

**DUELING CONSERVATION PERSPECTIVES:
GOVERNANCE STRATEGIES AND KNOWLEDGE NETWORKS FOR
AGRICULTURAL CONSERVATION ON THE DELMARVA PENINSULA**

by

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TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
ABSTRACT	viii

Chapter

1	INTRODUCTION	1
	A Walk through this Study	2
	BMPs and their Place in Agriculture	6
2	LITERATURE REVIEW	14
	Governmentality	16
	Social Production of Knowledge	23
	Bringing Governmentality and STS Together with the Local	29
	Contributions	30
3	METHODS	31
	Study Area	31
	Site Description	31
	Nutrient Management	33
	Data Collection and Analysis	35
	Participant observation	36
	Semi-structured interviews	41
4	GOVERNANCE STRATEGIES FOR AGRICULTURAL CONSERVATION ON THE DELMARVA PENINSULA	45
	Introduction	45
	To Regulate or not to Regulate? That is the Question	48
	Non-regulatory strategies for environmental governance	50
	Regulated strategies for environmental governance	61

	Governing through stewardship	68
	Bringing together these narratives	71
	Under Pressure, Who's Looking Down on Me?	73
	Environmental Pressures	74
	People Pressures	76
	Combined Pressure	81
	Conclusion	81
5	AGRICULTURAL KNOWLEDGE ON THE DELMARVA PENINSULA: CONTRIBUTING KNOWLEDGE TYPES AND THEIR INCORPORATION INTO KNOWLEDGE NETWORKS	84
	Introduction	84
	Results and Discussion	92
	Types and Value of Agricultural Knowledge	92
	Scientific knowledge and its transfer mechanisms	92
	Local knowledge and why it is prized	99
	Bringing the different knowledges together	104
	The Social Production of Scientific Evidence for BMPs	107
	Expanding relationships	109
	The flow of information	111
	Keeping up with the John Deeres	112
	Role reversals and collaborations	114
	Conclusion	116
6	CONCLUSION	119
	REFERENCES	125
	Appendix	
A	INTERVIEW GUIDE	137
B	DEMOGRAPHICS	138
C	CODES	140
D	INSTITUTIONAL REVIEW BOARD EXEMPTIONS	144

LIST OF TABLES

Table 1	Participant observation locations and descriptions.....	36
Table 2	Demographic table of the occupation and employers of interviewees..	138
Table 3	Demographics table of the agricultural type of interviewees.	138
Table 4	Demographic table of the sizes of the operations owned or worked by interviewees.	139
Table 5	Table of the codes used for analysis and their total frequency.....	140

LIST OF FIGURES

Figure 1	Schematic of the organizations and groups involved in agricultural conservation in the U.S. and their relationships.	7
Figure 2	Image taken from the U.S. Department of Agriculture, Agricultural Research Service paper titled <i>Best Management Practices To Minimize Agricultural Phosphorus Impacts on Water Quality</i> to illustrate the available BMPs to reduce phosphorus at the source.	9
Figure 3	Images of the educational material for cover cropping available through the Soil Conservation District.	12
Figure 4	Diagram of the information sources mentioned by interviewees as contributing to their agricultural knowledge.	109

ABSTRACT

Since the 1930's, and the extensive soil loss during the Dust Bowl, the United States government has enacted several laws in hopes of increasing farmer knowledge of conservation oriented management practices. In the United States, agricultural best management practices (BMPs) are the primary mechanism used by the state to increase water quality and soil health. These practices are defined at the national level, but ultimately are enacted, through assistance and guidance from the state level, at the farm level. I used these ubiquitous practices as way to ask farmers, and those working in close association with them, questions about the governance strategies that have motivated their BMP use and the information sources and knowledge networks that contributed to their conservation decision-making. Methods included semi-structured interviews (n = 30) and participant observation of agricultural information sessions and workshops, promotional events and tours. Results from this investigation were divided into two subsequent chapters - one on governance strategies, which uses the theoretical framework of governmentality as a lens; and the other on agricultural knowledge, which is supported by the social production of scientific knowledge literature. The chapter on governance strategies focuses on the four dominant narratives about state methods used to turn farmers into environmental subjects according to the farmers and state actors interviewed. These methods included: the use of relationships with members of the farming community; conservation oriented education through a series of information sessions, meeting and workshops; incentives to offset the cost of BMP implementation coupled with emphasis on the long-term

benefits of their use; and social pressure from people and groups in the surrounding area. These strategies were not used in isolation but rather in tandem to successfully create environmental subjects - farmers were convinced of the relevance of BMPs or were forced into implementing them by regulation. In the following chapter about agricultural knowledge the types and valuation of knowledges contributing to agricultural knowledge and knowledge networks were discussed. According to the literature the main types of knowledge used in reference to agriculture are scientific and local, which includes experiential, knowledge. Scientific knowledge is the purview of Extension, but also a variety of commercial and specialized sources, and, while it is valued by interviewees, farmers would rather choose the time and place where it is attained rather than be mandated to attend educational sessions. Local knowledge on the peninsula is a result of the accretion of experiential knowledge which adapts modern scientific techniques to the local context. Local knowledge is highly valued by both state actors and farmers with interviewees indicating that experience augments the relatability of state personnel and enhances their ability to transfer scientific knowledge while observation of other farmers' operations and experimentation ranked high on the list of information sources for farmers. These scientific and local knowledge sources come together in a network of heterogeneous actors whose combined efforts contribute to the production of agricultural knowledge for conservation to fulfill the goal of sustainability for soil and water resources. The final chapter is a conclusion which ties together all previous chapters and offers potential uses for this research and future directions.

Chapter 1

INTRODUCTION

During one of my interviews for this research project, a crop consultant explained their reasoning behind hiring people with a farming background. Their reasoning was that despite being able to teach all the other requirements of the position they “couldn’t teach how to talk to a farmer” nor could they teach someone from outside of this community “the work ethic that comes with the farm kid” (23). Recognition of the disconnect between agriculturalists and non-agriculturalists, especially in discourse about the environment, is what inspired this study. This study was developed to determine how farmers perceived environmental conservation and their role in it as members of a potentially ecologically destructive profession. To better understand the complexity that is environmental governance on the Delmarva Peninsula and farmer involvement, in this research I proposed three thesis questions which included: 1) how do the training for and implementation of conservation practices act as mechanisms for the creation of environmentally-minded citizens; 2) is local knowledge used to develop management practices for water and soil conservation and does local knowledge encourage or counter the creation of environmental citizens through the use of practices alternative to state conservation practices and; 3) how do members of the agricultural community on the Delmarva Peninsula interact with the various conservation information sources and does this reflect their view of state agencies? For consistency and due to their ubiquitous use for agricultural conservation in the United States, I used agricultural best management

practices (BMPs) as a starting point to ask farmers and those working with them questions about farmer perceptions of conservation. This introductory chapter will provide a brief description of each of the chapters in this thesis followed by an explanation of why I use BMPs as a model for understanding farmer attitudes toward conservation by defining their use at the national, state and farm level.

A Walk through this Study

The first chapter is defined above and the subsequent chapters describe the literary context I am drawing from, the methods used and how research results relate to the two theoretical frameworks I chose. Chapter 2 is a literature review of the conservation literature to date and the two theoretical frameworks of governmentality and production of knowledge. Current literature on conservation practices focuses on the viability of practices for water quality and soil health improvements and the determinants of practice adoption. Motivations for adoption were of relevance to this study and include agricultural knowledge, environmental awareness and economic viability. The governmentality framework is used to investigate the governance techniques used by the state (governing body) in environmental subject-making with the creation of new “environments” of state concern. This includes the influence of the different levels of relationships that have developed with the decentralization of environmental governance. Science, Technology and Society (STS) studies literature is used to investigate how scientific knowledge production is driven by the social, political and economic environment in which it is produced. Social production of knowledge literature, which is encompassed in this and several other frameworks, is used as a lens to further investigate the social component of this embeddedness and how relationships between and the combined efforts of a heterogeneous group of

actors is involved in agricultural knowledge production. My research contributes to these literatures by broadening them through a case study of BMPs on the Delmarva Peninsula. My study contributes to governmentality literature through an investigation of farmer perceptions of the governmental and disciplinary states that coexist for environmental governance in this region and the influence of the shift from the previous voluntary state to regulation on BMP implementation. My research contributes to the STS and knowledge production literatures by elucidating how governmental, private and public actors along the Delmarva Peninsula contribute to the production of agricultural knowledge through their common interest in developing and implementing BMPs for environmental sustainability.

Chapter 3 explains the methods used for this study including site and nutrient management descriptions, the collection of data through participant observation and semi-structured interviews, and how these data were analyzed. The Delmarva Peninsula was chosen for this study due to its proximity to several important water bodies and the prevalence of agriculture, and in particular poultry concentrated animal feeding operations (CAFOs) that have the potential to pollute these waters. Participant observation increased my understanding of farmer nutrient management requirements, which allowed me to better identify with farmers during semi-structured interviews. Interview questions were based on a guide, but not structured to allow interviewees to answer as they chose. Interviewees were selected through snowball sampling based on their membership in one of these groups: farmers who implemented BMPs, state agricultural personnel (Soil Conservation Districts, State Department of Agriculture (SDA), Cooperative Extension and NRCS) and other members of the agricultural community (agricultural and environmental consultants). Data were analyzed through

inductive and deductive coding for interviews and in support of these codes for participant observation field notes and education materials.

The next two chapters are empirical chapters in which I apply the theoretical frameworks identified above to the results from my research - governmentality is Chapter 4 and production of knowledge is Chapter 5. The governmentality chapter focuses on three governance strategies used to enact environmental policy that were demonstrated by my study. The first two governance strategies are the use of both regulated and non-regulated BMPs for agricultural conservation. BMPs are for the most part voluntary, but nutrient management planning (also a BMP) and its education are mandatory in Maryland and Delaware. These regulations based on interviewee responses have influenced the level of NM implementation and farmer feelings on both conservation for water quality and state educational and outreach efforts. The use of regulations for practices that were once voluntary diverges from the proposed trajectory of governance by Foucault (1991), which is why the Delmarva Peninsula is an interesting case study as both disciplinary and governmental tools are being utilized in subject-making. Both these suites of governance appear to have been successful, as farmer and state interviewees indicated that farmers are doing nutrient management to stay in compliance under threat of consequence and they are using other BMPs because they have adopted state philosophies of stewardship. Part of the regulated mechanisms of governance is the use of education and outreach by state agencies to encourage the use of voluntary practices. There are mixed feelings among the farmers interviewed in this study about state agricultural organizations and their role as educators. The final governance aspect covered in this chapter is the use of social pressure from the government, environmental groups and the farming and non-farming

public to force farmers to implement BMPs. Farming is a very public and, therefore, visible profession. For those that do not understand the needs of this industry the generation of wastes and use of inputs can be a point of contention. This research evidenced that environmental subject-making is happening on the peninsula through these four strategies.

The production of knowledge chapter focuses on the diversity of forms of knowledge used in agriculture on the Delmarva Peninsula and how agricultural knowledge is produced through a network of relationships between the various groups with agricultural interests. The primary forms of knowledge used are scientific, disseminated through state organizations and commercial interests, and local, which is accumulated through farmer experiential knowledge. There were mixed feelings among interviewees about available scientific knowledge from the state, from valuable to useless, but local knowledge was important to all groups for its value to the local context. Both these forms of knowledge are used in the network for agricultural knowledge production, which includes members of the scientific, agricultural and environmental communities, and commercial interests. State agencies and Cooperative Extension (CE) serve as a main source of information about BMPs, but commercialization and specialization through consultants and retailers are blurring the lines of where science is produced. These state organizations are also dependent on farmers for experimentation, both for the state and on their own, to increase knowledge of certain BMPs, as evidenced by the Soil Health Champion program. Relationships between members of these different groups also act as conduits of both scientific and local knowledge. For example, local knowledge is fed back to retailers so they can improve their products and farmers using BMPs serve as an example that

other farmers can observe, thus increasing the likelihood of state practice adoption. Farmers interviewed tended to value local knowledge from members of the community unless they have a strong association with state organizations. However, the expected alternative practices to BMPs based on local knowledge were not present, as more often they were adapting state practices to the local context rather than developing them. Interviewees indicated that use of farmers as employees and on the boards of state agencies facilitated transfer of knowledge through valued experience. The final chapter in this thesis is the conclusion which brings together all the lessons learned from this study.

BMPs and their Place in Agriculture

The benefit of using BMPs in this study is that they are ubiquitous nationally and have, in one iteration or another, been present in this area for decades - thus allowing for an investigation of differences in practice diffusion through several periods of shifting environmental governance. Research on agricultural conservation for soil erosion started in the 1930s (Sharpley et al. 2006) and for water quality in the 1960s, but federal commitment to soil and water quality conservation did not manifest until years to decades after research indicated the need (Logan 1993). Today, BMPs are part of national agricultural conservation efforts to counter the environmental impact from decades of intensification in livestock and cropping systems.

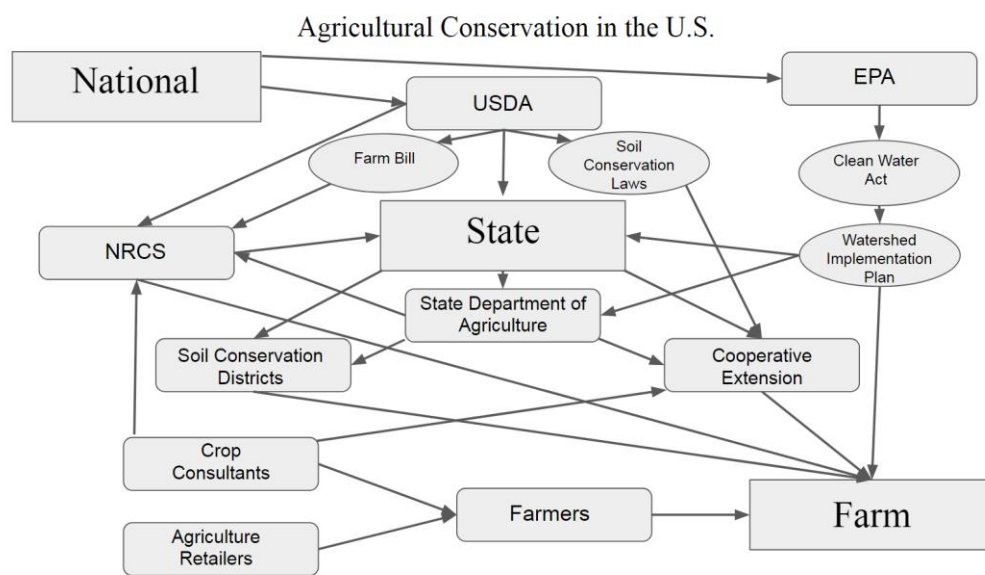


Figure 1 Schematic of the organizations and groups involved in agricultural conservation in the U.S. and their relationships.

BMP programs are developed by the federal government through the United States Department of Agriculture (USDA) and the Environmental Protection Agency (EPA), based on the Farm Bill and Clean Water Act (CWA), respectively. Agricultural conservation has been an aspect of the current and past farm bills and the purpose of the CWA “is to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters” (FS need ref). The current national BMP focus is on water quality due to the extensive eutrophication effects of nutrient loading to water bodies and the negative impact this has on animal and plant populations and potentially human health.

The design, installation and maintenance standards for agricultural BMPs are the purview of the USDA - Natural Resource Conservation Service (NRCS). There are 155 agricultural BMPs available through the NRCS with defined standards that are

distributed to states through the use of several technical and non-technical worksheets (Agricultural Best Management Practices (BMP) Database Phase 1 Literature Review, 2012). The NRCS practice standard for each practice includes sections for definition, purpose, conditions where practice applies, criteria, considerations, plans and specifications and operation and maintenance. Adoption of these practices is facilitated at the national level through incentive programs that offer technical and financial support for BMP implementation. These programs include: the Agricultural Management Assistance Program (AMA); Conservation Stewardship Program (CSP); EQIP (FA); Agricultural Conservation Easement Program (ACEP), Healthy Forest Reserve Program (HFRP); Regional Conservation Partnership Program (RCPP) (Farm Bill-NRCS Pamphlet).

There are a multitude of ways that BMPs are classified at the national level. For water quality, these categories can be broadly divided into stormwater and agricultural BMPs. Another way to identify the different BMPs for water quality is by their purpose, for instance, in-field management practices, edge-of-field treatment practices and in-field-constructed practices (Water Environment & Reuse Foundation (WE&RF), 2017) or source or transport BMPs (Sharpley et al. 2006). In-field management BMPs include practices like crop rotations and cover crops, which differ from in-field-constructed BMPs that involve land shaping practices like terraces. Edge-of-field practices are located on the edge of cropping systems, like buffers (WE&RF). Source BMPs are used to minimize the amount of nitrogen and phosphorus in agricultural systems through reduction of synthetic input use and nutrients in livestock waste through dietary changes. Transport BMPs reduce nutrient loading by reducing the movement of nutrients through runoff, erosion and leaching

(Sharpley et al. 2006). Figure 1 shows some of the BMPs for water quality promoted by the USDA-Agricultural Research Service (ARS) that are specific for phosphorus management. BMPs are a group of specific practices that have been shown to reduce environmental impact singly or in combination with other complementary practices to increase the effectiveness of conservation efforts. Popular BMPs on the peninsula include cover crops and no-till for crop systems and manure storage facilities and heavy use area pads for livestock operations. There is not much national literature specific to soil health BMPs, but these were included in the water quality literature as many BMPs have mutual benefits for water and soil.

Table 2. Phosphorus best management practices

Source BMPs—practices that minimize P loss at the origin
<ol style="list-style-type: none"> 1. Balance P inputs with outputs at farm or watershed scale 2. Minimize P in livestock feed 3. Test soil and manure to maximize P management 4. Physically treat manure to separate solids from liquid 5. Chemically treat manure to reduce P solubility, that is, alum, flyash, and water treatment residuals 6. Biologically treat manure, that is, microbial enhancement 7. Calibrate fertilizer and manure spreaders 8. Apply proper application rates of P 9. Use proper method for P application, that is, broadcast, plowed in, injected, subsurface placement, or banding 10. Carefully time P application to avoid imminent heavy rainfalls 11. Implement remedial management of excess P areas (spray fields and disposal sites) 12. Compost or pelletize manures and waste products to provide alternate use 13. Mine P from high-P soils with certain crops and grasses 14. Manage urban P use (lawns and gardens)

Figure 2 Image taken from the U.S. Department of Agriculture, Agricultural Research Service paper titled *Best Management Practices To Minimize Agricultural Phosphorus Impacts on Water Quality* to illustrate the available BMPs to reduce phosphorus at the source.

