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Catch My Drift? Perceptions and Experiences of Pesticide Contamination of Organic Crops in Montana

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CATCH MY DRIFT?

PERCEPTIONS AND EXPERIENCES OF PESTICIDE CONTAMINATION OF ORGANIC CROPS IN MONTANA

by

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Abstract

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Catch my Drift? Perceptions and Experiences of Pesticide Contamination in Montana Organic Agriculture.

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Pesticide drift and inadvertent contamination pose particular risks to organic production. Some organic producers have lost their crops, certification, and/or organic markets because of contamination events. Through this thesis research, I explain the perceptions and experiences that certified organic farmers in Montana have about drift and inadvertent pesticide contamination. I conducted semi-structured interviews with eleven certified organic farmers from various regions of Montana. Along with one-on-one interviews with organic farmers, interviews with industry and regulatory officials were conducted to better understand the policies and procedures that control what happens when drift occurs at the state level. Industry and regulatory official participants included organic certifiers, organic inspectors, Montana Department of Agriculture employees, and an organic policy analyst. Participants were given space to share their concerns, experiences, and recommendations regarding pesticide contamination and the future of this research. This research shows that drift is a complex issue and that farmers experience drift differently. However, common themes emerged in the interviews. Key themes distilled from the data include the importance of communication among organic producers and their community; contamination effects on rural relationships; and the outcomes producers face after contamination occurs. The data collected during this research also suggests that changes can be made to mitigate and even prevent contamination. I conclude this thesis with several recommendations for Montana and the National Organic Program. Recommendations include enforcing stricter pesticide regulations at the state level, creating a fund within the National Organic Program to compensate organic producers after contamination events, and working to educate consumers and conventional producers about certified organic agriculture. Organic producers are dedicated to growing food free of pesticides, but pesticide drift and inadvertent contamination are making that choice increasingly difficult in a chemical-laden world.

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List of Acronyms

Environmental Protection Agency: EPA

United States Department of Agriculture: USDA

United States Geological Survey: USGS

Natural Resource Conservation Service: NRCS

Montana Department of Agriculture: MT DOA

National Organic Program: NOP

Organic Program: OP

National Organic Standards: NOS

National Organic Standards Board: NOSB

Pesticide Action Network: PAN

Pesticide Action Network North America: PANNA

Montana Organic Association: MOA

Organic Trade Association: OTA

Organic Center: OC

Washington State University: WSU

Chapter One: Planning for the Season

Introduction

INTRODUCTION

In the winter of 2021-2022, a time of continued isolation due to the global pandemic, I was in the middle of conducting my graduate research and interviewing farmers. I spoke with farmers over Zoom and connected with eleven producers from across the vast state of Montana, along with seven industry and regulatory officials to learn about pesticide contamination of organic crops. The individuals I interviewed shared stories of pesticide contamination and their expertise in organic regulations and processes. During this time of isolation, I was able to form connections with participants in this study while hearing their stories from the fields.

Jess, a producer in this study, shared that they were finally able to purchase land just a few years ago. They had worked hard to buy this land and wanted to start farming their own land to grow food to feed their family and community. That first spring, Jess planned and prepped each detail to ensure that they would have vegetables and flowers come warmer weather. After careful planting, watering, and management, Jess was confident that this first year would be a success. Except it wasn't. Leaves curled, plants withered, and no harvests came. Jess assumed that they hadn't paid enough attention to the plants and had been too distracted by moving, the pandemic, and a new baby to adequately run a farm. Jess blamed herself for the death of the crops and even lost confidence in her growing abilities. It wasn't until the following June, with new confidence and another round of plants in the ground, that Jess realized it wasn't their farming skills. Upon seeing the same curled leaves and dying plants as last year, Jess started to do some research. They realized that these issues had nothing to do with her farming skills; rather, their soil was contaminated. Jess's story and ten others in this study show the harsh reality

of growing organic produce in a chemical world. Pesticide drift and inadvertent contamination is the broad topic of the present research. Inadvertent contamination refers to contamination caused by the presence of pesticides in precipitation, or legacy chemicals (persistent chemicals that remain in the environment long after introduction). Pesticide drift refers to contamination caused by the movement of synthetic pesticides to off-target crops or fields in the wind or rain. The coming pages discuss the complex issue that pesticide drift and inadvertent contamination pose for organic producers here in Montana.

As we shall see, the occurrence of contamination of organic fields is takes away the choice from organic producers and those who wish to support organic producers. Across the country, and here in Montana, where I have conducted this research, organic *and* conventional producers walk through contaminated fields, wondering how to recoup their losses and limit the future risk of drift or inadvertent contamination. Organic producers have heightened trepidations about their certification status and the possible loss of organic markets. Additional concerns include ecosystem and human health effects and the accumulation of synthetic pesticides in the environment (Sheer and Moss 2012). Organic producers and industry and regulatory officials experiences and perceptions of pesticide drift and inadvertent contamination, the topic of this thesis, are pervasive but not well documented in the literature. Accordingly, I set out to learn about the experiences and perceptions of organic producers, state regulators, and inspectors in Montana.

Producers are already facing challenges due to the effects that climate change is having on the industrial food system (Brown et al. 2015). Challenges of climate change and climate adaptation are compounded by pesticide drift and inadvertent contamination. Climate change is creating the “perfect storm” to threaten the already vulnerable industrial food system (Union of

Concerned Scientists 2019). Extreme weather, changing precipitation levels, and warming temperatures pose many risks to producers' livelihoods, both organic and conventional. The changing climate also brings about new pests and weed problems (Union of Concerned Scientists 2019). If these near future weed and pest problems are solved in the way the industrial food system has solved them in the past, with chemicals, then organic producers will not only be looking to adapt to climate change but also adapt to growing in an even more chemical-laden environment. The people tasked with growing food for the world are already seeing the effects of the changing climate on their crops and lands whether it is less water to irrigate with or no longer being able to grow crops that they used to twenty years ago (Union of Concerned Scientists 2019). While the time to create large-scale changes to stop climate change might have come to a point where adaptation is now the goal, there is still time to advocate for change in the food system to mitigate and prevent pesticide drift and inadvertent contamination.

Why Montana?

Montana is a unique site for research on contamination of organic food production. The state contains a large number of acres in organic production. These vast acres of organic grains, pulses, vegetables, and other niche crops abut those in conventional production. In the 2016 National Agricultural Statistic Certified Organic Survey, Montana reported 156 certified organic operations and 266,048 acres in organic production (NASS 2016). Deep community ties keep neighbors and families in rural communities close for generations. A state with deep roots in agriculture and in industries like mining has tried, sometimes succeeding and other times failing, to limit the pollution of the land, air, water, and people. The state's constitution gives each Montanan the right to a clean and healthful environment (MT Constitution Article II, Section 3). Pesticide drift and inadvertent contamination threaten the clean and healthy environment that

most Montanans have come to know and the rural relationships between farmers that are synonymous with 100 years of agriculture in this state. Producers in Montana are not immune to pesticide contamination, however (Gessaman 2008). In 2017, Monsanto (now Bayer) received 3,101 drift complaints from across the United States (Hettinger 2020). Producers from Minnesota to California are reporting contamination events and the losses these events are causing (PANNA). Today, only a small amount of information is available that concerns Montana organic producers' experiences and perceptions of contamination.

This research addresses this gap in knowledge and endeavors to answer the following central question:

What are organic producers' perceptions and experiences of inadvertent synthetic pesticide contamination in Montana?

This research also explores questions such as: (1) To what extent is synthetic pesticide drift a problem among Montana organic producers? (2) What actions are organic producers taking to mitigate risks from inadvertent contamination? (3) What policy, regulatory, outreach, and/or research needs do these producers suggest? Finding the answers to these questions is beneficial to all producers, especially organic ones, as well as participants in the greater food system. Contamination events may put organic producers at risk of certification loss in addition to posing long-term threats to human and environmental health. Examining the experiences, policy landscape, and processes that surround pesticide contamination events will hopefully lead to making necessary policy, regulatory, and educational changes.

To complete this thesis and meet the goals of this research, I have designed the following objectives:

1. *Conduct in-depth qualitative interviews with organic crop producers to better understand their perceptions and experiences with inadvertent pesticide contamination.*
2. *Situate the current pesticide contamination procedures within the policies and laws of pesticide use and regulation through the United States Department of Agriculture National Organic Standards.*
3. *Provide policy recommendations for the state from the organic crop producer community and industry and regulatory officials that could protect organic farmers from inadvertent pesticide contamination.*
4. *Create an educational guide for organic crop producers to prevent and address inadvertent contamination on their farms.*

OPERATIONALIZATION OF KEY TERMS

Specific key phrases will be discussed frequently throughout this research study. Pesticide drift and inadvertent contamination are complex issues with various terms and stakeholders. Certain terminology might be used with different definitions in different fields. This section describes how and why I am using specific terms and definitions. In addition, the figure below shows the many stakeholders who are involved in these events and provides an illustration to show just how complex and multifaceted contamination events are.

Figure 1: Variety of Stakeholders Involved in Contamination Events

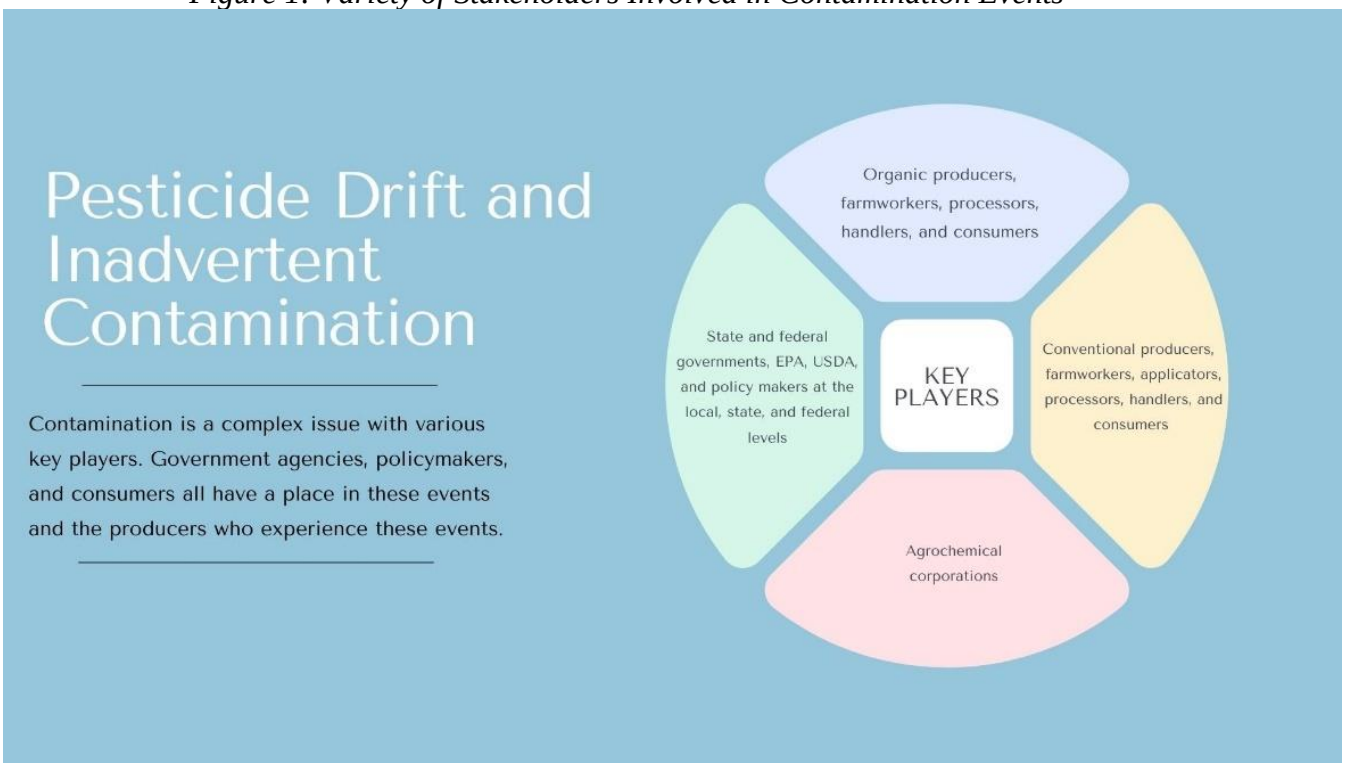


Figure 1: Pesticide drift and inadvertent contamination events involve many different food system stakeholders. From producers to consumers and government officials.

Terms and Definitions

The term I use to describe research participants is **organic producers**. This term refers to ranchers or field crop producers, and both can experience drift. Conventional producers experience drift. This study, however, only addresses the experiences and perceptions of organic crop producers in Montana because of their elevated risk of market loss, certification loss, and inability to sell their organic crops at organic prices due to contamination. This study also involves participants who are **industry and regulatory officials** by which I am referring to as an expert or official who supports producers on everything from certification, sales, markets, education, and policy.

For this study, I use the term **pesticide** to refer to "any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest, any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant, [and] any nitrogen stabilizer" (EPA). Insecticides, herbicides, rodenticides, and all fungicides fall under the definition of synthetic pesticides throughout this study. National Organic Standards, set by the United States Department of Agriculture (USDA), allow organic farmers to use certain approved pesticides consisting of natural substances while prohibiting synthetic ones (McVoy 2021). Approved natural substances include plant and soil amendments such as compost and naturally occurring elements like phosphorous and potassium. Other approved substances include soap-based herbicides and insecticides made of ammonium carbonate (CFR § 205.600 Evaluation criteria for allowed and prohibited substances, methods, and ingredients). While organic farmers use organically approved pesticides, for this paper, the term pesticide will be an umbrella term for synthetic herbicides, fungicides, and insecticides.

Conventional agriculture is often defined as what it is not or the definition includes what it is the opposite of. Commonly the definition of conventional agriculture is that it is not organic or regenerative and that it includes the practices that do not fall into other defined types of agriculture (Giller and Sumberg 2022). While it is easy to define conventional as everything that is not organic, I will define it more fully for the purpose of this study. The term **conventional agriculture,** in this study, refers to farming operations that depend on and use synthetic pesticides, herbicides, fertilizers, highly specialized mono-cropping, possibly plant genetically modified seeds, and use chemical-fallow rotations as a land management strategy. **Pesticide drift** using the EPA's definition refers to "the movement of pesticide dust or droplets through the air at the time of application or soon after, to any site other than the area intended. Pesticide

droplets are produced by spray nozzles used in application equipment for spraying pesticides on crops, forests, turf and home gardens" (EPA N.d.). **Inadvertent pesticide contamination** will refer to runoff, contaminated rain or snow, groundwater, soil, or contaminated equipment and storage (USDA N.d.). While pesticides can be incredibly harmful in large quantities or when directly ingested, synthetic pesticides have become an integral part of the industrial food system allowing producers to grow large amounts of food (Fitzgerald 2021).

The USDA definition of **organic agriculture,** "a production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity," is used for this study since all producer participants are certified, organic producers (USDA). By the USDA definition, organic agriculture is based on minimal use of off-farm inputs and on management practices that "restore, maintain and enhance ecological harmony." Certified organic producers must follow process standards that maintain the integrity of the practice and optimize the "health and productivity of interdependent communities of soil life, plants, animals and people" (USDA 2007). Synthetic pesticides can contaminate the soil, water, and non-cultivated vegetation (Gliessman 2016; PANNA). Additionally, synthetic pesticides threaten non-target organisms like birds, fish, and beneficial insects, destroying an ecosystem (Aktar et al. 2009)

Organic producers must adhere to specific standards for producing, processing, and handling for their food to be labeled as organic; they are also routinely inspected to ensure compliance (NOSB). One such standard addresses the history of inputs and substances applied to fields before and during organic certification. Continued monitoring of fields ensures that certain pesticides do not contaminate organically labeled products. Pesticides leave behind residue on fields and crops and have been cited to be dangerous to humans when consumed in sufficient quantities (USDA). If organic pesticide residue is found in organic fields in concentrations

higher than those allowed per organic certification standards, that field is no longer considered organic and must undergo a recertification process after three years (USDA).

CONCLUSION

Contamination events are complex. The entire food system is affected when these events occur. Much like the pesticide droplets that move through the air, causing drift, the impacts of these events can spread further than crops and fields. Synthetic pesticide drift and inadvertent contamination affect organic producers at the field and certification levels. Consumers, policymakers, health officials, and environmentalists alike should take an interest in learning about drift and inadvertent contamination events. While organic producers are at a heightened risk to losses from pesticide contamination, even conventional producers and those who buy conventionally-grown food should feel concerned. As drift and inadvertent contamination continue to exist in our food system, more chemicals will accumulate in the soil, water, and air, becoming ubiquitous in the environment and in the food we all eat (Bessin).

First-hand experiences, knowledge, and perspectives are valuable to understanding contamination in Montana. This type of data offers the potential to generate change at the state or producer level. This paper aims to elevate the voices of organic producers who are experiencing pesticide drift and inadvertent contamination. In addition to hearing the voices of organic producers, interviews with experts on the procedural and policy side of organic agriculture have been critical to my knowledge and understanding of these events. This knowledge will allow me to understand the organic producers' contamination events on a deeper level and offer more precise recommendations.

Based on my findings from this research, I share conclusions and recommendations for organic producers, industry and regulatory officials, and participants in the food system. This

paper is specific to Montana's agricultural systems; however, the conclusions and recommendations I make have the potential to inform and assist in further research and other communities experiencing pesticide drift and inadvertent contamination.

Chapter Two: Prepping the Fields

Literature Review

INTRODUCTION

Pesticide drift and inadvertent contamination impact both organic and conventional producers across the country and in Montana. To understand the impacts of contamination on organic crop producers more fully, an in depth look at the existing literature surrounding contamination events is required. This chapter will start by explaining United States Department of Agriculture National Organic Standards, certification processes, and how pesticide use affects certification of organic crops. This chapter will also provide background information on the history of and use of pesticides in agriculture, environmental, and health concerns of the long-term use of pesticides. This review will touch on drift and inadvertent pesticide contamination of conventional and organic crops as well as the mitigation and prevention techniques that are currently in use. The precautionary principle and the concept of defining complex issues as wicked problems conclude this chapter. Diving into the literature has shaped the formation of this research project and situated this study in the current body of literature.

ORGANIC STANDARDS

Background

Organic and conventional producers take different approaches to planning, planting, and caring for crops and animals. Across our country, these approaches can be seen in action across hedgerows and fence lines as organic and conventional growers tend to their crops and animals. The National Organic Program (NOP) sets the organic regulations that certified organic growers must follow to use the organic label. The organic label sets a process standard. The NOP's process standards regulate management practices, such as increasing soil health, growing without

synthetic pesticides, using renewable resources, and the conservation of water, which make a product organic (USDA, National Organic Program).

One of the most significant differences in management processes between organic and conventional producers is pesticides. Conventional producers may use synthetic pesticides for pest and weed management, while organic producers grow without synthetic pesticides and are prohibited from using them per the NOP standards. But some organic crop producers face inadvertent pesticide contamination from the conventional fields adjacent to their organic certified crops or livestock. Inadvertent or accidental contamination is a complex issue for organic producers in Montana and across the country, threatening crops, organic certification, and producers' livelihoods.

The 1990 Organic Foods Production Act created the United States Department of Agriculture's National Organic Program (NOP) to establish national standards for the production and handling of foods labeled organic (National Agriculture Library 2007). The National Organic Program created national standards for organic farmers, processes, and handlers to follow in order for their crops or livestock to be certified organic and remain that way. Organic farmers can certify crops or livestock through third-party organizations accredited by the NOP, such as state departments of agriculture, or independent certifiers such as Oregon Tilth Certified Organic, Quality Assurance International, and Quality Certification Services. Such certifiers ensure that organic farmers are following the national standards to create a level playing field across the country for producers and to create trust and confidence in the organic label for consumers (National Organic Program).

National Organic Standards

The Act also established the National Organic Standards Board (NOSB), which advises the Secretary of Agriculture in setting the standards that the NOP follows. NOSB defines organic agriculture as "an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony" (USDA NOSB 1995). The NOSB also maintains that organic food handlers, processors, and retailers must "adhere to standards that maintain the integrity of organic agricultural products. The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals, and people" (NOS 1995). The standards stipulate that organic agriculture practices cannot guarantee that all products are entirely free of residues. Nevertheless, organic practices keep the air, soil, and water free from as much pollution as possible (NOS 1995). To adhere to these standards and minimize environmental pollution, organic farmers' specific management techniques to keep their system certified organic. These techniques can include cover cropping, crop rotation, reduction of off-farm inputs, focus on renewable resources, the elimination of synthetic pesticides and fertilizers, and building diversity on and around the farm, to name a few (NOS 1995).

Certification

Organic certification is not something that happens overnight. Some operations can take up to 36 months to become certified, depending on what sort of farming or activities previously took place on the land. For a farmer who was already following organic practices and methods, certification might happen quickly, but if a farmer was previously farming conventionally or bought land that had prohibited substances applied to it in the past three years, they must wait

until 36 months have passed (USDA NOP 2018). At that point, farmers follow a process set by the NOS that goes as follows:

1. The farm or business adopts organic practices, selects a USDA-accredited certifying agent, and submits an application including an organic system plan and fees to the certifying agent.
2. The certifying agent reviews the application to verify that practices comply with USDA organic regulations.
3. An inspector conducts an on-site inspection of the applicant's operation.
4. The certifying agent reviews the application and the inspector's report to determine if the applicant complies with the USDA organic regulations.
5. The certifying agent issues the organic certificate. (USDA NOP)

Farmers can certify all or part of their operation depending on their organic system plan. To maintain certification, farmers and businesses must undergo an annual review and inspection to ensure that they are following their organic system plan and that their practices are keeping their operations organic. If for any reason such as a drift event or other contamination, a field or part of a field, is no longer organic, that area of land must be recertified through the NOP. Recertification is the same process discussed above, but for the specific area of land taken out of organic production (USDA NOP).

HISTORY OF AGRICULTURE AND PESTICIDES

Growing food has gone from a focal practice to an industrial one in about a century on some farming operations in North America. The industrial food system consists of “interlinked institutions and processes that transform sun-light, water, and soil into the meaning-laden foods we find in front of us” and has also included synthetic pesticides (Guptill, Copelton, Lucal 2017). The transformation from subsistence farming to industrial agriculture and the whole industrial food system did not happen overnight. Several decades of policy, consumer changes, mechanical developments, and profiting corporations have led to a food system with less biodiversity,

contaminated soil, water, and a growing gap between those that farm with synthetic chemicals and those that don't (Lappé and Terry 2006).

As agriculture became more mechanized, it also, in some cases, has become more reliant on synthetic chemicals to control unwanted weeds, pests, and rodents in fields. Although farmers have always battled nuisance pests and weeds on their farms and experimented with pesticides for centuries, synthetic pesticides are relatively new. They have swept farming by chemical storm (Lappé and Terry 2006). DDT, a synthetic pesticide, was first used by the U.S. military to wipe out insect-borne diseases; within a year of it coming on to the civilian market in 1946, DDT was being used widely in agriculture (Lappé and Terry 2006). Wartime over-production of chemicals created the opportunity for civilians to access these chemicals in large amounts (Lappé and Terry 2006). Post-war times brought the sale of old warplanes to farmers to convert them into crop dusters to apply pesticides at levels not seen before (Lappé and Terry 2006). Much of the early excitement of synthetic pesticides came without realizing that insects and weeds could build up resistance to these chemicals and that residues would exist in the environment for years to come. Not to mention the low-level pesticide exposure that humans experience daily breathing in the air, drinking water, and eating food contaminated with chemicals (Lappé and Terry 2006).

The 1938 Food, Drug, and Cosmetic Act established tolerances for some pesticides in food, and then in 1947, the Federal, Insecticide, Fungicide, and Rodenticide Act (FIFRA) required the USDA to register and label pesticides (UC San Diego). FIFRA is the regulation that controls all distribution, sale, and use of pesticides in the United States (EPA). This act ensures that all pesticides sold and distributed must be first registered as a pesticide under FIFRA by the EPA. The applicant must show that pesticide use “will not generally cause unreasonable adverse

effects on the environment" (EPA). FIFRA defines the term "unreasonable adverse effects on the environment" to mean:

> (1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, 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 408 of the Federal Food, Drug, and Cosmetic Act (EPA).

Though these laws were passed, the regulations were still based on testing and data from the companies themselves, not outside experiments and tests.

While there was some concern from agricultural workers and scientists, it took until Rachel Carson's *Silent Spring* to create enough public outcry for the Environmental Protection Agency to be created. After the EPA's creation, the agency started to register, evaluate, and reregister old pesticides already on the market (Lappé and Terry 2006). The EPA knows that chemicals can have lingering effects on the environment and on the health of human bodies, even stating that on its website, but the EPA rarely pulls chemicals from the market or changes tolerance levels to account for lasting toxicity (EPA). Synthetic pesticide use has continued on farms today with the promise from chemical companies of higher yields and fewer labor needs. But they haven't advertised the endocrine disruption, potential impacts on fertility and immune systems, or their connection to cancers and other severe illnesses (Moore 2002). Synthetic pesticides have severe consequences on the soil, water, air, farmworkers, and consumers in the food system. Because pesticides are highly mobile and can travel long distances, non-target insects, fish, birds, and crops can also be hit with synthetic pesticides' adverse effects (Moore 2002). Not to mention the continuous power that the makers and sellers of these synthetic pesticides continue to have over how food is grown, ensuring that farmers keep using their products.

