their new neighbors, not used to the sights and smells of swine operations and chicken houses, filed nuisance suits to shut down these farms. To prevent these suits, legislatures passed right-to-farm acts. Oftentimes, states would write that the express purpose of their right-to-farm act was to protect the state's agricultural industry (O.C.G.A. § 41-1-7).

#### *Different Approaches to Right-to-Farm Acts*

Generally, each state's right-to-farm takes either a "coming to the nuisance" approach or a statute of limitations approach (Centner, 2006). Right-to-farm acts within each category can be further divided based on other distinctions, but these two approaches distinguish the type of protections that farms receive under the law. The coming to the nuisance approach is more common and it protects farmers from nuisance claims that arise from changes in the surrounding locality that occur after the farm's commencement date. The statute of limitations approach simply bars a nuisance action against a farm after a certain period of time has passed since the

farm's commencement date, regardless of any changes in the surrounding locality or lack thereof.

The differences in these two approaches are best analyzed by comparing right-to-farm acts in two different states. The Georgia Right to Farm Law protects agricultural facilities, agricultural operations, and agricultural support facilities from nuisance claims that arise “as a result of changed conditions in or around the locality of such facility or operation if the facility or operation has been in operation for one year or more” (O.C.G.A. § 41-1-7). This language indicates that Georgia's right-to-farm act uses the coming to the nuisance approach. Notably, Georgia's law allow expansions in operations and the adoption of new technology to occur on a farm without resetting the commencement date. In *Herrin v. Opatut* (1981), the Supreme Court of Georgia concluded that the Georgia Right to Farm Law does not allow farmers to change the type of production (e.g., from crop farming to livestock) and retain the original start date. In *Herrin*, the defendant-farmer was found liable for the nuisance caused during his newly purchased farm's transition from pastureland to a large chicken egg farm. The Supreme Court of Georgia ruled that the farmer could not use the Georgia Right to Farm Law in his defense as this was “not a case where the plaintiffs' nonagricultural uses of their land have encroached upon defendants' existing egg farm” (Herrin v. Opatut, 1981). The Supreme Court of Georgia went even further to note that “it is not significant that the egg farm remained in operation for one year prior to the institution of this lawsuit” (Herrin v. Opatut, 1981).

The previous quote is important when predicting the case's outcome under a right-to-farm act that incorporates the statute of limitations approach. This approach is best illustrated in Mississippi's right-to-farm act which states that “proof that the agricultural operation, including forestry activity, has existed for one year or more is an absolute defense to the nuisance action, if

the operation is in compliance with all applicable state and federal permits” (Miss. Code. Ann. § 95-3-29). If *Herrin* had occurred in Mississippi instead of Georgia, the nuisance suit would have failed due to the suit being filed over a year after the farm’s commencement date which exceeds the statute of limitations of such actions.

Clearly, the commencement date for a farm under its state’s right-to-farm act can play a significant role in nuisance cases regardless of the law’s approach. States definitions for a farm’s (or an agricultural operation, agricultural facility, etc.) commencement date vary based on whether or not they are reset by three factors: expansions in the size of the farm, changes in technology used by the farm, and changes in production type (Centner, 2006). Unless a state authorizes a farm to undertake these changes in their right-to-farm law, the farm’s commencement date will restart once the change begins. Under a new commencement date, a farmer carries his/her operations out without the protections offered in a right-to-farm law until they once again satisfy the statute of limitations established within the law. In *Herrin*, the defendant’s egg farm was ruled as a nuisance because its transition from pastureland to an egg farm represented a change in production type (*Herrin v. Opatut*, 1981). Since changes in production type are not permitted in the Georgia Right to Farm Law, the egg farm established a new commencement date and the surrounding locality’s displeasure with the nuisance of the egg farm were considered during this time (O.C.G.A. § 41-1-7).

The Georgia Right to Farm Law does allow for changes in technology to occur on a farm without the farm undergoing a reset in commencement date (O.C.G.A. § 41-1-7). This provision means that Georgia crop farmers could switch from glyphosate-resistant crops to dicamba-resistant crops without issue, which is the same action that many farmers across the country took as glyphosate-resistant weeds became a problem (Dodson et al., 2019). When this switch to a

new technology occurs and the new technology is as problematic as dicamba, farmers in states with right-to-farm acts like Georgia's are at a heightened disadvantage when it comes to filing nuisance suits against pesticide applicators.

Right-to-farm laws cannot be mentioned without also addressing the 5<sup>th</sup> Amendment issues of their more expansive versions in certain states. In *Moon v. North Idaho Farmers Ass'n* (2002), House Bill 391 was alleged as an unconstitutional taking. House Bill 391 supplemented the state's right-to-farm act in order to allow farmers to burn their post-harvest fields. While the case eventually failed, Idaho became one of the six states to face constitutional challenges to their right-to-farm act (*Honomichl v. Valley View Swine, LLC*, 2018). In *Honomichl v. Valley View Swine* (2018), Iowa became the only state to hold that their right-to-farm act could be deemed unconstitutional under any circumstances. In *Honomichl*, the Supreme Court of Iowa established a three-part test to demonstrate the requirements plaintiffs must satisfy to obtain a favorable ruling. The three parts involved demonstrating that Iowa's right-to-farm law 1) did not provide them with a benefit that their neighbors received, 2) caused them to sustain a significant hardship, and 3) their residency's existence prior to the neighboring operation along with considerable investment in their property prior to said operation. This test has only been passed by a few Iowa citizens and it certainly does not pose a favorable solution to farmers who have experienced reductions in crop yield due to pesticide drift.