The guidelines for BMPs may be developed at the national level, but states were given the right through the CWA to choose the water quality standards, procedures, rules, and regulations that are best suited to their needs. The CWA requires each state to have a Nonpoint Source Management Program and Plan that directs water quality related operations by identifying sources of nonpoint water pollution and the BMPs that can reduce the contribution of these sources (FS need ref). States can use both regulatory and non-regulatory mechanisms to improve water quality. BMPs are usually non-regulatory, but some states have enacted laws that mandate the use of certain practices (USDA, 2012). States choose which BMPs to promote based on the physical conditions and dominant agricultural types within their territory. The Delmarva Peninsula has a high incidence of poultry operations and coupled with an insufficient grain supply this has “resulted in a major one-way transfer of P from grain-producing areas [in the Midwest] to animal producing areas” (Sharpley et al. 2006, p. 1). Due to the excess of nutrients from manure on the peninsula, most of which is used within a short distance of its generation, Delaware and Maryland have enacted nutrient management (NM) laws and focus a large portion of their BMP promotion on NM practices.

At the individual farm level, farmers use multiple BMPs that have combined effects for water quality and soil health. Farmers make operation type, and subsequent BMP, decisions in consideration to climate, soils, hydrology and the other limiting factors of their geographic region and “regional and often global economic pressures and constraints, over which they have little or no control’ (Sharpley et al. 2006, p. 31). State and federal agencies work in conjunction with farmers at the farm level to determine which BMPs are most appropriate to their local context and what financial

aid is available to facilitate their implementation. Various promotional materials are available to farmers from state agricultural organizations which translate NRCS standards to an available format. As an example, a popular BMP on the Delmarva Peninsula is cover cropping. The NRCS standard for this practice identifies it as follows:

DEFINITION Crops including grasses, legumes, and forbs for seasonal cover and other conservation purposes.

PURPOSE Reduce erosion from wind and water. • Increase soil organic matter content. • Capture and recycle or redistribute nutrients in the soil profile. • Promote biological nitrogen fixation and reduce energy use. • Increase biodiversity. • Suppress Weeds. • Manage soil moisture. • Minimize and reduce soil compaction.

CONDITIONS WHERE PRACTICE APPLIES All lands requiring vegetative cover for natural resource protection and or improvement (NRCS, 2011).

States can simplify this information or not, Figure 2 shows examples of BMP booklets developed by NRCS and available through Delaware and Maryland SCDs.

Implementation of this and other BMPs is messier than these guides imply and not all practices are suitable for every local context. For cover crops, farmers have to determine the best placement and seed mix for their financial and ecological needs. Then in-field experimentation allows farmers to perfect timing of sowing seeds and harvesting or burning down (killing the plants with herbicide) the cover crops in preparation for cash crops. To determine the best course of action, farmers may have to undergo an extensive trial and error process. Once practices are in place, states ensure that farmers are using BMPs appropriately if they are either regulated or paid for through cost share (incentive funds).

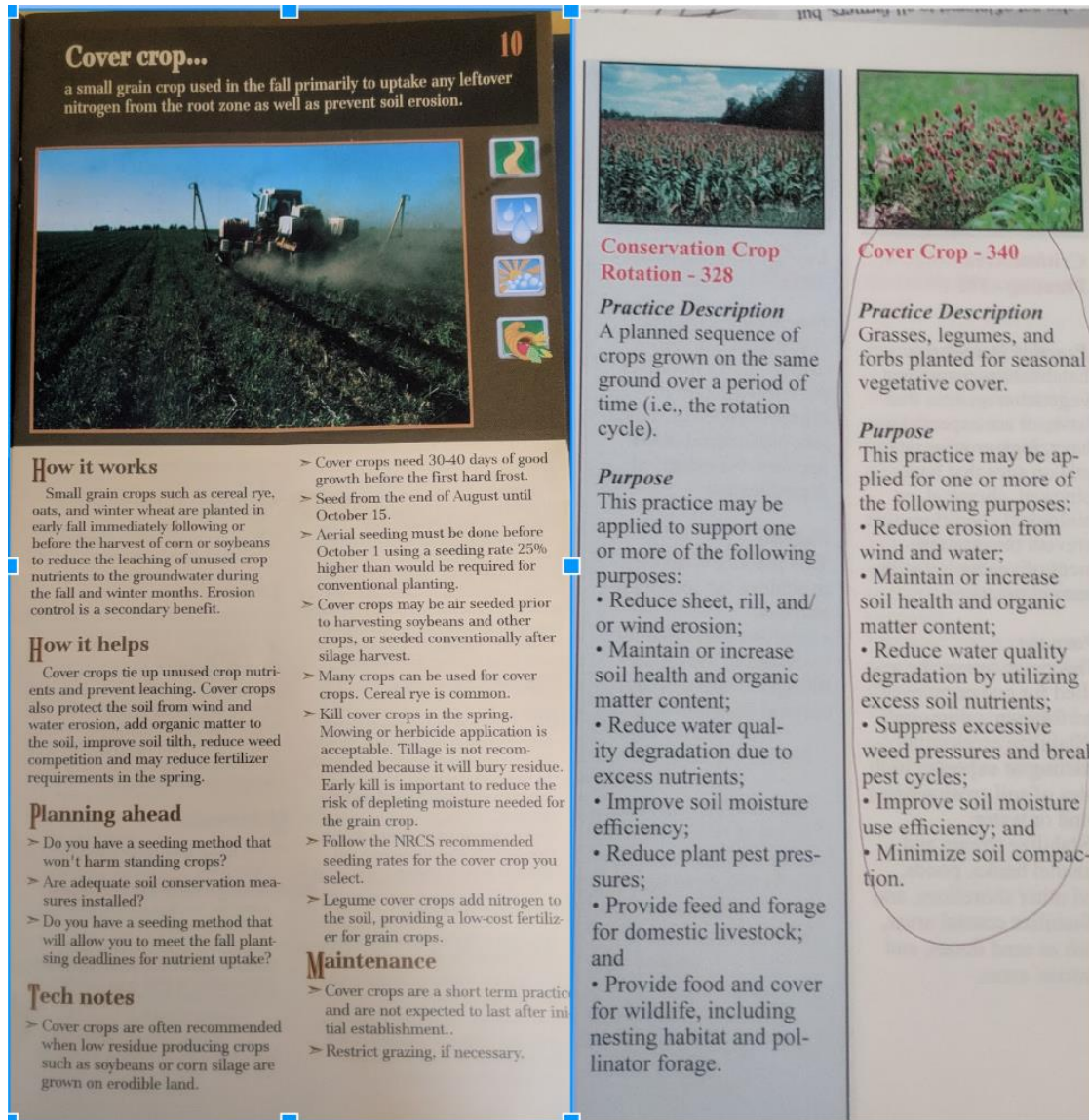


Figure 3 Images of the educational material for cover cropping available through the Soil Conservation District.

To reiterate, these practices are widely recognized and implemented, which is why I use them as the basis for conservation in conversation with growers and state agricultural organization staff members. The use of one suite of tools for two forms of

power is understudied in governmentality literature and can expand our knowledge of these processes, which may increase in the future with increasing need to conserve natural resources. They exemplify the multiple levels and decentralization of environmental governance and feed into networks of knowledge exchange through their adoption and adaptation to the local context, both of which I am investigating.

Chapter 2

LITERATURE REVIEW

This study utilizes conservation studies literature as a basis for existing agricultural conservation knowledge. Governmentality and production of knowledge literature is then used as a lens to investigate perceptions of BMPs throughout the peninsula. Local knowledge ties together the governmentality and production of knowledge frameworks, as it plays a crucial role in both the transfer of scientific knowledge associated with governmentality and the production of agricultural knowledge.

Many of the studies of BMPs concentrate on the physical dimensions and benefits of individual and combined practices (Hernandez & Uddameri 2010, Gabel et al. 2012, Kröger et al. 2013, Giri & Nejadhashemi 2014), especially in relation to non-point pollution and watersheds (Welch & Marc-Aurele 2001, Ripa et al. 2006, Cullum et al. 2007, Zollweg & Makarewicz 2009, Gabel et al. 2012, Hernandez and Uddameri 2010, Legge et al. 2013, Pearce & Yates 2017). Others focus on modeling and simulations to optimize placement of BMPs for increased efficiency (Johansson et al. 2004, Easton et al. 2008, Parker et al. 2008, Madigan et al. 2009, Legge et al. 2013, Xie et al. 2015, Pyo et al. 2017). Definitive evidence of the benefit of these practices is limited to researched areas, but these sites indicate the potential for conservation practices to increase soil organic material and reduce runoff (Uri 2000, Zhou et al. 2009).

The studies most related to this research are those that discuss the determinants for BMP adoption (Welch & Marc-Aurele 2001, Rahelizatoivo & Gillespie 2004, Troy et al. 2005, Gillespie et al. 2007, Kara et al. 2008, Paudel 2008, Prokopy et al. 2008, Campbell et al. 2011, Reimer et al. 2012, Kaufman 2013, Kalcic et al., 2015, Akkari & Robin 2017, Ulrich-Schad et al. 2017) and mechanisms for information transfer (i.e. CE and SCDs) (Feather & Amacher 1994, Herendeen & Glazier 2009). Other studies have found that social and political drivers that influence farmer interest in implementing BMPs vary across a spectrum from stewardship to production and from voluntary to mandatory (Reimer et al. 2012, Borisova and VanSickle 2015). Regulation, in particular, is a prominent motivator for change (Welch and Marc-Aurele 2001, Kara et al. 2008). Relationships are also a motivator for agricultural change with state personnel and the greater community, especially when associated with trust (Welch and Marc-Aurele 2001, Paudel 2008, Prokopy et al. 2008, Kalcic et al 2015). However, metadata studies intending to determine the socioeconomic factors influencing adoption of BMPs through analysis of conservation literature have inconclusive findings due to inconsistent reasons for BMP use (Rahelizatoivo & Gillespie 2004, Prokopy et al. 2008, Ulrich-Schad et al. 2017). Such inconsistencies may relate to local specificity and resultant differences in agricultural practice and products (Rahelizatoivo & Gillespie 2004, Lambert et al 2005, Troy et al. 2005, Kaufman 2013, Ulrich-Schad et al. 2017).

Potential positive relationships to adoption of BMPs involve level of education and access to information (Feather and Amacher 1994, Prokopy et al. 2008, Ulrich-Schad et al. 2017). Studies that investigated the relationship between BMPs and information sources focus on the benefits and drawbacks to working with state

agricultural organizations as a mechanism to increase farmer knowledge and subsequent BMP implementation (Feather & Amacher 1994, Herendeen & Glazier 2009). Awareness of the benefits of BMPs can increase farmer BMP implementation. This coupled with BMPs compatible with existing land management style have a positive relationship with practice adoption (Gillespie et al. 2007, Reimer et al. 2012).

Compatibility and practicality relate to conservation literature about the cost of BMP implementation influencing adoption (Gillespie et al. 2007, Paudel 2008, Prokopy et al. 2008, Herendeen and Glazier 2009, Perry-Hill and Prokopy, 2014), Economic studies have assessed the likelihood of farmer adoption based on the cost and/or income benefit of BMPs, as well as, the overall incentive cost for implementing BMPs with consideration to regional environmental improvement (Ipe et al. 2001, Wossink & Osmond 2002, Arbuckle 2013, Asci & VanSickle 2015, Nyaupane et al. 2012, Talberth et al. 2015, Haas et al. 2017). Profitability despite implementation was found to promote the adoption of conservation practices (Cary and Wilkinson 1997, Ipe et al 2001, Nyaupane et al. 2012). Currently federal and state agencies use incentive programs to offset the cost of BMP implementation. The conservation literature gives a range of reasons behind farmer motivations for conservation, but it does not address the mechanisms and deeper socially embedded drivers of farmer decision-making.

Governmentality

The Delmarva Peninsula is an ideal place to explore BMPs because they have a dual voluntary and regulatory nature in this region. Governmentality, as a framework, inspires a deeper investigation into how “technologies of power” intersect “technologies of the self” and how this influences subject formation (Singh 2013 p.

190). Hence why governmentality is an appropriate lens through which to ask questions about how BMPs serve as both governmental and disciplinary forms of power and how this influences farmer acceptance of environmental governance.

The idea of “governmentality” stems from Foucault’s 1978 and 1979 lectures given at the College de France, which were respectively titled “Security, Territory and Population” and “The Birth of Biopolitics”. Foucault, and others, used this framework as a lens to ask questions about the nature and practice of government and how the intersection of “historical, contingent and humanly invented existences” generate multiple forms of subjectivity (Gordon 1991 p.3). This process of subject making is multifold and is most directly related to Foucault’s (1 February 1978) lecture “Governmentality,” which attempts to explain the differences between sovereignty as expressed through Machiavelli's *The Prince* and the art and later science of government. Foremost in this discussion is the idea of the pluralities of means and ends through which government is realized in contrast to sovereignty’s singular and circular purpose of ensuring the continuation of itself. According to Foucault, government works at multiple levels and in varied capacities driven by relationships between those governing and those being governed. Rather than only laws, government uses a series of tactics that perpetuates its pedagogies and interests through these relationships. Or as Li (2007) states, government works through “educating desires and configuring habits, aspirations and beliefs” and “artificially arranging things so that people, following only their own self-interest, will do as they ought” (p. 5).

The second key point Foucault (1991c) outlines in this lecture is the differences in the areas of control as they relate to sovereignty and government. The

area of control for sovereignty entails territory, which subsequently includes the population occupying this area, and for government entails population, which makes necessary the control of the subsequent territory this population inhabits. Though these ideas may appear the same it is the point of reference that distinguishes them and has further effect on the means by which these forms of governance are realized.

Sovereignty does not consider the character or well-being of the population that occupies its territory. In contrast, according to Foucault (1991c), the purpose of government is the welfare of the population through its physical, political, and economic health, which is enacted directly or indirectly through activities performed by the government. If these activities are done correctly they ensure that members of the government's populace are well provided for and willingly adhere to its constraints. Population becomes “the subject of needs, of aspirations, but it is also the object in the hands of the government, aware, vis-a-vis the government, of what it wants, but ignorant of what is being done to it” (Foucault 1991c, p. 100). This is not to say that government works only through tactics or indirect means without thought to consequence. According to Foucault (1991c), discipline (which was and is present in the many and still existing forms of governing) became even more important through its role in the management of population.

Foucault (1991c) makes a point in the end of the “Governmentality” lecture to say, that while government has become a dominant form of governance over both sovereignty and disciplinary societies, all these forms of governance coexist in a triangular relationship centered on population. These coexist because of different state systems, but also the pluralities Foucault (1991c) mentions, which entail mechanisms of state governmental control and beyond. Beyond the state, governmentality extends

to organizations that through their work attempt to change people's thoughts and subsequent actions to achieve the organization's goals. These organizations can exist at all scales from the local to the international, examples include non-governmental organizations (Bryant 2002) and certifying organizations (Naylor 2017).

As mentioned, governmentality is not a means to develop forms of government, but rather a way of thinking about government and its practice (Foucault 1991b). Or as Rogers et al. (2016) state, it is a "critical perspective on the constitution of power" (p. 429). This framework has been used for a range of topics since its original inception and its subsequent translations into Italian and then English (Elden 2007). Foucault, for his part, used this perspective to study the nature and form of government, Greek philosophy, Christianity, the state, liberalism and neoliberalism (Gordon 1991). His contemporaries used it to further expound on self-governance (Burchell 1991), social economy (Procacci 1991, Donzelot 1991a, b), and risk (Ewald 1991, Defert 1991). In geography, it has been used in reference to territory (Elden 2007), space (Huxley 2008) and policy (Birkenholtz 2009, Jepson et al. 2012, Singh 2013) among others. This study will use this framework in relation to environmental policies and subjectivities. Governmentality has been used in reference to environmental subjectivity for a range of environments from the urban (Leffers and Ballimie 2012, Anand 2017) to the rural (Birkenholtz 2009) and even wilderness areas (Kosek 2006).

Though governmentality has been used extensively as a theoretical framework, some scholars question its validity as they believe it too focused on technologies of power and capitalist structures (Singh 2013). Critiques have brought into question Foucault's disregard for things such as the role of affect (Singh 2013), the

complexities of cultural and power differences (Dowling 2010, Cepek 2011), and unexpected views reflective of the inherent tensions and mixed intentions of regulatory practices (Bartnett et al 2008, Dowling 2010, Jepson et al. 2012). Other scholars propose a reworking of the governmentality framework to include new Foucauldian ideas of “neoliberal governmentality,” which encompass economic means of subject-making such as incentives (Fletcher 2010, Kolas 2014). This reframing expands the notion of governance through state governments to include other governing agencies, which use government-like rationality as they replace the role of the state as it retreats through the process of neoliberalization. The particular shift in governmentality thought that I will focus on is the shift to environmental governmentality, which is articulated most frequently through the terms “environmentality” and “green governmentality”. I use both terms in my discussion of environmental governmentality.

Similar to governmentality, environmentality is a theoretical framework used to analyze how levels of involvement in regulation, programs and movements inspire a sense of commitment of state subjects to state goals; but this framework focuses specifically on environmental state goals that manifest in the implementation of environmental practices (Agrawal 2005, Cepek 2011, Jepson et al. 2012). It differs from governmentality in its focus on the formation of environments of state concern, which through state interest have become new domains of government (Agrawal 2005). Agrawal developed this term through his work in Komoan, India with local communities responsible for the protection of local forest environments and his in-depth analysis of literature on environmental politics and Foucauldian

governmentality. Through this research, he identified these forest environments as new domains on which technologies of government were enacted.

As with Foucault and his insistence on pluralities Agrawal prescribes several levels of new relationships which are established through the creation of these new spheres of government: environmentalized localities, which are the relationships between the state and localities that facilitate decentralization of regulations; regulatory communities, which he calls the new technology of local environmental councils established for locally driven environmental protection; and environmental subjects, which he defines as “people who have come to think and act in new ways in relation to the environmental domain being governed” (Agrawal 2005, p. 7). These relationships, according to Agrawal (2005), allow for the enactment of environmental regulations that reduce struggles over resource use from groups with long-standing and economic relationships with areas of resource concern. Struggle is reduced by giving local communities the semblance of self-governance. However, this is only a semblance because, ultimately, state interests are served by communities through adhering to state distributed guidelines (Agrawal 2005).