PESTICIDES AND ORGANIC CERTIFICATION

The organic regulations state that farmers may use certain organic pesticides consisting of natural substances while prohibiting synthetic ones (USDA NOP). Approved natural substances include plant and soil amendments such as compost and naturally occurring elements like phosphorous and potassium. Other approved substances include soap-based herbicides and insecticides made of ammonium carbonate (Evaluation criteria for allowed and prohibited substances, methods, and ingredients, CFR 7). While there are NOP-approved pesticides used by organic farmers, for this thesis, *pesticides* will be an umbrella term for synthetic herbicides, insecticides, fungicides, and other chemicals not permitted per NOP standards from organic fields.

Some organic producers face inadvertent pesticide contamination when synthetic pesticides are applied to adjacent conventional fields and then are carried to their own (Gewin 2018). Other forms of contamination include equipment and holding containers during travel and processes that were not properly cleaned before being used with organic crops. Contamination might be from dicamba, glyphosate, or 2,4-D, which are chemical compounds that act as active ingredients in common brand names such as Roundup, Oracle, Banvel, and Vanquish (Barth 2016). In 2017 more than 1 billion pounds of pesticides were applied annually to agricultural crops in the U.S. (EPA). In 2021 the EPA published findings from a Dicamba-Related Incident study sharing that they had received 3,500 dicamba related incident reports from one growing season. The researchers found that "More than one million acres of non-dicamba-tolerant soybean crops were allegedly damaged by the off-target movement of dicamba" (EPA 2021). Incidental contamination of organic crops through pesticide drift can cause environmental, health, and economic concerns for organic producers (Harrison 2011).

The EPA, Tolerances, and Labels

While the Organic Program sets the regulations and standards for organic farmers through the Organic Food and Production Act, the Environmental Production Agency establishes the maximum allowable levels of pesticides used on foods (USDA NOP). With pesticides, the label is the law. The label, a physical piece of paper on the outside of every pesticide container, provides applicators with information concerning the pesticide and is legally enforceable (EPA). Pesticide labels include information on how to store the product, how to use the product safely and effectively, and restrictions on how and when to use the product (EPA). Every label also states, *"*Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application" (EPA). This label makes drift illegal if applicators do not follow the label's written information.

Although the EPA sets residue tolerances for substances generally prohibited in organic systems, there are some exceptions. If an organic farmer experiences drift or contamination from conventional neighbors or at a processing facility, and the organic operator hasn't directly applied the substances and has documented their efforts to minimize exposure to them, such as adequate buffers, then the USDA organic regulations allow "residues of prohibited pesticides up to 5% of the EPA tolerance" (USDA NOP 2011). If a crop is drifted and tested at or below the 5% tolerance level, it can still be sold with the certified organic label. If a prohibited substance is found in organic products but does not have a set EPA tolerance, producers have to refer to 0.01 parts per million measurements. If the contaminated crops test higher than 0.01 parts per million then it cannot be sold as organic. The EPA sets tolerances for many substances but has yet to do so with non-food crops (cotton) and minor or specialty crops (quinoa) (USDA NOP 2013). For example, if an organic farmer is growing quinoa and is drifted with a prohibited pesticide with

no EPA tolerance and then that crop tests higher than 0.01 parts per million, that product cannot be sold as organic. This can be very challenging to organic growers because the EPA has set tolerance amounts for certain pesticides on certain crops, but not all pesticides on all crops. This policy puts organic growers at a disadvantage. An organic grower might grow a specialty crop that gets drifted with a pesticide that the EPA has not yet set tolerances for on that crop. Instead of the usual 5% allowance, it is a much stricter test amount, just 0.01 parts per million, and might result in the crop not being able to be sold organically (USDA NOP 2013). Some specialty crops do not have conventional markets which would put the organic grower out of a season of sales.

Additionally, the EPA has set tolerances for certain substances in the case of inadvertent or indirect residues (indirect contamination rather than direct application events) (EPA). While setting tolerances for prohibited substances is incredibly important for the food system and the environment, such tolerance limits create challenges for organic farmers, permitting a narrow window of prohibited substances on organic products. This is a challenge because it applies the 5% tolerance levels set for drift events to a situation involving a direct spray (USDA NOP). A grower whose fields were directly sprayed, and most likely have more contamination than a drift event, now has to use a limit set by indirect spray events. This sets an unrealistic expectation and puts organic growers at a disadvantage. It penalizes the organic grower if they are directly sprayed and their samples come back higher than the allowable amount by forcing their crops to be sold at conventional prices when it is not the organic producer's fault. While stricter regulation regarding pesticides sounds like a positive for human and environmental health, it can actually hurt organic farmers who are already in an increasingly polluted world.

Inadvertent contamination from drift, rainfall, or legacy chemicals (persistent chemicals that remain in the environment long after they were introduced such as DDT), creates a barrier for

organic producers to get their products to market. When organic farmers corps test higher than the allowed 5% residue, they face re-certification as well as loss of money and time. The NOP regulations state that "when residue testing detects prohibited substances at levels that are greater than 5% of the Environmental Protection Agency's tolerance for the specific residue detected or unavoidable residual environmental contamination, the agricultural product must not be sold, labeled, or represented as organically produced" (USDA NOP). Producers in Montana, the location of this study, are not immune to pesticide contamination (Gessaman 2008). Yet, little is known about how Montana organic producers' experience and perceive contamination threats.

DRIFT

Background

Pesticide drift and chemical contamination are not new concerns for organic farmers. Drift events have been happening since organic farms started sharing fence lines and planting buffer zones next to their conventional neighbors (Platt 2017). However, pesticide drift is shifting towards the spotlight. As organic farms and acres become more prevalent, drift events are becoming more common. Pesticides are being found in the ambient environment, and countries worldwide, specifically in the European Union, are tightening (lowering) accepted levels of chemical residue on organic produce (Gessaman 2018). The European Union, China, and Brazil are all phasing out pesticides that are still heavily used in the United States today (Donley 2019). The pesticides banned in the EU account for more than a quarter of the pesticides used in the United States (Donley 2019). This makes it harder for organic growers to meet their market demands in other countries that are cracking down on pesticides. The countries that are imposing stricter regulations for pesticides, like countries in the EU, are doing so because of the harm to the environment they cause, human health concerns, and consumer demand for cleaner

food (Donley 2019). Growers in Montana and the U.S. are losing international markets because their crops are testing too high for accepted residue levels in the European Union and specifically in Italy (Gessaman 2018). Producers believe that higher levels of pesticide residue found on their crops are often coming from drift events (Lipton 2017). Some organic producers have even decided to stop growing certain crops or farming altogether because of the effects of pesticide contamination (Husted 2015).

Organic farmers must follow federal standards to secure and maintain USDA Organic Certification. These regulations address soil quality, soil amendments, pest management, weed management, and ensure that there have been no prohibited substances on certified crops or fields (USDA). Banned substances include chemicals found in synthetic pesticides. It is important to note that these are banned for certified organic producers but are used quite often in conventional agriculture (Andrews and Rose 2018). Synthetic pesticides can often decrease diversity on farms, kill beneficial insects, and lead to depleted and degraded soils (National Institute of Food and Agriculture). When a producer applies synthetic pesticides to a field, some might drift in the wind onto other producers' crops or fields in organic production. Drift, however, is not the only way that pesticide contamination takes place. Accidental or unintentional contamination can also happen through groundwater and runoff. Pesticides can concentrate in water supplies or rainfall and persist in soils long after application. Other times humans make mistakes, and organic crops are directly sprayed (National Pesticide Information Center).

After decades of heavy pesticide use, there can be one or several different pesticides concentrated in the ambient environment ("Pesticide and Water Pollution"). Through spraying every year and letting fields sit in fallow instead of planting cover crops or using other soil

regeneration practices, chemicals have built up in the environment ("Pesticide and Water Pollution"). Groundwater can become contaminated when a heavy rain event or excessive irrigation causes runoff from agricultural fields. Runoff mixes with recently applied pesticides and pesticide residue left in the soil and can then contaminate freshwater supplies or become part of the groundwater supply ("Pesticides and Water pollution"). Pesticides, when airborne, can be carried by rain and fall onto isolated fields, causing contamination (Vogel et al. 1995). If pesticides drift onto organic fields or end up in the groundwater used for irrigation or drinking water, it can be damaging to the environment, human health, and producers' livelihoods and income.

A Growing Sector

Organic agriculture is a growing sector across the country. Consumer demand for organic produce has shown double-digit growth almost every year since 1990 (USDA Economic Research Service 2021). Organic sales account for 4% of the total U.S. food sales, and this year organic products can be found in 3 out of 4 conventional grocery stores across the country (USDA Economic Research Service 2021). Similar to national trends, Montana is experiencing organic agricultural sector growth; in fact, organic foods are one of the fastest-growing agricultural sectors in Montana (Menalled et.al. 2009). The 2016 Certified Organic Survey saw an increase in sales, total certified acres, and the number of organic farms in Montana. As of 2019, there were 351,335 acres of farmland in Montana certified, growing, raising organic crops and livestock out of the 58.1 million acres of farmland in production (Loeffelholz 2019). The 2016 Certified Organic Survey recorded Montana as the second state in the country with the most certified organic acres, behind California, another state where producers experience significant drift events (Towers 2017). In 2016 Montana reported $53.2 million in certified

organic sales out of the entire 4.6-billion-dollar agricultural sector (Montana Department of Agriculture 2016). Thirty-nine point three million, or 74%, of the total $53.2 million of Certified Organic sales came from Certified Organic crop sales like wheat and lentils (USDA Agricultural Census 2017). Montana leads the country in the production of certified organic wheat and is second in organic production for all grains, peas, lentils, and flax (Menalled 2009).

Organic producers in Montana are sometimes able to garner two to three times the price of their conventional neighbors for specific crops (Stifler Wolfe 2021). This allows some producers to have more spendable money for their farms and even in their communities, bolstering other jobs, like equipment dealers and processors (Stifler Wolfe 2021). Some Montana organic producers are also working to revitalize the soil of the Great Plains. This will be crucial as this state continues to respond to the changing climate and consider the future of agriculture (Stifler Wolfe 2021). However, these organic producers lack protections such as crop insurance when they experience drift, causing producers to change their organic plans (like increasing buffer zones or growing conventionally on the borders of their fields) or live with the consequences (Hall 2021;Gessaman 2018). Organic farmers are operating in the current food system that leaves little room for different systems to flourish. The dominant food system, an industrial one, supports conventional agriculture through crop subsidies, loans, and institutions that keep conventional growers on the chemical treadmill.

It would be prudent of the Montana Department of Agriculture to consider protecting organic farmers from pesticide contamination to safeguard the growing economic markets that certified organic agricultural products bring to the state. Since there is limited research on how organic producers experience pesticide contamination from prevention to financial recovery, the Montana Department of Agriculture might not have sufficient information on how to best assist

organic farmers when it comes to this issue. This research will shed light on the experiences of Montana organic farmers with pesticide contamination. This information could prove useful to the Montana Department of Agriculture in providing assistance and support to organic farmers facing contamination.

CONTAMINATION IMPACTS ON CONVENTIONAL AGRICULTURE

While planting and harvesting crops, farmers also act as business owners, marketing professionals, and, especially, scientists. Across the country, both conventional and organic farmers are experiencing drift or other contamination events. Such events leave farmers to hypothesize about where the drift is coming from and what it means to the future of their operations (Barth 2016). While organic farmers risk certification loss of their fields for up to three years, conventional farmers also face loss from these events. Losses among diverse producers lead to more significant questions about the continued use of chemicals in agriculture and their persistence in the environment.

Drift: Not Just an Organic Issue

Conventional farmers in the Midwest are currently facing an epidemic of crop loss because of pesticide drift and crop tolerance to chemicals, specifically dicamba. Dicamba is an herbicide often used on broadleaf plants and is the active ingredient in many agricultural products used to control weeds (National Pesticide Information Center). Dicamba, a prohibited substance per the NOP, is applied to plants on conventional farms, where the leaves and roots absorb it (National Pesticide Information Center). In the last two decades, agrochemical companies have developed crops tolerant to specific pesticides such as glyphosate-tolerant corn, soy, and cotton that are resistant to chemical pesticides (Birth 2016). With the use of these Genetically Modified (GM) crops, specific weeds have developed resistance to these pesticides,

becoming known as “superweeds” (Barth 2016). This phenomenon has happened in the case of dicamba, with dicamba-tolerant crops leading broadscale chemical application that exerts selection pressure on weeds and leads to chemical resistance. Dicamba is much more volatile than glyphosate, meaning that it can quickly become airborne and drift away from where it is applied (Barth 2016). Dicamba can harm specialty crop growers, organic growers, and conventional soybean producers as it drifts away from its target crop. Dicamba-tolerant soybeans have also allowed farmers to spray the crop directly instead of applying dicamba to the field to kill weed seeds before planting. With dicamba-tolerant GM crops, spraying is happening more frequently and affecting farmers who have not planted dicamba-tolerant soybeans (Barth 2016). However, farmers in the Midwest are not alone in facing dicamba drift.

In 2017 dicamba damaged 3.6 million acres of soybeans due to the increased use of dicamba-resistant GM soybeans (Lipton 2017). The damaged soybeans were grown by conventional farmers planting non-GM soybeans dealing with spray drift. Farmers across the country are reporting drift incidents and crop loss to their departments of agriculture, looking for assistance in dealing with drift and the future impacts of drift if dicamba-tolerant soybeans continue to be the dominant soybean crop planted across the country (Hettinger 2020). Effects from dicamba have been so severe in some states, like Missouri, that a civil lawsuit was filed against Bayer and BASF (Baden Aniline and Soda Factory, a German chemical company) to assist farmers in recouping their losses (Hettinger 2020). In this case, the farmer, who filed the suit, went out of business, closing his peach orchard due to damages caused by his neighbors’ spraying of dicamba (Hettinger 2020). Bill Bader, the peach farmer from Missouri, received $15 million for his losses and $250 million in punitive damages from the jury (Hettinger 2020). After the lawsuit with Bader finished, Bayer came to a settlement of 400 million dollars for farmers

across the country and 300 million specifically to soybean farmers because of other complaints and lawsuits filed (Hettinger 2020).

While this lawsuit and settlement were taking place, the Midwest Center for Investigative Reporting combed through government documents. The lawsuit created the opportunity for the release of internal company documents from Bayer. This investigation found that Monsanto (now Bayer) knew that their product would cause widespread damage to soybeans without dicamba resistance but released their product anyway. The documents also revealed that Monsanto tested dicamba's drift ability in conditions and locations significantly different from those farmers would experience (Hettinger 2020). This investigation also found that Monsanto pushed the liability for these damage incidents on the applicators rather than themselves. When answering complaints from farmers who had damage from dicamba, farmers heard that the best way to prevent this issue in their fields was to plant the same dicamba-tolerant soybean that their neighbors were growing (Hettinger 2020). When this information was released to the public and farmers received settlements, many hoped that this would lead to a change in the ruling from the EPA about the use of dicamba, but in 2018 dicamba was approved for use for another five years. Chemical companies and large agrochemical corporations, like Bayer, tend to hold power in these situations based on the data that they submit to the EPA and share with the public. In this case, even when internal and government documents were shared, Bayer still had the upper hand, and its product is still on the market.

Organic farmers and their conventional counterparts face drift events with very little power of their own to stop these events due to powerful chemical companies. Conventional farmers are left to choose between dicamba-tolerant crops or continue the cycle of getting drifted, filing complaints, and hoping to receive a settlement if enough complaints are filed that

year. Organic farmers face these same challenges as well as concerns about losing their organic certification for three years. Organic farmers work hard to grow to produce free from chemicals, build soil health, and adhere to the National Organic Program regulations. While drift events from dicamba and the continued use of chemical-tolerant GM crops affect conventional growers negatively, they put organic farmers at higher risk because organic farmers must adhere to organic regulations to see their crops at all. Regardless of the various degrees of damage conventional and organic producers face when drifting, both groups still hit a wall due to the concentration of power and control among agrochemical companies in the food system.

CONTAMINATION PROTECTION

Mitigation and Prevention

Organic farmers face challenges such as crop loss and possible certification loss from contamination incidents. Once the contamination is reported to the state, lab tests, site visits, and reports by states Pesticide Programs cost the farmer money and possible re-certification (Gessaman 2017). If the pesticide contamination can be pinpointed to a specific person, then there is the option to sue (Gessaman 2017). Even if a producer finds a route to compensation, there are sometimes few protections they can take to ensure contamination does not happen again. Existing literature emphasizes that the onus is on organic farmers to prevent drift. Prevention techniques include planting hedgerows, buffer zones, and proactive communication with conventional neighbors, rather than on conventional growers not to contaminate (Ory 2017). however, there are several actions for conventional producers to take to prevent contamination. Conventional producers and pesticide applicators may use a coarse spray rather than a fine spray, check the weather, create buffer zones, use a different nozzle, check for leaks, and spray in a way that eliminates possible drift to protect organic neighbors (Ory 2017). These strategies place the

onus on the applicator, and the organic farmer, which is similar to the strategy that Bayer uses to avoid costly payouts to drifted farmers. This point makes me wonder, is there a different strategy? How can this research show a different way to handle these events?

A study in North-Eastern Italy found promising results in employing hedgerows as protection against inadvertent contamination through drift (Lazzaro et al. 2008). A hedgerow is a line or collection of densely planted shrubs or trees often placed at the boundaries of fields or properties to create a barrier. In pesticide contamination situations, these shrubs or trees would absorb and be hit by the pesticide drift first, buffering the crops in the field. In this specific study, Lazzaro et al. (2008), looked at droplet drift caused by broadcast-assisted sprayers and found positive results in mitigating pesticide contamination risks. These results showed that hedgerows eliminated between 50-80% of pesticide droplets usually found on unprotected crops. These results may be exciting for anyone who has experienced pesticide contamination, but they are costly and can take time to become as protective as these results show. Hedgerows consist of trees, shrubs, and various perennials that take years to reach maturity ("Hedgerow Revival: Grow a Living Fence" 2019). If a drift event causes a farmer to plant a hedgerow, protection will not come for several years, and the farm might continually face pesticide drift in the meantime. While beneficial, creating hedgerows can also be expensive since producers are growing plants that are not for profit, not normally grown on their farms, are time-intensive to plant, and take many years to provide adequate protection (Fowler et al. 2016). While this research could prove beneficial for drift mitigation, it still puts much of the burden of protection onto the contaminated rather than the contaminator.

SYSTEMIC PESTICIDES IN THE ENVIRONMENT

Scientific evidence has shown that synthetic pesticides move through the environment (Pesticide Action Network). Pesticides can become airborne and travel through the wind, accumulate in the soil, or enter bodies of water (both the groundwater and rain). The longevity of pesticides in the air, soil, and water depends on the environmental condition of that place and the physical and chemical properties of the actual chemical determine how likely the pesticide will travel through different properties (National Pesticide Information Center). Pesticides have a half-life that is determined by scientists through experiments using different chemicals and different environmental processes to determine how long they can last in the environment (National Pesticide Information Center). In the time after application and before the total breakdown, pesticides do accumulate and move through the soil, water, and air. This is a concern for the environment, the public, and organic farmers who are looking to grow food free of chemicals.

Producers who participated in this research study have discussed the probability of pesticides in the rain contaminating their crops. Is this observed knowledge that farmers across the country have or has it been studied? During the 2003 and 2004 growing seasons, rain samples were taken from four agricultural locations by the United States Geological Survey (USGS). These samples were analyzed for active ingredients (atrazine and metolachlor) found in the most common agricultural pesticides. Findings from the study concluded that pesticides, the most common herbicides, are in the rainwater. Researchers found that "Data from all sites combined show that 7 of the 10 most frequently detected pesticides were herbicides, with atrazine (70%) and metolachlor (83%) detected at every site" (Vogel, Majewski, and Capel 2008). Particularly in California researchers found that "Herbicides accounted for 91 to 98% of

the total pesticide mass deposited by rain except in California, where insecticides accounted for 61% in 2004" (Vogel, Majewski, and Capel 2008). This evidence that pesticides commonly used in agriculture are falling with rainwater is shocking. Especially given the toxicity of some of these active ingredients and their link to environmental and health effects.

In 2014 the Geological Society of America and the United States Geological Survey (USGS) tested for glyphosate, the active ingredient frequently used in agricultural pesticides, prevalence in groundwater, soil, and precipitation in the County. At the time of the study, glyphosate was being used in 130 countries, on more than 100 crops, and in 2006 researchers found that glyphosate accounted for 20 percent of all herbicide use (Battaglin et.al. 2014). Glyphosate is popular in the agriculture community and among homeowners because it was marketed as environmentally friendly because of its "Low toxicity and little mobility or persistence in the environment" (Battaglin et. Al. 2014). Results from 2,000 samples collected from locations across the country indicated that glyphosate is actually more mobile and occurs more widely in the environment than originally thought (Battaglin et. Al. 2014). The study found that "Glyphosate was detected more frequently in rain (86%), ditches and drains (71%), and soil (63%); and less frequently in groundwater (3%) and large rivers (18%)" (Battaglin et. Al. 2014).

The authors of this study pointed out that the concentrations that they were finding glyphosate in the environment were below the EPA's Maximum Containment Level but that chronic low-level exposure to pesticides can be hugely problematic to whole ecosystems (Battaglin et. Al. 2014). The Pesticide Action Network (PAN) published information on the chronic effects of pesticides as well. PAN researchers found honeybees, frogs, and bats to be severely affected by the presence of pesticides. Honeybee populations are plummeting, male frogs become females, and there have been dramatic bat die-offs (PAN). Non-target plants and

animals can suffer from the effects of pesticides just like agricultural workers as well as other humans who happen to be in the area after chemicals are applied. In addition to the widescale ecosystem effects that systemic pesticides can cause, there are also health effects on humans to be considered, and the viability of organic farmers who grow crops in areas across the country where researchers have found pesticides in the rain. While most of the studies discussed here pointed out that the levels of pesticides found in the rain are oftentimes below EPA set tolerance limits, this is still a concerning phenomenon. Especially in a state like Montana with a growing organic sector as well as a state constitution that guarantees a "clean and healthful environment in Montana for present and future generations" (Montana Constitution Article IX).

PRECAUTIONARY PRINCIPLE

The use of pesticides in our food is disconcerting to many. Science has repeatedly shown that pesticides pose risks to our health and environmental health, and usually, we don't take risks we wouldn't have to, and in the case of growing food, you don't have to use pesticides (Lappé and Terry 2006). Generally, we also don't require proof of precisely what harm will occur before choosing to evade it; humans usually choose to stay out of harm's way. But yet again, with pesticides, it is different (Lappé and Terry 2006). In this country with pesticides, Dr. Urvashi Rangan of Consumers Union says, "we're proof of harm, not proof of safety" (Lappé and Terry 2006). Conversely, the theory of the precautionary principle can be boiled down to "do no harm" and is often (especially in Europe) employed when deciding the health of the environment where there is data that there are inherent risks and "provide the moral justification for acting even though causation is unclear…employing a better-safe-than-sorry decision" (Gollier and Treich 2013). The principle directs that action be taken to reduce risk in the face of uncertain but suggestive evidence of harm (Pesticide Action Network International 2003).

In its briefing paper on the precautionary principle, the Pesticide Action Network (PAN) discusses the large body of laboratory work on pesticides' potentially hazardous effects on human health and the environment. PAN says that "there is a smaller amount of somewhat equivocal epidemiological data that, whilst it frequently does not prove a link between exposures to pesticides and chronic diseases such as cancer and Parkinson's disease, certainly does not disprove a link" (2003). The brief goes on to say that "although a direct causal link has not been established in most cases, there is significant suggestive evidence of harm to humans and the environment, and it is in precisely this situation of scientific uncertainty that the precautionary principle should be applied" (PAN 2003). PAN has created a list of how to employ the precautionary principle and change national policy regarding pesticides to create a healthier future (2003). This list includes working on scientific proof since the current system gives the benefit of the doubt to chemical companies where safety is presumed until proven otherwise instead of having to prove safety first (PAN 2003). Reducing risk and evaluating safer options are on the list along with looking at more extensive actions like banning persistent or overly toxic pesticides, acting early, including democratic principles to make transparent decisions, and regulating based on the most affected (exposure limits are set for the most at-risk people and followed by all) (PAN 2003). Lastly, the list includes "the burden of proof and responsibility" as an action item stating that "the ones who have the power, resources, and control to act and prevent harm must bear the responsibility for preventing harm" (PAN 2003). This item talks directly about the manufacturers of hazardous pesticides and their financial and ethical responsibility in mitigating and protecting the environment and human health from harmful pesticides.