Other states have declined to use either the coming to the nuisance approach or the statute of limitations approach and instead opted for methods of judicial redress that consider a defendant-farmer's agricultural management practices on a case-by-case basis (Centner, 2006). Washington's right-to-farm act states that agricultural operations "if consistent with good agricultural and forestry practices...are presumed to be reasonable and shall not be found to

constitute a nuisance unless the activity or practice has a substantial adverse effect on public health and safety” (Wash. Rev. Code §§ 7.48.300 – 7.48.320). In *Gill v. LDI* (1998), the US District Court for the Western District of Washington stated that “in any case, LDI cannot benefit from the statute because it has not engaged in ‘good forestry practices’ as demonstrated by the fact it violated several water quality laws.” With court interpretations like *Gill*, right-to-farm acts that consider agricultural management practices on a case-by-case basis essentially revert to a negligence standard for cases of pesticide drift. Without failures in following the label and all relevant regulations, it would be hard for a pesticide applicator to be considered a nuisance under such a right-to-farm act.

#### **4. Tort Models**

In pesticide drift, economic modeling can become easily complicated by various agricultural and legal factors that ultimately doom the model’s effectiveness. Per economic custom, certain assumptions have to be made. While some assumptions are discussed alongside the tort models, there are five assumptions with lengthier descriptions that need to be addressed prior to laying out the models. The first key assumption will involve the legal language used in the injunction for the trespass and nuisance models. Injunctions are written at the discretion of the court (*Macalpine v. Hopper*, 2012). An injunction could be as lenient as only prohibiting further drifting pesticides from the applicator or could be as stringent as prohibiting the future use of any pesticide on the applicator’s farm. There is insufficient case law to form the language necessary for a consistent injunction (*Johnson v. Paynesville Farmers Union Coop. Oil Co.*, 2012). Instead, the model will rely on agriscientific data that grants pesticide drift the possibility of off-site movement that exceeds a mile from the targeted crop under certain

conditions (Zollinger, 2017). Based on this possibility, the economic models for trespass and nuisance incorporate an injunction that prohibits further applications of the specific pesticide that drifted from the applicator's farm. Here, the injunction still allows for the applicator to use other pesticides in the future, as a judge would likely understand that an injunction against all pesticide use would reduce the value of the applicator's cropland to nearly zero.

Furthermore, the nuisance and trespass models are incorporating only permanent injunctions. Permanent injunctions are issued at the conclusion of a trial and forever governs the future actions of the enjoined party (here, the enjoined applicator) (Macalpine v. Hopper, 2012). The other type of injunction, called a preliminary or temporary injunction, is excluded from the scope of the models. Unlike permanent injunctions, preliminary injunctions are issued at the beginning of a trial and govern the actions of the enjoined party throughout the duration of trial, at which point the injunction loses effect unless a permanent injunction is further ordered. Though preliminary injunctions have been issued in drift cases, they are excluded from the models because of the minimal short-term effect to the applicator from the aforementioned assumed language of the injunction. As discussed in the introduction, farmers switched from glyphosate to dicamba due to the emergence of glyphosate-resistant weeds, but many of the farmers who made the transition did not apply dicamba on their dicamba-tolerant crops (Dodson et al., 2019). Setting aside the debate on why these farmers chose to switch to dicamba-tolerant crops, it should be mentioned that these farmers were likely still applying glyphosate, because dicamba-tolerant crops are also usually glyphosate-tolerant as well (Monsanto, n.d.). The models exclude preliminary injunctions in spite of their use in drift cases because most applicators could easily afford to simply revert to another herbicide for the one to two seasons that the trial lasts. Therefore, a preliminary injunction is a relatively ineffective remedy in terms

of its effect on an applicator's decision-making and its value within the models would be minimal.

Given the assumed legal language for the permanent injunction, it is important to note that the 'value' of the permanent injunction for its function within the model primarily varies with respect to its utility to the neighboring farmer. The neighboring farmer is responsible for assigning a certain value to the potential permanent injunction because its utility to them will ultimately play a role in the decision of whether or not to sue the applicator within the nuisance or trespass models. The applicator would almost always place a high value on the permanent injunction, but the neighboring farmer will vary in their valuation of the injunction depending on the nature of their farming operation. The owner of a peach tree orchard, for example, would likely place a high value on the ability to enjoin a bordering applicator from applications of a pesticide that had already drifted at least once onto his peach trees. Here, the peach tree farmer would have suffered losses to expected yield not only in the current season, but also in future seasons as a result of damage to trees that could take many seasons to fully repair (*Bader Farms, Inc. v. Monsanto Co.*, 2019). Conversely, an example could be established of a soybean farmer who neighbored other soybean farmers that applied dicamba. If this farmer suffered damage from dicamba drift but had been planning to shift to dicamba-tolerant soybeans in the following season, this farmer would have very little use for an injunction and would therefore place a relatively low value on it.

The second assumption made when establishing the models is that no settlements occur during the pre-trial process or the trial itself. Much like the prior assumption that excluded preliminary injunctions, the assumption that no settlements occur runs counter to how most drift incidents will develop (i.e., both parties in reality would prefer to settle before the trial's

conclusion to minimize legal costs). However, the assumption that no settlements occur is vital to the overall effectiveness of the model and the ability for policymakers to draw valuable data from it. By allowing a hypothetical drift incident to develop into a full trial, each model can be effectively compared with respect to their effects on farmer-decision-making. Given the ability to compare models, policymakers can make their own conclusions about the usefulness of negligence, trespass, and nuisance. As it stands now, many states have yet to take steps to identify which tort is applicable in cases of drift (*Satterfield v. JM Huber Corp.*, 1994). Trials in these states often progress further than trials in other states where attorneys know which tort will be used, since these attorneys can more easily predict the outcome of the dispute and more easily reach a settlement agreement. By assuming that no settlements occur, policymakers can make conclusions about which tort they perceive to be optimal and bring about legislative/judicial changes that clearly identifies this tort to attorneys and farmers. Ultimately, the assumption that no settlements occur is made in the hopes of these changes being made so as to encourage the highest amount of settlements possible.