Green governmentality is used similarly as a lens to view approaches to subjectivity related to environmental governance, such as regulation and knowledge dispersion (Birkenholtz 2009, Dressler 2014). According to Birkenholtz (2009), green governmentality can highlight changes in thought and subsequent actions that happen through “institutionalizing” farmer support for conservation. This establishment of conservation as social norm is similar to Agrawal’s (2005) experiences with local forest management and shifting environmental perspectives. However, green environmentality does not emphasize the new relationships and levels of pressure

defined by Agrawal as central to environmentality. Green governmentality is still used to elucidate the mechanisms through which environmental policies are enacted, though differently and more reminiscent of Foucault's original framework (Kolas 2014). Both these frameworks are used by researchers to showcase how thoughts and relationships with nature have shifted with the creation of an "environment", which according to the state, is in need of protecting.

Environmentality, or green governmentality, has been used to assess a range of environmental practices from water regulation (Birkenholz 2009) to wind farms (Jepson et al. 2012), in a range of places from India (Agrawal 2005, Birkenholtz 2009) to the Amazon (Cepek 2011, Adams 2015) and at regional to local scales (Shoreman and Haenn 2009). Beyond mechanisms for self-regulation, environmentality is used to examine views on conservation and changes in identities resulting from the shifting political climate associated with decentralized regulation (Burgess 2000, O'Riordan 2016).

As with governmentality, some scholars have proposed problems and/or caveats to the environmental governmentality framework. Proposed problems with how environmentality is being used are that it gives scant attention to local agency, or the varied and complex mechanisms by which people become environmental subjects (Singh 2013). As with governmentality, the use of environmentality is critiqued for its focus on power relationships (Cepek 2011, Singh 2013). A proposed caveat to the environmentality framework is consideration for the formation of unexpected views, a phenomenon that Jepson et al. (2012) terms "environmental skepticism" and "reflexive environmental skepticism." These terms relate to the adoption of practices for economic reasons without considering their core philosophies. While some

encourage a neoliberal focus for environmentality (Fletcher 2010), others critique it for scholars maintaining this dynamic (Rowling 2010, Singh 2013). There is also question whether green governmentality as a framework has relevance due to the difficulty in meeting both societal goals that focus on physical, political and economic health and environmental goals that focus on protection of state mandated resources (Kolas 2014). Finally, the ability to universally apply conclusions gained through the use of the environmentality framework is limited. As Shoreman and Haenn (2009) say, “no single formula for conservation is universally applicable to the world’s amalgam of communities”; while a regional view may indicate positive progress for a particular effort this may not be the case at a local level. As with governmentality more generally, this does not detract from environmental governmentality as a lens to investigate environmental governance, but indicates that its use should be in consideration to these critiques. Recognizing the relevance of these critiques, my research expands on the current literature through a case study of environmental governance on the Delmarva Peninsula, where BMPs are used as both governmental and disciplinary tools for environmental subject-making. My research sheds light of the different mechanism, both regulatory and voluntary, used to convince farmers to adopt state ideals of environmental stewardship.

Social Production of Knowledge

Both the conservation and governmentality literature emphasize the importance of information to the fulfillment of state sustainability goals. Environmental subject-making on the peninsula happens largely through education and outreach, which is why I also investigated the information sources used by the agricultural community for conservation-oriented land use decisions. This educational

focus coupled the heterogeneous group of actors involved in agricultural knowledge production on the peninsula is why I adopted the science, technology and society (STS) literature as a secondary framework. In particular, the social production of scientific knowledge is used to investigate the generation of agricultural knowledge, which is a subset of scientific knowledge and obtained through the same experimental mechanisms (Mendelsohn 1977, Wood et al. 2014, Stone 2016). Though a subset, agricultural knowledge differs in its need for further testing for local specificity, which means that unlike the traditional view of science it is not limited to the realm of the laboratory.

Science, technology and society (STS) studies serve as a critique to the previously held belief that the scientific process is neutral and unbiased and only trained scientists are capable of unearthing scientific facts (Star 1995, Kleinman 2005). This is not to say that researchers in this field do not think that scientific knowledge generated in the laboratory has relevance. However, science, as with other forms of knowing, must be considered within the social context in which it was produced and with the recognition that different internal and external influences may have led to different scientific “discoveries” (Star 1995, Kleinman 2005). Researchers that study science and technology can be broken into two main groups: interactionists, who tie language and meaning to institutional patterns and commitments; and constructionists, who try to understand the processes of inscription, construction and persuasion (Star 1995, p.6). Both groups are interested in “opening the black box” that is scientific knowledge production.

The most well-known volume of this literature was from constructivists Bruno Latour and Steve Woolgar (1978) who did an ethnography of scientists within a

laboratory setting. Through this two-year study they argued that science is not, as dominantly believed, separated from the rest of society with its associated biases and fallible nature. Rather, science is embedded within the relationships and histories of a certain discipline to the point that scientific facts and the reality they define can be considered socially constructed and backed by self-perpetuating credibility.

Subsequent researchers in this realm have reinforced that science “is dependent on the social, economic and political organization of society, and extremely sensitive to changes in this environment” (Blume quoted through Frickel and Moore 2005, p. 4, Star 1995, Bridgstock et al. 1999, Kleinman 2005). Therefore, scientists do not look at the world and its phenomena with completely naive eyes (Kleinman 2005), but with “frames of meaning, definitions of situations and perspectives based on experience” (Star 1995, p. 15).

Assessing science from a social and political position also demonstrates that “institutions and networks shape the power to produce knowledge and the dynamics of resistance and accommodation that follow” (Frickel and Moore 2005, p. 5). These knowledge institutions and networks are expanding to include a range of organizations outside the laboratories and traditional forums of scientific study (Gibbons et al. 1994, Frickel and Moore 2005). The contribution to science of the public or lay people, is of particular note for this research, and an area that has been under much debate in STS literature (Gregory and Miller 1998, Frickel and Moore 2005, Kleinman 2005, Moore 2005). The previously dominant linear model of knowledge transfer, wherein experts would give information to a relatively uninformed public, has largely been discredited as different forms of knowledge generation are being recognized, especially at the local scale (Gibbons et al 1994, Gregory and Miller 1998, Wolf 2005, Pascuccia and

de-Magistris 2011). Lay people are especially important in agricultural knowledge production because of the “contributions farm operators and farmers’ professional structures make to production, refinement and diffusion of agricultural technologies” (Wolf 2005, p.94). This relates to experts only having partial knowledge in the local context (McCorkle 1989), despite their generally “unreflected-on stature” (Kleinman 2005, p121).

The STS literature also delves into how market and industry interests have had an influence on the production of scientific knowledge both within and outside of the university setting (Frickel and Moore 2005, Kleinman 2005). Studies have shown that in the production of agricultural knowledge “the perceived traditional division of labor between public and private-sector actors is blurring, the role of universities in production of public goods is increasingly ambiguous and there is a tendency toward privatization and commercialization” (Wolf 2005, p.92). The STS framework can be used to study conflicts that arise when the power to acquire scientific knowledge is redistributed to include different sectors and institutions not previously considered (Frickel and Moore 2005). In agricultural knowledge production, acquisition is redistributed to farmers who facilitate state research and experimentation and commercial enterprises like equipment and seed providers undertaking private research.

The mode of knowledge production and transfer are also changing with specialization, taking production into finer scales and new societal contexts (Gibbons et al. 1994). There is some evidence that commercialization of specialized information through databases and consultants has degraded the “previous localized, informal or publicly facilitated collective structures” of agricultural knowledge production (Wolf

2005 p. 113). Studies show that farmers still adapt new technologies to their specific local needs, but since this can be a time-consuming process of trial and error, they share this experiential knowledge to stay up to date on new technologies (Wolf 2005, Chapman and Paine 2012, Nuthall 2012, Stone 2016). This information can also be shared with commercial interests in a feedback loop through which new technologies are developed or refined (Wolf 2005). Farmer participation in knowledge production may be constrained by limited funds and resources compared to commercial and private organizations (Wolf 2005).

STS researchers have largely found that knowledge production is facilitated by a heterogeneous group of actors that includes scientists, public and state actors and private and commercial interests, within the agricultural context these public actors are local farm operators and affiliated professionals (Gibbons et al. 1994, Henke 2005, Wolf 2005, Granjou 2011, Wood et al. 2014). Or as Gibbons et al (1994), states, “the interactions among these sites of knowledge have set the stage for an explosion in the number of interconnections and possible configurations of knowledge and skill” (Gibbons et al 1994, p.10). Such collaboration can be ideal for environmental problems, which involve a diversity of stakeholders, and allow for the integration of expert and local knowledge driven by the concerns of stakeholders (Simpson Loe and Audrey 2015). The agricultural community also establishes relationships wherein “farmers deliberate about science in intensive and durable networks that have significant implications for theorizing agricultural innovation” (Wood et al. 2014). Technology trajectories are also determined and constrained by socially-mediated choices and power relationships to the point that development tends to follow existing historic trajectories (Kleinman 2005) or learning processes (Star 1995).

The study of social relationships and behaviors can help us to determine engrained hierarchies of influence and how rules and procedures came about and are reinforced (Frickel and Moore 2005, Wolf 2005). Technologies are also not as believed universally beneficial and can reinforce hierarchical stratifications (Kleinman 2005). Unexpected outcomes can happen even within existing trajectories but “by shaping the relative power of actors and the extent to which particular technological choices appear legitimate and appropriate—does increase the likelihood that a particular direction of development will be followed” (Kleinman 2005, p.33). The problems that result from new technologies or that these technologies are created to solve are also defined by a range of players:

Environmental problems in agriculture are defined through a diverse set of interests including the scientists and growers who are the main actors in this story but also governmental regulatory agencies, environmental activist groups and community organizations. These groups alternately promote or decry an issue in “public arenas: shaping its definition as a problem (or not)” (Henke 2005, p 222).

Knowledge production is both embedded in the social and “diffused throughout society” (Gibbons et al 1994 p.4), which means it also influences society (Bridgstock 1999, Gregory and Miller 1998).

Even though by their nature STS studies are a critique of the scientific discipline, they cannot have fought against such a long-standing community without being critiqued themselves. One of the critiques of the constructivist tradition STS is their descriptive rather than relational or causal focus (Frickel and Moore 2005). Some scientists and proponents of technological development or “technology utopianism” feel that with the need for and the benefits associated with advancements critical examination is unnecessary and “have attempted to marginalize critics by referring to

them as Luddites, alarmists and champions of technological stagnation” (Kleinman 2005, p.5). The final critique is that STS is also influenced by the same factors as other scientific studies with biases and trajectories based on the experience of those doing it (Star 1995). In consideration to these potential pitfalls, my study adds to this literature by investigating farmer perceptions of the different forms of knowledge available on the Delmarva Peninsula for conservation-oriented decision-making. Coupled with this evaluation is an exploration of how the groups involved with agriculture in this region act as sources of information that when brought together form a network of people producing agricultural knowledge for conservation.

Bringing Governmentality and STS Together with the Local

Local knowledge was found to be of importance for all three of the above mentioned academic frameworks, both as a point of conflict and potential resolution. Inclusion of local knowledge for practice implementation improved producer attitudes toward conservation management (O’Riordan 2016). This is because local and traditional ecological knowledge are valuable sources of locally specific environmental information. They parallel scientific knowledge in their rigor and usefulness to adaptive management (Berkes et al. 2000) with some producers having a similar level of knowledge with regard to beneficial practices as scientists and specialists (Lehébel-Péron et al. 2016). That does not mean it is accepted across all forums there are still members of the scientific community that have entrenched beliefs or resist changing their opinions on its potential contribution to science and technology (McCorkle 1989, Simpson et al. 2015). This entrenchment relates to how local knowledge is obtained through experimentation and observatories outside the laboratory setting, which is common in agriculture. Farm- and field-level experiments

conducted by farmers contribute significantly to agricultural knowledge production even though farmers' concerns are not always considered by the scientific community or policymakers (Wolf 2006). Collaboration between the scientific, agricultural, and environmental communities was often recommended throughout these literatures as both a means to resolve conflict and to accelerate the R&D process. Suggestions for collaboration were always inclusive of local knowledge for its value to knowledge production and in facilitating farmer acceptance of new practices.

Contributions

This research will help to broaden the above literatures through a case study of BMPs on the Delmarva Peninsula. My study contributes to governmentality literature through an investigation of how the state utilizes training for and implementation of BMPs as a strategy for environmental subject-making. On the peninsula, BMPs serve as both governmental and disciplinary forms of power. This research investigates farmer perceptions of both these forms of power for environmental governance and the influence the shift from voluntary to regulatory mechanisms for water quality has had on farmer decision-making. My research contributes to the STS literature by elucidating how governmental, private and public actors along the Delmarva Peninsula contribute to the production of agricultural knowledge through their common interest in developing and implementing BMPs for environmental sustainability.

Chapter 3

METHODS

In order to answer the questions, put forth in the introduction, I conducted a case study of the parties involved with BMP implementation on the Delmarva Peninsula. I utilized mixed methods following the Yin (2014) case study approach. Methods included participant observation of agricultural certification sessions and informational meetings and semi-structured interviews (n=30) of the farming community and those working with them on agricultural conservation. These data were analyzed through coding of interviews, observation notes and state conservation materials. Results were evaluated based on the two theoretical frameworks I identified as important to decision-making about conservation - governmentality and knowledge production. This chapter includes descriptions of the study site and nutrient management regulations followed by data collection and analysis methods.

Study Area

Site Description

The site for this study is the Delmarva Peninsula, which includes fourteen counties that encompass all of Delaware and parts of Maryland and Virginia. This area is of conservation concern due to its proximity to significant water bodies and the high percentage of land under agricultural production. The peninsula is bordered on its western side by the Chesapeake Bay and on its eastern by the Delaware Bay, Delaware Inland Bays and Atlantic Ocean. The Chesapeake Bay, as the largest estuary in the

United States, is of particular national concern and thus has been the focus of conservation efforts since the early 1980s. Despite these efforts, agriculture is still estimated to contribute 42% of the nitrogen, 55% of the phosphorus and 60% of the sediment loading in the bay, which causes harmful algal blooms (Chesapeake Bay Program, 2018). Much of the ongoing struggle to restore these surrounding water bodies stems from the over 6500 farms located on the peninsula. Land under agricultural production is variable by county, but some counties have over 40% of their area dedicated to crops and livestock, the highest grossing products of which are poultry, cattle, corn, wheat and soy (Census of Agriculture 2012a, 2012b). Growing these products has the potential to contribute nitrogen (N) and phosphorus (P) to surrounding watersheds. For livestock operations, contributions of N and P are possible through the storage and/or spreading of manure and in crop operations it is through the use of organic and synthetic fertilizers.

Poultry, in particular, is an important part of the agricultural landscape on the peninsula, and thus the agricultural production and conservation practices used. In Delaware alone, the poultry industry's gross income was \$946,342,000 in 2015, which consequently leads to high generation rates and land application of litter (a mixture of manure and bedding materials, usually wood chips) from poultry houses (Delaware Department of Agriculture; U.S. Department of Agriculture, National Agricultural Statistics Service 2016). Previous spreading of this litter at N-based rates with the expectation that excess P would stick to the soil (best known practice at the time) has led to an overabundance of P in some soils throughout the peninsula. This legacy P may continue to pollute neighboring watersheds despite nutrient management.

Nutrient Management

Most BMPs are voluntary and therefore not enforced through a regulatory framework, but some states have adopted nutrient management (NM) laws that require agriculturalists who use fertilizer or produce animal waste over a certain limit (as set by the state) to take actions to reduce the source and transport of P and N, which can contribute to nutrient loading. Certifications are required for producers depending on use of inputs and production type (pesticide use and food safety certifications), but nutrient management is most closely related to BMPs because nutrient management law requires the implementation of these practices. Therefore, I will focus only on NM in this regulatory section. Qualified farmers in Maryland and Delaware are also required to participate in education sessions to maintain their NM certification. These programs are similar, but specific requirements vary by state. When not mandated through state law, education and outreach are used to encourage adoption of these practices by appealing to farmers' sense of environmental stewardship.

On the Delmarva Peninsula, due to the high incidence of agriculture and other point and nonpoint pollution sources, state led nutrient management began in the early 1990s with voluntary programs to encourage BMP use. However, new regulations were sparked in the late nineties by an outbreak of the dinoflagellate *Pfiesteria piscicida* in Maryland's lower Eastern Shore in 1996 and 1997 (Pfiesteria Fact Sheet, 2017). The dinoflagellate was thought to be responsible for an increased presence of toxins, which led to a rash of fish kills and various medical ailments in humans who were directly exposed to contaminated waters (Paolisso and Maloney, 2000). In part due to this scare, Delaware and Maryland enacted the Delaware Nutrient Management Law and the Maryland Water Quality Improvement Act, respectively. Virginia also developed NM regulation through the Agricultural Stewardship Act, but it differs

because participation is completely voluntary unless a formal water quality complaint has been filed (Agricultural Stewardship Act Guidelines, 2017). The *Pfiesteria piscicida* outbreak was attributed to poor agricultural nutrient management by a scientific paper, which was later retracted, but this legacy remains through changes in agricultural conservation practices for fertilizer use and waste management.