Considering the almost clear evidence that pesticides cause known harm in various ways, it would be easy to assume that the principle would be applied and that the government, farmers, or consumers would not accept pesticides. Instead, the current system for pesticide use in this country is innocent until proven guilty, and it is hard to prove that a billion-dollar chemical company is responsible when they have leverage in every part of the food system and policy system. There is a strong argument for pesticide use to be limited based on the precautionary principle already used in other countries to limit chemical use for the health of the environment and humans. The precautionary principle is employed regarding chemicals and other environmental harms in protocols worldwide, including the United Nations Environmental Program, the Second World Climate Conference, and the Rio Declaration on the Environment and Development (Estes 2006).

A WICKED PROBLEM

In an effort to better understand the effects of inadvertent pesticide contamination and drift as well as the possible solutions to these events, I have started to think about it in terms of a "wicked problem." When I first heard the term "wicked" being used in a graduate course, I assumed it meant that something was either really bad or really good; an extreme. I have often heard it walking through the quad on my undergraduate campus, people describing the weather in my New England town as "wicked cold" or a new adventure as "wicked cool." This guess was not too far off in the scheme of things. The term "wicked problem" was first introduced by design theorists Horst Rittel and Melvin Webber to draw attention to complex social and cultural challenges that have no clear solutions and often are difficult to solve because of their conflict natures, size, or scale (Rittel and Webber 1973). Wicked problems often have no one right

answer due to the fact that many stakeholders are involved, that they include other complicated issues, and that they are interdisciplinary.

Wicked problems is a term used to discuss a variety of current policy issues (B Guy Peters 2017), such as biodiversity in farming (Green, Landing, Ou, and Sze 2015), food security (Grochowska 2014), not to mention the use of the concept of wicked problems when considering climate change, waste, and healthcare (Kotler and Sarkar). Based on this understanding of wicked problems, I believe that inadvertent pesticide contamination and drift should be considered a wicked problem.

Inadvertent pesticide contamination of organic farmers has multiple stakeholders with different ideal outcomes and ideas on how to reach a solution. The buildup of pesticides and chemicals in the food system has seeped into the environment and is causing concern about increased pollution of the air, water, and soil. Organic farmers prefer to farm without the use of chemicals while most conventional farmers believe that they cannot farm without them. That difference in farming approach can lead to tension in communities and losses for both conventional and organic farmers due to drift and contamination. Another factor in this problem is that chemical companies have a concentration of power in the food system and would prefer to keep it that way with conventional farmers depending on their chemicals and GMO crops year after year (Hubbard 2020). Then, of course, there are the consumers who want healthy, safe, and affordable food. On top of all of this are the policies and regulations that guide how organic farmers grow and how to respond to chemical contamination when it occurs. For some, the answer to this wicked problem is to change the set EPA tolerances and allow more pesticide residues on organic produce. This might limit the amount of reporting and market effects for organic producers, but contamination would still take place. Pesticides would still build up in the

air, water, and soil. It seems like a solution to contaminants but actually, it would just change the problem into a different wicked problem. Each group mentioned above probably has a different solution to solve this problem. And with each solution, other stakeholders might bring up other problems or disagreements. From whatever angle you look at it, it seems to me that this is a wicked problem.

CONTAMINATION IN MONTANA

Unintentional or accidental pesticide contamination is an issue that is hitting farmers across the country (Husted 2015). Studies are in progress to better protect farmers and limit these contamination events. However, little research asks the farmers about their perceptions, recommendations, and experiences dealing with the contamination even though they are the ones experiencing these events. The current literature approaches the problem from a researcher's perspective, but not from that of the people experiencing these events firsthand. Furthermore, the available literature lacks perspective from organic farmers in Montana. This study looks to fill the current gap in the research surrounding pesticide drift by including firsthand perceptions and experiences from organic farmers in Montana. In-depth, semi-structured, one-on-one interviews will allow for the experiences, perceptions, and recommendations of the farmers experiencing pesticide drift to be part of the literature.

Pesticide contamination is a complex topic to discuss with those who have experienced it firsthand. This may be one of the reasons why there is little research centering on producers' voices on this topic. While inadvertent pesticide contamination is a difficult conversation to start, organic producers in the state are willing to share their experiences. They have done so through reports and articles as well as speaking engagements at state-wide conferences (MOA Panel 2018). Organic producers in Montana file reports and talk publicly about pesticide contamination

even if it makes them unfavorable in their communities, making Montana organic producers ideal candidates for this research. The Montana Organic Association (MOA), a non-profit organization that seeks to further organic production in Montana, has held panels and discussions with producers, processors, and certifiers in recent years to discuss contamination in Montana. During a conference in 2018, organic farmers from across the state shared their experiences of inadvertent contamination with the audience. The Organic Grains Council has also discussed contamination in Montana, but little action or additional research has occurred. In a 2018 article, Montana organic farmers Daryl Lassila and Bob Quinn shared about contamination on their farms. Both talked of the lengths they have had to go for any compensation (almost none) and for the sprayer to be held accountable (again, with little to no accountability) (Gessaman 2018). Accounts like these show just how vital interviews with organic producers in Montana will be to this research. Producers are looking for a platform from which to share their stories. It is time for researchers and scholars to give them one.

Apart from the article mentioned above, there is very little information about organic farmers' experiences in Montana. This research will ensure that their experiences are included in the larger body of research happening across the country. A team of researchers from Washington State University (WSU) and the Organic Center (OC) is looking at organic farmers' experiences with pesticide drift nationally. With partner researchers from across the country with various backgrounds, this study surveyed organic farmers about their experiences with pesticide drift. A presentation of the results took place on November 8, 2021 (WSU). The qualitative research that I am conducting here in Montana will add to this national study. In-depth interviews and a focus on how Montana farmers perceive pesticide contamination will add

richness to national survey data and complement that data with a narrative provided by organic farmers.

Impacts on Fence lines

Pesticide contamination does not happen in a bubble. Organic farmers raise crops next to fields in conventional production. Organic farmers risk losing their certification and potential income due to accidental pesticide contamination from their conventional neighbors (Barth 2016). In one rural community, neighbors who were once friendly no longer speak because of drift events (Gewin 2018). Some producers must decide between suing their neighbor or moving past the contamination with no assistance (Gessaman 2018). For others, the situation strengthens their neighborly ties and unites communities. These events might result in better communication between neighbors and more prepared organic and conventional producers (Worley 2019).

CONCLUSION

Researching relevant literature on everything from organic certification to social science ideas to frame my own research has been informative and helpful. As someone who is not an organic farmer, I needed to start with understanding organic as a practice and certification. I then needed to understand how and why chemicals in the form of synthetic pesticides became part of the dominant food system in the United States and how synthetic pesticides had broad enough impacts on the type of farming practice producers choose when they specifically want to avoid synthetic pesticides. Important topics such as pesticide contamination in conventional agriculture, contamination in Montana, and the effects contamination can have on a community all become critical parts of my own research via this review. Pesticide drift and inadvertent contamination are complex issues involving different levels of government, certifiers, inspectors, producers, and consumers. In order to understand the complexity of contamination events, I

found it useful to employ broad social science research ideas. Using the precautionary principle and the idea of a wicked problem helped frame just how complicated these issues are. These frameworks also helped me to ask different questions and think through the issues that come with pesticide contamination through a different lens.

Through journal articles, scientific studies, and grey literature I have become more knowledgeable in answering my guiding questions. While I have gained more in-depth knowledge about pesticide contamination and drift as a whole, I have realized that is a gap in the current literature and that there is a need for the study that I am conducting. In-depth interviews with organic producers will add to this body of literature and fill a gap in the current research. There are articles written about one or two producers who have shared their stories and experiences either on just the impacts of the contamination or the court case that they are involved in. My research is based on asking organic producers specific questions about their perceptions and experiences with pesticide contamination to better understand how organic producers are dealing with these events and understand their thoughts on how to make these events less destructive. In addition to the first-hand accounts of these contamination events from organic producers, I am also interviewing industry and regulatory officials who have different experiences and knowledge to share. These officials are experts when it comes to the policy landscape that dictates how these events are reported and processes organic producers follow.

Chapter Three: Planting the Seeds

Research Methodology

INTRODUCTION

The idea for this project first came out of a conversation with Professor and Committee Member, Neva Hassanein. In Professor Hassanein's course, titled *Research Methods for Social Change*, students are tasked with completing a qualitative research project of their choice. When discussing my research project with Professor Hassanein, she brought up a study she was involved in out of Washington State University (WSU) and the Organic Center, located in Washington D.C. The study focused on surveying organic producers across the country about their perceptions and experiences with inadvertent pesticide contamination and drift. Pesticide contamination and drift were relatively new concepts to me but piqued my interest. I read through the available research material and did a quick search using Google Scholar, OneSearch, and general Google searches to understand how pesticide contamination and pesticide drift affected organic and conventional farmers across the country. I quickly learned what pesticide contamination and pesticide drift meant both on a scientific level and personal level. What I found was a complicated issue plaguing farmers across the country.

I became interested in this topic because it felt like an injustice was taking place to all farmers who were experiencing inadvertent contamination or drift, regardless of their certifications. Power is concentrated at the top in the industrial food system that currently dominates our country, leaving producers at the mercy of agrochemical corporations and government regulations (Howard 2021). As I learned about these inadvertent contamination events, my interest grew. It seemed to be another concern on a long list of concerns that farmers, especially organic farmers, struggle with while trying to grow food and support themselves. I came to graduate school to learn how to make a difference and when I learned about organic

farmers here in Montana dealing with inadvertent pesticide drift, I felt like this research, sharing organic farmers' experiences, might make a difference for others and hopefully add to the literature and help policy change in the future.

During my research, it was clear how pesticide contamination could affect both the environment and organic farmers' bottom lines. These contamination events have the potential to impact the entire food system. It also became clear that any research on this topic should address the policy landscape where these events occur. Understanding the knowledge and experiences that inspectors, certifiers, and policy experts hold is incredibly important to fully understand the extent of contamination events and the procedures in place when these events occur.

OBJECTIVES

To complete this thesis and meet the goals of this research, I have designed the following objectives:

1. *Conduct in-depth qualitative interviews with organic crop producers to better understand their perceptions and experiences with inadvertent pesticide contamination.*

I interviewed organic crop producers who have faced pesticide contamination to understand the experiences and perceptions of pesticide contamination for these producers in Montana. Interviews generated a collection of personal accounts about what happens when contamination occurs. These producers' experiences and thoughts are vital to understanding the lived experience of the policy landscape surrounding inadvertent contamination. Interviews elicited the concerns and challenges that organic crop producers face when experiencing contamination. These producers' stories have led to a better understanding of the perceptions and experiences of organic crop producers in Montana facing inadvertent contamination.

Between February and March of 2021, I interviewed four organic crop producers who had experienced drift or inadvertent contamination. From December 2021 to April 2022, I interviewed an additional seven organic crop producers who also had experienced drift or inadvertent contamination. These in-depth interviews will elucidate Montana's current pesticide contamination landscape and what, if any, policy changes Montana organic crop producers suggest to create a healthier growing environment. With a smaller sample size, I was able to spend more time with each participant and get a better understanding of their experiences and perceptions.

2. *Situate the current pesticide contamination procedures within the policies and laws of pesticide use and regulation through the United States Department of Agriculture National Organic Standards.*

To better understand the current policy landscape around pesticides and pesticide use and the processes that occur when inadvertent contamination is reported, I interviewed industry and regulatory officials. These interviews were with members of the Pesticide Program at the Montana Department of Agriculture, Certified Organic Inspectors, Organic Certifiers (both through the State Organic Program and independent certifiers), and employees at the Montana Department of Agriculture Organic Program. Their expertise and experiences were critical to understanding the current policy environment. In addition to their knowledge of the policies surrounding pesticides, they answered important questions about what policies and procedures are put into effect when contamination is reported to the Montana State Department of Agriculture.

In addition to in-depth interviews, I reviewed the laws and policies that govern pesticides and pesticide use nationally through the National Organic Standards. Understanding the laws that

govern the use of pesticides and organic certification is critical to creating policy recommendations that support a healthy and safe growing environment for organic producers.

3. *Provide policy recommendations for the state from the organic crop producer community and other industry and regulatory officials that could protect organic farmers from inadvertent pesticide contamination.*

Based on the qualitative interviews with organic crop producers and industry and regulatory officials from the Department of Agriculture and Pesticide Program, I will conclude my thesis by outlining policy recommendations that could support organic producers in preventing and addressing the ramifications of pesticide drift and contamination. These recommendations will include policy change suggestions and educational material suggestions to develop procedures and processes that support organic crop producers experiencing inadvertent pesticide contamination.

4. *Create an educational guide for organic crop producers to prevent and address inadvertent contamination on their farms.*

Using the data collected through in-depth interviews with organic crop producers and knowledge gained from the policy review, I created resources for organic crop producers experiencing pesticide contamination (found in Appendix I). These educational guides will assist organic producers in the reporting systems for contamination in Montana and successes and suggestions from organic producers who have already experienced drift or contamination. I plan to share this resource with the Montana Organic Association through their website and newsletter and research participants to spread it through the organic community.

Interview-Based Research

Researchers from WSU and the Organic Center distributed a self-administered survey to organic farmers across the country. This survey provided baseline data about the landscape of pesticide drift and pesticide contamination events for organic farmers. Based on the methods used in the WSU study and on findings from my literature review, it became clear that organic producers' voices were missing from this topic. Individual farmers each have a story to tell that includes varying experiences and perceptions that will expand the spectrum of knowledge in this field of research. For this reason, I determined that semi-structured interviews would be my primary data collection method. Interviews allow participants to share their experiences and perceptions in a comfortable environment. While specific questions are asked, there is also room for participants to share additional information that I, as the researcher, might not have considered or thought to ask. This might lead to further learning, research, and solutions. By conducting one-on-one interviews with organic producers and industry and regulatory officials, their voices are centered.

SELECTION CRITERIA

Organic Crop Producers

I limited this research to the state of Montana's organic crop producers because of the effect inadvertent pesticide contamination has not only on organic farmers' production but on possible certification loss and crop market value. In Montana, organic farming is a growing industry. In 2014 there were 146 certified organic farms with 33 farms transitioning to organic (USDA Census of Agriculture 2017). Three years later, in 2017, Montana had 193 certified organic farms with 69 farms in organic transition (USDA Census of Agriculture 2017). Since organic agriculture is such a booming industry, it is important to understand the issues facing this group

of farmers. Primary selection required participants to be certified organic crop producers. One participant in this research was not yet certified but is working towards certification and currently grows in an organic and sustainable system with no synthetic pesticides. Since interviews took place over Zoom, there was no set research region or county within the state, so producers from all over the state could participate. Eleven organic crop producers participated in this research. I limited the participation to crop producers because, from my experience and research, pesticide drift and inadvertent contamination were clearer to recognize on field crops rather than processing contamination events or with livestock.

Industry and Regulatory Officials

In addition to organic crop producers in Montana, I also elected to interview industry and regulatory officials. Participants in this category included certifiers and inspectors working in Montana who had experience with pesticide drift events and pesticide contamination. I interviewed Montana Department of Agriculture employees who worked in the Pesticide Program and the Montana Organic Program. Policy experts who directly work with farmers on pesticide contamination and drift also participated in this set of interviews because of their knowledge and experiences with the topic.

RECRUITMENT

Organic Crop Producers

Eighteen interviews took place in February, March, and December of 2021 and in January through March of 2022, eleven of them with organic crop producers. By conducting interviews at the end of a harvest season and before the next growing season, farmers had more availability in their schedules to sit down for an interview. Participants for this research were not selected randomly but rather were selected purposively (Hesse-Biber and Leavy 2011). I started with a

list of producers provided by the Montana Organic Association (MOA) who had experienced pesticide drift or inadvertent contamination. I was able to add to that list through professional contacts provided by Professor Hassanein. I also contacted organic buyers and seed companies to introduce myself and my research so that they had my information to pass on to organic producers who they knew had experienced pesticide drift or inadvertent contamination to have my contact information and know who I was in hopes of recruiting additional participants. I initially emailed participants to introduce myself and request their participation in the research. Then, depending on their response or lack thereof, I also called participants and left a voice message.

Snow-ball sampling, a process where participants suggest other professionals in their field who would be beneficial to the study as participants, also expanded the pool of participants (Hesse-Biber and Leavy 2011). At the end of each interview, I asked participants if they knew anyone who should be included in this research. Some producers took my contact information and shared it with possible participants, and others shared other organic producers' contacts with me during the interview.

Industry and Regulatory Officials

In January of 2022, I interviewed seven industry and regulatory officials to better understand the policy landscape of these events. I used purposive sampling to identify the necessary officials whose perspectives would contribute to this study (Hesse-Biber and Leavy 2011). I interviewed two Montana Department of Agriculture employees, three Organic Inspectors, one Education and Advocacy Manager from Oregon Tilth Certification, and one policy director from the Organic Trade Association. These participants were selected because of their expertise, knowledge, and experiences with pesticide drift and inadvertent contamination.

DATA COLLECTION

Interviews with Organic Crop Producers and Industry and Regulatory Officials

While there were separate interview guides for the two groups of interviewees, the methodology remained the same; I used interpretive qualitative research methods, which position the meaning-making practices of human actors at the center of scientific explanation. I am using this methodology to gain a clear image of the experiences and perceptions organic crop producers have concerning drift as well as a better understanding of the policies and procedures that surround these events (Hesse-Biber and Leavy 2011). I conducted one-on-one, semi-structured, in-depth interviews, which required a pre-determined set of open-ended questions. I had separate interview guides for organic producers and industry and regulatory officials (both interview guides can be found in the Appendix). This also allowed me to gain rapport and trust to ask specific questions while allowing participants freedom and flexibility when answering questions (Hesse-Biber and Leavy 2011). Interviews, rather than a survey, are appropriate for this research topic given the sensitive nature of inadvertent pesticide contamination and drift. Interviews were also the ideal choice to collect data from industry and regulatory officials. I was interested in understanding their perspectives and specific roles during contamination events and the interviews created a space for that information to be shared. It created the space for officials to share their roles in contamination events. Participants were open to interpreting and answering the questions asked as they saw fit.

All eighteen interviews took place remotely via video conference or phone and lasted from forty to ninety minutes. The goal was to make the participants feel comfortable sharing their experiences. To do that, questions were asked in a way to build rapport with the participants before posing heavier questions (Rubin and Rubin 2011). Organic crop producers were first asked about their professional background and farming system. This initial conversation was

followed by questions about their experiences with pesticide contamination, the testing of groundwater and rainwater where they farm, and policy changes or recommendations regarding drift and contamination. Industry regulators and officials were first asked about their professional background and then a set of questions regarding how their position fits into the policy and procedures surrounding drift.

All interviewees identities remain confidential. I explained to each participant that their names and personal identifiers would never be used in a written report, they could skip any question they did not feel comfortable answering, and they could terminate the interview at any time. I provided each participant with an Informed Consent Form and verbally asked for their consent for the interview to be recorded. By recording, I was able to focus on the participant more fully during the actual interview, instead of focusing all my attention on taking verbatim notes. I also recorded so that I could transcribe them after the interview was finished and ensure that I was correctly citing the participants. All participants signed the Informed Consent Form. While all participants signed the form, two preferred not to be recorded. For the two participants who opted out of the recording, I took verbatim notes as best I could to ensure that I was correctly citing the participants.

Coding Process

I transcribed interviews as they were completed to stay as organized and efficient as possible. I did this by hand and by using Zoom Recording Transcription when applicable. As I transcribed, I edited as necessary to remove “um’s” and “like’s” and removed any personal identifiers. Each participant was given a number during transcription, and each number correlates to a pseudonym to be used during the formal writing process. Once all interviews were completed and transcribed, I began the coding process. Interviews were coded using an open-coding framework

(Miles et al. 2014). Open-coding involves breaking the textual data into discrete parts and creating codes or labels for each part (Corbin, J., & Strauss 1990). I generated a list of key themes, or codes, from the interview guide as well as the research questions that I wanted to answer. Then as I analyzed the data (interview transcripts), secondary topics or codes emerged. As the name states, open-coding opens the researcher to new possibilities that weren't obvious at the start, known as emergent themes since they came from the data rather than my interview guide or research questions (Corbin, J., & Strauss 1990). As I went through each transcript, I compared and contrasted events and descriptions from participants, combined codes, and created new ones as needed.

VALIDITY

Validity is essential to this research; it is imperative that the finds are trustworthy. These findings connect to producers' livelihoods and describe events that real people experienced, so ensuring validity is imperative. Validity is a process that occurs when the researcher gains the confidence of their readers; it allows trust to develop between the researcher and those reading their work (Hesse-Biber and Leavy 2011). To gain validity for this research, my findings will be shared with participants and organizations, such as MOA, which often assists producers when drift events occur. The full results chapter is to be shared with participants to ensure that I have adequately described their experiences and that they are still comfortable with their contributions. Feedback, thoughts, and questions will be taken into account before the final submission of this thesis. At that point, I will have done my best to show integrity with my participants and communicate openly about the research process and findings. Throughout this process, I have tried to make it so that the voice of my participants is the one that is shared in my findings and that I have communicated the participants voice to the best of my abilities. Direct

quotes from participants have been used to validate the findings and conclusions that I make here. As mentioned, these findings are not definitive or exhaustive, rather they provide a first-hand look into the experiences and perceptions Montana organic farmers have about pesticide contamination. In presenting quotes, awkward or unnecessary words have been removed and will be noted with ellipses.

LIMITATIONS

With this research comes limitations. One limitation will be the sample size: not every organic crop farmer in Montana participated in this research study due to scheduling, interest, or whether or not they have experienced pesticide drift. This means that my results may not be generalizable. But small sample sizes can still be beneficial in qualitative research. Interviews, especially those regarding sensitive topics, require the researcher to be fully immersed in the research field to create genuine relationships with the research participants (Crouch and Mckenzie 2006). By limiting my participants, I was able to form connections with participants and reach immersion in the community. This would not be possible in a larger study, hopefully resulting in a richer data collecting experience.

Additionally, there is an inherent bias in this work. As a researcher, I have beliefs, morals, and ethics surrounding farming and food. I have worked on organic farms, interned at the Montana Organic Association, and often chose organic produce in the grocery store. I am an environmentalist who believes that we have a right to soil, water, and air free from chemicals. It is not possible to remain completely unbiased in this work. I want to acknowledge that as a researcher I can try but might never fully escape my own lenses and biases that I bring to this research. I also want to acknowledge that while some research removes the researcher as a human with biases completely from the research, this study purposely does not do that. There are

areas where I speak in first person in order to share my learning throughout this process. I acknowledge my biases and I will do my best to put the voices of the participants first to share their experiences and perceptions of pesticide drift and inadvertent contamination.

Chapter 4: Harvesting

Results

INTRODUCTION

The central purpose of this research is to understand the perceptions and experiences that organic farmers in Montana have regarding inadvertent pesticide contamination and drift. To understand these perceptions and experiences, as well as the policies and procedures that affect these events, I am asking questions such as: what are organic producers' perceptions and experiences of inadvertent synthetic pesticide contamination in Montana? To what extent is synthetic pesticide drift a problem among Montana organic producers? What actions are organic producers taking to mitigate risks from inadvertent or accidental contamination? What policy, regulatory, outreach, and research needs do these producers suggest? The findings from in-depth interviews with organic producers and regulators shine light on key themes.

All eleven farmers had different experiences and stories regarding their contamination events. Producers also shared their perceptions and thoughts when responding to broader questions about contamination and drift. Interviews with seven industry and regulatory officials illustrated the process on the regulation side of contamination according to the National Organic Program. This chapter will share results and analyze the findings from both interview sets, in order to create a more detailed picture of how these events are happening in Montana and where further research could benefit the system in place and the producers who are part of that system. These results are in no way generalizable or definitive, but they do offer firsthand experiences of farmers, inspectors, certifiers, and state Department of Agriculture employees. As well as provide valuable data to support future studies of pesticide contamination and drift.

DEMOGRAPHICS

Producers

Eleven crop producers participated in this research. Ten are organic producers certified either through the State Organic Program or through an outside organic certifier. One producer is working towards certification but is reevaluating due to contamination issues. Eight of the producer's contamination events involved their conventional neighbors through spray drift or accidental application. One producer shared that their event involved the county weed district spraying their crops, and one involved the previous landowner. Lastly, one interview involved the organic producer talking about their previous time as a conventional farmer. This producer, who is now certified, shared their experiences of drift and pesticide contamination as a conventional grower prior to their transition to organic.

Of the producers interviewed, eight are male and three are female. Of the eleven, nine are still farming, and two are not due to retirement and contamination. Participants grew many different crops. These crops included lentils, peas, Kamut, flowers, wheat, winter, wheat, alfalfa, oilseed, barley, vegetables, and various cover crops. Producer farm size also varied among the participants, from three acres to thousands of acres in production or cover crop, depending on the year. The location of participants included areas in the Bitterroot Valley, the Gallatin Valley, north-central Montana in an area known as the Golden Triangle, and Eastern Montana. One producer was interviewed twice to talk about their own experience with drift as a producer and as an organic inspector in Montana. Each producer has been given a pseudonym for the results and analysis chapter and any identifying details have been removed.