The third assumption used in the formation of the models is that the plaintiff and defendant will incur equivalent legal expenses during the course of the trial. Unlike certain aspects of the prior two assumptions, this assumption generally holds in trial settings where the plaintiff succeeds (as will be noted in the fifth assumption, plaintiff success is guaranteed throughout all model scenarios). Given plaintiff success, the plaintiff's attorney, who traditionally operates on a contingency basis, will charge the plaintiff a percentage fee based on the amount of monetary damages. Plaintiffs' attorneys often charge 30-40% of their client's award, in addition to any costs incurred during the trial such as crop experts being used as witnesses (Centner, 2016). Though plaintiff success is guaranteed in the models, the fee

structure of plaintiffs' attorneys mean that most plaintiffs' attorneys will not accept a case unless a certain amount of damages can reasonably be expected to be won. In reality, some drift cases will simply never go to trial because the damage level is not high enough to warrant the interest of a plaintiffs' attorney, and most plaintiffs' attorneys will not be interested in cases as complicated as pesticide drift unless at least \$100,000 of damages occurred. Defense attorneys, on the other hand, will usually charge their clients on an hourly basis with their payment being made irrespective of trial outcomes, in addition to any costs incurred during the trial. Despite the difference in fee structures, the assumption that the plaintiff and defendant will spend equal amounts on legal expenses generally holds, and we can assume that both parties will spend equal amounts on crop experts, data analysis, etc. in an effort to prevail in trial.

The fourth assumption addresses the exclusion of punitive damages from all three models. Punitive damages exist within tort liability in order for the court to punish the defendant for any wanton and willful misconduct (Punitive damages, n.d.). In cases of pesticide drift, wanton and willful misconduct would, at the bare minimum, require noncompliance from the applicator. Of all the relevant cases cited in this paper, very few of the plaintiffs sought punitive damages (*Babb v. Lee Cnty. Landfill S.C., LLC*, 2013; *Johnson v. Paynesville Farmers Union Coop. Oil Co.*, 2012; *Martin v. Reynolds Metal Co.*, 1959). Of these few cases, plaintiffs' requests for awards of punitive damages were repeatedly denied at the trial court level. Despite their relative ineffectiveness in case law, punitive damages are still a possibility if a defendant-applicator is non-compliant to such a degree that it warrants consideration for the dubious label of wanton and willful misconduct. However, the infrequency with which punitive damages are even requested in pesticide drift cases indicates that their inclusion within these general models would be improper.

The fifth and final assumption made within the model is perfect information with respect to the neighboring farmer being able to accurately identify drift damage, the suspected responsible applicator, as well as the compliance decision of said applicator. A lawsuit will ultimately require significant costs to prove each of these aspects, but most farmers have the expertise needed to usually be correct in their predictions on each of these questions. After recent issues with dicamba, agricultural extension agents from various universities have been providing numerous educational resources that help farmers identify crop damage that is caused specifically by dicamba (Division of Plant Sciences, 2020). These resources greatly reduce the possibility that a farmer misidentifies damage from pests, drought, etc. as being from drift. Additionally, farmers will know the crops grown by their neighbors. Given the small number of herbicide-tolerant (HT) crop varieties combined with the fact that these HT varieties rely on an even smaller number of herbicides, farmers will also know the herbicides used by their neighbors (Dodson et al, 2019). By combining this knowledge with recorded wind conditions from the prior seven days, most farmers should be able to identify the specific applicator liable for the drift damage with relative ease. Finally, states with the most drift damage have been imposing the most stringent dicamba restrictions, to include cutoff dates for applications, additional weather restrictions, etc. (Bureau of Pesticide Control, n.d.). Farmers in these states who experience drift damage should be able to make a reasonable prediction of the applicator's compliance decision based on these additional regulations. For example, a farmer who experiences drift damage in July in a state that prohibits applications of the suspected drifting herbicide after April can realistically assert that the drift resulted from a non-compliant application. Based on this series of successive assumptions, the economic model can plausibly assume perfect information regarding the neighboring farmer's understanding of the drift. A

final consequence of this assumption is that trial success is guaranteed for the plaintiff. Due to this result, the intended takeaway from the model concerns the plaintiff's profitability from a potential lawsuit and not their likelihood of success.

Given the details of those five assumptions, it is now appropriate to discuss the models of each tort. To formally compare and contrast the effect of different legal structures on the (a) incentive to comply with label requirements, (b) economic outcomes for pesticide applicators and potential harmed parties, and (c) the prevalence of lawsuits when damages occur, we develop a simple game theoretic model. We consider a setting with two players, the applicator (i.e., defendant in the event of a lawsuit) and the neighboring farm (i.e., plaintiff in the event of a lawsuit). In this game, the applicator moves first and decides whether to *Comply* or *Not Comply* with the pesticide's label. Applicator profit under compliance is  $\Delta^C$  and non-compliance is  $\Delta^{NC}$ , where  $\Delta^{NC} \geq \Delta^C$ . Applicator profit under non-compliance is higher because the applicator is no longer constrained to the application cutoff dates, weather restrictions, buffer zone rules, among other rules imposed by the label (Bureau of Pesticide Control, n.d.). Without these constraints, the non-compliant applicator can spray more pesticide over larger quantities of cropland.

Conditional on the compliance decision, nature determines if and to what degree damages occur to the neighboring farm. We consider a setting where three potential damage levels may occur on the neighboring farm: high damages  $\bar{D}$ , low damages  $\underline{D}$ , or no damages where  $\bar{D} > \underline{D} > 0$ . Letting  $\Pi$  denote the neighboring farm profit in when no damages occur, this implies in the absence of legal remedies the neighboring farm profit would be  $\Pi - \bar{D}$ ,  $\Pi - \underline{D}$ , or  $\Pi$  depending upon the degree of damage. The probability of these three damages levels occurring are, respectively,  $\bar{P}^C$ ,  $\underline{P}^C$ , and  $1 - \bar{P}^C - \underline{P}^C$  if the applicator complies and  $\bar{P}^{NC}$ ,  $\underline{P}^{NC}$ , and  $1 - \bar{P}^{NC} - \underline{P}^{NC}$  if the applicator does not comply. The probability of damages is assumed to be