The NM requirements vary by state; in Maryland, certification and plans are required for farms grossing over \$2,500 a year, that raise over 8 animal units (8000 lbs.) of livestock or with 10 acres or more of fertilized land. Maryland farmers can forego becoming certified farm operators and writing their own NM plans, but if they fertilize over ten acres they must at least have an Nutrient Applicator Voucher (Maryland Nutrient Management Law, 2017). The Nutrient Management Law in Delaware is similar in that farmers raising over 8 animal units are required to have an animal waste management plan, and producers fertilizing over 10 acres are required to have NM plans (Delaware Nutrient Management Law, 2017). The nutrient management plans consider the source and transport of nutrients and are written with allowances for unexpected circumstances (Maryland Nutrient Management Law, 2017). NM plans are short-term contracts for nutrient use based on recommended rates determined through analysis of fields, soil and organic waste tests, expected crops and their yields, and timing and methods for application. To remain certified and to avoid penalties, these plans must be updated every three years. Farmers must also participate in informational meetings and seminars to gain a state mandated number of initial and continuing NM education credits. Required farms were given a period of time to comply with the new regulations, but enforcement efforts are ongoing. If a farmer fails to comply with nutrient management requirements within a reasonable amount of time

there are associated fines and penalties. In Maryland, 98% of the regulated farm operations had a NM plan on file with Maryland Department of Agriculture (MDA) by the end of the 2016 fiscal year (MDA, 2016). Additionally, by 2016 over half of the agricultural acreage in Delaware was under a nutrient management plan to reduce the source and transport of these pollutants (NMC Annual Report 2016). As efforts were still showing limited results, the EPA as part of Section 303 of the Clean Water Act established a Total Maximum Daily Load (TMDL) for the Bay and its tributaries in 2010, which uses Watershed Implementation Plans to identify the nutrient and sediment reductions needed to restore water quality in the Bay by 2025 (Chesapeake Bay Total Maximum Daily Load, 2017). Non-mandatory BMPs, such as cover crops and conservation tillage, can contribute to the overall reduction of nonpoint nutrient pollution and are encouraged and incentivized by various state agencies throughout the Delmarva region.

Data Collection and Analysis

Data collection for this study consisted of participant observation, semi-structured interviews and data mining of conservation information resources obtained during participant observation and from state agencies and CE. Semi-structured interviews were analyzed through inductive and deductive coding for items and themes determined to be important during data collection and analysis and relevant to theoretical frameworks. Field notes from participant observation and conservation materials were also coded for relevant codes.

Participant observation

Participant observation was conducted at nutrient management certification courses and information sessions, but also included agricultural tours and fairs. Educational observations were located in Delaware, but some of meetings and workshops were attended by Maryland farmers. Participation consisted of being present for educational and promotional events to better understand what farmers are required to do for NM and the nature of informational and promotional resources available to them (Laurier, 2010). Notes were taken at each of these observations consisting of the topic and goal of each session, where it was located, who attended these events and how and what information was presented. For tours and fair visits, the same observations were made with the additional focus on how agriculture is presented to the public. These notes and materials were analyzed for information content and accessibility and for how participation at these events influences farmer perceptions of BMPs.

Table 1 Participant observation locations and descriptions.

Participant Observation	Location	Description
Delaware Nutrient Management Certification Sessions	The W. Charles, Sr. and Eleanor Clement Pardee Center	Initial educational sessions for nutrient generators, private and commercial nutrient handlers and nutrient consultants
Twilight Meeting	New Castle County, DE	Annual meeting to update farmers about crop, pest and cost share information
Soil Health Workshop	Elbert N. and Ann V. Carvel Research and Education Center	Educational workshop with presentations and cover crop demonstrations
Delaware Ag Week January 11, 2018	Harrington Fairgrounds, DE	Annual winter meeting featuring seminars on a range of agricultural topics

January 12, 2017		
Delaware Nutrient Management Commission Meeting	Delaware Department of Agriculture: Dover, DE	Monthly meeting of nutrient management commissioners to discuss regulation changes
Cecil County Fair	Fair Hill Fairgrounds, MD	County fair promoting agriculture through farm demonstrations and activities
Delaware State Fair	Harrington Fairgrounds, DE	State fair with farm activities and demonstrations and state agency outreach areas.
County Agriculture Tour	Princess Anne County, MD	Tour of dominant agriculture types and specialized facilities related to farming
Farm Tour	Kent County, MD	Tour of crop and conservation areas on a production agriculture site

The first group of participant experiences consisted of attending Delaware NM certification sessions to learn about the regulatory process and the different requirements for agriculturalists who produce and/or use nutrients. This was driven by a need to more deeply investigate the non-voluntary nature of nutrient management in Delaware and Maryland (it was indicated that their regulations were similar), which would influence farmer perception of BMPs and because one of the key points of the law was education about BMPs. These sessions consist of 4 classes that encompass different aspects of NM. The first session concentrated on information about the law and the requirements for each qualified type of agricultural operation, including nutrient management plans and animal waste management plans. The second session was primarily for nutrient generators, which is the class of farmers that produce, but may or may not land apply. For this session the focus was on the plans and permits required for animal operations, as well as mortality and manure management practices and technologies. After the second session the generators are certified. In the third

session the focus is on soil basics, nutrient cycling, fertilizers and all the associated practices and technologies. The third session concludes the requirement for the private nutrient handler certification, which is necessary for those who apply their own nutrients in the form of organic and synthetic fertilizers. The fourth and final session is an advanced course for nutrient consultants, which are the individuals responsible for writing NM plans based on NM law stipulations.

The second group of participant experiences was in the form of meetings and seminars for continuing education hosted by University of Delaware Extension (UDE) and the Soil Conservation District (SCD) for New Castle and Sussex counties. The first meeting attended was a Twilight Meeting where speakers provide updates to farmers in the area about some of the on-going research undertaken by UDE. This consisted of traveling to a University of Delaware field site where several agricultural trials are conducted. Attendees ($n = 16$) of the meeting consisted of farmers from the surrounding area and the presenters from UDE. Extension personnel presented information on pest control, nutrient management, crop varieties and incentive programs. This meeting is one of several Twilight Meetings that are given annually and hosted by the UDE agent in the area they are needed. This was one of the hundreds of available meetings related to NM and pesticide use that provide farmer with the continuing education credits necessary to maintain their certifications. This experience allowed me to assess what information farmers have access to through CE. The second meeting attended was a Soil Health Workshop, which was similar to the Twilight Meeting in most aspects except that it took place at the UD Carvel Research and Education Center, was jointly hosted by UDE and the SCD and had different information sessions. The information was centered on cover cropping practices, their

benefits, potential concerns related to these practices and related equipment. The final sessions I attended were at Delaware Ag Week, which is a week-long meeting that hosts a series of sessions designed for a variety of participants. This series of sessions was especially important because it is one of the major annual meetings in my study area, and was mentioned by both Delaware and Maryland farmers in reference to information sources about conservation practices. I attended the urban agriculture session in 2017 at the Delaware Horticulture Society, which included various topics related to urban farming and self-sufficiency, and drew in a different crowd than the main sessions of the week. I also attended the Agronomy sessions at the Harrington Fairgrounds in 2018, which included a range of topics from insurance and seed saving to malted barley and beer. Both Ag Week experiences had booths and exhibitors that I spoke with to gain a deeper understanding of their involvement with agriculture in the area.

Another data source was a monthly Delaware Nutrient Management Commission (DNMC) meeting, which was important in understanding the governance mechanisms for NM law in Delaware. These monthly meetings are open to the public and are eligible for education credit for farmer who attend. Another relevant reason for attending the commission meeting is that the DNMC was a key factor in differences in acceptance between Delaware and Maryland when regulations were first proposed. The DNMC includes farmers representing all the agricultural types and the commercial nutrient users found in Delaware, an environmentalist, a public citizen and a moderator who is an ex-officio member of the commission. The meeting consisted of members of the commission discussing new proposed regulations and how they relate to the needs of the populations they represented. Scientific information and

community member needs were used as evidence for changes or additions to the regulation. Votes were unanimous for all proposed changes and they were added as potential alterations to proposed regulations, but the NM law remains unchanged.

The next set of participant observations consisted of attendance at a county and state fair. The reasoning behind the inclusion of this to my participant experience is because these fairs are used as mechanisms to promote agriculture in the area, as evidenced by various agriculture related demonstrations and booths. These demonstrations were for educating both the farming and the non-farming public and allowed the non-agriculturalists to interface with members of the agricultural community and increase understanding of farm life.

The final experiences consisted of agriculture tours with interviewees that highlighted the different practices implemented by individual farmers and the overall agricultural community. The community tour took place on the lower eastern shore of Maryland and entailed an interviewee taking me on a driving tour to point out various industries and landmarks discussed during the interview. This was for the most part distant observation from the vehicle, but I also had the opportunity to explore a seed treatment facility. The second tour was for a farm operation and, as with the first tour, highlighted topics discussed during the interview by pointing them out in the operation.

All the participant observation experiences helped me to develop a picture of conservation-oriented decision-making mechanisms for farmers and state employees. They also increased my understanding of the pressures that the farmers work under and facilitated conversation during the interview process through relating shared experiences. Data collected in the form of field notes through this experience

were used in conjunction with interview data to support the common narrative proposed in the empirical chapters. Field notes consisted of the date, time and location of the observation venue, as well as the purpose, information relayed and who attended. I also retained all conservation information materials from these events and obtained those available at UDE and SCD locations. These notes and materials were coded for information content and themes related to theoretical frameworks and consistent with interviews.

Semi-structured interviews

I conducted semi-structured interviews to test my hypotheses about farmer motivations for BMP implementation, if other non-BMP practices are being implemented and what information sources farmers use to make conservation decisions. Interviews were semi-structured and based on an interview guide I utilized to maintain consistency across all interviews for comparative analysis. I asked guiding rather than structured “yes or no” questions to allow interviewees to develop their own responses (Longhurst, 2010). The interview guide consisted of four suites of questions with one primary question and one to three sub-questions. The interview guide is included as Appendix A at the end of this chapter.

Snowball sampling was used to identify potential interview participants. Initial contacts consisted of recommendations from UDE and SCD in Delaware and personal connections to the farming community in Maryland. Further contacts were found by asking for participant recommendations. This form of sampling increases the number of participants, but may skew the data in that interviewees tend to recommend individuals with a similar background and perspective on conservation. Snowball sampling is often used to ensure all important parties for a project are interviewed, as

indicated by repetition of recommendation, but since there are over 6500 farms on the peninsula very few names were repeated. To avoid bias as much as possible I used different connections and avenues to the farming community to diversify the sub-groups within the greater community that I was pulling from for interviewees.

Potential participants were contacted via phone or in person to request an interview, after which interested parties set a convenient time and place to conduct it. Most interviews were conducted in person and whenever possible on farms or at agencies, but three were conducted through video conferencing. A total of 30 interviews were done with most interviews being one-on-one, but some had multiple participants for a total interviewee count of 35. Interviewees gave their verbal consent to participate and all interviews were recorded and stored in audio form for later coding in a password protected location. Length of interviews ranged from 7 minutes to two hours. Interviewees were selected based on their membership in one of these groups: farmers who implemented BMPs, state agricultural personnel (Soil Conservation Districts, State Department of Agriculture (SDA), Cooperative Extension (CE) and United States Department of Agriculture - Natural Resource Conservation Service (NRCS)) and other members of the agricultural community (agricultural and environmental consultants). The demographics of participants were: 73% farmers, 33% state employees, 10% consultants. The greater than 100% total was due to farmers also being either state employees or consultants. All agricultural types present on the peninsula were represented, as well as, different operation sizes with farms ranging from 7 to 12,000 acres. Locations of operations of farmers interviewed were distributed throughout the peninsula to account for differences in the physical characteristics between the rolling topography of the north and the flat lands of the

south, except for the lower Virginia counties. Not including Virginia was a choice driven by differences in agricultural characteristics and regulation (primary among which was no NM plan requirement for Virginia farmers) and consideration for how this difference influences motivations for BMP implementation. A complete list of demographics of interviewees can be found in Appendix B. Given the number of potential interviewees (1000+) throughout this area and the limited number of interviews ($n = 30$) comparatively, this study will speak to the experiences of participants and how this relates to other studies within the framing literature. Though representatives from each agricultural type were interviewed that does not mean they speak for their entire group. Having a varied sample does highlight the different concerns of sub-groups within the agricultural community, which is important to this research because what is produced and the land resources available determines the practices implemented – BMPs included.

Atlas ti software was used for the qualitative and quantitative analysis of the interviews through coding. I used both inductive and deductive coding based on previous research and expectations and those themes which evolved out of the collection and analysis process. The first group of codes identified the questions and sub-questions and frequently mentioned items and expressions. The frequency and frequency of intersection of these codes were then used to develop themes that were part of the second group. The second group of codes consisted of themes of relevance to my theoretical frameworks and determined to be important during the interview and analysis process. A full list of the codes and counts are included in Appendix C. The four main questions shown in Appendix A were each given their own code. Concurrence tables within the Atlas ti software were used to determine the frequency of codes intersecting with question and other significant

codes. These frequencies were used in conjunction with a secondary in-depth analysis of code-specific quotes and grounded in theory to develop narratives (Cloke 2004, Cope 2010). Relevant codes and subsequent narratives are defined for each empirical chapter. Combined, this interview list and participant experience gave me a snapshot of the perspectives of the producers and conservationists on the Delmarva Peninsula regarding BMPs.

Chapter 4

GOVERNANCE STRATEGIES FOR AGRICULTURAL CONSERVATION ON THE DELMARVA PENINSULA

Introduction

In the 1930's a dry period in the southwest, more popularly called the Dust Bowl, led to extensive soil loss largely brought about by agricultural practices implemented by the recent influx of inexperienced farmers. To alleviate and hopefully avoid such an event from happening again, the United States government has enacted a series of acts and laws beginning with the Soil Conservation Act of 1935 to educate and motivate the agricultural community to make more conservation-oriented decisions (McLeman et al. 2014). Despite state and federal efforts to emphasize the beneficial nature of conservation practices their implementation remains a point of conflict. This chapter investigates how conservation philosophies and in particular the training for and implementation of agricultural best management practices (BMPs) are utilized in environmental subject-making.

BMPs are generally voluntary practices that were developed for the purpose of improving water quality and/or soil health. Though most BMPs are not enforced through a regulatory framework, education and outreach are facilitated through the establishment of relationships between the agricultural community, state and federal agencies and Cooperative Extension (CE) personnel. States determine the specific BMPs that are most applicable for their agricultural community, but the standards for implementation are based on federal guidelines. Depending on environmental

concerns, some states have enacted laws that require farmers to obtain certifications and/or do planning for specific inputs if their operation exceeds state defined limits. These educational and planning mechanisms encourage farmers to consider environments of state and federal concern (i.e. the Chesapeake Bay) as places for conservation for the sake of sustainability. These mechanisms pressure farmers to act beyond their everyday management concerns and become environmentally conscious subjects for the sake of current and future generations. I argue that due to the inherent flexibility and voluntary nature of this widespread conservation framework, BMPs are one example of the broader neoliberalization of environmental governance away from state intervention to self-regulation (Birkenholtz 2009). Therefore, governmentality is a useful lens to shed new light on how BMPs contribute to the making of environmental subjects.

Governmentality as a framework is utilized to investigate how “technologies of power”, intersect “technologies of the self” and how this influences subject formation (Singh 2013 p. 190). These technologies of power are administered by the state, which is the governing body of a particular territory, and subjects are the people who occupy this territory and are willing to adhere to state goals. Foremost in governmentality is the idea of the pluralities of means and ends through which government is realized in contrast to sovereignty’s singular and circular purpose of ensuring the continuation of itself. According to Foucault (1978), the government works at multiple levels and in varied capacities driven by relationships between those governing and those being governed. Rather than only laws, the state through government uses a series of tactics that perpetuates its pedagogies and interests through these relationships with state subjects. Foucault (1991) mentions the persistent presence of all forms of state power

including sovereignty and discipline alongside governmentality, but perceived government as the final stage of governance because it does not require the use of either force or threat of consequence to ensure its subjects adhere to state goals (Daurier, 1999). Specific to environmental governance, governmentality is used to elucidate the mechanisms through which environmental policies are enacted (Agrawal 2005, Birkenholtz 2009, Cepek 2011, Jepson et al. 2012, Dressler 2014, Kolas 2014). Included in this discussion is the idea of biopolitics, which conceptualizing the environment in need of security to ensure its continued viability for humanity (Luke, 1999). Environmental governmentality investigates how state defined environments become new domains of governance (Agrawal 2005), and the “environment emerges as a ground for normalizing individual behaviors” (Luke 1999, p. 149) through “institutionalizing” subject support for state environmental goals (Birkenholtz, 2009).

For this research I had two expected hypotheses: first, farmers will use BMPs when mandatory or advised by an experienced member of their farming community, but would otherwise follow their own management practices based on personal perceptions of environmental stewardship and land use priorities; second, education and training for BMPs, coupled with environmental members of the farming and non-farming public, pressure farmers to be more environmentally conscious citizens, but acceptance of these practices will be variable. In the following I will discuss three technologies of power used by the state, the last of which is also used by environmental groups and the public. These technologies are: voluntary and regulatory BMPs for soil health and water quality, which relates to farmer perceptions of land stewardship and the different levels of relationships in environmental governance; and the social pressure placed on the farming community from the state, environmental

groups and the farming and non-farming public because of the high visibility of farming practices.

To Regulate or not to Regulate? That is the Question

The Delmarva Peninsula, in particular Delaware and Maryland, is an interesting case of environmental governance because what began as voluntary mechanisms of government have reverted to a disciplinary state through regulation for nutrient management (NM). Regulation is considered a necessary intervention to reduce nutrient loading, which would otherwise have a plethora of negative impacts on organisms within and dependent on polluted water bodies. In this sense, this regression to regulation relates to Foucault's concept of biopolitics - wherein enacting power in the form of "interventions [is] commonly justified in terms of nurturing and sustaining life" and the acted upon "object is commonly 'populations'" (Fletcher 2010, p.176). To reiterate some key points of the regulatory shift to highlight biopower at work, Maryland and Delaware enacted NM laws in 1997 and 1998, respectively. These laws require qualified farmers to have a NM plan and be certified through initial and continuing education sessions to use or generate nutrients. Exceptions are specific to each state, as an example, Maryland farmers can forgo some NM requirements through the use of consultants or other specialists that develop plans and do input applications, but all qualified farm must be acting under an NM plan. Regulation is not typical of national NM initiatives, or even regional, as Pennsylvania and Virginia have limited or complaint-driven (farmers only have to change practices if someone lodges a formal complaint) regulations for NM, respectively. Rather on most of the peninsula, water bodies and their subsequent watersheds have become environments of state concern and new domains of disciplinary governance. And this

is in addition to the on-going national discourse that improved water quality and soil health is necessary for continued economic viability - that speaks more to a neoliberal governmentality, which uses incentives to change individual practice (Fletcher, 2010). To avoid confusion from this point forward state refers to sub-territories within the United States that have their own political structures, i.e. Maryland and Delaware, and federal will be used for the national system.