Industry and Regulatory Officials

Seven industry and regulatory officials participated in this research. Participants included representatives from the Montana Department of Agriculture, the State Organic Program, and a third-party organic certifier (Oregon Tilth) who certifies producers in Montana. Three organic inspectors who work in Montana participated as did a policy expert from the Organic Trade Association. Four of these officials were women, and three were men. Four of these participants live and work in Montana, while three do not live in Montana but work in the state. These interviews provided critical information on how drift and contamination events are experienced from the state, certifier, and inspector perspectives. Each industry and regulatory official has been given a pseudonym to ensure confidentiality.

PERCEPTIONS

Overall Perceptions

The guiding question for this research study involves understanding the *perceptions* that organic producers have about pesticide drift and inadvertent contamination. Gaining a better understanding of how organic producers perceive these events, talk about these events, and think about contamination events, in general, will allow me to make better suggestions and conclusions based on findings from this study. Participants were not asked directly about their perceptions in a single question. Instead, the interview guide contained questions throughout that assisted in understanding each producer's perceptions by asking broader questions about contamination in general, their concerns for the future of organic agriculture, how and if drift or contamination is talked about in conversations with other producers, and suggestions and thoughts on changing policies and processes.

Generally, producers expressed several perceptions on drift and inadvertent contamination. Some producers feel that drift and inadvertent contamination are inevitable to organic producers, and it's almost a necessary evil (Devon and Hunter). Others expressed nearly opposite viewpoints and feel that these events should not be happening. These producers expressed that powerful corporations and companies that are part of the food system should take the responsibility for these events instead of other producers (Mike, Matt, and Frankie). Sammy said, “It’s a tragedy of the commons,” but one that is left to just the organic farmer to handle. Another shared that organic farmers have to “Have all their ducks in a row” because as the organic farmer, it's up to you to hold yourself and your neighbors accountable (Charlie). Skyler felt that it was important to frame the issue in a more positive light instead of being upset about contamination and condemning conventional agriculture. They shared that they think “We need to have the right tools to say ‘this [organic agriculture] is better for the farm’ and if I can say that it’s better for the sustainability and livelihood and for the land they are farming, that is better than saying, ‘drift is bad, you’re drifting on my organic farm!’” (Skyler). Two participants felt that there weren’t enough conversations surrounding these events which leaves producers feeling isolated and that contamination would only become more frequent and more severe (Jess and Mike).

While there were some different perceptions about whether drift and inadvertent contamination events are inevitable and a necessary evil or if they are malicious events of injustice, it's clear that most producers were concerned about these events. In addition to other organic concerns (fraud, GMOs), producers in this study feel that there is not enough being done to mitigate these events beyond the farm gate. Three producers in this study also expressed that

consumers often don't understand the organic process or label. If contamination continues, these events might cause further confusion and possible distrust, leading to potential market changes.

Organic Producers' Perceptions of the other Key Players in Contamination Events

Producers also shared their perceptions of others involved in these drift and contamination events: conventional neighbors, applicators, and the State Organic Program. For the most part, producers felt that the state was doing its job correctly. Of the eleven in this study, nine felt that the state adequately did its job especially during contamination events. The same nine producers felt that the State Organic Program was helpful and efficient, and if the Pesticide Program was involved, producers believed that they carried out their collecting and testing responsibilities and processes correctly. Not to say that the reporting process or state is perfect in the eyes of the producers. Half of the participants thought policy changes were needed to better manage contamination, though they were unclear if changes needed to happen at the state or federal level. While changes are needed, the reporting process works the way it's supposed to as of now. The State Organic Program follows the regulations created by the National Organic Standard Board. As I listened to producers, it was clear that they understood the state's role in these events but often wanted other options or additional support during drift and contamination events from start to finish. But in the end, the process worked the way it was supposed to. Seven participants shared that they believed the state understood the impacts on their operations but wanted more response or action from them. As the regulations are written, I want to point out that the state cannot do more or have other actions. It follows the written rules per the National Organic Standards. Regulations set by the National Organic Standard Board control the reporting process and procedures. For this to change, the National Organic Program would need to change its regulations and write a new or different reporting process.

Producers also had perceptions regarding their conventional neighbors and applicators, specifically about the degree of understanding they have about contamination's effects to organic operations. Hunter, who has farmed the same land their family has had for generations and who has excellent relationships with their neighbors, said, “No, I don’t think they do. I think that most of these guys don’t think of these chemicals as dangerous for food production, or they wouldn’t be using them.” One producer who has recently transitioned to organic agriculture shared that he Thinks there is a bit of an unfair advantage for conventional farmers and a lot of leeway that way [conventional growing]” (Robbie). Another said, “Not well, there is a lot of misconception” and that maybe some conventional growers might feel threatened when drift occurs, which creates misunderstandings (Jack). Others felt like they couldn’t speak to what their neighbors or their neighbors’ pesticide applicator thought about drift and contamination. Two producers thought that they had strong enough relationships with their neighbors to confidently say that their neighbors did understand the impacts for the organic farmer, which has led to positive changes in their neighbors’ spraying practices. Charlie shared that their neighbors are “conscientious people that actually are looking out for their neighbor.”

These perceptions bring up additional questions about the neighborly relationships and potential tensions in rural communities between organic and conventional neighbors. Their perceptions also guided the coding process revealing emergent themes relevant to this research discussed in further sections.

GROWING ORGANIC

Reasons Participants Grow Under the Organic Certified Label

In a nation where there are many approaches to agriculture, certified organic producers fill out paperwork, write organic system plans, pay a fee, and go through yearly inspections to

sell their products under the certified organic label. Why do farmers go to such lengths to sell their products with an additional, costly, label? The answer is different depending on every farmer. This is no different for the participants of this study. Of the eleven producers who participated in this study, three grow organic crops for economic reasons, seven for ethical reasons associated with organic production, and one for a combination of economics, ethical reasons, and health effects.

Organically grown crops are sold at a premium price compared to conventionally grown crops. Producers who are willing to go through three years of certification, routine inspection, and grow without synthetic pesticides or fertilizers get to sell their produce at higher prices due to the process that they are grown under. While three producers in this study named financial or economic reasons for initially transitioning to organic production, many shared that now, after several years in organics, they continue to farm this way due to ethical or philosophical alignment with organic farming principles. At this point for many producers who have been growing organic for many years, it is more about ethical reasons than money. That being said, economic and financial reasons still play a big part for some of the participants. Jack said that as a small farmer, growing organically makes their business profitable. Another shared that their father, a conventional producer, steered them to it as a way to "Get going on small acreage and stretch the farm to fit" (Hunter).

Farming without synthetic pesticides gives agency to farmers about how they grow their produce. Other farmers, who I am sure do benefit from the premium cost of their produce, claimed ethical reasoning as what truly pushed them into organic. Sammy answered this question without hesitation, saying, "Oh, it wasn't a decision; it was just how we're going to do things from the beginning. We just don't think that you can grow food or take care of the land, and for

us, it's about land stewardship…Not using things that end in 'cide.'" Matt saw it as an experiment years ago and has never looked back, "It was so much more interesting to grow your own fertilizer and not use pesticides…and it was very successful." Skyler shared that the whole system really interested them from the chemical to the biological and the physical. They said that they want to "Be a good steward, to participate in life that way…And to create a market to communicate with people that this [organic agriculture] is happening!" (Skyler). Another shared that they believed in the certification process and wanted to support it in a state where organics were growing (Frankie). That same producer shared that "We were growing food for people and didn't think that chemicals were appropriate to do that, we want the healthiest soil…to have the healthiest food." Jess shared sentiments along the line of wanting to feed people healthy food through organic agriculture practices.

One producer shared an additional reason for growing organic. The motivating factor to transition to organic agriculture for producer Robbie was their health. Robbie shared that they had chemical pneumonia from using pesticides as a conventional grower. They said, "I would just get a wafting of chemicals all the time, and I would go home smelling like chemicals and then just get up early the next day and do it all over again." As a new fully organic operation, the producer said, "I feel a lot better, I am not around all this chemical, and I don't get headaches, I'm just feeling better, and it was a lot more enjoyable." For this farmer, the transition to organics had benefits in the bank but more importantly, their health.

The reasons and routes that producers take to organic production are all unique, but it was clear after my conversations with these participants that they all value their certifications. These producers are committed to the USDA organic agriculture goals by growing pesticide-free food, improving soil quality, and practicing beneficial management strategies. Regardless of their

initial reason for going organic, whether it was economic, ethical, or health, they do not want to risk losing the hard work they have put into their farm business due to pesticide drift and inadvertent contamination. The dedication to this work is guided by their values tied to organic agriculture and is why pesticide drift and contamination can be so devastating to these operations.

CONTAMINATION IN MONTANA

Contamination Events

Contamination events look different across the state depending on where the farmer lives, what kind of land surrounds the farm, and how their contamination happened. While there were similarities across the eleven farmers interviewed, each story was unique. Figure two below shows the eleven organic producers, the number and type of contamination events they discussed, and their effected crops.

Figure 2: Contamination Events by Producer

Producer	Contamination Event(s)	Crops Affected
Sammy	Direct spray, isolated event, and soil contamination	Buffer zone, Kamut, and legumes
Mike	Direct spray	Peas
Matt	Direct spray, spray drift, and isolated event	Kamut, lentils, wheat
Frankie	Two spray drift events	Buffer zone, various vegetable crops
Charlie	Direct spray, two spray drift events	Peas and barley
Robbie	Spray drift (contaminated neighbor as conventional producer)	Paid for losses
Jack	Spray drift	Lentils
Hunter	Spray drift	Buffer zone and Kamut
Jess	Soil contamination	Various vegetable crops
Devon	Direct spray	Specialty crops (seed crops and vegetables)
Skyler	Isolated event	Kamut

Figure 2: This table shows the producers who participated in this study, the type of event(s) they experienced, and crops effected by the contamination. Events are broken up into spray drift, direct sprays, or an isolated contamination event.

From the information provided by participants in this study, contamination is happening in four different ways in Montana; (1) spray drift, (2) direct spray, (3) isolated contamination event, and (4) contaminated soil. Spray drift is pesticide drift from a spray applicator, either a plane or tractor. A direct spray occurs when an applicator directly sprays an organic field. An isolated event refers to any contamination event when it is unclear where the pesticide came from. In this study, isolated events occurred either in the middle of a field with no other contamination around it or surrounded by many acres of organic agriculture. With these isolated events, producers often do not know of the contamination until their crop is tested before being sold (Jack). Lastly, contaminated soil means that the soil was contaminated with chemicals before the farmer started growing and this prior contamination is currently affecting their organic goals.

While I interviewed eleven farmers, there were eighteen contamination events discussed in total. Eight were spray drift events, five were direct sprays on organic fields, three were isolated events where it is unclear where the contamination came from, and two were from contaminated soils. Three producers experienced these events directly and were able to share exactly how the event took place. One participant said,

> The neighbor was spraying their field by airplane, there were two airplanes in the air over his field, and they were coming into my field… you could see they were starting early…There were two airplanes in the air, and I couldn't do anything…You stand there, and it happens (Charlie).

Another shared, "the first thing I did was pull out a camera…I had to drive half a mile to get closer and see what they were doing. I took multiple pictures and then went to the loading area

and confronted them" (Mike). Mike experienced a direct spray of pesticides on their organic crops. They also reported seeing the direct spray drift further into their own fields.

If the event was not witnessed firsthand or evidenced by presale testing, participants suspected drift due to visual observations, such as yellowing and curling leaves or dead crops. Others did not witness the events or see visual evidence initially and had to investigate how their crops became contaminated. Sammy, who experienced soil contamination, shared that while trying to transition additional acres to organic, they created a plan based on the pesticide label that had been previously applied to the field. Based on the label, when the pesticide was last applied, and their three-year certification, Sammy had assumed it was enough time to plant cover crops to assist with organic material in the soil. Instead, they found that "Even trying to do our soil building planning has been challenging, the residues [from a broadleaf herbicide] are lasting 34 months before you can plant a legume [longer than the label said]…Even though applicators and companies say don't use that much, and it's sustainable… It's really impeding our ability to get our crop rotation in place." Their legumes didn't end up making it due to the pesticides in the soil, even after waiting the allotted time specific to the label and then some. This pushed their certification timeline back further. Another farmer who experienced soil contamination initially thought that it was their farming skills causing their crops to die in the field two years in a row, only to realize that they were facing contaminated soil caused by horse feed and horse manure that had been applied to the field prior to the farmers' tenure on the farm (Jess).

Producers' Perception of Contamination Causation

The majority of the events discussed by farmers were spray drift events (eight), with direct spray events (five) as the second-highest in frequency. The discussion of drift events brought up some concerns from organic farmers about why these events were happening. Devon

said, “Every summer they hire a new young person…I could say some things about their training.” While Charlie noted a similar sentiment, “They weren’t particular enough, they went right down the fence line and weren’t paying attention…It was clear to see, he just didn’t have the experience.” Matt shared that the aerial applicator simply sprayed the organic field while not paying attention, while Mike was shocked that the aerial applicator didn’t know where the field borders were. Hunter, Jack, and Devon all felt that these events are just accidents that sometimes happen to organic producers, and it is something producers should be able to handle. Robbie, who used to grow conventionally and sprayed many pesticides on their land, is now concerned about being drifted as an organic producer due to their knowledge about the prevalence of inexperienced applicators and the frequent, and sometimes the careless manner in which some conventional growers use pesticides (often and freely). They shared that, based on their experiences with conventional agriculture, farmers are often using additives in their tanks that supposedly reduce drift which gives applicators more confidence to spray without an abundance of caution. Robbie pointed out that when using these additives, applicators feel like they can’t drift even though that isn’t the case.

After speaking with various inspectors and certifiers and spending hours combing through details on the Montana Department of Agriculture website, I learned that pesticide applicators must go through licensing to use pesticides and require additional training if using restricted-use pesticides (Kris). The active ingredients in many on-farm pesticides are restricted use like dicamba, paraquat, and atrazine. Applicators must also have insurance before applying pesticides to fields. New this year, commercial applicators must carry liability insurance, which is the only accepted means of financial responsibility (MDOA). The licensing and additional training for some applicators ensures the safe and effective use of pesticides in order for the

applicator to safeguard themselves and others. Such certification also allows them to act as a supervisor rather than an actual applicator. An inspector pointed out during an interview,

> I find that farmers and ranchers are a little sloppy on that because the license is good if you're supervising the person doing it, but really what happens is a lot of farms and ranchers send the woman of the house [to get certified] and maybe that is the right person to go, but maybe it isn't…what they really care about is getting the signed documents (Spencer).

These comments and others from study participants and an inspector bring up a couple of essential considerations. The first is that perhaps applicators are not spraying in conditions they should be spraying in, given that Montana is a windy place. A study out of Montana State University found that "sixty percent of Montana private applicators indicated they sprayed when they knew it was too windy" (Thorp 2009). Sammy talked about having to "know your environment" to ensure pesticides are applied correctly. The second is that applicators are not as exact as they could be, especially given that there are organic fields bordering conventional fields. Producers said things like "not particular enough" or "didn't have the experience" (Charlie). Although the conventional producer knows they have an organic neighbor, if it is not the farmer spraying, the applicator might not know that there are organic fields bordering the ones they are spraying. The importance of being incredibly exact might not be passed on to pesticide applicators by conventional growers in the same language an organic farmer might.

REPORTING PROCESS

Per the National Organic Program, organic farmers have a set reporting process to follow if their fields contain prohibited substances, whether contamination occurred as a result of their own doing or a contamination event. Regulated procedures set at the national level are carried out at the state level. While there is a drift and contamination reporting process, and organic

farmers are regulated to report, this does not always happen due to various reasons. This section will describe the reporting process that farmers in this study described and those discussed with various certifiers, inspectors, and Montana Department of Agriculture employees.

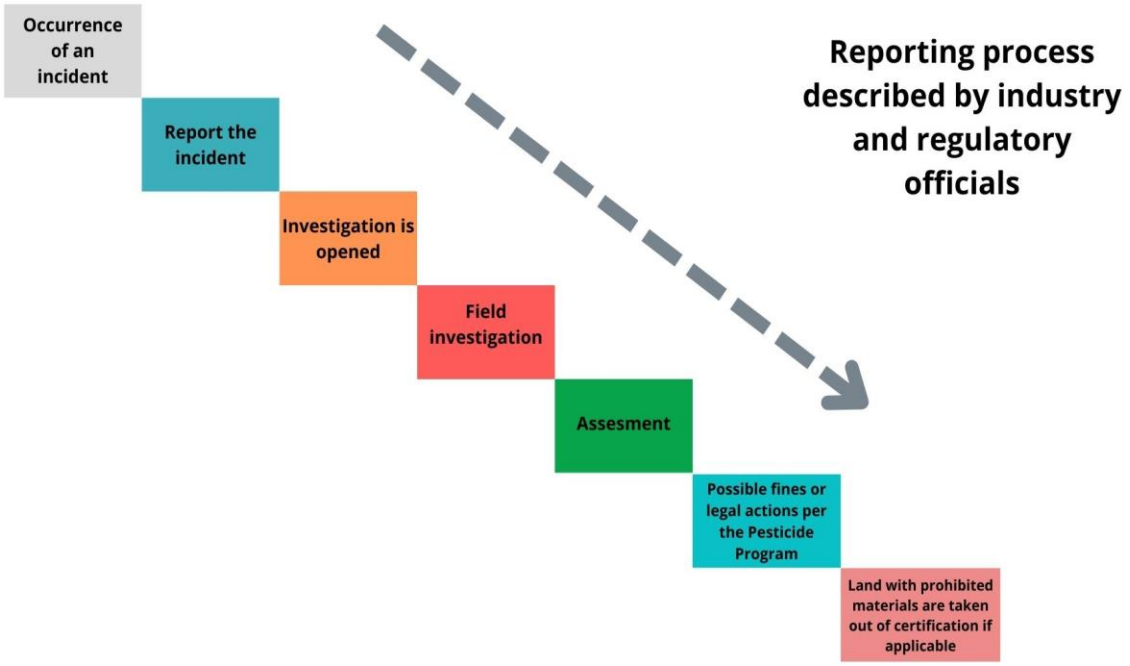
Reporting Process Described by Industry and regulatory officials

The industry and regulatory officials I interviewed for this research work closely in organic certification, organic inspecting, and organic regulations policy. On the topic of the reporting process for contamination, it would be fair to say that they are experts. When asked to describe the reporting process, answers among industry and regulatory officials were consistent. Based on conversations with participants, the process for reporting contamination events goes as follows when the producer is looking to open an investigation with the Pesticide Program or alert the state Organic Program if it is not their organic certifier:

1. Occurrence of an incident
2. Report the incident to organic producers certifier, State OP, and Pesticide Program
3. Investigation is opened
4. Field investigation
5. Assessment
6. Possible fines or legal actions per the pesticide division
7. Land with prohibited materials are taken out of certification if applicable

The list above is the process as described by industry and regulatory officials who participated in this research. To compare the reporting process from industry and regulatory officials and the reporting processes described by producers in this study, I have created two informational graphics. Figure three shows the seven step processes as described by industry and regulatory officials as well as the reporting process described by organic producers in this study. While there are similarities between the two processes, organic producers shared that there are a lot of extra variables and decisions that go into this process that are not encompassed in seven linear steps.

Figure 3: A Comparison of the Reporting Process Described by Industry and Regulatory Officials and Organic Producers.



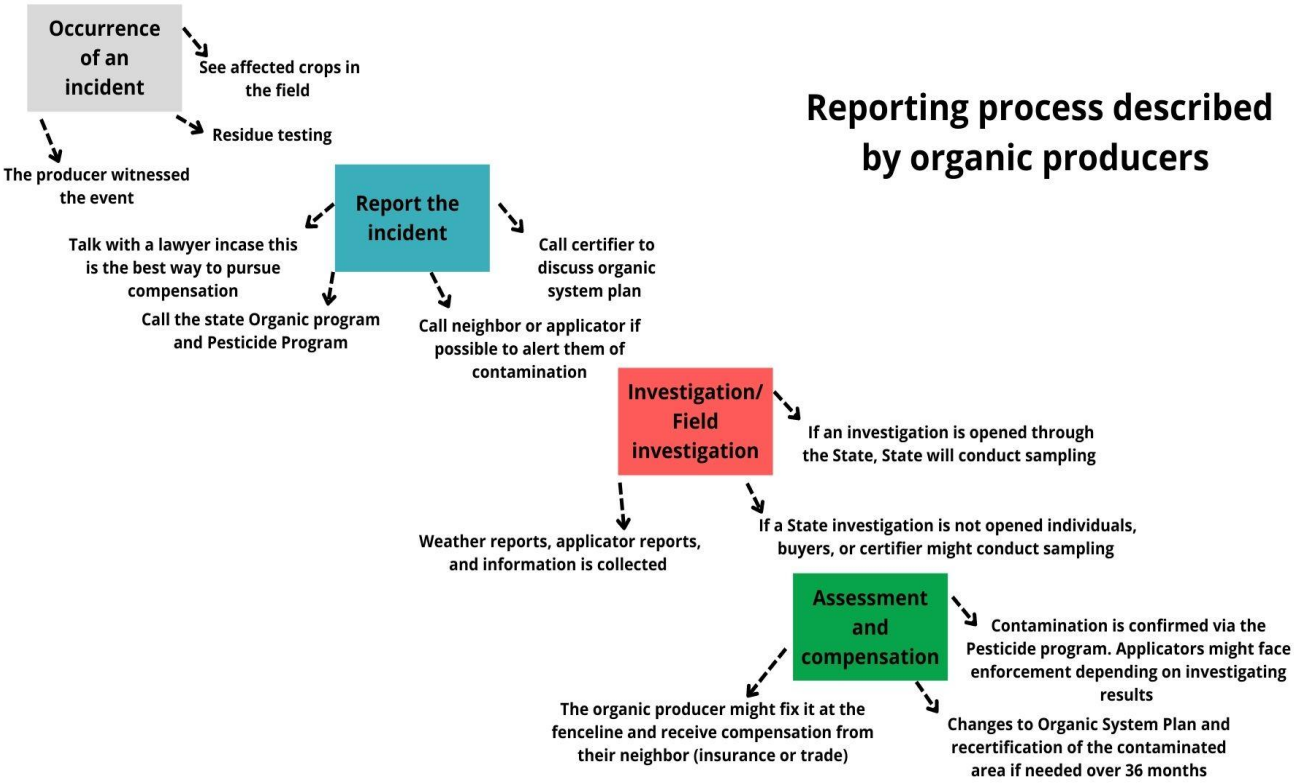


Figure 3: This figure visually shows the differences in the reporting process described by organic producers and industry and regulatory officials in this study. Officials were able to describe the process fully and succinctly, while organic producers' description of the process involved extra steps and is less linear.

After this process is complete, the involved parties might reach a legal agreement, nonbinding agreement, or other private agreement on their own based on documentation and investigation results. But that cost and time are all on the organic producer who reported contamination (Parker). Costs might include independent testing and hiring a lawyer if the organic farmer chooses to pursue that avenue of compensation. Time will be spent actually reporting the event to the organic farmers' certifier and the Organic Program and even more time if there is an investigation with the Pesticide Program.

The certifier's job in this process is to ensure that the organic system plan is being followed and that necessary precautions are in place (adequate buffers) in the future to prevent these events (Parker). The State's Pesticide Program housed in the Montana Department of

Agriculture (MDOA) investigates the event further to see if the applicator of the pesticide is at fault in any way and then issues enforcement to the applicator if needed (Kris). Enforcement might come in the form of a fine, issued training, or taking an applicator's license if necessary. Inspectors are sometimes the first call organic producers make before being directed to their certifier. Sometimes inspectors are the ones who find contamination during annual organic inspections. Still, their participation in this reporting process ends after noting it in their files and referring the organic producer to others who might help them further (Spencer and Avery). When asked if this process operates the way it is supposed to, all participants responded that they believe it does. One participant said that "the process is the investigation and appears to need no changes" (Parker). Another shared that they thought that this process was doing what it was supposed to do. The process ensures that the organic farmer is following their plan to maintain their organic label and that the plan is adequate and in some of these events maybe it shows that the plan needs to be reworked (Spencer). The policy representative shared that they think the process is operating the way it was meant to and that "Residue testing and the role of certifiers across the country is an extremely strong program" (Kerri). Certifiers work with organic operations to create organic system plans, enforce organic standards, and hold organic producers accountable to their plans. One inspector said that they think the process is working but are hardly involved after the initial detection and didn't feel that they could provide relevant information (Avery).