greater under non-compliance,  $\bar{P}^{NC} > \bar{P}^C$  and  $\underline{P}^{NC} > \underline{P}^C$ , hence the probability of no damages is greatest under compliance. Once nature determines what level of damages occurs conditional on the compliance decision by the applicator, the neighboring farm decides whether to bring a lawsuit. We assume if a lawsuit is filed, both the plaintiff and defendant bear legal expenses denoted by  $L$ . To distinguish between levels of damages sufficient for a plaintiff and legal team to be willing to bring a lawsuit, without loss of generality we assume  $\bar{D} > L > \underline{D}$ . This implies, in the absence of other benefits from filing a lawsuit, a plaintiff may be willing to file a lawsuit in the event of high damages but not if low damages occur. As would be expected, the neighboring farmer optimally would not file a frivolous lawsuit in the event of zero damages. We denote potential fines and penalties levied by the EPA and state agencies on the plaintiff as  $F$ . Notably, these fines, if issued, are the result of a state agency-led investigation that is conducted independently of any trial proceedings and the money collected from it goes to the state agency alone (i.e., none to the harmed neighboring farmer). Per notification statutes in many states, the model assumes that the state is notified by the neighboring farmer as required to pursue their losses in court, except in instances where no damages occur since the neighboring farmer would not have any crop damage to present to the state. Finally, in the event the court grants an injunction against the applicator, we denote the value of an injunction against all future applications of the drifting pesticide on the applicator's farm as  $E$ .<sup>2</sup> Profits for both parties that are presented in bold denote the neighboring farmer's optimal strategy given an observed level of damages. Absence of bold for a terminal node denotes an outcome without a dominant strategy

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<sup>2</sup> For simplicity we assume the legal expenses  $L$  and the value or cost of an injunction  $E$  are the same for both the plaintiff and defendant and are independent of the level of damages. This assumption generally holds for the legal expenses, but the value of the injunction will often be different for the plaintiff and the defendant, as noted in the first assumption.

on the part of the neighboring farm without further assumptions, which will be discussed later in detail.

#### 4.1. Negligence Model

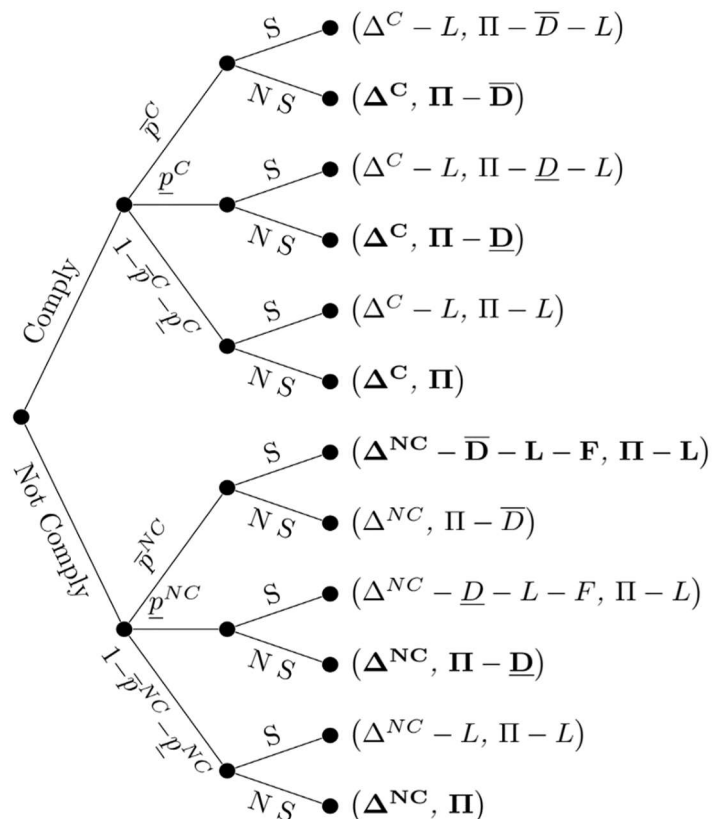


Figure 1. Negligence

Given this game theoretic structure, Figure 1 presents a compliance-lawsuit game under a negligence system. As with all the models, it is assumed that the neighboring farmer knows whether the applicator was compliant or non-compliant.<sup>3</sup> Under negligence, the lawsuit is only successful if the applicator was not compliant. Further, given the absence of potential

<sup>3</sup> Simply observing high damages to crops is not sufficient for the neighboring farm to determine whether the applicator was compliant or not. Though a trial would necessitate scientific support for non-compliance, most farmers should be able to determine if a neighbor's application was compliant even without witnessing it if they know the law, as noted in the third assumption of the models. Although more complicated, the presented game could be recast as an imperfect information game where the neighboring farm either has a noisy signal of the probability of compliance or plays a mixed strategy in the event of high damages.

injunctions against further activity, lawsuits will only be filed when high damages,  $\bar{D}$ , occur. Given that the plaintiff will only file a lawsuit if high damages occurs and (in this perfect information setting) the applicator was non-compliant, the expected profit for the applicator under compliance is  $\Delta^C$ . Therefore, expected profit if the applicator does not comply is  $\Delta^{NC} - \bar{P}^{NC}(\bar{D} + L + F)$ . The applicator will weigh expected profit by complying or not complying with pesticide label requirements and hence will not comply if:

$$\Delta^{NC} - \Delta^C > \bar{P}^{NC}(\bar{D} + L + F)$$

### 4.2. Trespass Model

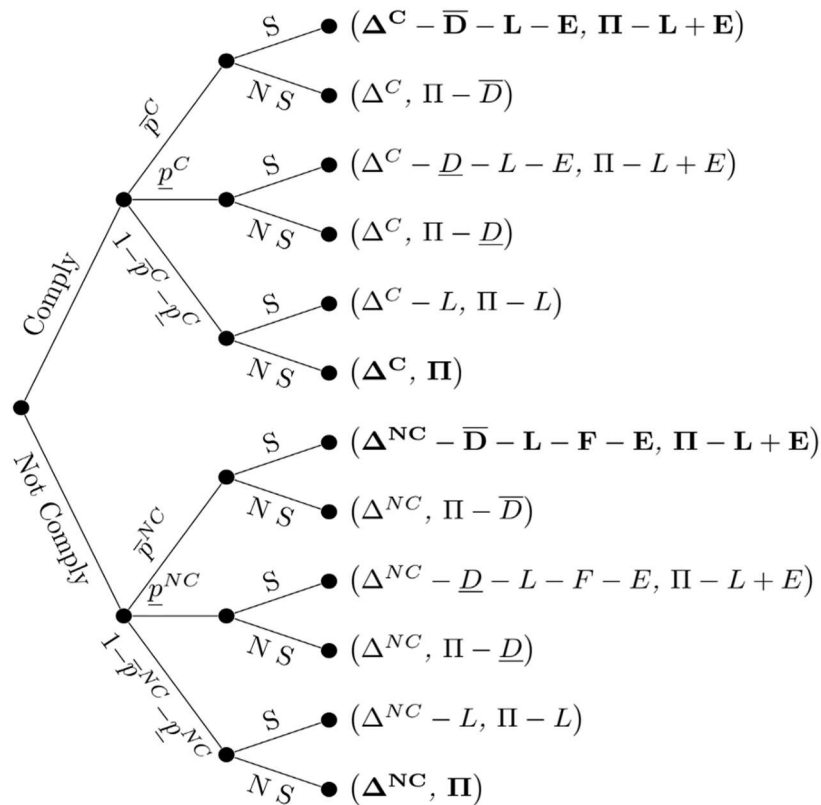


Figure 2. Trespass

Trespass is distinguished from both negligence and nuisance by the fact it produces the same outcomes for both the neighboring farmer and applicator regardless of compliance, except

for the inclusion of EPA and state-levied fines,  $F$ , in the payoff for the non-compliant applicator. As can be seen in Figure 2, regardless of whether the applicator is compliant or not, the neighboring farm will sue if high damages,  $\bar{D}$ , occur. Given that under trespass the neighboring farm can recover damages, regardless of compliance, when low damages,  $\underline{D}$ , occur, the decision whether to sue in this setting depends upon whether  $E + \underline{D} > L$  or not. If  $E + \underline{D} > L$ , then the neighboring farm will bring a lawsuit when low damages occurs, else it would be suboptimal to sue. This is similar to the condition used in the non-compliance setting that will be seen in the nuisance model, but distinctly under trespass this applies to both the compliance and non-compliance setting.

From the perspective of the applicator, we can summarize the expected profit from compliance and non-compliance, conditional on the relative value of the injunction as:  $\Delta^C - \bar{P}^C(\bar{D} + L + E)$  and  $\Delta^{NC} - \bar{P}^{NC}(\bar{D} + L + F + E)$  when  $E + \underline{D} < L$ . When the value of the injunction is sufficiently large to trigger lawsuits under low damages,  $E + \underline{D} > L$ , applicator compliance and non-compliance expected profits are  $\Delta^C - (\bar{P}^C + \underline{P}^C)(L + E) - \bar{P}^C\bar{D} - \underline{P}^C\underline{D}$  and  $\Delta^{NC} - (\bar{P}^{NC} + \underline{P}^{NC})(L + F + E) - \bar{P}^{NC}\bar{D} - \underline{P}^{NC}\underline{D}$ . Hence, we can express the conditions under which the applicator will not comply as:

$$\begin{aligned} \Delta^{NC} - \Delta^C > (\bar{P}^{NC} - \bar{P}^C)(\bar{D} + L + E) + (\underline{P}^{NC} - \underline{P}^C)(\underline{D} + L + E) + \bar{P}^{NC}(F) + \underline{P}^{NC}(F) & \text{ if } E + \underline{D} > L \\ \Delta^{NC} - \Delta^C > (\bar{P}^{NC} - \bar{P}^C)(\bar{D} + L + E) + \bar{P}^{NC}(F) & \text{ if } E + \underline{D} < L. \end{aligned}$$