To determine whether BMPs are contributing to environmental subject-making and how each form of power has influenced this shift, this section will focus on interview responses and participant observation notes and materials related to motivations for BMP use. Particular attention was given to whether responses indicate that farmer stewardship, as evidenced by their stated intentions and voluntary use of BMPs, or another reason, such as regulation or economics, determine BMP implementation. State employees interviewed were also asked about their role in environmental governance to assess the mechanisms used for subject-making. State interviewees included members of CE, the Soil Conservation District (SCD) and the USDA-Natural Resource Conservation Service (NRCS), some were exclusively employed by these organizations while others were also part of the farming community. Questions were asked in general and specifically in reference to NM. In this section I will discuss the voluntary and regulatory relationship on the peninsula by focusing on the differences between the NRCS and SCD using relationships and cost share to facilitate BMP use versus the regulatory push from these states that CE facilitates through required education. This is further tied to farmer perspectives of stewardship and how their practices have changed to assess the influence of the regulation.

Non-regulatory strategies for environmental governance

According to Foucault (1991), government uses relationships between the governing and those being governed to facilitate state goals. These relationships act as a mechanism to perpetuate state pedagogies such that subjects follow state desired behaviors without having to be told to do so (Foucault 1991, Li 2007). Though certain NM practices and education are mandatory, BMPs are largely voluntary, of the 155 practice guidelines put forth by NRCS only the 5 related in NM planning are mandatory in Maryland and Delaware. Therefore, to increase the adoption of non-regulated BMPs state agencies and CE rely on non-disciplinary strategies, in general; and according to interviewees relationships and incentives, in particular. Interviewees identified three main ways that relationships that facilitate the adoption of voluntary BMPs were established, which included employment or membership in state agencies or CE, farmer innovators interested in new programming and technologies, and conservation planning (includes NM plans). Incentives mentioned by interviewees included both financial ones in the form of cost share and ecological ones in the form of long-term benefits. The use of cost share funds relates more to the neoliberal turn in governmentality literature. Fletcher (2010) defines neoliberal governmentality as a form of governmentality that “seeks merely to create external incentive structures within which individuals, understood as self-interested rational actors, can be motivated to exhibit appropriate behaviors through manipulation of incentives (p. 173). Incentivizing the ecological benefits of soil health BMPs is another tactic (in conjunction with relationships) that SCD and NRCS interviewees used to perpetuate state philosophies of soil health. This perpetuating of state narratives may or may not relate to biopower and more disciplinary forms of governance involving internalizing

the state's moral imperative. The following will expand on these strategies and give interviewee evidence.

All state interviewees mentioned that one of their primary roles is to establish relationships with the farming community to assist and advise. The interviewees from the SCD and the NRCS, which are agencies that have maintained their non-regulatory capacity, reinforced their use of relationships to convince farmers of the value of BMPs. One member of SCD when asked what the role of the agency was said: "All the agencies work together to try to do the right thing for the farmer, for the landowner and for the environment" (26). When asked about the SCD's role in relation to BMPs in general and NM in particular, the same interviewee emphasized the non-regulatory capacity of this state organization:

I've talked to you about the comprehensive nutrient management plan. The nutrient management plan that everybody has to have. They are developed by people with licenses- high dollar people with licenses- and they bring them down to you - some of them are that thick. Guess what? They are going to sign that and you're going to sign that and that becomes an implement of law. . .Nobody has really enforced it. We are the office, but we are not enforcement (26).

When the SCDs were initiated in the 1930's they had the right to enact regulation, but since they had and still have farmers on their board and in their employment, they have for the most part forgone the use of regulation to maintain relationships with the local community (Helms, 1992). The presence of farmers within this organization was evidenced by 4 of the 7 SCD members I was in contact with being agriculturalists in some capacity. Interviewees indicated that these relationships, between state agencies and farmers, act as a conduit of conservation information to the rest of the community. The educational benefit of farmers also serving in state agencies or CE goes beyond current employees and members, as several farmers interviewed mentioned previous

ties to these organizations and/or business partnerships or friendships with farmers with previous ties.

Some farmers without previous ties to these organizations are also attuned to their message and interested in perpetuating it. These innovators or champions are another conduit of information, and are valued as a source of local knowledge by the farming community (Enloe et al., 2010). Champions interviewed often adopted new state practices to test them for local compatibility, and for non-structural BMPs like cover crops, used experimentation to adapt them to the local context. For instance, a NRCS employee expanded on how innovators were used as an example to the rest of the farming community:

The manure storage facility - it was hard to get the first one on the ground because some people said *ah I don't know about that*, but like you said you have to go to those that are the innovators, those that think outside of the box, and if you can get those guys to jump on board - everybody else follows suit, because they think *if that guy is doing it it must be okay*. . . Once you can show them, not really convince, but just show that there is a better alternative than doing it that way - then they are willing to. They say, *you know what I will give it a try*. . . And they start to pop up and everyone else is like *man that guy down there he has two of those things already* you know and it catches on (29).

This quote illustrates how a state can use relationships for “educating desires and configuring habits, aspirations and beliefs” to get subjects to willingly adopt voluntary practices without threat of consequence (Li 2007, p. 5).

Another way NRCS and SCD interviewees indicated they establish relationships is through conservation planning. Conservation planning is defined at the federal level through the Farm Bill. Both the current and previous farm bills have had stipulations for agricultural conservation, in general, and funding, in particular. Farm

Bill material, obtained through NRCS, identified the following goals of conservation planning:

The NRCS staff is available to help you define resource concerns on your land and identify assistance opportunities available through Farm Bill programs. NRCS conservation professionals are available in nearly every county across the country and can help you develop a conservation plan based on your natural resource and operation goals. Through the conservation planning process, NRCS staff can identify and explain the Farm Bill [cost share] programs that best match your natural resource objectives (USDA-NRCS).

Of note in this material quote is the emphasis on how this planning is helpful to farmers and that through this process both “natural resource and operation goals” can be considered and achieved. Furthermore, NRCS staff members serve in an advisory capacity but goals are the farmer’s because it will be the farmer’s responsibility to fulfill them. Conservation planning (of which nutrient management is a part), is initiated through engaging the interests of farmers at various promotional events, like the state fair, or through existing relationships. Plans are developed in communication with farmers to ensure their goals are considered and through evaluation of their property. This process of achieving state goals was reinforced through conversation with a NRCS employee that said:

The conservation planning aspect is meeting with the landowners to sit down with them and discuss if there are any problems out on the farm. The planner’s kind of do a walkthrough of the different parcels of land that an individual may till to look for problems. . . If it is resource based and it is a thing or problem that we can remedy we like to bring that to the landowner’s attention so that we can potentially solve that resource concern (29).

This staff member reiterates the advisory capacity of planners through mention of recommendations, but also explains more about the field assessment and hints at how through this process relationships can develop - as planners walk the fields with

farmers. This consideration of farmer desires along with the seemingly place-based approach of assessing their individual needs, both agricultural and environmental, may facilitate farmer acceptance of BMPs. I say seemingly place-based because these organizations have a suite of practices they promote (evidenced by educational material pictured in Figure 1), but interviewees indicated they focus on relatively few of them based on agricultural type. A SCD member also referenced re-establishing relationships through walking and elaborated on plan suggestions:

When I am doing whole farm plans for people because that is a requirement we have to get a grant fulfilled it is usually multi-practices that I can get farmers a [cost share] credit for. I am usually finding that they are doing no-till, crop rotation, nutrient management, IPM [integrated pest management] and cover crops. And if they are not doing all five of those things and then I will recommend adding one of them and I will put that in the list of objectives in my plan. The reason we are doing this whole farm plan is because that is how we used to do things with the NRCS, but it has gotten away from that and it is all contract driven now so we are trying to get back to where we can go to a farmer and say - *hey, can I walk your farm and see if there is any resource concerns I can help you with - there are things you could be doing* (30).

Beyond relationship building, this quote speaks to the promotion of relatively few practices. Even if their placement is assessed on a field by field basis, these few practices are encouraged to all, or mandated in the case of NM, to get all farmers to the same level of conservation. Whether all agencies across the peninsula utilize this strategy cannot be determined, but conservation with members of three of them hinted at the promotion of a few popular practices; the practices promoted did seem to shift, which may indicate that implementation of some BMPs has reached a saturation point in the agricultural community.

Farmer resistance to advised BMPs can complicate NRCS goals, especially when relatively new employees or younger farmers working within these agencies advise more senior farmers as shown by the following quote by the above SCD employee:

And it is tough because - who am I? I am just some kid who shows up to tell a guy who has been farming for 40 years that he should try to find a way to squeeze another crop into his rotation (30).

This interviewee did not have the range and strength of relationships that one of the other interviewees had established among the farming community through serving in an advisory capacity for a long time. The long-standing employee indicated that relationships can be initially difficult to establish especially when farmers have different levels of resistance to state goals. Akerman (2005) found in his study of the Finnish farming communities that there was resistance to agri-environmental management schemes, which did not consider the “local and ecological conditions” in their attempt to standardize environmental practices (p. 603). Whether that is the circumstance here is ill-defined, but the rhetoric of the NRCS indicates that they are interested in doing a place-based assessment. However, this does not explain why, despite farmer consideration, several interviewees mentioned that there are still people “flying under the radar” because they are disinterested in state involvement in their farm operation (26).

As part of the planning process and in consideration to the practices they have identified as needed both the SCD and NRCS offer free or subsidized services through funding mechanisms. Much of this funding comes from federal incentive programs (identified in the Farm Bill) through which farmers can qualify for cost share funds for designated uses (i.e. erosion control structures and irrigation management). Funds are

distributed by the federal government to states which allocate the funds to farmers based on a scoring system that evaluates the farmer and environmental benefits of each proposed cost share agreement. The literature available to farmers states the goal of the Farm Bill incentive programs as:

The 2014 Farm Bill provides America's farmers, ranchers and non-industrial forest landowners a package of voluntary programs for conserving natural resources. Technical and financial assistance helps agricultural producers implement conservation practices and activities that protect our waters, promote soil health, enhance wildlife habitat, improve air quality, and conserve energy. This guide introduces the conservation assistance available from the USDA-NRCS through the Farm Bill.

That this quote qualifies the use of these funds for conservation efforts of interest to the federal and state governments elucidates how this mechanism is used to achieve the goals of the governing body. These funds are used to level the financial ability of farmers to implement state recommended BMPs. The general impression given by both state personnel and farmers interviewed was that cost share is the reason farmers visit NRCS and SCD in reference to BMPs. Two SCD employees interviewed emphasized this point, though in different ways and with different levels of criticism. One said:

Everything we do in here is about cost share. We have a cost share for different things if someone is going to do something on a farm, every farm has to have a farm plan, and in that farm plan they have to have managements and with the new nutrient management law everybody has to be in compliance for that. Every farmer has to have a nutrient management plan by law and there are certain things you have to do on your nutrient management plans to be in compliance. So that's when we go into BMPs that they got to have. Most people come in here, through us, for the BMPs - everybody. Everybody goes to their local soil conservation district. . . [Those not interested in cost share] can come in here for technical assistance (26).

The second SCD employee was a little more cynical, believing that farmers are interested in the payment amount with respect to profitability rather than the environmental benefits. Both stressed how financial assistance is a driver for practice adoption for those interested in cost share, but there may be bias in this impression as they primarily interacted with farmers that came to SCDs for cost share. It was difficult for these agency personnel to determine if farmers not using cost share were environmental subjects as they did not interface with them.

To fulfill their role of increasing the use of BMPs, both voluntary and regulatory, the SCDs and NRCS members interviewed use incentives in conjunction with conservation planning and relationships as multiform tactics to further state goals of agricultural conservation. One SCD member described this process as follows:

What's happening before we do anything with anybody when they come in to try to apply to anything [cost share] [we say] let me see your current nutrient management plan, if you do not have a current one, that's up to date and everything, come back when you get that straight and we'll talk again. [If they are flying under the radar then they are not likely to come in for cost share?] Exactly. We have a lot of people in these rural areas that do not believe in these programs they want to be left alone they don't want to be bothered and we are a very rural county . . . Most the people I am talking about are the older generation (26).

Based on this quote, cost share is a mechanism that non-regulatory agencies use to aid with compliance. Even though SCD and NRCS employees do not have the authority to enforce regulation, this quote and Maryland (MDA-Steps into Compliance) NM compliance literature indicates that they can withhold support to compel farmer to comply. While it is interesting to note that this tactic helps fulfill compliance requirements, farmers who mentioned cost share during interviews did so in reference to voluntary BMPs. Interviewees were seeking cost share for a range of practices based on personal interest in farm improvement (environmental subjects) or state

advisement (current or future environmental subjects). The second part of this quote that references those disinterested in cost share was also present in interviews as farmers did not want to “jump through” the required “hoops” (15).

Since financial margins in agriculture can be so tight, funding to offset cost can be a powerful tool to increase use of voluntary BMPs. One farmer who was eligible for cost share brought the need for financial assistance into focus when they mentioned having to take out a loan because the payments from the state were delayed. Expenses and financial margins were high on the list of concerns for farmers interviewed, which is why it was the second highest ranked code overall (total code frequency = 83). Several of the farmers interviewed, when asked their resource concerns, indicated that they were economic (code intersection frequency (cif) = 18). The need for profitability or at least the influence of the cost of BMPs has been studied within the conservation studies literature (Prokopy et al. 2008). The evidence in this body of work that farmers would adopt BMPs if they do not suffer a financial loss, may have sparked the federal governments to use a more neoliberal governmentality strategy to increase participation in the BMP program.

Alternative to and in conjunction with cost share, BMPs are incentivized through emphasis on their practical and beneficial aspects, i.e. increased soil organic material for water retention. One interviewee from NRCS when asked about farmers' resource concerns as they relate to conservation said:

We hope that they are the same as ours that is the whole concept behind conservation planning you know. A farmer knows when something is not quite right and our mission at NRCS is to help an individual help the land and so if you are operating at a high level it is because you are doing something right or because you understand what it means with the give and take relationship you can't take from the soil without giving something back so we try to get people to understand that you

got to protect your resources because that is all you have so when it comes to soil erosion . . . with NRCS we try to teach individual that this is how you should protect this area (29).

The Farm Bill rhetoric of farmers saving the environment through conservation exemplifies the decentralization of environmental governance. These philosophies are perpetuated through state agencies - NRCS prominent among them due to participation in policy development. In relation educating soil health philosophies, when one farmer was asked if their practices relate to land stewardship they stated:

Well it's all based in soil health - heavily steeped in healthy soils. In healthy soil you gain organic matter, cation exchange capacity, your soils make nutrients more available, they percolate better, they handle water better, they have higher water holding capacity. . . Like I said, I am thinking, it is difficult to run the numbers because there are no real numbers and I have too much emotion involved so my numbers are always going to work out. I think over time as land improves and soils improve it will make stronger crops and more money and improve the world (22).

This interviewee can be considered an environmental subject who has internalized state philosophies related to both soil health and sustainability for future generations.

Other interviewees also tied BMPs to soil health and profitability. One farmer identified soil health as follows:

Soil health- it is where you make your money your ground is what you are growing out of you can't rape it for all it's worth and then throw it away and get new stuff. It's kind of expensive. It would be different if you could pack it up and move on down the line. It's kind of hard to pick a farm up and move it (16).

Neither of the above farmers participate in cost share programs, but they are aware of the value of healthy soils and willing to conserve this resource based on what they learned from the state and other information sources.

State and federal governments recognize the need for farmers to remain profitable, which is why it is a stipulation in Maryland and Delaware's NM laws and

mentioned in the Farm Bill. According to my interviews, without consideration for profitability at both the federal and state level farmer needs for financial security would supercede the need for environmental stewardship. One interviewed farmer defined the relationship between profitability and resource concerns as:

We have to stay profitable - I wouldn't say primary. We also look at the overall. I wouldn't say we are necessarily concerned about the bay, but us being concerned about our land and our runoff so we also think about what we are doing as far as sprays and rotations and preventing erosion and utilizing as much manure as possible on our own farm without it running off. That helps the bay, but our motivation is that my manure is valuable to my land. My ground is valuable to my farm. So it is sort of difficult to separate the economic from the altruistic feel good environmental (4).

In Yeh's (2005) study, inconsideration of farming livelihoods and disregard for rural populations in environmental restructuring caused unnecessary tension between farmers and state personnel, which delayed acceptance of new environmental policies.

The above NRCS interviewee's hope that farmers have a similar ethic illustrates how the state and federal governments are making efforts to teach desires in such a way that their constituent farmers adhere to state goals without even realizing it. Use of economic reasoning, either through financial assistance or incentivizing practices based on their production value, aligns with the thoughts of farmers interviewed, as evidenced by several farmers indicating their primary concerns are economic given the tight financial margins in this industry (cif = 18). Farmers interviewed were also more likely to accept and adopt some practices if they knew they add to productivity (cif = 33) or their cost is offset (cif = 25). State efforts to convince farmers of the value of BMPs have been to some degree successful since interviewed farmers often related their use of BMPs to soil health benefits (cif = 29). Awareness and access are predicated by relationships between agency personnel and

members of the farming community that facilitate the transfer of knowledge. Such transfer is undertaken by all state agricultural organization, but is the purview of CE.

Regulated strategies for environmental governance

When water quality regulation was initiated it shifted BMPs related to NM planning and NM related education mechanisms from governmental forms of power to disciplinary ones. The biopolitics of resource conservation for all living things dependent on water resources was already present when the voluntary NM programs began in the early 1990's - with state attempts to instill in farmers a moral ethic of shared responsibility for sustainability. National initiatives that are not regulated are also trying to instill the value of water quality to the U.S. public. When the *Pfiesteria* outbreak endangered the health and livelihoods of people dependent on the water resources on the lower eastern shore, internalizing a moral imperative for reduced nutrient loading became a state priority - to the point of intervention and mandatory education for all possible offenders.

While CE interviewees cited similar mechanisms to facilitate state goals of BMP adoption (acting in an advisory capacity and establishing relationships to facilitate knowledge transfer), they became associated by most farmers interviewed with the certification process through their role as facilitators for mandatory NM education. CE, in both states, is contracted by their state department of agriculture to moderate the initial certification sessions and co-host the meetings and workshops for continuing education credits required of nutrient generators, handlers and consultants. The primary focus of some of the agents interviewed was NM education, but it was not CE's only role. Other interviewed agents participated in a range of experiments to assess conservation and agronomic practices through their position within their

College of Agriculture. State departments of agriculture work in tandem with state environmental agencies to ensure farmer compliance of the NM laws. According to the Delaware Department of Agriculture (DDA) its current nutrient management mission is:

To manage those activities involving the generation and application of nutrients in order to help maintain and improve the quality of Delaware's ground and surface waters and to help meet or exceed federally mandated water quality standards, in the interest of the overall public welfare (DDA, Nutrient Management).