The question asked in these interviews was about the reporting process and whether or not it was working correctly. After these conversations and my research, it is clear that the process is working the way it was created to work. An organic producer calls their certifier and then can choose to open an investigation with the Pesticide Program. The Program investigates

and then an applicator either has to face enforcement (fines, training, etc.) or doesn't. There is no part of the contamination reporting process that assists organic farmers with their losses. The question might not be, is the process working but rather should the process change?

When asked this question, industry and regulatory officials had less definitive answers. One said, "I am sure there is always room for improvement in any system" (Parker). Two shared similar sentiments that there should be change, but they were unsure of what that would look like or where it would happen (Spencer and Avery). Two participants mentioned that any changes would need to occur at a much higher level of government, looking specifically at the highest policy level, the federal government, and EPA in charge of setting tolerances that perhaps no longer make sense in our current system (Dylan and Kerri).

The reporting process might be summed up in seven simple steps or a lengthier flow chart, but what matters is how farmers are reporting, if they are reporting, if they are not reporting, and how they are handling these events as a community.

Reporting Process Described by Producers

Industry and regulatory officials were able to present the reporting process clearly and easily. When asked to describe the process, the responses from industry and regulatory officials were almost identical. The same seven steps listed above were discussed by the seven industry and regulatory officials. When I asked organic producer participants questions about the reporting process the answers were not identical. Producers each had different experiences reporting their drift events and some even shared that they followed different reporting processes for each of their multiple drift events (Charlie). Their reporting process is illustrated in the second chart in Figure Three. Some producers knew who to call and started at their certifier (Devon) while others had to do more investigation as to where to get the process started (Mike).

Two producers reported that they didn't know that they had been contaminated until their buyer alerted them of it (Skyler and Jack). At that point, the crops had already been harvested and sold and the buyer made sure to pay the producers anyway. These two producers shared that they wouldn't even know where to begin with the reporting process because they were protected from it by their buyers and didn't really feel the effects of the contamination (Skyler and Jack). The figure below shows the eighteen contamination events, what kind of reporting took place for each event, and on-field outcomes.

Figure 4: Reporting Experiences for each Contamination Event

Contamination Event	Event Reporting	Outcomes
Direct Spray	No reporting of any kind	The buffer zone, zone did what it was supposed to and protected organic fields.
Isolated event	Certifier	Discussed contamination in Organic System Plan (OSP) with certifier. Lost possible markets for Kamut.
Soil contamination	Certifier	Acreage was in transition during the contamination event so the transition process just took longer.
Direct spray	Certifier→ State→ Pesticide Program	Confirmed drift, recertified land, and pursued compensation on their own.
Direct spray	Certifier	OSP changes and worked out a deal with the neighbor for adequate compensation.
Spray drift	Certifier	OSP changes decided with certifier. Crops were destroyed by contamination.
Isolated event	Certifier→ State→ Pesticide Program	Confirmed contamination and Kamut market loss.
Drift	Certifier→ State→ Pesticide Program	Confirmed contamination. Did not sell crops.
Drift	Certifier→ State→ Pesticide Program	Confirmed contamination. Decided not to grow vegetables again.
Drift (from study participant into neighbor fields)	Participant (who drifted) called their insurer	Participant and neighbor worked it out at the fence line with compensation
Direct spray	Certifier→ State→ Pesticide Program	Confirmed contamination, the applicator pilot was fined, and it was found that they broke the law. Pursued compensation on their own.

Drift	Certifier	Notified organic certifier but fixed it at the fence line and received compensation through this avenue.
Drift	Certifier	Notified organic certifier but fixed it at the fence line and received compensation through this avenue.
Drift	Certifier	Recertified field.
Drift	Certifier	Alerted certifier.
Soil contamination	No reporting of any kind	Changing growing practices from in the soil to raised beds.
Direct spray	Certifier→ State→ Pesticide Program	Confirmed drift. Applicator (County Weed District) received a fine. Did not pursue compensation.
Isolated event	Certifier	Called certifier, not enough contamination to recertify fields but lost Kamut market.

Figure 4: This table has each contamination event listed that was discussed in this study, the reporting process or steps the producer took, and the end results of that process. Drift refers to contamination through pesticides drifting in the air onto organic crops, a direct spray refers to a misapplication where the organic producers' crops were directly sprayed, soil contamination is contaminated soil, and an isolated event refers to contamination that took place in areas isolated from conventional fields possibly through contaminated rain.

Producers who participated in this study fall into two groups, those who reported contamination to the state using the regulated process described above (Figure Three) and those who decided to fix it at the fence line. Regardless of reporting contamination to the state or fixing it themselves, most farmers I talked with had to take the contaminated area out of organic certification and work to recertify it over the next three years. Between organic producers, there were some differences in how they chose to report, if they thought they needed to report, and how they had learned this information. Eighteen contamination events were discussed throughout the eleven farmer interviews. Of those events, all participants called their certifiers to let them know of the contamination or wrote it into their system plans so that their certifier could see the changes to their land in organic production. Producers who are certified through the State Organic Program notified the State of the contamination but did not always open an investigation.

Of the eighteen contamination events discussed in this study, only six were reported to the State Organic Program and the Pesticide Program. That means just six of the eighteen events were officially investigated by the Pesticide Program to either confirm or deny contamination. Producers made this choice to either report to the Pesticide Program or not for many different reasons. Twelve contamination events discussed in this study were not reported to the State Organic program and Pesticide program. For those twelve contamination events, producers opted to fix it at the fence line or just moved on from the event.

Fixing it at the Fence line

The producers who make up the twelve contamination events that were not reported to the Pesticide Program in the Montana Department of Agriculture for further investigation discussed several reasons for their actions. Some had experienced contamination in their buffer zones and didn't lose enough of their crops to render an investigation worthwhile, in their minds (Sammy and Hunter). Others chose not to initiate an investigation because the contamination was an isolated incident, and they knew that they would not receive the answers they were looking for (Matt and Jack). For these isolated incidents both of which were soil contamination cases, both producers did not report their contamination to the state. One such producer knew where the contamination was from and was still working to certify their land.

When asked if they reported the event to the state, farmers who didn't often said things like "we chose not to make a big deal of it" (Sammy), "there was no reason to report it because we took care of it" (Charlie), "we just worked it out quietly between us" (Hunter), "it's discouraging, but you don't dwell on it" (Jack) and "I can have the Department of Agriculture come out…or we could just do this the easy way, and I figure my losses and give you an invoice" (Charlie). Farmers, like Charlie, Sammy, Hunter, and Skyler who chose to handle it

themselves had witnessed the event, had visible damage in the field or felt they had not lost enough to continue beyond their certifier without the Pesticide Programs' involvement.

Organic Producers Experiences with the State Pesticide Program

For organic producers who did decide to notify the Pesticide Program, most of their experiences were similar. They went through the regulated process involving sampling and testing. They waited for a confirmation of drift or contamination with hopes of figuring out what chemical ended up on their fields and where it came from. Mike, Frankie, and Charlie all reported to the state to have the necessary data and information available in the event they chose to pursue compensation. By having the data to prove drift, Mike and Charlie were able to work through agreements with applicators and neighbors to receive compensation. Compensation either came through the conventional producer's insurance or their wallet depending on the severity of the event. The amount of compensation was worked out by the organic producer for the losses to their crop and the next three years of not selling crops from that field at organic prices. Matt, Jack, and Devon all chose to report contamination to the State Organic Program and the Pesticide Program involved to learn about the chemical they had been contaminated with and make informed decisions for their land and business in their organic system plan.

While a couple of participants shared that they called their certifier because they thought they should for their certification process, one participant talked about it as their duty, which legally it is. Mike said, "A couple [conventional] neighbors asked if I reported it, and I said yeah, that's my responsibility…I'm doing what I'm obligated to do [as an organic producer]." Mike was the only producer in the study who brought up that they are obligated to report. I am not sure if they were the only one because other participants do not know about the obligation or if they assumed I knew and felt no need to tell me. Perhaps if it was clearer to producers that they had to report

all off-farm contamination, more producers would feel more comfortable taking their drift and contamination to the State Organic Program for additional assistance.

Most producers who I interviewed experience contamination one or two times throughout their careers, so their knowledge of how this process is supposed to work is limited (Avery). They often depend on the guidance of their certifiers and investigators to help them through this process, or they have resources available that enable them to manage the contamination event themselves. While most participants shared that they felt the process happened professionally and efficiently, there was one incident that stood out from the rest. Frankie thought they would only have to contact the state about pesticide contamination once in their career as a farmer. They went through sampling and testing to have a confirmed drift event from the Pesticide Program but decided not to pursue any further actions due to cost, time, and personal reasons. The following year they experienced drift again but, having been frustrated and a little disappointed with the reporting process, decided to test their samples independently, "We didn't like the process the first time around, so we decided to call our neighbors ourselves, get independent tests from an independent lab…we also contact the Organic Program at MDOA saying we have been drifted." Due to the high costs of tests, the producer ended up in the same place as last year, not being able to sell their crops and with no compensation. Two years, two drift events, and no compensation for the loss of crops and future growth.

The even more interesting part of this story comes from a conversation this producer had with an inspector on their farm. After the second drift event, an organic inspector was at the farm, and the producer shared that they had been drifted a second time and chatted briefly about the testing on their farm. After explaining what happened to the inspector, "The inspector said, 'that's not how you test for pesticides', and she got on the phone and started really getting after

and explaining that was not the way to do testing." After the call from their inspector, the Pesticide Program ended up coming out again trying to recover the damage that they had done by testing incorrectly (Frankie). Testing was done again; however, the sampling looked different this time around then the sampling done the previous year. The producer described that the pattern and organization of collecting samples from the field were different the second time and that the Program seemed to take more samples. Frankie was left in the same position. "Ultimately, it didn't matter anyway, because we ended up in the same place being drifted by a couple of chemicals. Nobody's going to do anything unless we sue them…just didn't seem worth pursuing" (Frankie). This producer is no longer growing food on their land due to the frequency of drift events.

Farmers who decided to fix it at the fence line talked about working things out quietly, on their own, and not making a big deal out of these events. In contrast, the sentiments of organic farmers who chose to report incidents to the state talked about how long the process was and that it was a lot of time and energy to report. Producers who did report it to the state and start an investigation were often wrapped up in the event longer. Some producers were able to find out what chemical contaminated their crops but not all of them received the compensation they were looking for from reporting and investigation. Participants shared that they were often unaware or frustrated with the results of the process. One producer who experienced a contamination event before Google became our society's go-to for figuring things out said

> We just had to figure it out. Just to have someone do it, would help with a paper or someone to dial in (for help). We couldn't see the steps, what we needed to do, or where. It [contamination events] was kept quiet because anybody else who got sprayed was paid off (Mike).

Jess shared, "we haven't really known what to do…for us it has been hard to know how to move forward." Another couple of producers, who did report contamination to the state Organic

Program, just called their certifier and then were directed to the Pesticide Program and the state. Participants Mike and Charlie didn't know what they were getting into when they were directed to the state Organic Program after speaking with their certifiers. The events after one call stunned Charlie,

> When they come out, they say we can do so and so. But the rest is up to you. I did not know that. I had no idea that I had to pursue my own losses, and that came as a news flash to me. Like woah, woah, so that's why I wrote everything down because I had no idea I was in no man's land, no one could guide me.

It is clear that even if producers know how the reporting process works and complete the necessary steps the results are not always useful. Organic producers have little support going through the reporting process and at the end of the investigation are left with no compensation for contamination in their fields, which is the biggest concern for producers.

OUTCOMES

I have touched on some outcomes that organic producers in this study have faced due to pesticide drift and inadvertent contamination. The outcomes participants in this study discussed range from crop loss to community loss and from receiving compensation to no longer farming organically. There is a spectrum for how these events turn out, ranging from mild to operation ending. Outcomes can also be found in Figure Four above.

Certification loss

Ten participants had to recertify their land, one did not due to low levels of contamination. Those that did have to recertify had to sell crops from that land at conventional prices in conventional markets or leave the land in cover crop until the 36 months had passed needed to recertify. Participants in this study were told to recertify their land by their certifiers and per Organic Standards. Some participants in this study had low enough levels of

contamination in their fields that they didn't have to take the land out of organic production but chose to anyway. They choose to recertify because they felt that any amount of contamination was too much to call their food organic. Recertification takes 36 months causing producers to lose out on three years of income at organic crop premiums. Certification also costs money so producers will have to pay to recertify their land after 36 months.

Financial Loss

Producers lost crops due to contamination. Three participants reported finding their crops dead in the field. Others lost the ability to sell contaminated crops organically and sold them conventionally. Some producers grow Kamut, a trademarked ancient grain that does not have a conventional market, they couldn't sell their crop (Matt and Hunter). Additionally, participants who grow Kamut lost their markets in Europe due to contamination. Europe has stricter standards for residue on organic food than the United States does. Four participants explained that they can no longer grow Kamut because residue levels were consistently too high on grain from their fields bound for European markets. Those participants took the loss, were still paid through their contracts and the company took the loss, or invested in better holding bins to keep the grain fresh while waiting to mix it with cleaner grain in hopes of lowering the level of pesticide residue to acceptable levels. Skyler said, "Ours was the same story on every farm in Central Montana, all the way to Canada…Can't grow Kamut around here anymore."

All eleven participants discussed the loss of money due to contamination because testing, loosing crops, and possible sales is expensive. Participants reported losing anywhere from $2,000 to $40,000 in crops, sales, and testing. One participant lost $30,000 in organic wheat because of high residue levels. They were able find a conventional buyer but did not get the prices they hoped for especially given the time and effort to create "a healthier product focusing

on soil health and cover crops" (Jack). Although this did not come up among participants in this research, other producers might spend even more time and money hiring a lawyer to sue their neighbor if they choose to pursue a route to compensation. Participants in this study did not choose to sue due to high cost and drawn-out processes, Charlie said, "No I didn't [hire a lawyer] because you're talking 4,000 dollars. It doesn't make any sense."

Time

Producers also talked about the time that they put into these events. Figuring out who to call, how to start the reporting process, and then staying involved to ensure that it happens fairly and with a beneficial outcome is valuable time away from the fields. Hunter shared that you also have to think about the time in the fields dealing with the contaminated crop. This producer explained that figuring out how to handle contaminated crops brings up all sorts of questions like, Do you harvest it? Do you cut it down? Can you find a conventional market to sell to? Do you have the time and money to do all that yourself or pay someone to? Time and capital are at stake for all of the producers that I talked with for this research, but other consequences came up that I was not expecting. Charlie, who received compensation at the fence line, wrote the time he spent walking through his fields and researching the reporting process into the final invoice they gave to their neighbor in order to be compensated for all the effects of contamination. Mike talked at length about the time their family put into trying to find a lawyer who would even talk to them about this event before deciding to handle it on their own. Organic producers are busy people, and these events add something else to handle on their daily to-do lists.

Emotional Outcomes

During the interview with participants, I specifically asked about any outcomes or consequences that happen to their operations, or their lives, because of contamination events. I

expected to hear the producers share their crop loss, financial loss, and certification loss, but I did not expect to listen to these events' emotional and lasting impacts. Jess, who faced soil contamination and spent thousands of dollars over two growing seasons with no products to show for it, shared the emotional consequences contamination left. They said, "last year we kind of stopped taking care of our farm…we had a moment of total agonizing, for lack of a better word, fuck this, you know" (Jess). They continued, "we dumped every bit of our extra time and money and soul into this, and it kind of just feels so demoralizing to get this close…and then feel like we've already failed." While this young producer has invested money, changed their system, and is continuing to try to grow, it almost caused them to stop farming. They had felt like they were no longer a productive producer. Jess said that "at times it feels like it's becoming more of a hobby rather than an actual lucrative business…I don't feel like we are excessively privileged in the sense of having an abundance of money to do that…We need to make a profit". Another producer was not as lucky. After their incident, they said, "We are no longer farming. And I would say in large part because of these [events]…In 2019, that third year [after two drifted years], we just didn't feel it was worth the risk." Other participants also shared emotional responses, such as feeling isolated, confused, unsure of how to move forward, and not wanting to share that they were contaminated very publicly (Sammy, Jess, and Frankie). They were also all conscious of keeping the identities of other involved parties out of the conversations in this study.

Pesticide drift and inadvertent contamination are changing the way producers think about their systems and the way organic producers look to make money. One event could take a whole operation out for a season, three seasons, or forever. Not to mention the hurt pride and sour taste often left in the mouths of organic producers operating in a system that seems to favor the

conventional grower. Mike shared that "You can't tell nobody" and Matt said that "They're [other organic producers] afraid of failure and afraid of what their neighbors might say." Jess talked about feeling like a failure and "very alone through this and it didn't feel like it was urgent to anyone else." It is easier to see the damage in crop numbers and lower sales, but the damage done below the surface are even more impactful and not as apparent to other producers or consumers.

MITIGATIONS

Producers and industry and regulatory officials who participated in this research have similar thoughts for on-farm mitigation strategies before and after drift or contamination occurs. One producer said organic farmers must "minimize the potential for conflict" (Sammy) when asked about how to prevent contamination events. This is overlap of responses is most likely because there are only a few mitigations that can be done by the organic producer short of convincing neighbors to stop spraying pesticides and adopt stricter policies around pesticide use.

Communication

When asked, both to producers and officials, the first and most suggested mitigation strategy was to have early, often, and open communication with surrounding neighbors. Regardless of what organic producers choose to communicate, it is crucial that they at least let their neighbors know they grow organically, without synthetic pesticides, and to have a conversation about field edges and buffer zones to limit possible mistakes while spraying. Below are a few key communication suggestions from organic producers and industry and regulatory officials. These suggestions came about from questions such as "when and what do you communicate to your conventional neighbor's," "what do you communicate during

contamination events," and how do you communicate after these events" that came up during interviews.

- *All participants*: Share with your neighbors that you are an organic producer and the effects that contamination might have on organic certification
- *Sammy, Matt and Frankie*: Work to create open communication about pesticide application so that the organic producer is aware when pesticides are being applied and can be present during application if they are available
- *Avery:* Offer to walk field edges together to show buffer zones
- *Devon:* Keep open communication during a contamination event to allow for proper information to flow between producers
- *All participants:* communicate losses and certification effects to neighbor if necessary
- *All participants:* Communicate ways to mitigate and prevent contamination and any changes to buffer zones

Communication seems like straightforward mitigation in terms of the severity of most of these events, but it is often the only thing that can keep organic fields free of chemicals. Open and early communication ensures that there is already a working relationship to lean on if a contamination event were to happen to handle the issue in the best way possible for the organic farmer and the community. Devon pointed out, "We all had challenges as a farming community…we worked together…they [conventional neighbors] felt safe there with us" (Devon). Skyler shared that their communication has been about drift but also about the ecosystem impacts they fear because of drift. They said, "I've been proactive to communicate why pollinators are important and how drift is not good for any invertebrates…I guess I have called farmers to find out when and what they are spraying…I've called neighbors more and more to say be careful…It's a community effort" (Skyler).

Communication came up frequently but in many ways. The figure below shows commonly discussed types of communication that organic producers shared in this study. It also shows the frequency at which these types of communication came up.

Figure 5: Communication, the most commonly discussed mitigation practice and the frequency and type of communication

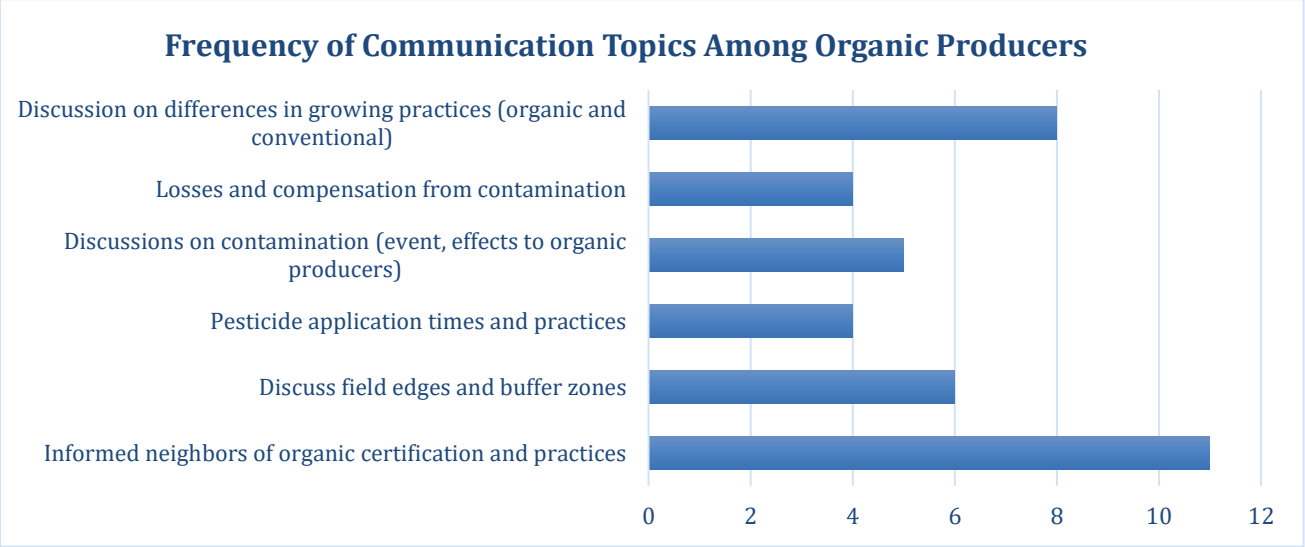


Figure 5: Communication was discussed as the best mitigation tool for contamination events. Organic producers shared various ways that they communicate before, during, and after these events. This table shows the frequency of the most common ways producers in this study are communicating about contamination.

Buffer Zones

After communication, buffer zones came up as the most frequently discussed mitigation strategy to avoid or limit contamination. All producers and industry and regulatory officials brought up the importance of adequate buffer zones as an important mitigation strategy behind communication. Buffer zones were also something that participants discussed communicating about. Organic producers must have "adequate" buffer zones on their field edges (National Organic Program). This is a regulation that organic producers must follow to be certified organic. Buffers are written into the organic system plan and checked yearly or after a contamination event to ensure that they are adequate. The organic producer determines the adequacy of buffers, and some choose to cut into their growing space to have larger buffers, while others keep them minimal to grow more cash crops. One producer discussed 20-40 feet of buffers, while another discussed their five-foot buffers (Mike and Charlie). Buffers zones are often trees, shrubs, or

crops that will not be sold but instead grown for protection. If a contamination event happens, these edges take the brunt of the contamination rather than the crops intended for the market. Sammy shared that it is crucial to choose suitable buffers for your environment as well as protection needs, “So in our place you know we’re not going to go plant a bunch of trees and shrubs that don’t necessarily grow here but you should think about your field layout and what’s across the fence” (Sammy). All producers and industry and regulatory officials commented on the need for buffers partly because they are mandatory and partly because they are one of the only on-field protection strategies that an organic producer has.

The need to have buffers is clear, but buffers' adequacy varied for each producer in the way they chose to use the buffer as protection. For the most part, organic producers I talked with had buffer zones 15 feet wide or larger made up of plants and crops that were planted for protection, not for sale. This is especially true when considering that their conventional counterparts are not required to have buffer zones, and conventional producers grow (and spray) sellable crops right up to the property line. Mike shared that they have always kept their buffers at 20 feet so that if they see infringement at 20 feet, they can ‘confront’ the neighbor and try to stop it before it goes any further. One participant shared that “you have to be proactive with your buffers, and maybe, you know, it needs a wider strip or think of the winds.” Buffers are mandatory for organic producers, but they also are something that most organic producers in this study would choose to have as a form of protection regardless of organic regulations. However, not every producer I talked to felt that buffers were the perfect solution. One participant said that drift sometimes goes up and over buffers, rendering them useless. Another shared that while they believe buffers are helpful, they provide too much leeway for their neighbor to drift them again,

> Actually, I am thinking of minimizing the buffer…Down where the last spray happened, the neighbor talked about a 20-foot, on each side, but that’s not going

> to happen, ‘cause you can do it on your side of the fence. It's fine…but I might only have 3 feet cause if I have 20, I give them a free pass to drift (Charlie).

Small buffers to create more protection is an interesting thought that only this participant brought up. But I think it is a valuable part of this discussion. As producers increase their buffer size, there is the potential to allow more leeway to applicators. In some ways, large buffers permit conventional growers to be less precise allowing (and assuming) room for applicator error. But buffers are mandatory, and it is up to the producer to know their land, weather, and neighbors to decide what works best for their operation.

Additional Mitigation Techniques

One producer and one regulatory official brought up DriftWatch. One producer is already using this software, but no other participants brought up this relatively new resource. DriftWatch is a “voluntary communication tool that enables crop producers, beekeepers, and pesticide applicators to work together to protect specialty crops and apiaries through a mapping program” (DriftWatch 2022). This interface was created to manage and limit drift events and effectively promote awareness and stewardship of the land. The online map shows applicators the boundaries of registered specialty crops to evaluate this information before they spray. This could be a very effective tool in Montana, but only if organic producers register their specialty crops and if applicators also register on the device and check it before spraying. In the future, it would be interesting to see what would happen if DriftWatch became more frequently used in Montana.