### 4.3. Nuisance Model

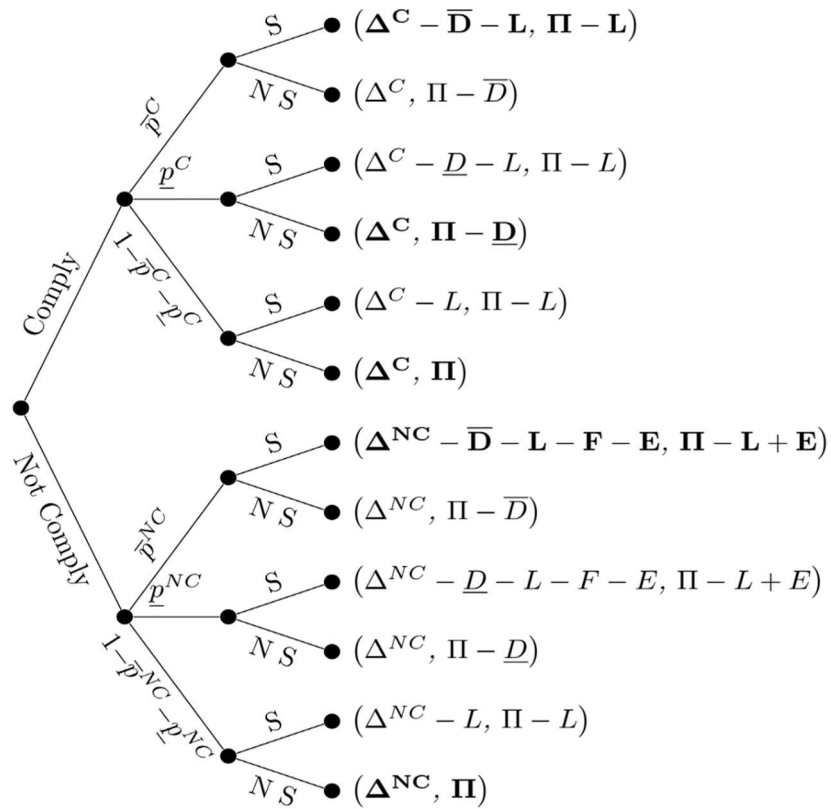


Figure 3. Nuisance

Given this game theoretic structure, Figure 3 presents the applicator-neighboring farm game in extensive form for the case of nuisance. Under nuisance, the neighboring farm will file a lawsuit whenever high damages  $\bar{D}$  occur, regardless of applicator compliance. The decision to file a lawsuit when low damages,  $\underline{D}$ , occurs hinges on two factors: whether the applicator was compliant and the relative value of the injunction to the neighboring farmer. Assuming the potential plaintiff is able to distinguish whether the applicator was compliant or not, optimally he will not file a lawsuit against a compliant applicator who caused low damages. If the applicator was not compliant, the neighboring farm will sue if the value of the recouped damages and the potential injunction outweighs the cost of bringing the lawsuit. Specifically, a lawsuit will be filed if  $E + \underline{D} > L$ , and not otherwise. Given that the plaintiff will always file a lawsuit if high

damages occurs, the expected profit for the applicator under compliance is  $\Delta^C - \bar{P}^C(\bar{D} + L)$ , profit under compliance less the loss in the event of high damages. Under non-compliance, a lawsuit will be also be filed if high damages occur and potentially under low damages conditional on the value of the potential injunction. Hence, expected profit for a non-compliant applicator is  $\Delta^{NC} - (\bar{P}^{NC} + \underline{P}^{NC})(L + F + E) - \bar{P}^{NC}\bar{D} - \underline{P}^{NC}\underline{D}$  if  $E + \underline{D} > L$  and  $\Delta^{NC} - \bar{P}^{NC}(\bar{D} + L + F + E)$  if  $E + \underline{D} < L$ . The applicator will weigh expected profit by complying or not complying with pesticide label requirements and hence will not comply if:

$$\begin{aligned} \Delta^{NC} - \Delta^C &> \bar{P}^{NC}(\bar{D} + L + F + E) - \bar{P}^C(\bar{D} + L) && \text{if } E + \underline{D} < L \\ \Delta^{NC} - \Delta^C &> (\bar{P}^{NC} + \underline{P}^{NC})(L + F + E) + \bar{P}^{NC}\bar{D} + \underline{P}^{NC}\underline{D} - \bar{P}^C(\bar{D} + L) && \text{if } E + \underline{D} > L \end{aligned}$$

That is, the applicator will not comply if the incremental gain in profit from not complying,  $\Delta^{NC} - \Delta^C$ , outweighs the expected loss if high damages occurs. As can be seen, when the value of the injunction is sufficiently low such that the neighboring farm will not bring a lawsuit in the event of low damages ( $E + \underline{D} < L$ ), the applicator has greater incentive to be non-compliant because they do not face the risk of a legal challenge unless high damages occur.

#### 4.4. Implications of Models

Comparing all three legal structures – negligence, nuisance, and trespass – reveals multiple implications for the incentive of applicators to comply with regulations, prevalence of lawsuits, and profit of neighboring farmers and applicators. Under negligence, lawsuits will only be filed when the applicator is not compliant and high damages occur. Of the three systems, negligence offers the highest incentive to comply and the lowest expectancy for lawsuits. As a result, negligence offers the lowest expected profit for neighboring farmers and the highest expected profit for applicators, relative to all other models.

Trespass, on the other hand, offers a much different outcome for neighboring farmers and applicators. Under a trespass system, lawsuits are filed when  $E + D > L$ , regardless of the level of damages (assuming it is greater than zero) and applicator compliance. The large disregard for compliance under trespass results in the lowest incentive for the applicator to comply and the highest expectancy for lawsuits. Due to their greater ability to recover damages and enjoy surrounding applicators, neighboring farmers under trespass have their highest expected profit of all three models. For the same reasons, applicators have their lowest expected profit under trespass.

Relative to negligence and trespass, nuisance provides a middle ground for the comparisons of expected number of lawsuits, incentive for applicator compliance, and expected profits for both parties. Neighboring farmers under a nuisance system will sue a compliant applicator only when damages are high but will sue a non-compliant applicator when  $E + D > L$ , regardless of the level of damages (assuming it is greater than zero). This decision-making process for the neighboring farmers leads to an incentive for applicator compliance under nuisance that exceeds the incentive under trespass but is less than the incentive under negligence. Consequently, the expected profit for neighboring farmers is higher under nuisance than under negligence but lower than under trespass. The opposite is true for applicators under a nuisance system, who face a lower expected profit than under negligence and a higher expected profit than under trespass.

## **5. Discussion of Results**

As state agencies and the EPA continue to manage the dicamba situation, losses from drift remain a heightened possibility for farmers across the country. The path for legal remedy to

these losses can be confusing, if not impossible, for many farmers to navigate. If state governments seek to improve this system, they will realize that each tort presents different tradeoffs to groups within the farming industry. Depending on which tort is permitted for use as a cause of action in drift cases, the tradeoffs stand to improve certain groups and worsen others. These groups will be called the ‘winners’ and the ‘losers,’ respectively, under the specific tort model. Before a state can make a reasonable change to their jurisprudence system, it needs to have clear priorities on which groups should finish as winners as a result of the change. Therefore, this paper will conclude with the identification of the winners and losers under each tort model. Additionally, the most likely process with which the tort would be implemented as a viable cause of action will also be included in order to avoid potential complications related to policy changes.

### **5.1. Negligence**

A negligence system is established when the neighboring farmer cannot use nuisance or trespass to recover drift losses. A negligence system can thus be reverse engineered simply by precluding the implementation of either a nuisance or trespass system. Specifically, the state must have a strong right-to-farm act that broadly limits nuisance actions against farms. The state court system must also reject the substantial damages requirement for trespass which would allow intangible invasions such as pesticide drift to qualify as an actionable trespass. If those two steps are satisfied, then a state has limited the pool of viable drift-related actions to only those that include non-compliant applicators.