The Maryland Department of Agriculture has a similar mission:

The Nutrient Management Program protects water quality in the Chesapeake Bay and its tributaries by ensuring that farmers and urban land managers apply fertilizers, animal manure and other nutrient sources in an effective and environmentally sound manner (MDA, About Maryland's Nutrient Management Program).

The language of both missions is similar, but different from, the Farm Bill literature in that emphasis is placed on environmental concerns, but fulfilling these goals is mandatory. With the new laws the role of CE expanded from its previous capacity of being a source of information which farmers voluntarily sought out to facilitators of regulatory information because part of each law stipulates that farmers learn about BMPs. Based on my participant observation and interviews there are a range of positions within CE that agents fill related to education of BMPs. As an example, one agent said this when asked about CE and BMPs:

Everything I do is BMPs from making fertilizer recommendations to talking about handling mortality. Whether we call it a BMP or not what we do is we present what we think the best information to you is and that's a BMP (10).

This quote emphasizes the importance of BMPs and their education to state water quality goals because according to this interviewee BMPs are considered the “best”

solution, which is why much of the CE programming I participated in is centered around them.

Like the non-regulatory agencies, interviewees indicated that CE personnel establish relationships with farmers to facilitate the transfer of information. These connections can be important when farmers are resistant to state philosophies of sustainability due to tensions associated with relatively new regulation. This can be an awkward position for agents who are attempting to assist in the fulfillment of regulation requirements while serving a community they may have close ties to - as the following quote illustrates:

I just hope that whatever I do, whatever I have been doing for however many years, I hope it hasn't caused anybody heartburn and I hope it has helped them in some way. Even if they learn, I don't know, like how to compost correctly or maybe LED lights will save some energy which hopefully will translate into having less of a global impact (10).

This interviewee recognized that farmers were not initially interested in regulation and that resistance remains within the community and much like references to SCD and NRCS they emphasize their advisory capacity. A similar regulatory push is discussed by Henke (2006) in relation to soil testing in California, their concern with the shift of state personnel from an advisory to a role in facilitating regulation (as has happened with CE in this case) is that farmers will associate previous advisors with new environmental activism and government agendas. This association could stress or even break established relationships between CE employees and the farming community thus hampering the transfer of information and BMP implementation.

Despite the potential severing of relationships with CE, interviewees, both farmers and non-farmers, valued the NM certification program and accredited continuing education opportunities with making local farmers more knowledgeable

than elsewhere in the country about NM. One agent expressed their feelings on the program as follows:

Delaware has got one of the longest running nutrient management certification programs in the country and honestly, I would say because of that we have probably some of the most intelligent farmers as far as nutrient management goes in the country because of that program and the number of years it has been around. And I think it's been a great program to educate growers (12).

This interviewee and others associated this advanced knowledge with greater adoption of BMPs and the visible differences in their use on the peninsula. Without regulation, as indicated by this quote, some interviewees believed that farmers would not attend information sessions and may maintain practices counterproductive to state goals. As one CE agent said, “If you're not seeing the new practices, the new techniques you are either going to have to come up with your own probably or you are going to keep doing what you have been doing for years” (12). Requiring that nutrient generators and applicators attend state meetings and workshops ensures state pedagogies of conservation are delivered to those farmers most likely to contribute to water quality issues and institutionalizes farmer support for state goals.

At the beginning of the regulation process, some farmers were paranoid that with mandatory information sessions CE was going to “come in and tell them how to farm” (10), but agents continued to serve in a more educational capacity. One agent stated this as:

Since these sessions are a regulation - they have to attend them- I think that's why we try to focus the program on what they can learn in the least amount of time that is most valuable to them (9).

All state organizations participate in the bi-directional transfer of conservation information through the use of meetings, workshops and written material available in

the respective locations. These meetings and workshops qualify for the 6 continuing education credits farmers are required to collect every three years to maintain their certification. The number of credits information sessions are worth is defined by the state along with whether information is applicable for NM certification. Farmers mentioned meetings frequently (cif = 27) as information sources, but with mixed feelings that ranged from excitement to criticism.

Interviewees indicated that the time constraints of farming, especially during certain times of the year, may limit their attendance and in some this was associated with negative feelings. One farmer was particularly upset about the poor timing of meetings in general and Mid-Atlantic Crop School in particular:

They do the one in Ocean City for Maryland and Delaware and its during harvest and I am like how do you expect farmers to come. It ostracizes the farm community. It drives me crazy, I mean, I've got folks that work with me that want to go to it - I'd like to go to it but if you do it the first week of November when everyone is still cutting beans and it happens to be sunny and windy those days I can't afford to shut down. And then you go there and every state agency under the sun is all there and I ask *like wouldn't it be nice to have farmers here?* (And they say) *oh well farmers don't come.* Why do you think they don't come - they're working! How do you get your farm community educated when you host your meeting during harvest? How do you expect us to attend it? . . So, if they are that out of touch that they can't even schedule a meeting that would enable farmers to be able to attend to become educated on nutrient management and the latest technology, that is the only big meeting in the area, then I am like they just disrespected me in the fact that they don't care if I come or not (22).

More often than voluntarily attending, the general impression from state personnel and regular farmer attendees interviewed is that farmers are going to meetings to fulfill continuing education requirements. As this quote highlights even when farmers are interested in these learning mechanisms, if they do not consider farmer schedules it

becomes more of a burden to attend meetings than a benefit. Some farmers resented this education requirement identifying information sessions as “worthless” (20) or “stupid” (18) because they do not apply toward their operation.

Perhaps the most successful, and least burdensome, aspect of mandatory education for qualified farmers is that it gave them direction in relation to NM:

I think we didn't have the direction we have now about 20 year ago they would spread 4-5 ton per acre and not think twice. That was the recommendation from the university at the time and that's what's changed - in early nutrient management it was okay to do it and that's what we were told to do and now we are spreading 3 tons on corn ground, if we are allowed, with your phosphorus (28.2).

NM had the benefit of reducing input costs through better assessment of available nutrients and plant needs. Farmers interviewed often cited the expense of fertilizers as the primary reason why they adhere to state goals to minimize nutrient use and why they were doing NM before it was required by law.

NM requirements were not well received by the farming community and this includes mandatory education. The regulation was enacted differently in both states with the shift in Maryland being more difficult since it happened first, which enabled Delaware to learn from this state's mistakes. Delaware was more inclusive of agricultural stakeholders from the beginning of the regulatory process by instating the Delaware Nutrient Management Commission (DNMC). In my observation of a DNMC meeting the board was comprised of representative farmers who used scientific evidence and their community's support to put forth changes to regulations in progress. Along with farmers and other industries which use nutrients (i.e. horticulturalists) there were present an environmentalist, a public citizen and facilitators from the SDA. At the meeting I attended, changes mainly revolved around

the amount of time that poultry litter is allowed to remain piled before it needs to be spread or transported to another farm or facility for use. This change speaks to the concerns of the community and the prevalence of poultry in the area evidenced by having more than one representative on the committee. This inclusion of representative promotes cross communication, but one Delaware farmer still claimed the shift happened so quickly “we weren’t prepared to deal with it” (24). Though farmers interviewed indicate that members of their community were initially upset, and some interviewees remain unconvinced of the necessity of disciplinary governance for practices they were already doing, one crop consultant claimed that over time this changed:

There was a lot of voluntary stuff early on and farmers were not happy with being mandated to do these things and they thought they were already doing a good job. When push comes to shove and you look at nutrient management plans and you tell them how much manure to put on and how much fertilizer to put on most of them today will probably tell you it wasn’t a bad thing - the dollar and cents of it made sense - it forced them to do more soil testing to keep a better eye on what was going on and in the end economically it made sense. They didn’t adopt it and embrace it with open arms to start with (23).

Notable in this quote is that some farmers were already implementing NM while others needed that extra regulatory push or guidance.

What once was a voluntary technique of government, wherein farmers chose when and where to get their agricultural information about BMPs and what practices to use, is no longer. Now farmers are forced through regulation and the threat of disciplinary action to comply with certain practices that facilitate the state goal of water quality Interviewee indicate that this form of power was also successful, as evidenced by visible differences in practice use.

Governing through stewardship

The best way to determine if farmers were internalizing state philosophies of stewardship which connote a level of flexibility, or “disciplinary techniques that . . . compel individuals to internalize the social values and norms by means of which they will self-regulate their behavior in ways consistent with the state’s [population] goals” (Fletcher 2010, p. 175) - is through an analysis of how farmers prefaced their BMP use. If farmers indicated that land stewardship and sustainability were largely their reasoning for implementing BMPs, especially those related to soil health, then that indicates to me that they have internalized the message that SCDs and NRCS have been broadcasting since the 1930’s. Furthermore, if interviewees claimed to be doing practices prior to them being mandated and/or BMPs have become so much a part of their operation they became common practice, I also took that as an indication they are environmental subjects who are willing to implement voluntary BMPs. Alternatively, interviewee claims that there were differences in BMP use after the NM laws were enacted, I attributed that change to disciplinary mechanisms and potential penalty for non-compliance.

Some of the farmers interviewed were, initially and still are, critical of mandatory BMPs that compelled them to fulfill NM needs based on state prescriptions and timetables. Many farmers interviewed (64%) indicated they had been implementing soil health and NM practices well before they were encouraged or enforced by the state (coded as Did Practices Anyway) as part of good farm management because “if you don’t know what the ground needs you don’t know what to put on” (02). One farmer was particularly upset with state regulation and enforcement as they felt that they were inconsiderate of farmers and their needs:

Didn't need to make a law out of it. People who look at things from a far are not the ones who do the work every day, which is one of the problems. They think - *this will be good*, but the guy over here has been doing it all along, but just now someone got the bright idea that they need to make a law out of it and that is ridiculous! (01).

This quote highlights the benefit of relationships as the interviewee is angry because they feel someone "in a suit and tie" who has little relation to the farming community and they believe could not understand farmer concerns and struggles is writing agricultural policy. Unsurprisingly, the same percentage of interviewees doing practices already indicated that few if any of their practices changed with new regulation because they were already doing "the right thing" by farming responsibly. Identifying their use of BMPs as the right thing to do is tied to their production benefits and farmer ideals of stewardship and environmentalism. One consultant when asked said:

Next to cost and productivity, environmental impact is right with them in the decision-making process . . .at the end of the day we are all environmentalists. . .I truly think all the farmers in the region- obviously you are gonna have a couple bad apples - but I think most of them do want to do right, do the environmentally proper thing (8).

Even state personnel interviewed acknowledge that farmers were implementing these practices prior to being mandatory. One member of the SCD when asked if farmers were already implementing NM practices said:

Absolutely they were doing it, they were doing it on their own, they had to because they wanted to keep the value of their property up you don't want to let your property go down (26).

This SCD employee went on to qualify that:

99% of the farmers in the state of Maryland are good stewards of the land, their intentions are to do the best because they want people to come on their farm and say this is a showplace farm. They want it to look good. Everything is going to have one or two bad apples and we

have one or two bad apples, but the majority of the people are in compliance and want to do well (26).

When asked, all the farmers interviewed claimed they were stewards and interested in caring for the land. Both state and farmer interviewees acknowledged the need for further improvement and mentioned that there were some individuals or regions which were not stewardship-minded. Those that quoted statistics claimed 90% or more of farmers are interested in state goals of stewardship.

Stewardship was often tied to preserving the land for future generations, “farming isn’t just their job it is the way they live, the generations before them took care of it and they are taking care of it for someone else” (10). This sentiment was professed as leaving the land better than when they received it by several farmers (total code frequency (tcf) = 9 does not equate to number of farmers). One of these farmers stated it as:

Conservation practices allow me to take care of the land. Part of my value is I am a caretaker. I am here to build up the soil and make it better for myself years down the road, but also better for whoever comes after me. The conservation practices allow me to take care of that land and make sure it is there for future generations. I am just here for a short time (25).

Sustainable use of resources so they are available for future generations and stewardship are the philosophies the state wants farmers to adopt as evidenced by state conservation materials. Therefore, this farmer and others wanting to leave the land better and considerate of future generations are environmental subjects, which have more often than not (based on their negative views of regulation) become subjects through government tactics. According to Foucault (1991), state pedagogies are perpetuated through relationships, like those identified by CE, SCD and NRCS personnel, and serve as alternative government tactics to law.

In contrast to this acceptance, not acknowledging a farmer's ability to assess the viability of practices in consideration to both their production needs and locally specific environmental needs, can cause tension between agriculturists and "experts". This was found in a study conducted by Burgess (2000) who determined that conservationist's views of farmers differed from farmers personal views of being "natural conservationists". Tension arose from conservationists' assumption of farmer ignorance of ecosystem processes coupled with the rigid management style of ditch regulation which contrasted the more flexible practices of farmers (Burgess, 2000).

Bringing together these narratives

The reason the Delmarva Peninsula is an interesting case of environmental governance is its trajectory from government technologies, starting in the 1930's for soil and the early 1990's for water, back to disciplinary ones in the late 1990's, and as a comparison of these governance strategies for environmental subject-making. When farmers were asked about the agricultural agencies in their area there were a range of perceptions from negative to positive. With respect to SCD and NRCS it was often positive or ambivalent with most references to conservation planning or incentives. For CE interview responses were much more varied, with some farmers considering them a valued source of information while others felt constrained by state educational requirements and cast the shadow of their temperament on CE.

The differences in perception may relate to the capacities these organization serve. SCD decided to forgo their right to regulate (Helms, 1992), maintaining the use of voluntary practices and depending on educating the value of land stewardship and offering financial assistance since their inception in the 1930's. In contrast to these voluntary mechanisms, the NM laws that Maryland and Delaware enacted in the 1990s

made NM for water quality mandatory and placed CE in the awkward position of mediator. The difference between Maryland's rough transition and Delaware's relatively easy one could be due to stakeholder involvement reducing farmer resistance from the beginning. Decentralized governance through stakeholder involvement may have proven more effective with the farming community in Maryland, too. Farmers in both states felt they are more knowledgeable about the needs of agriculture as indicated by several farmers (tcf = 8) saying essentially "you can't be a dumb farmer" and not necessarily needing state involvement.

Through both the voluntary and regulatory processes, the state environmental goal for the peninsula has been for farmers to make environmentally conscious decisions to ensure the sustainability of the region's natural resources. Many of these farmers when asked about their use of BMPs had limited knowledge of what was classified as a conservation practice within this program. Despite this, when I listed practices that qualify many farmers interviewed were implementing them. Some were so ingrained into farm practices that interviewees could not remember a time when they were not in use. These farmers under their own initiative have so incorporated them into agricultural decision-making they have superseded state practices to become the "right thing to do". Even if not considered the "right thing to do" interviewees were still utilizing soil knowledge gained through state organizations as their reasoning. This indicates that these farmers accept state pedagogies, but responses indicate that some are still resistant to the forced mechanisms used by the state to reach its goal of an educated agricultural community. Farmers cited a range of available resources during interviewees from CE-hosted information events to the internet. Many of the farmers interviewed indicated that they would rather use their

own discretion to determine which information sources are of value, than be mandated to attend meetings that may not be relevant to their farm operation. Similarly, farmers interviewed who are already implementing BMPs would rather do so based on their own understanding of the needs of their land and business.

Viewed through the lens of governmentality the decades of introduction of soil practices initiated in the 1930's and the established relationships between members of these agencies and farmers can be perceived as tools used by government to create environmental subjects that to some degree have succeeded. However, environmentally minded individuals do not represent the entire community which also includes farmers that only do what is mandated and others that have never been in compliance. This non-compliance and that many interviewees cited changes in BMP use over the last 20 years indicates that the state's push for water quality may have been needed and has also been successful as a governance strategy. Farmers in this study were interested in ensuring soil and water resources are available for their children and beyond, which makes them environmental subjects who through a plurality of governance strategies both governmental and disciplinary have internalized state philosophies and determined to follow state goals even if they do not realize it.

Under Pressure, Who's Looking Down on Me?

The relationship building in the previous section is part of a cross-scalar governmentality process, which involves government pressures at multiple levels from the federal to the county (Foucault 1981 and Agrawal 2005). These are not the only pressures acting on farmers to increase BMP implementation. Coupled with

governmental pressures is pressure from environmental groups, fellow farmers and non-farming members of the public.

Environmental Pressures

Beyond the state, governmentality extends to organizations that through their work attempt to change people's thoughts and subsequent actions to achieve the organization's goals. These organizations can exist at all scales from the local to the international, examples include non-governmental organizations (Bryant 2002) and certifying organizations (Naylor 2017). This is exemplified on the peninsula through environmental groups, which are both actively working with and against farmers. Environmental groups were identified as antagonists to the agricultural community by some interviewees, as shown with the following SCD member mentioning the threat of water groups:

Yes, you will follow that [NM plan] or you are out of compliance with your nutrient management and if the right environmental group got to you and took you to court - Waterkeepers are watching all this - you could be in serious trouble probably be out of business. And they are starting to watch this very closely because there are still people flying under the radar that still don't have nutrient management plans (26).

The Chesapeake Bay Foundation is another watershed group that is very prominent in the area and their mission statement could allude to a conflict with the agriculture community:

Serving as a watchdog, we fight for effective, science-based solutions to the pollution degrading the Chesapeake Bay and its rivers and streams. Our motto, "Save the Bay," is a regional rallying cry for pollution reduction throughout the Chesapeake's six-state, 64,000-square-mile watershed, which is home to more than 18 million people and 3,000 species of plants and animals (Chesapeake Bay Foundation, Our Mission).

Mention of being a “watchdog” and “rallying cry” reinforces the previous quote about the Waterkeepers, but I did not communicate with any members of this organization to know if they use NM plans in a similar way. This environmental group orchestrates restoration activities throughout the peninsula and the remainder of the Chesapeake Bay watershed. Similar voluntary mechanisms of governance as the state, are used to influence the millions of people in this watershed to follow their goals of improved water quality in the bay. This relates to the neoliberalization of resource conservation and how this, and the groups mentioned above, are further decentralizing or replacing state mechanisms for environmental governance (Agrawal 2005, Birkenholtz 2009, Fletcher 2010). Agriculture is often cited as the number one problem with the Chesapeake Bay through public news outlets, which may or may not have sourced their information from scientific literature on nutrient contributors. However, this information and these groups may not consider the socioeconomic circumstances that lead to the eventuality of nutrient pollution from agricultural sources:

No one gets up in the morning and says I am going to pollute the bay today it's an economic trail that leads you there (03).