Post-event mitigations include finding additional ways to sell products, even if that meant selling at conventional prices, and investing in better storage facilities for their crops if they needed to hold grain longer to mix with cleaner grain in the future. Retroactive mitigations are limited, especially in an environment that continues to be predominated by conventional

producers and the liberal application of agrochemicals. One producer summed it up by saying, "In a way it feels like there's not much that can be done" (Frankie).

RURAL RELATIONSHIPS

As I interviewed participants, producers, and industry and regulatory officials, it became clear that rural relationships and community ties were a significant component of these events. Community bonds run deep in some places. For some neighborly relationships were important because the bonds organic producers had in their community helped the compensation processes go smoothly. Others expressed concerns of being scorned in their community for following organic regulations. Terms like "neighborly spraying," "being a good neighbor," and "it's the neighborly thing to do" were common to hear in my interviews, even if their drift or contamination event had caused brief tension in the community. In the end, it was clear that these organic producers are not looking to cast themselves outside of their communities by making a fuss but rather they want to be part of the community that they live in while still growing in a way that aligns with their values. In Montana, neighbors are sometimes the only other people a farmer has around during bad weather or when farm issues occur. Devon said, "that's a rural community…because everybody has a shared ethic about that…it was really beautiful." Another shared, "We have been fortunate to have four generations of very good neighbors. We are good neighbors to them, and they are good neighbors to us… [When drift occurs] we shake hands and continue being good neighbors" (Hunter).

While most producers reported strong relationships with others in their communities, some shared challenges spurred by drift or contamination. Mike had an especially difficult time in their community after reporting a drift event. They said that there was excess tension between a neighbor, that the tension spread to other areas of the community, and that they had to put up

with “their abuse” (Mike). This producer said that a different neighbor had said to them, “He flat out told me, nothing against you, but you ruined the community when you started organic farming” (Mike). Skyler shared that “If I wouldn’t have grown up here and I moved into this community, yes [there would tension].” Another said, “It’s already bad enough just to be an organic farmer [without pesticide contamination]” (Matt). A couple of participants talked about the cultural differences between organic and conventional producers, referring to their decisions to grow with or without chemicals, which can cause tension in communities. Others didn’t report any negative experiences with their neighbors but shared how isolating the contamination experience was when their neighbors and community members appeared numb to the situation. Neighbors and community members didn’t make matters worse, but they also didn’t help to alleviate stress and concerns caused by contamination events. Jess shared, “There wasn’t empathy, there wasn’t compassion, there wasn’t a lending hand,” and producer Frankie shared that it felt as if the state was talking down to them and trying to dimmish the producer's concerns making their neighbor who drifted them feel in the right. But in cases where the organic producer didn’t feel heard or understood by their community or even the state, the organic producer often moved on from those feelings as quickly as possible since they planned to stay in the community for a long time.

As a researcher, through these events, I was hearing the organic producers' perspectives and the views of those who work in organics and with organic producers. From the perspective of the participants in this study, much of the onus for prevention, protection, reporting, and mitigation falls on the organic farmer. The organic producer must be vigilant, report the issue, contact their neighbor or the applicator, and even maintain healthy relationships with their neighbor and the community they live in while dealing with operational losses. Two parties are

involved in these events, but according to the producers I spoke with, it feels more like a one-way street.

RESPONSIBILITY

Conventional Producer or Applicator Responsibility

When considering pesticide contamination and drift, the question of who should be held responsible comes to mind. Producers are thinking about this issue of responsibility as well but in various ways. For some, responsibility is a clear-cut issue. For Devon, "It's a trespass issue," and the person who trespassed should be held responsible. A couple of participants echoed this sentiment: the person who drifted or caused the contamination should be held liable, but that didn't necessarily mean they all thought that the responsible party should also be the one to pay. For many, they talked about how insurance needs to kick in with more insurance options for organic farmers to cover these events on their own and even allocated money from the government to assist in organic producers' recovery (Frankie, Charlie, and Jess). But where would that money come from, one producer pointed out? They said that a pot of money to help organic producers would only exist if organic producers were the ones who paid into it because other producers wouldn't be interested in that sort of thing (Devon). Skyler shared that for producers who had been directly sprayed "especially the smaller vegetable farms that their whole operations basically shot, it would be nice to have something [policy] in place [to support or compensate those farmers]…It would be nice to have some protections in place." Others felt they wanted less government involvement, which left them at a loss for other ways to hold the responsible party accountable (Hunter and Jack).

Corporate Responsibility

For others, it is not such a cut and dry answer. It wasn't the person who trespassed to be held accountable but actually the corporations who made the product. Others see the responsibility being further up the food system,

> It's the [chemical] companies' fault for making a defective product, and the farmer I do not believe should be held accountable for defective products that are produced by chemical companies who have their own fancy lawyers to ensure they're not liable. That's how they escape lawsuits and still perpetrate their pollution on the rest of us and the environment…It's terrifying (Matt).

This same participant compared synthetic pesticides to a manufacturer with a defective car. They explained that a defective car would be pulled off the market immediately, but chemicals aren't treated in the same way in this country, where more power concentrates in the hands of the chemical companies. While the blame rests on chemical companies' shoulders for pushing these chemicals into the food system and encouraging increased spraying, how do organic producers in Montana ensure the blame goes to them? Two producers and a couple of industry and regulatory officials felt that it was a far-off dream to have chemical companies assume responsibility for these events and those large-scale policies would have to change for that to be a reality. The EPA would have to set stricter tolerances for synthetic pesticides and the federal government would have to limit or ban especially toxic pesticides and chemicals. Jess who thinks that the states need to have more accountability, also touched on chemical companies' responsibility,

> Yeah, but who will hold them accountable? I mean, lobbying groups for chemical companies are so overly funded; there are so many politics deeply in sync and aligned with big agriculture companies…It's like David and Goliath. How are we supposed to fight Goliath?

Another producer was unsure if the changes would happen at the highest level to make a difference and that change may need to start more locally to have a more significant impact. Sammy shared that chemical companies have conventional growers so addicted to what they sell that it would be hard to sway other producers to limit their pesticide use or go against agrochemical corporations, let alone change the big corporations selling or production models.

The question of responsibility is complicated, with producers having different ideas on where the burden should fall. However, they agree that the burden of responsibility cannot just fall on to organic producers. It's clear that changes are wanted from most organic producers in this study, but the question remains how and at what level? Half the producers think that the answer is with policy change and the other half think that there is already too much government oversite in agriculture. Robbie, Jess, and Mike think that a pot of money should be set aside to alleviate the effects of these events while Devon and Hunter wonder where that money would even come from.

ENVIRONMENTAL AND HEALTH CONCERNS

Systemic Pesticides

On top of navigating the reporting processes and facing a wide range of outcomes from pesticide drift and inadvertent contamination, these events bring up other problems for organic producers. Many producers I spoke with noted concerns of continued environmental degradation due to the lingering and systemic presence of pesticides. One producer exclaimed with their hands waving after discussing contamination from glyphosate in the middle of their fields, “It’s in the freaking environment. It’s in the rainwater; glyphosate is in the rainwater!” (Sammy). Another said, “I could really lose a lot of sleep if I start thinking about groundwater or rainwater…The chemicals start seeping around in there…nobody is safe” (Mike). Matt shared definitively that they have found glyphosate in the rain where they live, and due to that, they have lost international markets for certain crops because residue levels are consistently too high. This producer has even set up an experiment to see how many producers in their area are also finding glyphosate in the rain. Another producer said they haven’t experienced glyphosate or other chemicals coming down in the rain themselves, but they have heard about it affecting other

producers and said that there's "stuff coming down in the rainwater that no one wants to talk about" (Mike). The same producer talked about the lasting effects they see in their fields from DDT and wondered how they were supposed to deal with that, let alone chemicals falling out of the sky. Robbie said that "It's definitely a concern…you have to worry about your crops getting rejected over something you have no control over. Rain should be clean and clear for everyone, ya know?" This statement is powerful and is something that I have sat with since hearing it.

The observations that producers have made about synthetic pesticides lingering in the environment and rain are supported by research and experiments from the United States Geological Survey. The USGS has confirmed that the most common pesticides are in the rainwater (Vogel, Majewski, and Capel 2008). A study on just Glyphosate alone found that Glyphosate was more mobile than originally thought and could be found in the rain, soil, and groundwater in agricultural areas across the country (Battaglin et. Al. 2014). This evidence supports what organic producers know and observe on their farms in Montana. Rain should be clean and clear for everyone, and everyone should have the choice to have food grown in a clean and clear way, and both producers and consumers want that. Pesticide contamination is taking that opportunity away.

One producer mentioned that this is all about our food systems and our collective food security. They commented on the continued contamination from pesticides in the environment that put many people's food security at risk (Jess). If there is a world so polluted that there can no longer be food free of pesticides or grown without the support of chemicals, then food security is at risk. This producer continued sharing that everyone should be concerned about this extreme contamination and that they haven't seen as much uproar on this topic as they feel they should be seeing. Devon was most concerned about Genetically modified organisms (GMO) contaminating

the environment, saying, “What we cannot change is the genetic material in the environment that, then, is a contaminant for all time. And that is my concern in addition to pesticides that I am really worried about.” This concern came as a surprise to me. I had heard the concerns about growing GMOs and a lack of diversity, but I had not yet heard about contamination from GMOs and how long they can stay in the environment. Like GMO contamination, the concerns these organic producers have are not always on the minds of consumers and other food system participants.

Health Concerns

Synthetic pesticides contain harmful active ingredients. When synthetic pesticides are handled incorrectly or used frequently, both the person handling the pesticide and those in the area at the time of use might experience headaches, eye irritations, and long-term illnesses. Drift and inadvertent contamination expose organic producers, their crops, and their consumers, to the harms of pesticides. Concerns about health did come up in my interviews talking to organic producers but not as frequently as I had thought it was. Robbie discussed being nervous about their neighbors who use pesticides frequently after his own experience with chemical pneumonia prompted him to transition to organic agriculture. Growing organically has allowed Robbie to get away from chemicals most of the harmful chemicals they used when growing conventionally. Pesticide drift and inadvertent contamination in their area make it impossible to get away from all the chemicals. Robbie said

> Not a lot of farmers even follow the safety protocol…I think guys have the same attitude going into glyphosate or into paraquat and it’s a little spooky to see farmers mixing without gloves and masked…I mean that was part of the reason I got sick and kind of moved on [from conventional agriculture to organic agriculture].

They also pointed out that “You can smell when they are spraying and if you can smell it then its wafting over you…you can really taste it” (Robbie). Another producer talked about how they

transitioned to ensure that they were not feeding produce with chemicals to their consumers and that drift took that option away. They did not feel comfortable eating the food themselves and for that reason did not sell it (Frankie). Frankie shared "Well we're not willing to eat this, then we're not going to sell it if we aren't willing to eat it". Other producers, Jess, shared similar sentiments that if they didn't feel comfortable eating the food grown on their own land then they couldn't sell it to others. Skyler also talked about health effects but as a reason for conventional producers to apply pesticides carefully. They said that in their community applicators and conventional producers are careful to spray "Not because of the organic [fields next to theirs] but because they don't wanna kill the neighbors" (Skyler). Matt did bring up health effects and the importance of knowing about them by saying, "Has anyone thought about the connection of these chemicals and health? The health effects are the Achilles heel…The chemicals are causing cancer and chronic diseases."

It is interesting to me that only a few participants brought up health concerns from pesticide drift and inadvertent contamination. I had assumed that they would be concerned for their own health as pesticides drift from their neighbor's fields into their own. Synthetic pesticides can be incredibly harmful to producers' and farm workers' health. In my mind, I had thought that producers would be concerned for their health considering that pesticide drift and inadvertent contamination puts them at direct risk of health effects that they were avoiding by growing organic. The five that discussed health consequences mostly focused on their consumers' health, not their own except for Mike who did bring up concerns for their own health. I think that this shows how dedicated organic producers are, in this study, to the organic label and the effort producers this study put into ensuring that their food is as organically grown as possible.

While this research focuses specifically on the events and perceptions around pesticide contamination and drift, it is evident that more research must be conducted to learn more about the various concerns that are adjacent to contamination. Additional research should include producers' thoughts on organic fraud and pesticide drift, conventional producers' thoughts on pesticide drift and contamination in organic production, and consumer's perceptions of these events.

Chapter Five: To Market

Conclusion

INTRODUCTION

Pesticide drift and inadvertent contamination events are complex, wicked problems with no clear or simple solution. While I did not explicitly ask organic producers and industry and regulatory officials how to solve pesticide drift and contamination, I asked questions regarding policy changes, recommendations, as well as mitigation. Organic producers interviewed in this study made it clear that producers of all kinds can make the choices that they feel best suit their operation. For some producers, growing with chemicals is the best plan for their business, and organic producers in this study understand the circumstances that make chemical agriculture ubiquitous in the current, industrial system. Organic producers' thoughts and recommendations focused less on drastically altering the dominant chemical system. Instead, their thoughts and recommendations focused on working towards a system where producers of all kinds can successfully grow how and what they choose. Of course, the most obvious solution to pesticide drift problems to me as a non-producer researcher, would be to abate the ubiquitous use of chemicals in agriculture. However, in a country with such economic and political power embedded in agrochemical companies, a food system free of chemicals feels more like a dream than an answer.

While systemic change might not result in the banning of pesticides from the food system, there are some recommendations rooted in the data from this research that I believe can protect Montana organic producers from drift and contamination and offer augmented support when it occurs. In addition to policy and education recommendations, I will also discuss important topics about Montana's organic community and offer future research ideas.

RESEARCH QUESTIONS

To write this thesis, I asked guiding questions that informed my research. These guiding questions I hoped to answer during the course of conducting this research. The questions that I set out to answer at the beginning of this thesis are:

1. *What are organic producers' perceptions and experiences of inadvertent synthetic pesticide contamination in Montana?*
2. *To what extent is synthetic pesticide drift a problem among Montana organic producers?*
3. *What actions are organic producers taking to mitigate risks from inadvertent contamination?*
4. *What policy, regulatory, outreach, and research needs do these producers suggest?*

The research suggests that organic producers in Montana are experiencing pesticide drift and inadvertent contamination and that, in most cases included in this research, these experiences come with unfortunate outcomes such as lost markets, destroyed crops, and tensions in their communities. This study also suggests that producers' perceptions of these events are that they are mostly accidents caused by pesticide application that could be more precise than it currently is in Montana. While the perceptions of producers in this study suggest that pesticide drift and inadvertent contamination are accidents, producers also talked about their concern for organic agriculture in an increasingly chemical world. After speaking with eleven producers and hearing about eighteen contamination events, the data suggests that drift and inadvertent contamination pose real problems for organic producers. After learning about these events and on-farm outcomes, I would argue that even the occurrence of one or two events per producer during their careers should be considered a problem. Interviews with participants in this study highlighted the

very important role that regulation and policy have in contamination events and the role that both could play in mitigating and preventing contamination. Further in-depth answers to my guiding research questions can be seen throughout the recommendation section of this chapter.

EMERGENT CONCLUSIONS

Rural Relationships

Organic producers and industry and regulatory officials both discussed the impact of pesticide drift and inadvertent contamination on rural communities. Pesticide drift and inadvertent contamination can affect the broader community beyond the farm gate. Producers acknowledge that these events can become public; a whole town might be aware of a particular drift event's details. In the wake of a contamination event, organic producers' choices can often have ripple effects in their communities, with lasting effects on their relationships.

Organic producers shared their experiences of tense moments with neighbors (Charlie), uncomfortable calls about contamination (Frankie), and public disdain for choosing to report the incident to the state, which is mandatory for organic producers (Mike). Others shared sentiments of "being a good neighbor" (Sammy), and that handling the outcome of the contamination across the fence line was the "neighborly thing to do" (Roy). Industry and regulatory officials also brought up the term "neighborly" and "being a good neighbor" more often than I expected. Kris shared that from their position in the Pesticide Program that everyone is "just trying to be a good neighbor" when talking about how drift and inadvertent contamination are just unfortunate, even inevitable, accidents. Two inspectors shared that organic producers are sometimes the only organic producers in their community, sometimes separating them from their conventional neighbors. A public or very damaging drift or inadvertent contamination event can sometime isolate organic producers even further from their communities (Spencer and Avery). When

producers shared about wanting to being a good neighbor and the emotional experience of being scorned by their neighbors, it became clear to me that in rural communities, being a neighbor – especially a good one – is required and valued.

As I heard more and more about organic producers trying to be good neighbors or relying on their neighbors to practice "neighborly spraying," the comments about community tensions between neighbors became unsettling. I am not from Montana, but from the two years I have spent here and from my time talking with producers and officials, it's evident that people in rural communities rely on each other. In some of the places where participants live, your neighbor might be the person that plows your driveway, your mechanic, your state representative, or an extra pair of hands for big farm tasks. The relationships built through generations of the same families living on the same land across Montana are testament to the years of hard work these families have spent on the land alongside one other. Organic and conventional producers alike have no interest in being the farmer who severs those longstanding relationships. Pesticide drift and inadvertent contamination have the potential to end or strain relationships that have been cultivated for generations.

While it may be upsetting to think about pesticides disrupting rural relationships, this idea challenges one of the most talked-about mitigation techniques from organic producers and industry and regulatory officials. Both groups of participants pointed to early and often communication as a means of mitigation and even prevention of pesticide drift and inadvertent contamination. Early and often contact with neighbors stands in direct opposition to the stories shared by producers about severed relationships with community members. If contamination events are destroying rural relationships, then using communication as a mitigation strategy could become less of an option for organic producers. Organic producers need to talk to their

conventional neighbors about the effects contamination could have on their operation while also navigating the possible social tension of being an organic producer in a region of primarily conventional agriculture. After a contamination event, the organic producer still needs to be on good terms with their neighbor to contact them regarding the outcome of the event and to try to limit future contamination. The need for organic and conventional neighbors to communicate is crucial but challenging when these same events that require contamination create the risk of tarnishing relationships and communication avenues.

Organic Fraud and Market Concerns

In November of 2021, *The New Yorker* published a piece titled "The Great Organic-Food Fraud." The subtitle reads, "There's no way to confirm that a crop was grown organically. Randy Constant exploited our trust in the labels and made a fortune" (Parker 2021). This article generated backlash through the organic community of producers, certifiers, and inspectors who have dedicated their careers to organic agriculture. The article exposes and condemns Randy Constant, who grew conventional corn and soy but was able to pass it off as organic. While Ian Parker, the author, does a compelling and necessary job of writing about the fraud Randy was able to pull off, Parker also alludes to solutions that have far-reaching impacts. Parker tells the facts about Randy's ploy and the harsh realities of the corrupt actions he took. The piece's message, however, left the Montana Organic Association members with a sour taste.

Parker suggests that "The real difference, then, between a ton of organic soybeans and a ton of conventional soybeans is the story you can tell about them" (Parker 2021). The fraud committed by Randy Constant is upsetting. It resulted in Randy's death, prison sentences for others involved with Randy, and consumer distrust of organic producers who have followed organic standards to a tee. Parker's telling of this story is accurate but does not educate the public

about the work that other organic producers who do not commit fraud do to ensure that their product is organic. Nor does Parker inspire confidence in organic agriculture, which does have its faults. Parker mentions contamination, infrequent testing, paperwork, cost of the certification, and set pesticide residue tolerance level for crops grown in communities where chemicals are pervasive (2021). These faults are valid criticisms of the organic certification process and label. Industry and regulatory officials, agricultural action groups, and Producers across the country are concerned about these same faults and working to eliminate them. Regardless of the faults, and the continued work to eliminate them, there are still thousands of certified organic producers growing crops without chemicals and following certification regulations to a tee.

In response to the article, the Montana Organic Associate sent a letter to the editors of *The New Yorker* regarding this article. Becky Weed, the author of the letter, addressed concerns about how this article would affect organic producers across the country. In the letter, Weed called this piece an "out of date exposé" that did not acknowledge "the dedicated organic farmers who can help navigate the complex dialogues underway in the organic community and beyond… Where farmers are carving out pathways toward solutions" (2021). Weed also discussed that many of the regulations and standards that Randy could manipulate to commit fraud have since been corrected. Organic monitoring has increased since the early 2000s when much of Randy's fraud started. In her letter, Weed also points out that "real organic farmers" would never have fallen for Randy's commodity scheme and are just as concerned about fraud as consumers are (Weed 2021). In a concluding sentence to her second paragraph, Weed writes, "Rather than spew diffuse journalistic cynicism across all food labels and farmers, we should be asking instead how USDA can best improve its management and understanding of the organic label" (2021). Skyler had similar thoughts toward organic fraud as Weed did and said, "I think it's all of our jobs to get

better across the board, and we do a pretty darn good job, so it's asking, how could we get better?" The article from *The New Yorker* and letter from MOA came out just as I was considering asking about organic fraud and organic market concerns due to pesticide drift and inadvertent contamination. In this study, organic producers mentioned worries about fraud and the impacts fraud has on organic markets. Some had concerns regarding pesticide drift and inadvertent contamination causing fraud, while others felt they couldn't say if it would affect the market.

Matt, Hunter, and Jack did mention pesticide contamination leading to ideas of fraud. Matt talked about consumers not trusting the label if contamination kept occurring. Hunter and Jack spoke about consumers not trusting the label because they didn't know what the organic label meant. Organic fraud was not something on my mind as a researcher until I took a deep dive into this topic. I started to consider the potential that more public information about pesticide drift and inadvertent contamination could, in fact, hurt organic producers. Or, perhaps, that more information could inspire necessary change regarding pesticide use. It's difficult to consider. As discussed in the Literature Review, one possible solution to pesticide drift and contamination is loosening organic standards to allow higher concentrations of pesticide residue. Such an idea contradicts the whole reason organic agriculture exists. However, this solution would limit the harms contamination presents for producers, which could increase consumers' trust in organic. Or this solution could make consumers question the existence of organic products in the system. As one participant in this study said when thinking about how to mitigate concerns of organic fraud, "We don't want to create a utopia that doesn't exist in the world but does in the mind of consumers, but we also don't want to lower the standard and say 'wow we are just in a chemical world and that the way it's gonna be" (Skyler). This topic interests me

greatly, and understanding the relationship between pesticide drift and contamination and organic fraud warrants further research and is discussed in greater detail later in this chapter.

A Wicked Problem

One solution some might offer for pesticide drift and inadvertent contamination is to change the residues allowed on the organic side, essentially allowing more pesticides to be on certified organic produce. This might limit the frequency of drift reports and certified organic operations needing to recertify, but it would change what organic agriculture is at its core. It wouldn't fix the reliance on pesticides in the food system or the presence of systemic pesticides in the air, soil, and water. While I strongly disagree that a solution to pesticide drift and inadvertent contamination is making the allowed residues higher, I also don't have any simple solutions to offer. Pesticide drift and inadvertent contamination is a wicked problem. Stakeholders on both sides of the issue provide solutions that fit their interests, but those exact solutions from one group might preclude solutions from the stakeholder group with different ideas and suggestions. Those solutions may also subvert the system they're trying to change. If you ban pesticides, conventional growers will be upset. If the use of pesticides continues on the path it is currently on, what world will there be for organic growers to grow in? Contamination is already affecting organic producers. Contamination events might happen once or twice in their career, but even that is too much. It feels that a future where organic agriculture is untenable is nearer than we realize.

What world does that leave for plants, animals, and humans to live in? One where we are all just as contaminated as our organic fields? While no solution proposed here is a panacea, it is clear that this issue should be on the minds of anyone who eats. Politicians, corporations, producers of all stripes, and consumers need to consider pesticide drift and inadvertent

contamination. Pesticide drift and inadvertent contamination are wicked problems, and if they are not given the appropriate attention, consideration, and discussion towards solutions, they will only persist. Organic fields do not exist in a vacuum. The food system is heading towards a future where no foods may truly be considered organic. I have felt this conundrum during this research, and it is a challenging future to imagine. Climate change, another wicked problem, forces us also to consider the future, one with extreme weather, rising sea levels, and warming temperatures (NASA). Without global change and policy dedication to climate change, humans might be adapting to a world much different than the one we know now. Like climate change, pesticide drift and inadvertent contamination need policy stakeholders to take action to limit contamination and the build-up of pesticides in the environment. While these two wicked problems will affect people on different scales and at different times, they both have regulatory and political action that could be taken to mitigate current and future impacts. Taking that political action is possible and critical for both these wicked problems if politicians and policymakers are willing to let go of the financial and corporate institutions that limit political action.

I hope that this thesis will inform people about this wicked problem and nudge it toward its time in the light to find solutions that organic producers, the environment, and consumers deserve to continue to have the option of food free from pesticides.

RECOMMENDATIONS

Interviews with industry and regulatory officials and organic producers generated specific recommendations to mitigate the effects of and protect organic producers from pesticide contamination. In these recommendations, I will address policies and educational efforts that have the potential to augment support for organic producers. While not all producers experience

pesticide drift and inadvertent contamination, all producers are at risk for drift and contamination. Conventional and organic producers both experience the risk of pesticide drift and inadvertent contamination during their careers. Since pesticide drift and inadvertent contamination put all farmers at risk, this issue should interest all involved in the food system. State and federal policymakers and consumers should take interest and action regarding these contamination events. Much like chemical agriculture is ubiquitous in the food system, so too is pesticide drift and inadvertent contamination for organic and conventional producers.