Under a negligence system, farmers who use HT crop systems can easily be identified as winners. Farmers who use HT systems face the lowest probability of being sued for drift

resulting from their herbicide applications. These farmers can only be sued if their applications are found to be non-compliant. Even then, non-compliant applicators under negligence face weakly superior outcomes than they do under trespass and nuisance. Furthermore, HT crop fields face a decreased likelihood of being damaged from drift due to their genetic immunity to at least one if not multiple herbicides (e.g., dicamba-tolerant crops are often also tolerant to glyphosate). The combination of a relatively low probability of being sued and a similarly low probability of suffering drift damage allows farmers of HT crops under a negligence system to have their highest expected profits out of all three models. The tradeoffs offered to HT applicators would cause an increase in the demand for HT crop systems in a negligence system. Therefore, the pesticide companies that produce HT crop systems are also identified as winners under negligence.

With respect to the losers in a negligence system, farmers who do not use the same pesticide as their neighbors face the most challenging path out of all three models to recovering drift losses. This aspect holds true for both farmers of annual, perennial, and Certified Organic crops because the surrounding applicators face the lowest probability of being sued under negligence. Making matters even worse for perennial and Certified Organic farmers, injunctions are not common under negligence systems, even with non-compliant applicators. Therefore, applicators have the lowest incentive to avoid volatile pesticide use. Without significant disincentives to volatile pesticides, an applicator could theoretically apply the same volatile pesticide over consecutive seasons and repeatedly wipe out parts of the neighboring farmer's cropland. If these applications were compliant, the neighboring farmer would not even be able to recover their losses from the drift.

Interestingly, the second group of losers from the use of negligence is comprised of the EPA and state agencies. These regulatory agencies establish the requirements for a compliant application. Applicators obtain legal immunity from negligence lawsuits by performing compliant applications. This aspect of a negligence system emphasizes the need for regulators to make extremely accurate judgments in their rule-making on pesticide applications. Repeated updates to dicamba regulations over multiple seasons support the argument that adherence to these regulations is not sufficient to prevent the occurrence of pesticide drift (Goodis, 2018). There is also notable case law that gives additional examples of compliant applications that nonetheless resulted in drift damage on neighboring farms (Hall v. Phillips, 1989; Mangrum v. Pigue, 2004).

Though *Bates v. Dow Agrisciences LLC* (2005) focused largely on state versus federal pesticide regulations, the Supreme Court emphasized the importance of tort litigation in pesticide regulation several times, noting that “tort suits can serve as a catalyst in this process [of improving pesticide labels].” In *Bates*, the Supreme Court also cited *Ferebee v. Chevron Chemical Co.* (1984) which mentioned the possibility that tort litigation could bring the EPA’s attention to changes that need to be made to pesticide labels in light of new information. Without litigation that involves compliant applications, the EPA might not even learn about drift from such incidents thus further hindering regulators’ ability to write and potentially rewrite adequate regulations.

## **5.2. Trespass**

Trespass can be incorporated as a civil remedy for drift losses through a precedential court ruling that recognizes pesticide drift as a legitimate cause of action under trespass theory

(*Borland v. Sanders Lead Co., Inc.*, 1979). Though courts in many states have thus far declined to set such a precedent, many of these courts have not explicitly ruled it out (*Larkin v. Marceau*, 2008). Oftentimes, these courts that initially rejected a trespass label on intangible invasions assert conditions under which said claims could succeed. Generally, the missing element from plaintiffs in those failed trespass cases is the demonstration of damages that occurred as a result of the intangible invasion. Though states vary on the specific legal category of damage that they desire to satisfy this requirement (e.g., substantial damages to *a res*, physical damage, etc.), crop losses from pesticide drift will generally meet any of these requirements if properly pleaded (Centner, 2014). Therefore, for trespass to become a viable cause of action in drift suits, a state will need at least one farmer suffering losses in yield from drift to adequately plead his losses to a judge who is willing to allow a trespass case under the circumstances. This way, the state will set a new precedent that allows trespass to be used in cases of pesticide drift.

Perennial farmers and USDA Certified Organic farmers are identified as winners under trespass. These two groups of farmers face a distinct risk from pesticide drift in that they stand to lose both present and future crop yield from drift losses. As noted alongside the model for trespass, these two groups of farmers place the highest values on enjoining their neighbors from future pesticide applications. The trespass model is unique from nuisance and negligence in that the neighboring farmer can enjoin an applicator regardless of the applicator's compliance. Given the increased risk they face drift along with the ease in which an injunction can be obtained, perennial farmers and USDA Certified Organic farmers are most satisfied under a trespass system.

Farmers of annual crops have a lower value for the injunction, given that their losses drift are usually only felt for one season. In cases of drift, annual crop farmers are mainly concerned

with the recovery of their losses for that season, which is possible under trespass. Therefore, they are generally just as satisfied with trespass as they are with nuisance and are considered winners under both systems. Extreme cases of drift occurrences throughout multiple seasons may lead these farmers to place a higher value on the injunction though. Therefore, similar to the perennial and Certified Organic farmers, farmers of annual crops are also slightly more satisfied under a trespass system than a nuisance system. Still, it is worth noting that the gap between satisfaction levels with both tort systems is larger for the perennial and Certified Organic farmers.

Farmers that utilize HT crop systems can be viewed as losers under trespass. These farmers can broadly spray herbicides across their fields when their crops (and likely their neighbors' crops) are growing in the field. While this is the main selling point of HT crop systems, the increased number of herbicide applications entails more opportunities for drift to occur. Due to the fact that HT crops cannot be sold with a price premium similar to that of their non-HT counterparts (e.g., Non-GMO, Certified Organic, etc.), farmers of HT crops maintain profitability through high yield rates that are made possible by additional herbicide applications. The increased number of opportunities for drift to occur along with their financial reliance on the additional applications mean that farmers of HT crops in a trespass system face both an increased likelihood of being sued and a more significant harm from the resulting injunction. The dangers posed by farming HT crops in a trespass system would also be felt by the companies who sell HT seeds and their corresponding herbicides, thus making them losers under trespass as well.