This remark was in answer to questions about agriculture's role in water quality issues. The farmer had originally planned on a more environment-centric approach to farming, but they could not reconcile it with their financial needs. Despite financial constraints, some environmental groups are in outright conflict with the farming community and blame them for water quality issues inconsiderate to their need for a secure livelihood and their environmental efforts. Some farmers are actively collaborating with these groups to increase understanding:

Through always being open to collaboration and collaborating heavily with environmental groups starting with the Chesapeake Bay Foundation and walking in the shoes of the environmentalist trying to

help the farmer and realizing the problems are all the same. It is just a matter of looking at it through a different lens, no different than any problem in the world it is just a matter of figuring out how to get on the other side of that problem and look at it and is that person willing to come to your side and look at the problem from the same side as you (22).

This relationship, as with relationships with state agencies, inspired greater interviewee experimentation with conservation practices which align with the Chesapeake Bay Foundation's mission. Environmental groups recognize the potential in these connections and are seeking out opportunities to work with farmers. Farmer interviewees worked with water foundations, school groups, 4-H and others to increase understanding on both sides, to facilitate conservation which considers both the farmer and the environment.

People Pressures

The social pressure associated with the high visibility of farming, which allows colleagues and neighbors to judge, and potentially find fault with, operations based on their internalized state pedagogies, is part of the diffuse mechanisms used by federal and state governments for environmental governance. The quotes above about maintaining their land and ensuring that they have a "showcase farm" speak to the value of public opinion. Social pressure can also serve as a disciplinary mechanism as indicated by talk of the Waterkeepers and their potential use of NM plans for civil action. In other instances, discipline through social pressure may take the form of censure from people with which a farmer regularly interacts through working relationships or otherwise.

Agriculturalists with strong ties to state agencies and who internalized state philosophies act as one form of "people" pressure, as they can be respected members

of their community and inspire change. These environmental subjects were often termed “champions” with “complete” operations which served as places for BMP observation. Champions and other innovators were a go to source for information and hosted farm tours and workshops. This observation of other farmers was one of the top five information sources used by farmers, which speaks to their influence on other members of the farming community. According to interviewees, innovators tended to be respected sources of locally specific information as they tested out the effectiveness of state conservation practices within the local context. One champion spoke of the purpose of their experimentation as:

[I am] trying a lot of stuff and not doing it just for myself but so that others can alleviate my mistakes and bypass what I learned (24).

This was not the only interviewee trying new things, several of them were doing their own research to evaluate different conservation practices and in the process inspiring other farmers to follow suit (Enloe et al., 2010). In this way champions expand state networks of knowledge exchange and act as one of the diffuse means through which government creates environmental subjects (Luke 1999, Agrawal, 2005, Fletcher 2010). Farmers willing and eager to try new things are not confined to one age group or agricultural type. Even the older generation contributed despite the general belief they are comfortable with older management styles. One farmer keen to do their own experimentation explained his drive for knowledge as:

I am 62 years old but I am not that hard headed yet I try to learn something every day. Every season is different so you have to be able to adapt to it so if you can keep an open mind not be stuck in a certain way of doing things and not be afraid to change whether it be a tillage practice or a conservation practice or the way you put fertilizer on or the type of fertilizer that you use. I am always trying new things I have plots after plots after plots out here. (31)

Some of this concern over resources stems from interviewees having close associations with the SCD through being a board member for years. Close relationships with these organization through working with them or their members has influenced farmer perspectives in both directions.

Champions and innovators have a tendency toward accepting state scientific knowledge, but the interviewed members of the farming community valued local knowledge. The importance of valuing farmer knowledge cannot be overstated. Other studies have shown that a disregard for farmer contributions through locally specific knowledge can lead to resistance to state pedagogies and distrust in other forms of knowledge (Akerman 2005, O’Riordan 2016). Farmer distrust of the underlying science for conservation practices was found in O’Riordan’s (2016) study to be due to an exclusionary approach by regulation authorities. However, eventual inclusion of local knowledge inspired a more positive attitude toward conservation management (O’Riordan 2016). Inconsideration for local knowledge may also cause the farming community to band together against state institutions. As Akerman (2005) determined in their study, criticism toward environmental policies unified an otherwise heterogeneous farming community, due to distrust in the predictability of proposed practices and lack of inclusion of local knowledge of natural variations.

Additional pressure comes from colleagues and neighbors who are questioning your use of certain practice and lack of use of others. Farming is a very visible profession so it is obvious when farmers utilize practices that potentially cause nutrient leaching and soil loss. Social pressure from fellow farmers and the public plays a vital role in adherence to state goals. This pressure is from existing environmental subjects and part of the multiform tactics of government. The tactic is

applied to all subjects of the state thereby reinforcing and perpetuating state pedagogies and goals. Behavior change grounded in state pedagogies and driven by social pressure is evidenced by one farmer who leased extensive amounts of land. When asked what inspired the change to becoming an environmentalist the farmer stated:

I don't know- kids. I think having children is probably what did it. Mid-life crisis- buy a fast car- become an environmentalist. . . Plus I have pressure from peers and pressure from landowners. You know there is a social pressure associated with the way you farm now. It is a very public job and profession so people ride down the road and see what you do. . . [As someone who leases their land] I am dealing with the next generation of landowners and there is no one with kids that are less environmental than they were. It is very seldom that you would because the environment is in poor shape so every kid is growing up learning how to protect the environment and that's how you get change. But as a farmer I have adapt to that because they are my bosses. I got a lot of bosses (22).

This farmer's "bosses" were a range of landowners from retired farmers to the Chesapeake Bay Foundation who had their own ideals of what they wanted for their land. Targeting of farmers because of the visibility of this profession was also recognized by state agencies. State personnel interviewed agreed that the public nature of agriculture makes is obvious when farmers are disinterested in conservation. These interviewees also sided with agriculturalists against a lack of public understanding of what farming entails. An interviewee from NRCS had this to say about the situation:

I know in this area the ag community has really shifted to step up and take hold of the problem, but ag is an easy target because everybody can look at ag and can say it smells, it's not pretty. Especially when you are dealing with animal production. Especially when even if a producer is using poultry manure the way it is intended, when you see a spreader out in the field applying poultry manure you smell it and it stinks and people are like that can't be good for the environment. It's just a stigma, It's an easy target (29).

There are also inter-generational pressures, as one environmental consultant noted. Tension can happen when the younger generation, which is generally more interested in conservation, takes over from the older generation interested in maintaining their farm management styles:

This young farmer recognized right away - that if I farm these in conventional techniques I am going to lose so much of our soil this is just not going to work for us in the long-term. He just got right away that wasn't going to happen so this guy he's brought on no-till equipment he's been working with Cooperative Extension to learn about how to do things like multi-species cover crops. . . So, I think the farmers that are young and taking over the farm management are wide open to doing things better and I think there can oftentimes be tension between the generational transfers of farm management in that the young farmer wants to try something new and a lot of times they get a little bit of push back and I have seen that on a number of occasions (27).

This younger farmer had likely undergone more intensive conservation education through the state during his childhood and into adulthood as alluded to by the farmer above who was influenced by his kids. On the other side of this issue, approaching farmers to change their practices may necessitate delicacy. As one farmer explained:

You can't say what he is doing is wrong because in his mind it's right, so that's kind of the hard part because if you come off as condescending. If you're like *what you are doing is wrong - well shoot, this is what my father did* and you just insulted his father (22).

Discussion with state agencies and other researchers indicated that the greatest change in agricultural practices is intergenerational. The last two quotes indicate that the process of environmental subject-making is contingent on the history and experiences of the people on which policy is enacted.

Combined Pressure

Pressure at different levels influences the creation of environmental subjects within the agricultural community. It is difficult to determine what pressure is more effective as farmer interviewees credited their interest in conservation to all the above sources.

Conclusion

Environmental problems in agriculture are defined through a diverse set of interests including the scientists and growers who are the main actors in this story, but also governmental regulatory agencies, environmental activist groups and community organizations. These groups alternately promote or decry an issue in “public arenas: shaping its definition as a problem (or not)” (Henke 2005, p 222).

When I initiated this research, I expected that farmers use BMPs when mandatory or advised by an experienced member of their farming community, which interviewee seem to indicate they do. Interviewees claimed that 90% or more of farmers are in compliance, MDA literature says 98% of regulated farmers have a NM plan (MDA, 2016) and 50% of agricultural land in Delaware is under a NM plan (NMC Annual Report, 2016). Interviewees also claim that, based on their experience and visual inspection of their surrounding community, there remains a small subset of farmers disinterested in state environmental subject-making even under threat of consequence.

The second expectation I had for this study is that education and training for BMPs, coupled with champions of conservation within the agricultural community, pressure farmers to be more environmentally conscious citizens. Governmental and social pressure is felt by the members of the farming community I interviewed,

especially due to the visibility and public nature of this profession. Farmers indicated they are pressured by members of agricultural state organizations (through regulation and otherwise), environmental groups and the farming and non-farming public to use more environmentally responsible practices. The plurality of mechanisms used in environmental governance include conservation planning, cost share, mandatory education and NM planning and social pressure from inside and outside of the farming community. Even though interviewed farmers adopted some BMPs (some because they were mandatory), they were not convinced of the viability of all conservation practices and so pick and choose the practices best suited to their existing management system and disregarded the rest unless mandatory. Most of these practices are chosen because interviewees believe they contribute to responsible farming practices that ensure the profitability and sustainability of their farm operation for this and future generations. This acceptance of conservation as being the right thing to do for responsible farming and contributing to sustainability is evidence of the success of environmental subject-making by state agricultural entities. This is not to say that all members of the community are willing to become environmental subjects even under pressure, because they are not. Some farmers are so resistant to state intervention that they run the risk of consequences by being out of compliance for NM. This is the reference to “bad apples” that was mentioned by several people, but this group was not included in my study. Even responsible farmers were resistant to NM regulation initially. The mandatory nature of an increase in regulation caused tension between the state agencies involved and the agricultural community, as farmers felt the state was questioning their environmental ethic through the need for regulated compliance for plans many already implemented (Paolisso and Maloney, 2000). This resistance

indicates to parties of the state that regulation and the potential of consequence is necessary to meet the state goal of water quality. However, the narratives of having practices in place before they were required speaks to the success of the voluntary system. Though the noticeable improvement and the admittance by the those interviewed from the farming community that there was and still is room for improvement speaks to the value of regulation.

The following chapter elaborates on education mechanisms through an evaluation of agricultural knowledge types and their valuation by farmers. The second aspect of this chapter focuses on the networks of heterogeneous actors that contribute to agricultural knowledge production.

Chapter 5

AGRICULTURAL KNOWLEDGE ON THE DELMARVA PENINSULA: CONTRIBUTING KNOWLEDGE TYPES AND THEIR INCORPORATION INTO KNOWLEDGE NETWORKS

Introduction

“You can't be a dumb farmer- not and stay profitable” (02).

In today's complex agricultural systems farmers have to make decisions about every aspect of the production process, from timing to inputs, to ensure they remain profitable (Mace et al. 2006). To add to this process, farmers are mandated or pressured into implementing ecologically mindful conservation practices. Studies have shown that farmers are ecologically knowledgeable and aware of environmentally beneficial practices, especially with respect to regulatory requirements, but use is mediated by economic and social sustainability (Bernues et al., 2016). Information and its incorporation into farmer agricultural knowledge can influence the adoption of conservation practices like agricultural best management practices (BMPs) (Namatié et al. 1998, Prokopy et al. 2008, Vignola et al 2010). In this chapter I investigate the different types of knowledge utilized in agricultural decision-making and the value placed on these types from members of the agricultural community and those working in close association with them for conservation. On the Delmarva Peninsula, scientific knowledge forms the basis of farmer experimentation and is available through a myriad of sources including state education mechanisms which play a key role in transferring BMP information to the agricultural public. Local knowledge in this

context is highly valued, but differs from traditional definitions centered on indigenous peoples, as farmers on the peninsula are blending modern scientific and local knowledge through experimentation to refine state practices. I also investigate how agricultural knowledge is produced through a network of relationships established between the agricultural, scientific and environmental groups that are involved with agriculture. Farmer acceptance or rejection of information is influenced by an unexpected number of connections between these three groups through regulatory guidelines, facilitating relationships, personal experimentation.

There are several forms of knowledge utilized by the agricultural community to facilitate their decision-making. For the purpose of this research I use Blaikie et al.'s (1996) definition of knowledge, which focuses on the cultural context and iterative process of information acceptance and rejection:

Knowledge is not about the discovery of some final objective 'truth' but about the grasping of subjective culturally-conditioned products emerging from complex and ongoing processes involving selection, rejection, creation, development and transformation of information. These processes, and hence knowledge, are inextricably linked to the social, environmental and institutional contexts within which they are found. (Bp.218).

I use this definition as this paper discusses the inclusion of local knowledge in natural resource research and development and it encapsulates the potential variation of knowledge of farmers and those working with them to implement BMPs. Agricultural knowledge is an especially interesting case of how institutions and cultures influence the acceptance or rejection of information since this knowledge serves as an interface between the scientific and farming communities, two groups that have different, and sometimes opposing, ideas of the relevance of conservation.

Within agricultural literature two major types of knowledge have taken precedence, scientific knowledge and local knowledge. Another often cited form of knowledge in agriculture is experiential knowledge. Local knowledge accumulates through the accretion of observations and experimentation that constitutes experiential knowledge.

Agricultural scientific knowledge production has historically been driven by the need for increased production (Kleinman 2005), but this is changing as scientists recognize the impacts of intensive agriculture practices (Henke 2006). Several agencies and institutions contribute to or act as a repository for scientific knowledge about agriculture. State entities include land-grant institutions which encompasses Cooperative Extension (CE) personnel, and agencies including Soil Conservation Districts (SCD), State Departments of Agriculture (SDA) and the USDA-Natural Resource Conservation Service (NRCS). Additionally, private institutions and corporate interests conduct scientific research that can contribute to the knowledge of state organizations and/or is specific to their products to facilitate farmer use. Most notably, CE has historically fulfilled the role of knowledge transfer from academia to the agricultural community through their association with land grant universities, which were originally founded to participate in and promote agricultural research (Cash 2001).

Scientific knowledge is still actively being produced and consequently the conservation practices advised by state agencies have also evolved. With this evolution the role of agricultural scientists changes as “agricultural scientists now find themselves in a strange position: they are faced with the challenge of reordering a system that they have constructed and promoted as especially efficient and rational

while mitigating its environmental impact” (Henke 2005, p.215). Scientists and state advisors may also struggle with their role in agricultural knowledge production as they balance between advocating for the needs of farmers and the need for reduced environmental impact (Henke 2005).

Though land grant institutions started evaluating agricultural inputs when they began to be widely used, they shifted their focus to the harmful effects of particular nutrients in relation to agriculture by the 1970’s. Unfortunately, this did not gain federal attention until the Water Quality Act Amendments of 1987 that focused on nonpoint water pollution sources including agriculture. This led initially to voluntary nutrient management and eventually to nutrient management laws in Maryland and Delaware. These laws required farmers to undergo initial and continuing education to remain certified to use or produce nutrients. Similar to federal acts driving increased interest in water quality, the Soil Conservation Act of 1935 spurred interest in soil conservation, even though soil research had already been conducted prior to this period. Through this and later acts, Soil Conservation Districts (SCDs) were created, with the goal to educate farmers on the need for and use of conservation practices for soil health (Helms, 1991). The distribution of knowledge from state agricultural organizations was historically considered linear, wherein experts from agencies and institutions would transfer their knowledge to presumably uneducated farmers and those associated with them (Pascuccia and de-Magistris 2011). This transfer process has not always been smooth (Alarcon 2013) with scientific knowledge being a point of contention when considered without regard to local knowledge (McCorkle 1989, O’Riordan 2016).

In literature about local agricultural knowledge, it is more often associated with indigenous knowledge (Sillitoe, 2007). Endogenous knowledge is another classification of local knowledge inclusive of knowledge acquired through long-term observation and modern scientific knowledge distributed through state educational mechanisms. In consideration to this definition, local knowledge in this study is place-based and locally specific information on the conditions of an area rather than traditional and indigenous knowledge. This local knowledge can be used in conjunction with scientific knowledge to fine tune its more general prescriptions (McCorkle 1989). This knowledge is most closely associated in agriculture with the farming community who have through repeated observation and experimentation accumulated knowledge about the local context. Studies show that farmers still adapt new technologies to their specific local needs, but since this can be a time-consuming process of trial and error they share this experiential knowledge to stay up to date on available technologies (Wolf 2005, Chapman and Paine 2012, Nuthall 2012, Stone 2016). It is through their long tie, in some cases generations, with this place and its community that farmers have learned enough about local specificity to successfully farm.

During the process of developing conservation practices and regulatory guidelines different value and thus constraints are placed on local knowledge depending on whether state personnel and policy-makers recognize its validity. Focusing on scientific knowledge in this context can devalue local knowledge relegating it to “a matter of rhetoric or unfulfilled intention” or “market information on the technical choices available” (Blaikie et al 1996 p. 219 - 222). In general, even though farmers contribute significantly to agricultural knowledge production through

farm- and field-level experimentation, modern scientific research and subsequent policy show little consideration for farmers (Wolf 2006). For this reason, local knowledge was found in several studies to be both a point of conflict and potential resolution for implementing agricultural conservation practices (Akerman 2006, O’Riordan 2016, Simpson et al. 2015). Consideration of local knowledge can also accelerate the process of developing new conservation practices that fit within heterogeneous landscapes (McCorkle 1989). This is because local and traditional ecological knowledge are valuable sources of locally specific environmental information similar to scientific knowledge in their rigor and usefulness for environmental management (Berkes et al. 2000, Lehébel-Péron et al. 2016). Experiential knowledge, which contributes to local knowledge, is widely used by farmers for decision-making, and is privileged over other forms of knowledge because, as Woods et al. (2014) state, “it operates in plain view as the repeated and public sharing of empirical observations” (Wood et al. 2014, p. 9). When farmers are disinterested or distrustful of this scientific knowledge they will use a more informal system which relies on their experiences and those of other farmers (Nuthall 2012). This experiential knowledge is then transferred to the wider agricultural community as local knowledge. In this sense it is more social learning (Stone 2016) and relates to the next interesting trend in knowledge in agriculture - that of the social production of scientific knowledge.