Figure 6: Recommendations and Key Points

Recommendation	Key Points
Clarify and communicate a transparent contamination reporting process	Montana Department of Agriculture and Organic Program should create easier access to information for producers who have experienced drift or contamination. Phone numbers, timelines, and processes need to be made clearer and more available.
Compensation for organic producers	Routes towards compensation for organic producers facing pesticide drift and inadvertent contamination should exist. One possibility might be for the National Organic Program to create a fund to compensate organic producers who have been drifted or contaminated from off their farms.
Implement contamination prevention policies by creating a state-wide working group on pesticide drift and inadvertent contamination	A state-legislature implemented working group comprised of policymakers, producers, and consumers would have a chance to talk around the same table and figure out how to best mitigate and prevent drift and contamination in Montana.
Stricter regulations on pesticides from the Montana State legislature	Montana could follow in the footsteps of other states and ban specific toxic pesticides and set stricter regulations about pesticide application and use.
Advocate for agrochemical corporations to take responsibility and accountability for pesticide drift and inadvertent contamination	Following core principles of food democracy, food system participants must take a more active role in the food system, especially around the topic of pesticides. Agrochemical companies need to be held accountable for their defective products.
Education	Education for consumers and conventional producers might lead to increased trust in the organic label and less extreme pesticide drift and inadvertent contamination.

Recommendation 1: Clarify and communicate a transparent contamination reporting process

Throughout interviews with industry and regulatory officials and organic producers, it became clear to me that the process of reporting contamination varies from producer to producer, as it did among the producers interviewed. One industry and regulatory official interviewed listed the process in seven easy steps, while some producers shared that they were unaware of any process until they spoke with their certifiers. Speaking with both the industry and regulatory officials and the producers made it clear that the process for reporting contamination is not being effectively communicated. Industry and regulatory officials felt that the process was straightforward and could easily talk about it. Organic producers did not always know the exact process and talked about it in less detail and in a vague manner. Some producers even shared that they called their certifier and had to learn about the process from them. Additionally, some producers chose not to go through the reporting and investigation process. These producers alerted their certifier and nothing more. Reasons producers decided not to report or investigate contamination varied from not being concerned, handling it on their own, and putting the event quickly behind to preserve their relationships with neighbors and community members.

While researching the contamination reporting process myself using online resources before interviews, I found the information difficult to find and confusing. Who do I call first? Does an investigation *have* to happen? The question that remains now is, why aren't the seven steps industry and regulatory officials shared with me listed online in a visible spot? Figure 3, shown here again, shows two graphics. The top is the process described by industry and regulatory officials and the bottom is described by organic producers.

Figure 3: A Comparison of the Reporting Process Described by Industry and Regulatory Officials and Organic Producers.

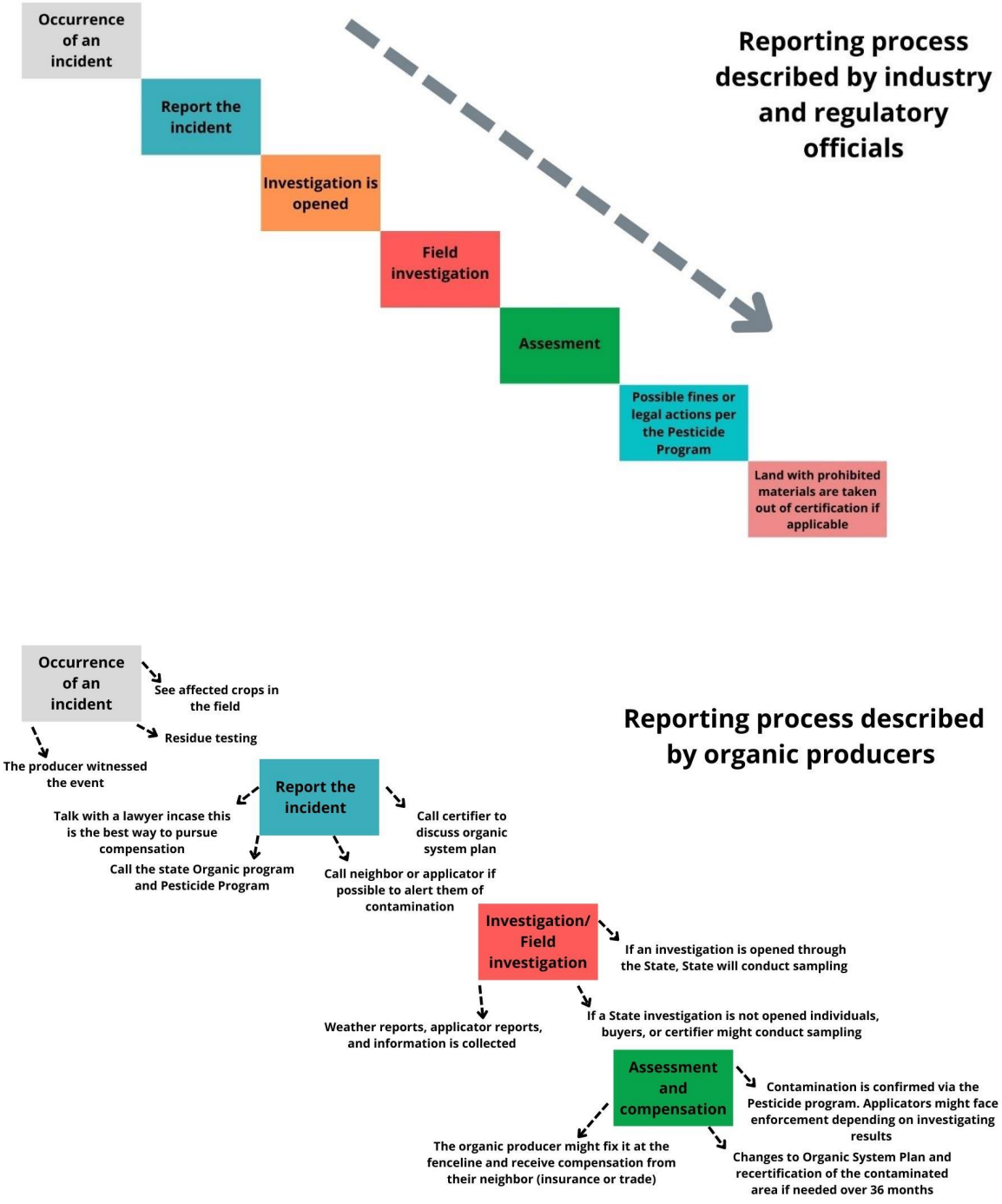


Figure 3: Visual representation of the difference in reporting process understanding and use between organic producers and industry and regulatory officials

The process described by the industry and regulatory officials is how reporting is supposed to happen. The graphic illustrating how producers described the process was created from interviews with producers who told how they handled their pesticide drift and contamination events. Producers shared a reporting process that was less precise, convoluted, and rarely followed the seven steps industry and regulatory officials shared in order or at all. Only two producers (Mike and Frankie) shared a reporting process that followed the industry and regulatory official's description of the process explicitly. Other producers had a process similar to the organic producers described process. Some organic producers described a process with more than seven quick steps. When discussing the process, Robbie said, "I don't think there's enough help in informing conventional farmers or the organic farmers as to what to do or what to be aware of."

The process ends after an investigation with the Pesticide Program. Organic producers in this study shared that this came as a shock to them after calling the Pesticide Program to learn about the investigation process while reporting their contamination events. After the Pesticide Program investigates the contamination, there are two possible outcomes for organic producers. The first is that contamination is confirmed, and the organic farmer is given information about what chemical was the source of contamination and from where it came. The second is that contamination is not confirmed, and the organic producer might not know what chemical they were contaminated with, where it came from, or both. The process ends with a report. It is up to organic producers to pursue compensation. Organic producers might work something out with the applicator and applicators insurance, make a fence line deal, or simply move on.

I recommend that the Montana Department of Agriculture (MT DOA), Organic Program (OP), and third-party Certifiers in Montana communicate the reporting process more fully to

organic producers. The Montana Department of Agriculture Organic Program should have a straightforward, easy to find, step-by-step list of the reporting process for organic producers on its website. Certifiers should also communicate this process clearly to organic producers either by directing them to the MT DOA Organic Program website or with their education material about this process. Phone numbers and email addresses of useful contacts for producers experiencing contamination events should be posted on the MT DOA Organic Program website. Posting accessible information on a webpage could be a simple step for the MT DOA to better support organic producers. If more organic producers can find this information, more producers might report it to the state. More effective reporting might lead to broader policy change at the national level if drift and contamination reports show the actual amount of contamination happening on the ground. In this study, only six contamination events of the eighteen discussed were reported to Pesticide Program or State Organic Program. All eighteen events were reported to certifiers, but just six went further by opening an investigation with the State.

Recommendation 2: Compensation for organic producers

I recommend that the National Organic Program create a fund for organic producers to access as compensation for lost crops due to pesticide drift or inadvertent contamination. Organic producers who participated in these interviews collectively felt like policy could change in the future to better support organic producers after these events. Organic producers in this study talked about wanting more support during and after contamination events. Many producers wanted the support to be monetary and suggested that compensation for lost crops come from the government when it did not come from insurance claims (Mike, Skyler, Jess, Frankie, Robbie, and Devon). For some pesticide events, compensation for lost crops comes from applicators or

conventional producers' insurance claims, but for organic producers who cannot precisely say where the contamination came from, they are left without a route to compensation.

Compensation could come from a fund housed in the National Organic Program. Producers could apply to this fund through the State Organic Program. Producers would have to submit their crop plans, losses, and current and future Organic System Plans to receive compensation for the losses caused by contamination. County Extension Offices, Montana Organic Association, and local Natural Resource Conservation Service offices could assist in disseminating information about the application process to organic producers and assist in the application process to the Organic Program. Conventional producers have insurance that protects them in these events, but organic producers do not. This fund would support organic producers who have experienced pesticide drift or inadvertent contamination and cannot secure compensation from the applicator or conventional producers' insurance. Contamination affects organic producers across the country who would benefit from a financial assistance program in drift or inadvertent contamination cases. There are grants and support systems to assist in the payment for certification of organic operations, but why not the same financial assistance to support producers maintaining their certification?

This is just one option that could be used to create a route to compensation for organic producers. While I won't get into to the details of other routes in this study, there are other options such as a higher pesticide applicator fee where some of that fee goes into a fund to compensate producers or a special tax on pesticides where the tax would create the compensation fund.

Recommendation 3: Implement contamination prevention policies by creating a state-wide working group on pesticide drift and inadvertent contamination

Prevention is vital in pesticide drift and inadvertent contamination events. Stopping contamination before it takes place is perhaps the most cost saving and time-effective strategy for producers. Mitigation strategies exist. These strategies include buffer zones, spray technology to limit drift, and best practices for spraying. Producers in this study also shared that early and often communication with whomever was applying the pesticides was a valuable mitigation strategy. Producers shared that it was essential to communicate about buffer zones, spraying practices to limit drift, pesticide application dates, and the risk pesticide contamination poses to organic certification. But mitigation only lessens the effects of contamination; it does not prevent it. Even the fact that drift is illegal per the label on the pesticides does not prevent it. Better prevention strategies and policies need to be implemented on the conventional and organic sides of contamination events.

For conventional growers, drift discussions have much to do with finances. Representatives from chemical companies often come to states to meet with conventional growers to share new products, sell more pesticides, and hold training on new application technologies. Robbie, who still attends these meetings to stay in touch with his conventional friends, explained that drift is discussed during these events because the label makes drift illegal. However, the producer explained that the discussion at these events did not focus on the impact on organic producers. Robbie further explained that conventional producers are concerned about drift because pesticides are expensive. If more pesticides land off-target conventional producers and applicators are wasting product and, thus, money. Robbie explained, “It’s more from an economic standpoint…for their own and the chemical salesman.” The cost could be considered as a prevention strategy in and of itself. Pesticides are expensive, so producers aim to ensure such chemicals are applied effectively and with precision. Drift events do happen. Perfect

pesticide application is not a current reality in Montana. Beyond Pesticides, an advocacy group in Washington D.C. spoke on this same topic of applicator accountability. Jay Feldman said, "state regulators slowly ramp up enforcement of repeat violators, from warnings to fines to license suspensions of a week or so. But only stringent penalties will stem the sloppy practices" (Tempus 2020).

Washington state producers, specifically orchard producers, have suffered extreme effects of pesticide drift and contamination (Stanley 2019). The Washington State legislature witnesses the impact of pesticide drift on orchardist constituents and the broader effects on the Washington food system and environment. In 2019 the Washington state legislature passed a bill to boost the University of Washington's Pacific Northwest Agricultural Safety and Health Centers (PNASH) pesticide drift work (Stanley 2019). PNASH conducts research and "promotes best safety and health practices for producers, workers, and communities in farming, fishing, and forestry" (PNASH). PNASH is dedicated to creating a safer and healthier work environment for those who work in and live around farming, fishing, and forestry industries (PNASH). The impact of drift and inadvertent pesticide contamination on producers, workers, and communities are PNASH's newest research interests.

Along with boosting PNASH efforts, the bill also forms a Pesticide Application safety Panel. The Pesticide Action Panel brings together lawmakers, state agencies, farmworkers, growers, and universities to "improve training, safety, and data collection around pesticide application and exposure" (Stanley 2019). This group is working to find solutions, including prevention strategies, to the complex problem of pesticide drift and inadvertent contamination and the broader consequences of these events. These broader consequences include creating

protections for applicators and farmworkers and the wages of underpaid farmworkers who are sometimes the ones applying pesticides.

Washington isn't the only state taking regulatory action to support drift prevention. In an area of California where pesticide drift has been "normalized because it happens so often," producers in San Joaquin County reported drift events multiple times in one season (Tempus 2020). After being drifted, community members passing by conventional operations reported headaches and eye issues (Tempus 2020). The intensification of pesticide drift and inadvertent contamination in California spurred legislative action. In 2017 California banned the application of some pesticides within a quarter-mile of schools and daycares during the day (Tempus 2020). Additionally, California's Pesticide Program is "exploring its options in developing a statewide notification system" to alert community members and other producers that applicators would be spraying "especially potent pesticides" (Tempus 2020). This is far different from a story one producer shared with me during interviews. Robbie told a story of pesticide application during a Friday night football game. They said "We went to a high school football game and it's right by a field that uses paraquat. There was a farmer just spraying like 200 yards from 400 people. I think you can't spray that close…but nobody said anything." (Robbie).

From the interviews with participants in this study, it is clear that the 'label is the law' regulation is not preventing drift or contamination. The threat of wasting money on off-target pesticides is not a preventive measure either. States have an essential role in finding solutions to pesticide drift and the consequences of contamination. Montana might follow in the footsteps of Washington in creating legislation that supports finding solutions and working towards the prevention of pesticide drift and contamination events. Legislation could begin, as in Washington, by establishing a working group or panel made up of diverse stakeholders to

discuss these events. The act of creating this panel might alert people who live and eat in Montana to the events happening in their state and to the experiences of their local producers. Much like the reasons for conducting this research study, the panel would allow for the producers' voices – both organic and conventional – to be heard on this issue. Organic and conventional producers could sit at the same table as lawmakers, researchers, and consumers to share the challenges they face regarding drift and contamination. Organic producers would also have the opportunity to share how damaging drift and inadvertent contamination are to an audience of conventional growers and applicators who might not have had the chance to hear the impacts of contamination. One of the main reasons I conducted this research was to share the voices of the people experiencing drift and contamination. This panel or working group could allow the producers to share their experiences directly with the people with the power to change and prevent drift and contamination.

Recommendation 4: Stricter regulations on pesticides from the Montana State legislature

Additionally, Montana legislators could add additional regulations for contamination prevention. Like California, Montana could enforce stricter synthetic pesticides and spray application regulations. In 2019, California banned "a widely used pesticide that has been linked to brain damage in children" (Levin 2019). Chlorpyrifos, a pesticide commonly used on almonds, citrus, cotton, and other widely grown crops in California, has caused "countless people to suffer" (Levin 2019). In addition to the ban, the state has also allocated funding for the agricultural sector to transition chlorpyrifos to "safer, more sustainable alternatives" (Levin 2019). Regulatory change from the state could take place in a few ways. The EPA sets tolerance levels for pesticides, but states have the power to impose even stricter tolerance levels to limit the amount and intensity of pesticides in the environment. If the state chooses to, it could write

regulations restricting the types of toxic pesticides used on conventional fields throughout the growing season. Going a step further to protect organic producers, community members, and Montana's environment, the state could ban incredibly toxic and damaging synthetic pesticides. If conventional producers no longer have access to a harmful pesticide, drift and contamination would be prevented. This option, while appealing, is unlikely very unfeasible given the political climate at this time in the Montana Legislature.

Along with enforcing stricter regulations for pesticides and pesticide use in Montana, the state could also ensure that applicators understand that pesticide drift is illegal. As the representative from Beyond Pesticides pointed out, enforcement escalates slowly. More serious enforcement only hits repeat contaminators rather than first-time contaminators. Early enforcement might limit applicators from drifting or contaminating producers more than once and could influence other producers to prevent drift and contamination. Stricter enforcement of these regulations would protect fans from getting drifted at a high school game. It would also safeguard organic producers from certification loss. Residents of Montana have the constitutional right to a clean and healthy environment (MT Constitution Article II Section III). Pesticide drift and inadvertent contamination are directly affecting that right. Legislators in Montana could choose to take decisive regulatory action against synthetic pesticide use to protect this right.

Recommendation 5: Advocate for agrochemical corporations to take responsibility and accountability for pesticide drift and inadvertent contamination

Interviews with organic producers and industry and regulatory officials often brought up questions and comments about responsibility. Whose fault was the contamination? Who is really to blame when one system (conventional agriculture) precludes the functioning of another system (organic agriculture)? Questions of responsibility are tied to questions of retribution.

Who needs to pay for compensation for lost crops and possibly the next three years of lost crops? Organic producers' thoughts varied on this. For some, pesticide drift is a trespass issue. Whoever did the trespassing, most likely the applicator of the pesticide (the person holding the license to apply the pesticide, usually the farm owner or independent applicator), is the one who is at fault (Producers Devon, Charlie, and Jess). Thinking of pesticide drift as trespassing makes it easy to figure out who is responsible. It is either the conventional producer spraying their fields themselves or the applicator they hired. Their insurance would need to kick in and pay for the organic producer's field losses. If insurance didn't cover all the compensation, then the conventional grower or their applicator would cover the rest (either by choice or via a lawyer). Case closed.

Responsibility wasn't as easy to place for other producers like Sammy, Matt, Frankie, and Robbie. For these producers, the person spraying the pesticides was part of the equation, but something bigger was at play. Sammy described conventional producers' use of pesticides as an addiction. According to Sammy, conventional producers are "Stuck in a system they don't know how to get out of." Hunter talked about how their neighbors have convinced themselves that the chemicals aren't harmful or they wouldn't be on the market. Robbie said, "They [conventional producers] are in one rabbit hole of their own production method…[conventional producers] are stuck under the thumb of chemical companies having to spray this and this all these times." Matt looked into the camera during the interview and said in a tone of exasperation, "It [drift] wasn't his [conventional neighbor's] fault, it was the [chemical] company's for making a defective product, and I do not believe the farmer should be held accountable for defective products made by chemical companies." Matt furthered this point by comparing the situation to a defective car. A defective car would never stay on the market as long as these chemicals have. He said, "The

pesticides keep poisoning people, and they [chemical companies] don't take the liability for the death of people using their products." Hunter and Sammy both alluded to what Robbie and Matt said more clearly. Conventional producers are in a toxic system of using pesticides, which were forced on them in significant quantities by chemical companies who refuse to take any of the blame.

As a researcher, I was interested in finding out who should be responsible for pesticide drift and inadvertent contamination events. As I researched and interviewed, I kept looking to find a person or entity to blame so that organic producers didn't have to carry such a significant burden of responsibility. Considering my own biases, it was easy for me to see organic producers as the hero and conventional producers or applicators as the villain in this story of drift and contamination. However, I never once heard any sort of that feeling from participants in this research. While there were emotions of anger and hurt feelings over lost crops, such feelings were never directly placed onto another producer. Rather, the blame was often put on the larger system in place and the chemical companies that wield considerable power in the food system. Even producers scorned by their communities over these events were hesitant to blame a single producer. They opted to share the facts of the event and then discuss their systemic concerns. Throughout the interviews, organic producers all pointed to chemical companies as the responsible party for these events. According to these producers, contamination is not an organic versus conventional issue. For these producers, it is a public versus agrochemical company issue.

Corporations in our conventional food system control everything from seeds to stores. Four corporations control 60 percent of the global seed market (Hubbard 2019). The Big Four corporations that hold immense power in the agrochemical industry are the same corporations that own sixty percent of the seed industry. Those corporations are Bayer, Corteva, ChemChina,

and BASF. The consolidation of corporations (the Big Four was known as the Big Six not that long ago) means less choice and higher prices for producers (Hubbard 2019). These four companies are deciding how farmers should grow food. These billion-dollar companies come with roundtables full of wealthy stakeholders, the best lawyers money can buy, and even the ear of politicians (Food Ethics Council). These companies also sell synthetic pesticides, pesticide applicator technology, and promise that the more pesticides producers apply to fields, the bigger the harvest (Lappé and Terry 2006). But multiple externalities occur because chemical companies participate in and wield outsized influence over the food system. Producers interviewed for this study pointed to the companies that sell pesticides as the responsible party at fault in cases of drift and contamination. Yet, in court cases across the country, these same companies argue that contamination is the applicator's responsibility (Hettinger 2020). Corporations – such as Bayer – have the financial power to win lawsuits and push the blame onto applicators or conventional growers. Blaming producers leaves compensation to be figured out at the fence line even though liability could be on stakeholders much higher up the food chain.

Matt's comparison about other industries having to take responsibility for their defective products is relevant to this discussion. It also makes a strong argument for policy change. Why are chemical companies not held accountable for the effects of pesticides, which they create, market, and sell? These effects include environmental contamination (PAN), pesticide drift and contamination on organic and conventional land and community members (EPA), and continued severe health effects for farm workers (cancer, autoimmune issues, and other serious diseases) (Moore 2002). Consumers have the power to call for more accountability, as do legislators at the state and federal levels. If consumers knew more about the pervasiveness of pesticides in the food system, then there might be more accountability and less drift and contamination. It might

also lead to conventional growers using fewer pesticides for fear of long-lasting and expensive court cases surrounding their operation. Decreased pesticide use would undermine some of the chemical corporations' power in the food system. Producers in this study suggested that legislation to hold chemical companies accountable for off-target pesticide events is necessary. The label that corporations legally have on the pesticide packaging makes drifting illegal. But when the consequences of unlawful drift make their way to these corporations, the fault is quickly pushed back to the field.

Dismantling the power agrochemical corporations wield in the food system is not a quick or easy task, but legal and regulatory frameworks exist that have the potential to hold these companies accountable for defective products. As drift events and inadvertent contamination occur, producers in this study stressed the need for chemical corporations to be held responsible in court regarding their faulty products. Organic and conventional producers, consumers, and state governments need to take an active role in reshaping the food system. Possible avenues include choosing to grow without chemicals, holding the company you buy chemicals from accountable, buying food grown without chemicals, and state-level pesticides regulations. This active participation rather than a passive experience for people in the food system is one of the core principles of food democracy (Hassanein 2003). Hassanien writes that "food democracy is about citizens having the power to determine agro-food policies and practices locally, regionally, nationally, and globally" (2003). Hassanein goes on to say that food democracy is a method that can be implemented for making choices when "values and interest come into conflict" and that food democracy is an "essential pragmatic device for moving towards sustainability of agriculture and food systems" (2003). Active participants (consumers, producers, processors, etc.) in the food system, who use the principle of food democracy effectively, can work to put the

power back in the hands of the people rather than the chemical companies to shape a food system that fits the goals of what participants want. In this case, consumers' and producers' goals might include a food system with fewer chemicals.

Recommendation 6: Education

When producers talk about fraud and perceptions as to why they are experiencing contamination, their next comments generally concern education. Education for consumers as well as conventional producers and even extension agents. Hunter and Jack specifically talked about consumers not understanding what organic agriculture is. Organic policy analyst Kerri also felt similarly. The three participants spoke about 'organic' as a buzzword like 'regenerative,' 'natural,' or 'local.' The most significant difference is that those three words do not come with a certified label from the USDA. Not all consumers know this. The words natural and organic might be interchangeable for some, even though the process and standards behind the words are not. This lack of understanding among consumers is what concerns organic producers. Skyler mentioned that it's essential to educate all types of farmers and consumers and thinks that a good starting point is asking, "Why are we using chemicals?" and "Could we use less?" If consumers are unaware of what goes into being a certified organic producer and read articles like "The Great Organic-Food Fraud," what stops them from choosing a package that says natural instead of the one with the certified organic label the next time at the store? What is stopping them from thinking that Parker is correct? Consumer education on the organic certification regulations and processes might make a difference when consumers head to stores and decide between buying organic or conventional products.