Until this point, it has likely become apparent that the winners under negligence were also losers under trespass and vice versa. When it comes to the discussion of how pesticide regulators fare under a trespass model, this trend ceases to continue. Though the EPA and state

agencies will be listed as winners under nuisance, it is difficult to consider these regulatory agencies as winners under trespass because of the unpredictability of the language of the injunction. As noted in the first key assumption of the model, courts write injunctions at their own discretion and there is significant variation in how courts have historically written injunctions (Johnson v. Paynesville Farmers Union Coop. Oil Co., 2012; Macalpine v. Hopper, 2012). The recent issues with dicamba provides a potential scenario in which judges in a trespass system enjoin numerous compliant farmers from the use of dicamba to protect neighboring farmers' property rights. In such a scenario, the judges would be considering the scientific data that suggests dicamba can drift over a mile from the targeted crop (Zollinger, 2017). While negligence poses issues for pesticide regulators because they might not become aware of unfiled drift cases, trespass poses issues for pesticide regulators because they might not get the opportunity to fix issues with the original label rules before enough applicators simply move to a new pesticide. Despite this weakness of trespass for the EPA and state agencies, the issues with dicamba drift did not result in any large abandonment of the use of the herbicide but instead changes in both federal and state dicamba regulations that may be considered responsible for subsequent decreases in drift (Dodson et al., 2019). Therefore, the EPA and state agencies are not labeled as winners or losers under the trespass model.

### **5.3. Nuisance**

As stated in the legal discussion, pesticide drift is a textbook example of a nuisance (Klass, 2005). In most states, nuisance is broadly precluded as a remedy for pesticide drift due to right-to-farm acts (Centner, 2006). Consequently, the means for allowing nuisance in drift cases entails amending right-to-farm acts. Specifically, states would need to amend their right-to-farm

acts to include language such as that in Nebraska's right-to-farm act which allows nuisance suits to continue when the offending farm would have been considered a nuisance when it commenced operations (Neb. Rev. Stat. §§ 2-4401 – 2-4404). This option is fairly lenient to pesticide applicators as it requires the neighboring farmer to have been farming the land for at least as long as the applicator has been farming their land. Still, it does provide a pathway for nuisance to be used as a cause of action in cases of pesticide drift (Hall v. Phillips, 1989). Given that most farmland has been under continuous agricultural operation for decades, this requirement would likely not pose an issue for most potential plaintiffs.

Should a state choose to promote the use of nuisance, two major winners can be identified. As noted in the previous subsection, farmers of annual crops are the first group of winners under nuisance. For this group, nuisance provides a desirable remedy as its frequent use of monetary damages means that they simply recover their financial losses (minus legal expenses,  $\bar{D} - L$ ) from drift, regardless of the applicator's compliance. In the event of applicator non-compliance, these farmers could also factor the value of an injunction in their decision of whether or not to file lawsuit. As mentioned in the previous subsection, farmers of annual crops likely place a low value on the injunction, meaning that nuisance and trespass offer essentially identical outcomes to this group. Still, injunctions are possible under nuisance if the applicator was non-compliant, which could provide some benefit to farmers of annual crops who for whatever reason place a higher value on the injunction.

Farmers of perennial crops (e.g., peach orchard, blueberry vineyard, etc.) are excluded from this first group because their losses from just one incident of drift will continue for seasons after the incident as new trees, vines, etc. take time to become as productive as the previous ones. While the possibility of an injunction against a non-compliant applicator is beneficial for these

farmers, the alleged drift issues with compliant dicamba applications in 2017 and 2018 revealed the shortcomings of limiting injunctions to only non-compliant applications. The sheer magnitude of drift incidents in those years makes nuisance a risky system at best for perennial farmers given their high value of the injunction. For similar reasoning, USDA Certified Organic farmers cannot be accurately labeled as winners under nuisance either. Organic farmers must restart the three year-certification process if drift causes them to exceed the 5% threshold for synthetic pesticide residue (USDA Agricultural Marketing Service National Organic Program, 2018). During the certification process, these farmers are required to follow organic farming procedures but cannot market their products as organic (USDA Agricultural Marketing Service National Organic Program, n.d.). The assumption that a court could grant the future value of these losses is uncertain, and the benefits of nuisance to both perennial farmers and Certified Organic farmers could be an appealing topic for future research (Bader Farms, Inc. v. Monsanto Co., 2019).

The second group of winners under the nuisance model is comprised of the EPA and state agencies. Unlike negligence, nuisance produces similar outcomes for the neighboring farmer regardless of applicator compliance, with the exception being the injunction granted in situations of applicator noncompliance. The requirements for a compliant application are established by the EPA and state agencies. Under negligence, a potential disqualifier for the neighboring farmer to recover damages is whether or not the applicator obeyed the necessary regulations. This aspect of a negligence system emphasizes the need for regulators to make extremely accurate judgments in their work. Repeated updates to dicamba regulations over multiple seasons supports the argument that adherence to these regulations is not sufficient to prevent drift occurrence (Goodis, 2018). The implementation of a nuisance system could potentially reduce

the neighboring farmers' scrutiny on regulators, as they would have the ability to recover drift-related losses regardless of their neighbor's adherence to (often imperfect) regulations. Unlike trespass, the nuisance model does not incorporate injunctions against compliant applicators, which could similarly reduce the applicators' scrutiny of the regulatory bodies since they cannot be enjoined for following the necessary regulations.

After discussing the winners in a nuisance system, it should be unsurprising that the losers in a nuisance system are farmers of HT crops and consequently the companies that produce these seeds and their corresponding herbicides. These farmers are considered losers under nuisance for much of the same reasoning that earned them loser status under trespass, given their reliance on applications combined with the fact that applicators in both models earned relatively low profits and were sued more often than under negligence. Due to the lack of an injunction under the compliance setting of nuisance, farmers of HT crops are weakly superior under nuisance than under trespass. Still, the financial disincentive from the payment of monetary damages could induce changes in pesticide applications that somewhat resembled changes mandated by an injunction.

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