Consumer education is critical for organic producers. More transparency with consumers and the organic certification, growing, and testing processes must occur. I consider myself to be

engaged with the food system and involved in the food that I eat. As part of this research process, I have learned an incredible amount about organic agriculture. The information I have learned makes me a more informed consumer and has created a higher level of trust in organic certification that would benefit all consumers when making choices in the grocery store. A more informed consumer, I think, will lead to more confidence in the certified organic label. If a consumer understands the certification process that an organic producer goes through and then learns of a drift or contamination event that puts that organic producer out of certification for the next three years, they might be more empathetic to that event and buy other products from that producer or support them after their recertification. Educating consumers will also be beneficial because not every consumer has the opportunity to meet their farmer or know the name of the farmers whose wheat is in the bread they are eating. If they understand the process that the producer had to go through to receive and keep their organic certification or recertification, it might form a connection. Understanding, in turn, might create more trust so that when an article about organic fraud is published, organic producers know that consumers understand the facts.

Education efforts could come from the stop down, starting with the National Organic Program. The National Organic Program could start a full-scale educational campaign with signage in grocery stores explaining what the organic label means. An educational ad campaign on the T.V. and small YouTube series featuring organic producers and their farms from across the country so that consumers can "meet" their organic producers while also learning about the certification process and the regulations producers follow to keep their certification. The National Organic Program could create educational materials (informational sheets, flyers, and posters) about the benefits of organic agriculture for the food system and the environment that could be disseminated in grocery stores, farmers' markets, and restaurants that purchase organic

agriculture. State Organic Programs and organic associations could also participate in this educational campaign by having open farm days for consumers to visit an organic farm in their area and chat with a farmer. They could also hold workshops, forums, and meetings for consumers to ask producers, processors, and state Department of Agriculture employees essential questions.

In interviews, Producers suggested that their neighbors might also benefit from education campaigns focused on the organic certification process and the effects of pesticide drift and contamination on certification. Education initiatives could happen at the Country Extension Office or through conventional grower organizations. If conventional growers understood the organic certification process and that inadvertent contamination and drift put organic producers directly at risk of losing that certification, contamination might happen less often. Knowing more about organic agriculture might cause applicators to spray more cautiously. It might also lead to some conventional growers transitioning their fields to organic, leading to fewer contamination events and fewer pesticides in the environment.

SITUATING RESULTS

Washington State University (WSU) and the Organic Center (OC) conducted research on pesticide drift and inadvertent contamination in 2021("Assessment of inadvertent chemical contamination of organic crops" USDA NIFA OREI #2020-51300-3226). Their study involved a survey of organic producers across the country. The sample size for this survey was less than expected. The data from the survey are preliminary but still offer interesting topics to consider. Some questions on the survey are similar to those I asked participants in this research. Other questions differed from those in my interview guide but nevertheless came up during conversations with producers. The results from the survey and this research alike are not entirely

representative of the organic community in the U.S. Despite the lower than expected response rate, this data is still valuable to consider in the present research context. Due to the fact that this preliminary data is not yet published and is being used as a baseline for further research, results from this survey will be cited using an approved citation from the lead investigator and the Organic Center. That citation will be, "J. Goldberger, personal communication, 2021."

The survey asked about mitigation. 100% of the survey respondents listed communication as the best strategy to reduce pesticide contamination. 96% also said buffers were a good strategy (J. Goldberger, personal communication, 2021). Participants in my research study responded similarly when asked how to mitigate or prevent these events. All eleven producer participants first talked about communication, followed by buffer zones.

Questions about crop loss, crop type, and contamination events were also asked. Like the producers I interviewed, point-source drift was the most prevalent type of contamination discussed. Rainwater and legacy chemicals were also included in survey responses, providing quantitative support to the qualitative narrative's producers shared about their experiences of non-point-source contamination. Mostly the survey had replies from vegetable, corn, and grain producers. This survey supports my data collection from the same types of producers. WSU and OC asked questions specifically about the pesticide or chemical producers were drifted or contaminated with. Dicamba, Glyphosate, 2-4-D, and Atrazine were mentioned the most (J. Goldberger, personal communication, 2021). I did not specifically ask producers what they were contaminated with during my interviews. Some participants knew the chemical and were able to share this during interviews, but others never found out which chemical had drifted into their fields. Glyphosate and Dicamba were often discussed among the producers who talked about chemicals by name.

The survey also asked producers across the country their thoughts on 'opinion questions.' 71% of survey respondents think that organic producers, processors, and handlers should receive monetary compensation for losses due to contamination. 63% feel that consumers associate residue with fraud. 45% think that state regulatory agencies do not understand the impacts of contamination, and 58% believe conventional producers don't understand the effects of contamination on organic operations (J. Goldberger, personal communication, 2021). The same topics came up in my interviews, but the survey illustrates that many producers across the country felt the same way as the eleven producers who participated in my research. Eleven producers in Montana are also thinking about compensation, fraud, and the role of state agencies and conventional producers during contamination. The survey results provide numerical data to support the textual data that I have collected. It also points to further research that needs to take place. Further research ideas are discussed below.

ADDITIONAL RESEARCH TOPICS

As I conducted this research, I kept having more and more questions and felt like I had fewer concrete answers. This thesis suggests that more research needs to occur on pesticide drift and inadvertent contamination.

Expand and Duplicate Interview-based Data Collection Methods

Organic producers were a tremendous source of knowledge on this topic. Their experiences and voices need to be amplified, and this study model needs to be reproduced across the country, as experiences and processes for reporting contamination differ across states. Interviews with certifiers, inspectors, and the state department of agriculture employees must also be included if research is done on this topic. One of the biggest takeaways from this research was the disconnect between what organic producers knew about the reporting process and what

industry and regulatory officials shared about the process. If organic producers and from around the country participate in interviews about their experiences and perceptions about pesticide drift and contamination, a more accurate baseline of information will be available on contamination events and regulations contiguous with contaminant events. A large field of participants will create generalizable data that could lead to real change in state and federal governments. It would be interesting to see what this looks like across the country and in different contexts. The national survey conducted by Washington State University and the Organic Center has met some of these goals by conducting research nationally but not all of these goals have been met by the existing study mostly due to sample size.

Expanding Research Participant Criteria

Consumers also need to be included in this research, as do conventional growers. Research into what consumers know about organic agriculture and what they know about pesticide drift and contamination is crucial. More data about what consumers know can influence how future education on the topic is conducted. Research with consumers could lead to a better understanding of the organic certification label and how pesticide drift and inadvertent contamination affect the certification of organic producers. It might also shed light on the issue of organic fraud and how consumers are affected by what they know or do not know about organic fraud.

I also think it is essential to talk to conventional growers and applicators. Even if the responsibility of contamination should fall on the shoulders of chemical companies, conventional growers and applicators do and likely will continue to play a significant role in contamination events. It would be interesting to conduct research using focus groups of organic and conventional producers and applicators. These focus groups could lead to a better understanding

of organic agriculture for conventional growers and applicators and generate productive discussions that might lead to new solutions.

Rural Relationships

Rural relationships and their place in the prevention and mitigation of pesticide drift and inadvertent contamination is an area that requires further study. It would be useful to know how often communication breaks down after a contaminant event, how frequent organic producers feel like their choice to grow organic isolates them in their rural communities, and if there are widespread effects on rural communities when drift or contamination occur. Organic producers in this study felt that contamination events impacted relationships in their rural communities, and it would be interesting to see if other community members feel the same. Researching rural relationships and how they change or don't change after contamination events might assist rural communities in creating more robust support systems during and after contamination events and, in the end, create stronger rural communities.

Environmental Justice

The scope of this thesis did not look at the environmental justice concerns that are attached to pesticide drift and inadvertent contamination events. Considering environmental justice was not something that came up to me until I was deep into this research, and it occurred that there are so many more converging issues all tied to pesticide drift and contamination than appear at the surface. While writing the literature review there was also little discussion about environmental justice or justice at all. This framing is crucial to pesticide contamination. That being said, I believe that future research needs to involve an environmental justice framing. EarthJustice reported that among farmworkers 10,000 to 20,000 pesticide poisonings occur every year ("Protecting People from Pesticides"). The Pesticide Action Network found that

farmworkers are regularly exposed to pesticides in many ways on the job and that their families who might live with them near agricultural fields are also being exposed at high rates (PAN). The USDA reported that 57% of the farm labors identified as Hispanic or nonwhite (USDA Economic Research Service). In addition to the demographics of workers, the USDA also found that the workforce was aging which makes them even more susceptible to illnesses from pesticides (USDA Economic Research Service).

Questions such as "Are farmworkers the predominating pesticide applicator on conventional farms?", "When pesticides drift are they drifting onto the farmworker?", "Who is usually the farmworker?" and "Are farmworkers of color disproportionately bearing the burden of pesticide application risks?" need to be addressed. While organic producers are facing injustice on their land, there are also injustices taking place on the conventional side of things mostly to those tasked with the job of applying pesticides.

CONCLUSION

This thesis shares the experiences and perceptions of pesticide drift in Montana organic agriculture. It also shows the immense need for more research at a larger scale on this same topic and topics that came up through interviews. Research into rural relationships and communities changing due to contamination, education initiatives, federal policy changes, and a focus on solutions needs to occur.

Pesticide drift and inadvertent contamination are on-field events that can send shock waves through the industrial food system, the environment, and human health. By conducting this research, I have listened to eleven first-hand accounts of contamination events. In addition to hearing about the events, I listened to the fears and the concerns organic producers have for their fields, organic agriculture, the food system, and the world in which they grow their crops.

Chemical contamination in any other field would be front-page news. Imagine chemical contamination taking place in an office building. It would only have to happen once for new safety measures, mitigations, and preventions to be set in place. In organic agriculture, contamination is a common occurrence that organic producers are left to handle mostly on their own. If drift and pesticide contamination are not met with both consumer, producer, and regulatory pushback then the future of the environment and food system seems to be one with increased consumption of chemicals for all participants in the food system. It is important to acknowledge that some might argue, in response to these points, that a world without synthetic pesticide use might lead to extremely low yields and increased levels of hunger across the world. While that is a valid argument and concern, I still believe that it is worth thinking of a future free of pesticides in food. While some of these statements might seem idealistic, I think it is important to envision a less contaminated world. While a less contaminated world might not exist right now or in the near future, it is time to start considering some of these idealistic ideas so that one day they might lead to changes that create a less contaminated food system and world.

These events must be taken seriously and more extreme mitigations for producers need to be researched and developed. Organic producers and food free from chemicals are at risk. It is a pivotal time to make important regulatory changes and create support for producers after contamination events. These events concern the food we eat, the water we drink, the air we breathe, and the soil we depend on to feed ourselves and others. Contamination puts all of that at heightened risk.

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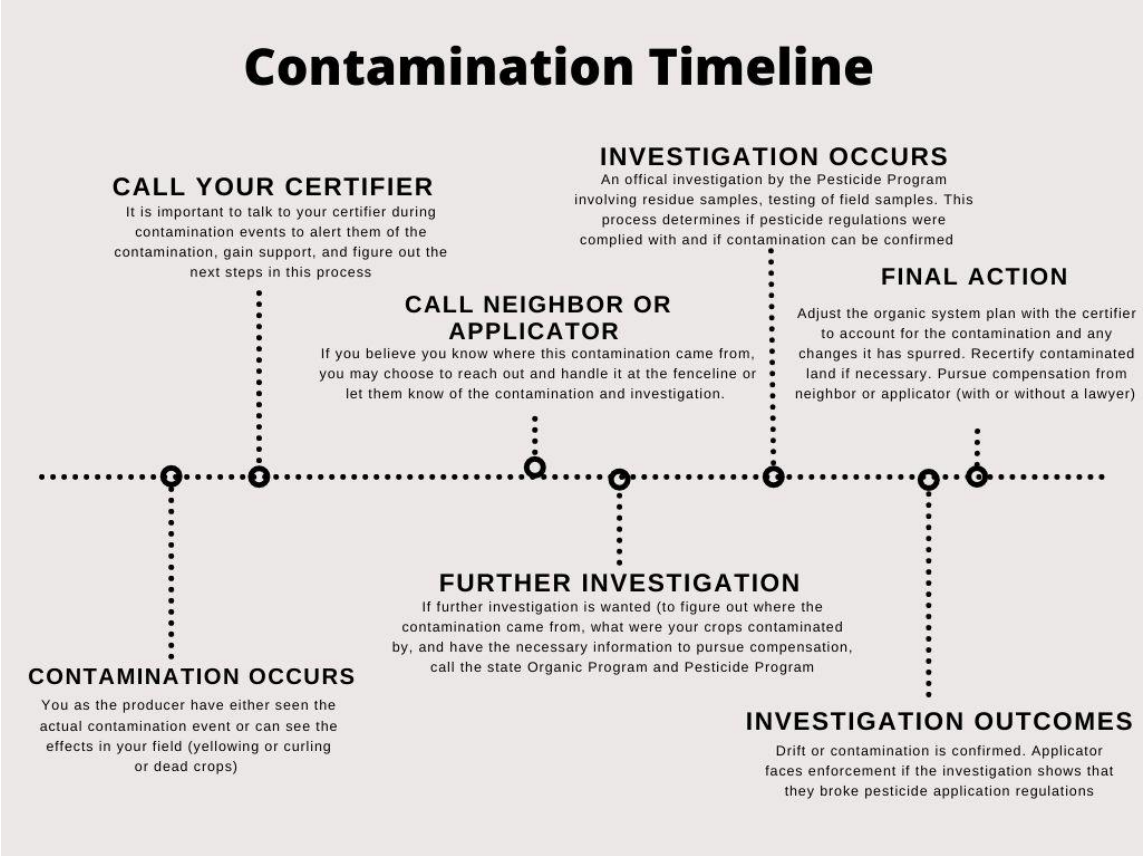
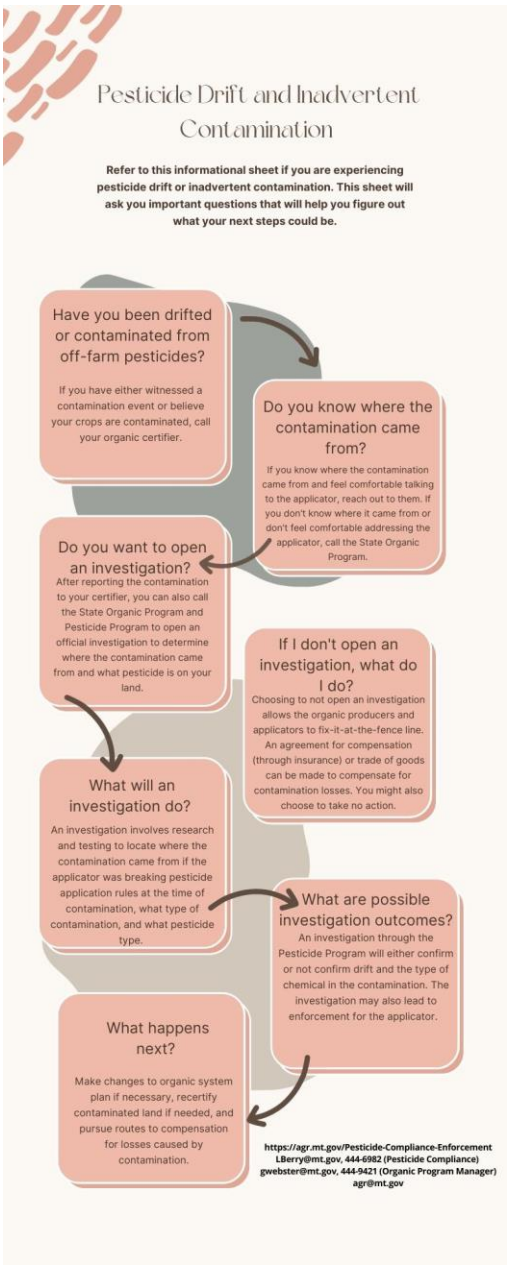
Appendix I: Educational Materials for Organic Producers

Below are informational graphics that I have created to assist organic producers through contamination events. I made a variety of graphics, including a contamination timeline and a step-by-step list of the reporting process so that producers can choose whatever representation of information helps them the most. I hope to provide these to the Montana Organic Association, organic buyers, and County Extension Agents so that these graphics can become a tool that producers have access to and refer to if they are drifted or contaminated from off their farm.





PESTICIDE DRIFT AND INADVERTENT CONTAMINATION REPORTING PROCESS

This is a streamlined process shared by participants in this research study for producers who experience inadvertent pesticide contamination to follow

STEP 1. REPORT THE INCIDENT

State Organic Program and Organic Certifier

STEP 2. INVESTIGATION IS OPENED

Organic Program and Pesticide Program open an investigation

STEP 3. FIELD INVESTIGATION

Residue samples are collected, weather reports are evaluated, and applicator records and licenses are checked

STEP 4. ASSESMENT

Was there drift? Did the applicator make a mistake? Did they follow pesticide regulations?

STEP 5. ACTION

Possible fines or legal action from the Pesticide Program to the applicator. The organic producer can pursue routes to compensation on their own and work to recertify land if necessary

https://agr.mt.gov/Pesticide-Compliance-Enforcement
LBerry@mt.gov, 444-6982 (Pesticide Compliance)
gwebster@mt.gov, 444-9421 (Organic Program Manager)
agr@mt.gov

Pesticide Contamination

If you have experienced pesticide contamination on your organic farm, refer to these steps for assistance if you are looking to purse an investigation through the Pesticide Program

If contamination is suspected for any reason, producers can file a report of loss to the MT Department of Agriculture

This can be done by sending an email, calling, or writing the Montana Department of Agriculture and the Pesticide Program (helpful emails and website below)

Information to include on filed report:

1. Name and address of the claimant
2. Type and location of property alleged to be injured or damaged
3. Date of the alleged injury or damage.
4. Name of person thought to be responsible.
5. Name of the property owner or occupant for whom the pesticide application was made

Do you think that you have been drifted or your fields are contaminated? Check your fields for:

1. Plant death in certain spots or across whole fields
2. Pesticide burn on plants (yellowing leaves, tip burn, spotting)
3. Death of other plants or trees in the area
4. If contamination is suspected, call the certifier and request residue tests on crops or collect and send your samples for testing to an independent lab

What to do after you have filed

1. Contact certifier and ensure that samples are taken of the contaminated crops or field areas
2. Talk with neighbors and pesticide applicators to get a better idea of how this event could have taken place
3. Check for other areas of contamination

Additional Information:

1. Making a report and filing it with the MT Department of Agriculture and the Pesticide program is the only way to have contamination officially recorded

2. Helpful contacts include the Agricultural Services Bureau, the Pesticide Compliance Program, and the state Organic Program
https://agr.mt.gov/Pesticide-Compliance-Enforcement
LBerry@mt.gov, 444-6982 (Pesticide Compliance)
gwebster@mt.gov, 444-9421 (Organic Program Manager)
agr@mt.gov

Appendix II: Interview Guide for Organic Producers

Introduction: Casual talking upon entering zoom, then

Thank you so much for your participation in this interview. I am doing research to better understand the perceptions and experiences that Montana's organic producers, like you, have about unintentional or accidental pesticide contamination of agricultural products. By contamination, I'm referring to things like: spray drift; contaminated water, rain or snow; and contaminated equipment or containers.

I realize this can be a sensitive subject. But, I am hopeful that this research will generate meaningful recommendations for improvement to best meet the needs of organic producers in Montana.

In addition, as you may be aware, there is a national survey of organic farmers underway right now on this same topic, and my professor Neva Hassanein is part of that research team. These interviews can complement those surveys by getting more in-depth farmers' views. So, I really appreciate your time.

Of course, your participation in this interview is completely voluntary **and** confidential. If there are any questions you feel uncomfortable answering, please let me know and we can move on.

Your identity will not be disclosed in any reports or presentations. So please feel free to share your ideas and experiences confidentially.

At the end, I'd be happy to answer any questions you have.

I would like to record this interview through Zoom for research purposes only, and to ensure that your views and statements are accurately captured. Is it alright with you if I record this interview? (start recorder)

Great. Let's jump in.

History and production- Just so I can start to understand a little bit about you as a producer,

1. Please tell me about your background as a farmer. When did you start farming? What do you grow?
    - Is there anything else you would like to say about your background?
2. What year did you become a certified organic producer? Is all or part of your farm organic?
3. Please tell me a little about your choice to go organic. Why did you decide to certify and to practice organics?
    - Echo and probe: any other reasons?
4. What is the area like where your farm fields are located, and what are the surrounding areas like? (Land use that borders farm)
    - Probe

- Echo. And get depth re: other farms, organic farms or conventional farms in area(s)

Thank you for sharing a bit about your background and a little bit about your farm. Now my next questions ask you specifically about pesticide contamination.

5. Please tell me about **your experiences** with pesticide contamination from off your farm. What happened?
    - Please tell me more about that
    - How many incidents have there been? Tell me about all of them please.
6. Which crops were contaminated? How were you able to tell that your crops had been contaminated?
7. Has you experience with crop contamination generated any concerns about general environmental contamination? Water/rain/air contamination?
    - Is there anything else you would like to say regarding water quality?
8. What actions did you take upon **first realizing that your crops** had been contaminated?
9. Have you tested for pesticide residue on your crops? Were residues found at unacceptable levels? How often?
10. Did you report the incident(s) to the state government? Why or why not?
11. In what ways did the state government try to address your problem?
12. Do you wish they had done more?
    - How should they have addressed this?
13. To what extent do you think state agencies understand the impacts of contamination?
14. To what extent do you think your neighbors understand the impacts of contamination?
15. Did you personally pursue any actions against the persons responsible for the contamination on your property?
    - If yes, what?
    - If no, why not?
16. Do you think producers should receive compensation when contamination occurs?
    - Why or why not?
    - How?
17. How did the contamination affect your farming operation and your family?
    - Probe
        - Was there any financial loss?
        - Loss of crop? Certification?
18. What changes, if any, have you made to your operation as a result of your experiences with pesticide contamination?
    - Strategies to reduce inadvertent contamination?
    - Probe. Any other changes you've made?
19. What do you know now about inadvertent pesticide contamination that you would have liked to know before this event?
        - Advice to someone who has not yet run into this problem? What would you tell them?

- What recommendations do you have for other organic farmers as a result of your experience?

General Opinions: My last few questions are going to be about your opinions on pesticide contamination and the organic food industry more generally.

20. To what extent do you think unintentional pesticide contamination negatively impacts the organic industry generally? Probe: any other ways?
21. In your experience, do organic producers talk much about the threat of pesticide contamination to their operations? why or why not, do you think?
22. To what extent should frequency and impacts of contamination be a research priority?
23. Those are all the questions I have for you. Is there anything else you think I missed or that you would like to add?
24. Lastly, are there any producers who you think I should contact to be included in this study?

Those are all my questions today but if something comes up later would it be okay to reach out to you again?

Thank you again for your participation, I will be sure to keep you updated on the progress of this study!

Appendix III: Interview Guide for Industry and Regulatory Officials

Interview Guide (Industry and regulatory officials - Montana Department of Agriculture, Extension Agents, and Pesticide Program Employees).

Introduction: Thank you for speaking with me today! I was hoping you would answer a few questions regarding procedures and policies around pesticide use here in Montana.

I am researching the perceptions and experiences of organic crop producers on inadvertent pesticide contamination in Montana. I am looking to better understand the policy landscape of pesticide use and the systems in place when an event of contamination, such as drift, is reported.

Of course, your participation in this interview is entirely voluntary **and** confidential. If there are any questions you feel uncomfortable answering, please let me know, and we can move on.

Your identity will not be disclosed in any reports or presentations. So please feel free to share your ideas and experiences freely.

I would like to record this interview through Zoom for research purposes only and ensure that your views and statements are captured accurately. Is it alright with you if I record this interview? (start recorder)

Great. Let's jump in.

1. Please tell me your name, job title, and a bit of what your day-to-day work looks like?

I am trying to understand what happens when producers experience drift or inadvertent contamination from your perspective as a (job title). I have some general questions to help me understand this process.

2. Can you share with me what a farmer would do when they suspect they have been drifted?

   Probes

   a. What does this process look like?
   b. What are the laws and policies that are associated with this process?
   c. How does a farmer know how to start this process? Where would they go to find this information?
   d. What happens when contamination is confirmed?
3. Can you describe the differences, if any, in this process for organic and conventional crop producers who experience inadvertent pesticide contamination?
4. Are there ways that this process could change?
   a. Does it operate the way it is supposed to?
   b. Do you think the state could improve its response to organic growers? Conventional growers?
5. How many times a year do you receive complaints and concerns from Organic Producers and do you keep data from those incidents?
   a. Is there a way to access that data?