The production of scientific knowledge is influenced by personal struggles, political initiatives and a variety of circumstances, but science maintains its status as it is built on a pillar of credibility based on its historic context and the associated cost of attaining it (Latour and Woolgar 1979, Star 1995). Knowledge is determined by the

social context in which the person assessing the available information is embedded. This is true of all forms of knowledge including scientific, despite the general belief that its repeatability prevents it from suffering bias or human fallibility. Thinking about the production of knowledge in the tradition of Latour is a way to critique the nature of knowledge based on the potential political and institutional influences - what these could mean about embedded biases - and how reality is constructed in the process of scientific research. It is also a lens through which to investigate how production of knowledge is changing as it shifts away from the strictly laboratory setting where a highly educated few are arbiters of information to the realm of local knowledge and citizen science where the general public can and do contribute to the construction of their own reality (Gibbons et al. 1994). Farmer decision-making about land use and conservation practice implementation is highly influenced by the social networks and learning that takes place among members of the agricultural community. Often, they depend on observation of other farmers and joint experiences to learn about new technologies and products which may work on their own operations (Eastman et al. 2012, Stone 2012). According to Wood et al. (2014) “farmers deliberate about science in intensive and durable networks that have significant implications for theorizing agricultural innovation” (p. 1). Collaborative approaches have also proven to lead to positive and enduring change for environmental management through the integration of scientific and local knowledge. Joint problem-solving recognizes the social context of management areas through consensus building mechanisms which facilitate cross communication and expansion of existing knowledge for all stakeholders involved (Prell et al. 2009, Simpson et al. 2015). They can be stymied however when time constraints which reduce the ability to fully

explore the problem-solving potential of joint endeavors and/or some forms of knowledge are devalued in terms of others (Pascuccia and de-Magistris 2011).

State-led agricultural programs help to increase environmental awareness but this can also happen through involvement in non-state organizations such as producer organizations (Namatié et al. 1998) and environmental groups (Granjou 2011). Farmers and farm organizations can also take on the role of educators for environmental and other outside groups who are unfamiliar with the socioeconomic concerns of agriculture through “reversals in learning” (Chambers, 1983). Ultimately there are several ways that scientific and local knowledge are produced in agriculture that involve a range of heterogeneous actors that have some tie to the farming community or their surrounding environment.

To answer questions about how information sources, and particularly local knowledge, influence farmer decision-making, interviewees were asked about BMP information sources with an emphasis on the role of local knowledge and relationships with state agricultural agencies. I had two expected hypotheses related to information sources in general: 1 - that unless farmers are closely associated, in business or for information sharing, with agency and Extension personnel they are more likely to seek assistance or information from a respected member of their farming community and; 2 - that when agency and Extension personnel are part of or have established a relationship with the local agricultural community it facilitates their acceptance by farmers. For local knowledge specifically, I expected: 1 -that family run operations with several generations of ownership have maintained residual connections to management practices that are traditional to their family and locally specific and that could augment the BMP program, but also discourage BMP adoption; 2 - that the

long-term observation of and relationship with the land that farmers have has led to management practices of equal benefit to local nutrient management which could contribute to sustainability and; 3 - these alternative management practices may make producers question the viability of BMPs for their local area. The following section will investigate the two main narratives that came about in reference to knowledge throughout the peninsula, that of farmers having different values for different forms of knowledge and the complex way which knowledge is socially produced throughout the Delmarva Peninsula.

Results and Discussion

Types and Value of Agricultural Knowledge

Scientific knowledge and its transfer mechanisms

As indicated above scientific knowledge about agriculture has historically been the purview of CE and its associated land grant university. Now, however, with increasing commercialization and specialization, farmers have access to information that can be classified as scientifically derived from a myriad of sources. I say classified on scientifically derived to differentiate these new avenues of scientific knowledge from the traditional laboratory setting, but to maintain that such experimentation is supposed to be repeatable. Repeatability is where scientific knowledge draws its credibility from and why, in contrast to local knowledge, it is rarely questioned except with consideration of conflicting scientific or anecdotal evidence. I argue however in the nature of Latour and Woolgar (1979) that production of this knowledge is socially embedded and therefore has associated socially-derived biases.

The state institutions and agencies (including the CE, SCD and NRCS) play a key role in transferring scientific information to farmers so they were included as sub-questions under the information sources suite of questioning which is why they were frequently cited (CE cif = 32, SCD = 23, NRCS = 25) by interviewees in reference to information sources. CE interviewees stated this organization's intention is to educate farmers about scientific research and supply them with local supplemental data about new practices and technologies. One CE agent explained their role as an educator as follows:

As an Extension agent my overall goal is outreach and education - to take research from the university and transfer that knowledge to the farmer. Sometimes that requires reformatting that material so that it is in a digestible format. I do that in a number of ways. We do a lot of meetings in the winter time, things like Ag Week and Crop School. So, you are not just talking to the farmer you are also talking to his crop scout, his agronomist, his seed dealer. All of the folks that he interacts with at Crop School and then directly with him or her at Ag Week. And then I do some county based education as well. I will hold a night meeting or something like that on a relevant topic whatever it may be. Applied research project . . . trying to do projects that we will be able to take some of that information and put it into the farmer's hands you know keep progressing (13).

The above interviewee epitomizes the role of CE in agricultural knowledge production and information transfer with an emphasis on the linear model. The SCD and NRCS were most often cited (NRCS: plans cif = 8, cost share cif = 16 SCD: cost share cif = 13) by interviewees in relation to information about cost share and conservation planning.

Interviewees had mixed feelings about the value of state organizations with some farmers having established long-term positive relationships with state employees

and board members, while others thought their use should be re-evaluated. One farmer who questioned the viability of CE explained their reasoning as:

I would assume most of the farmers that you talk to are pretty knowledgeable to begin with. I mean what is Extension going to offer that every magazine I get doesn't offer - that every meeting I go to doesn't offer - that I can't Google and get better information. . . I think that farmers that are bringing their games are especially knowledgeable. Why do I need someone to come and advise me on what to do if I can't figure it out I shouldn't be running my business (22)?

This farmer was not the only one to question CE's usefulness. Of the interviewees, farmers from Maryland tended to believe the information they have obtained through a plurality of sources has exceeded the capacity of CE or that this organization is lacking in personnel or scope. This lack may be related to state investment and ongoing cuts in the budget for this and other state organizations. As one farmer indicated "Extension service is pretty well non-existent in Maryland" (02). The limits of CE were felt by farmers in both states or as stated by one farmer:

County Extension is a joke. I call them up with a question and they are on the Extension website looking up stuff or on Google. I am calling for specific information and they pass me along to someone else. *Call this person* and that person passes me to someone else. Well isn't this your job? I have a question and you find the information. . . A part of it may be that this is not like a traditional produce area so they are not focused on it but I feel nothing comes from it- there is no interest even. . .but dealing with any of those bureaucracies is always challenging (03).

The expectation for interviewees not interested in state organizations is that they have the information necessary to be good farmers already. That this interviewee and, other farmers that participated in this study, devalued the use of CE indicates that for some interviewees CE failed in its capacity to transfer information to the point they have sought other resources such as colleagues or internet sources.

When financial and personnel resources are available the low opinion interviewees had of this organization may be related to residual resentment towards CE as the face of the NM regulations. Though there was no specific farmer mention of discontinued use of CE for this reason, several interviewees across both states were disinterested in mandatory education or felt it was unnecessary. According to Henke (2006), the use of a regulatory push can alter or even sever relationships between farmers and state employees that once served in an advisory capacity, but are now part of ensuring they follow through with government mandates. The more difficult transition from voluntary to regulatory mechanisms, as indicated by interviews, in Maryland may reflect a greater opposition in farmers due to their lack of involvement in the process compared to Delaware's instatement of the Nutrient Management Commission, which considers farmer knowledge through the use of farmer commissioners. Both funding and resentment were mentioned in reference to CE. However, these sentiments devaluing state organizations for agricultural knowledge were in contrast to Baird et al. (2015) who found in a study exploring agricultural advice networks that regional government employees played a more influential role than locals. There were some farmers that valued CE and its associated connections to universities throughout the region. One farmer interested in continuing education said this of his relationship with CE:

We use some Extension. We do have pretty close ties with the University directory because there are several people down there doing a lot of research- fruit research- Delaware, Maryland, and Pennsylvania. All the universities in this general area communicate very well and actually share some employees. Some time is spent here and some time is spent across lines which I think is great. That just started in the last 4 or 5 years. They'll actually hire someone and that is a shared person (6).

This farmer valued CE for its knowledge about orchard products despite the relatively low number of these operations in the area and one could expect that there would be fewer state and farmers members of the fruit growers group, however this interviewee indicated otherwise.

Part of both the Maryland and Delaware NM laws requires farmers to attend information sessions and meetings that include an initial series of certification courses and then 6 continuing education credits worth of meetings every three years to maintain the certification. Meetings covered a range of agriculture related topics from insurance and risk assessment to growing barley for microbreweries. The number of credits the meetings were worth depended on their duration and how well they applied toward the certification type. Some meetings (i.e. Crop School) could be used for credit for more than one certification type (i.e. NM and pesticide certifications) and across several states. Since these education events are a key mechanism used by the state for communicating scientific knowledge they were mentioned by all farmers. Feelings about these educational events varied, among farmers interviewed, with the same amount of vitriol and positivity as thoughts on CE. High among the complaints of farmers interviewed is the inability to attend mandatory meetings, due to production and time constraints. Difficulties in attending sessions were noted by state personnel interviewed and CE attempts to avoid attendance conflicts by having meetings throughout the year. One agent explained this process as:

We try to keep something throughout the whole entire year so that people can kind of build their credits. Not just all at once “hey I need 6 credits right now”. We try to eliminate that problem but sometimes it doesn’t always work because no matter what time of year it is going to be busy (9).

There are also meetings available through non-state companies associated with agriculture, like seed and fertilizer companies, that qualify for points and allow farmers more options. One farmer interviewed who was particularly avid about attending meetings talked about their experiences with fellow farmers and the continuing education credit system:

They don't even have to go to any of them that are required by NRCS or whatever. The chemical companies the seed dealers all have meetings all during the year that you can get points. That's what I told a guy the other day. I said "I don't need no points I got enough points to last 50 years" and he said "well they take them away after 3" and I said, "it doesn't make any difference I got enough in those 3 years to last me 50 years". I said, "because I just go to meetings to learn" (24).

Despite their value for some interviewees, the meetings were most often associated with the certification process and with negative emotions by farmers. Negative emotions were related to farmer belief that the information presented did not apply to them or their agricultural interests. Meetings include a range of speakers, from within and outside of the region, and consist of both state employees and active farmers. However, the general focus of BMP education is on dominant agriculture types on the peninsula. Although some interviewees found them valuable, it also appeared to me that attendance at meetings was credit driven. When I attended one of the Ag Week Agronomy Day in January 2018, most farmers promptly got in lines after a CE presentation to get their attendance marked for points. I also witnessed how one farmer was upset that he was required to stay all day when he needed only one of the three points offered for his certification. Since sign-offs happen after attendance instead of before it ensures farmers attend the full meeting or workshop. In this process, farmers expand their existing knowledge and stay up-to-date on new technologies but information is not always relevant for every attendee.

I also attended the Delaware NM certification sessions to determine what agriculturalists were required to do to produce and/or use nutrients and because one of the key points of the law was education about BMPs. These sessions consist of 4 classes which encompass different aspects of NM including: information about the law and its requirements for each qualified type of agricultural operation; waste management for nutrient generators which is the class of farmers that produce, but do not apply nutrients; soil basics, nutrient cycling, fertilizers and all the associated practices and technologies for cropping; and a final advanced course for nutrient consultants.

Based on the information given in these sessions, in meetings and seminars to maintain this certification and the available pamphlets through CE and SCD, farmers have the available scientific information to make informed decisions for water quality. However, many (cif = 10) interviewees felt the education aspect of this was unnecessary even if it applied to their operation. As an example, one farmer found continuing education meetings to be useless since they often did not apply to their operation - despite ties to CE for their initial start-up and regular visits from friends in this organization they said this:

You can take it however you want to. [CE] can be a great source if you use them. Some of the mandatory stuff that we end up with - is well let's be honest - it's a fanny buster - it's a little worthless. (Are a lot of things applicable to your farm?) A lot of them are [] they are really targeted to down state to people with hundreds of acres and dozens of employees. I sat through a whole thing last year about how to keep Mexican employees from shitting in your lettuces by providing proper Port-a-Pots and hand sanitation. . . some of its a little worthless. . . so when they get ahold of me I am dutiful. When they hunt me down and drag me into these things I go. I am making them work for it though these days. I've got my hands full (20).

This particular farmer had a non-dominant agricultural type with a livestock operation that was not considered a large concentrated animal feeding operation, which are dominant on the Delmarva Peninsula and encompass much of BMP educational material. Even farmers that grow dominant products like poultry, corn, soy and wheat questioned the relevance of some information sessions. For instance, one of the sessions at agronomy sessions at Ag Week was meant to spark interest in barley, but some of the farmers afterward questioned its relevance considering barley is not prevalent in the area. As an example of farmers already being well-informed, at one session a farmer explained the value of the various parts of the equipment being demonstrated and further expanded on the information given but pointing out different configurations they use to increase performance. The mix of views with some believing available state information is useless or irrelevant and others that access to such information has helped Delmarva farmers to be the smartest in relation to NM speaks to the conflict that can arise from inconsideration for the lived experiences of those being taught and how this influences knowledge.

Local knowledge and why it is prized

Local knowledge on the peninsula takes the form of endogenous knowledge that is place specific because it involves farmers adapting scientific-based state practices to the local context through the use experimentation and observation. Though most farmers interviewed are not maintaining previous or developing new practices based on local knowledge as I expected, they value endogenous knowledge inclusive of this knowledge and emphasize the relatability of farming experience. Sometimes these experiments are in the form of trial and error testing of new practices, and the information gained from it is incorporated into informal networks

for local knowledge exchange to reduce the amount of work each individual farmer would have to do to keep up-to-date with new technologies, While these agencies and companies are interested in local knowledge, and it is highly prized by both the farmers and state actors interviewed, at times its informal nature means that its use in policy can be devalued, in comparison to scientific data, despite studies indicating it has the same level of rigor.

An interviewed consultant highlighted the value of experience to the farm community by talking about their ideal applicant for a consulting position:

When looking for a new hire, the ideal one is the farm kid, if you can find them . . . in [agricultural consulting] it is very important to be able to talk to a farmer . . . but we can't teach how to talk to a farmer . . . and the work ethic that comes along with the farm kid (23).

This quote highlights how the interviewed farmers felt about experience and their belief that only someone with farming experience can understand operational needs and financial concerns in conjunction with conservation needs. The results of my study closely coincide with those of Wood et al. (2014), primarily among which is that the farmers studied and those that work with them and have farm experience are more respected sources of information and that they value information coming from colleagues rather than institutions.

Farming experience was also beneficial according to interviewed CE personnel, as it increased their relatability to farmers when attempting to propose conservation or other state advised farm management practices. When I interviewed state employees I asked if they had any farming experience. If they responded in the affirmative I asked if this experience aided them in connecting with the farming community and the transfer of knowledge. All interviewees with experience said that it was helpful. The following quote is from a CE agent who also farms:

It gives you street cred. In all seriousness, if they've had a problem or I've had a problem they might ask me that same question and I can relate to them and say *well in my experience I've had that same issue this is what I did, it did or did not work, here is what the research says*, which is most the time what I am going to follow on my farm. So, I think it does help, somebody saying *yes, I understand what you are going through I have been through it myself- I have experienced this economic loss myself but here is how I dealt with it* (13).

As a farmer this agent is using experiential knowledge to blend scientific and local information thereby increasing their credibility amongst the rest of the farming community that values practices proven to be effective in the local context. The willingness of this farmer to implement conservation practices while understanding the inherent risk in farming and potential financial loss adds credibility to state practices and inclines farmers to accept rather than reject offered information - especially if other growers have the opportunity to see the success of these practices themselves. This leads to another widely mentioned source of information, observations of other farmers operations.

Observation of other farmers' operations was a primary mechanism used to share experiential knowledge among the community members interviewed. Farmers frequently (cif = 21) cited observation of other operations as a way they learn about new practices. One farmer talked not just of the value of observation, but in reference to a particular practice state agriculture organizations were trying to promote:

I constantly ride around in the fall looking because I thought the Airseeder was going to be a big deal in our area, but I'll be honest with you I don't like the stands, but stands have a lot to do with what chemicals you use. It's been a challenge to figure out what chemical not to use but still have some kind of weed control on your crops but we are getting there (24).

Though these practices are coming from the state interviews indicate they are perpetuated through the experiential knowledge of the farmers implementing them.

This may blur the lines of where the initial practices came from, especially if the second or third waves of farmers are not tying them back to the original state agency through cost share. Therefore, what is spread through the agricultural community is a hybrid of scientific and local knowledge that is born of the initial adoption of scientifically derived practices followed by their adaptation to the local context by lay people in the form of farmers. The second part of this chapter expands on the use of experiential knowledge and observation in this way as part of informal networks of knowledge exchange. This secondary form of knowledge diffusion relates to many of the farmers interviewed having limited knowledge of BMP lists and not being able to identify state recommended BMPs and yet utilizing them. One farmer who was initially unsure about BMPs said this about their process of choosing conservation practices:

We assess what we have to do to stay profitable and do the best we can for our farm. We never intended to set out to do BMPs because they were now called BMPs it just happens to be a lot of the things we ended up doing are BMPs (04).

This experiential knowledge accumulates into local knowledge which is highly valued by the members of the farming community I interviewed. Even within meetings hosted by state organizations I observed that local knowledge was shared among the farmers and this was corroborated by an interviewee:

I may not learn anything from what goes on with the speaker for a particular meeting, but I do learn from a farmer. There is always something at a meeting that you can pick up that will help you (24).

This farmer also mentioned that meetings get repetitive after attending so many yet they continued to attend because they valued learning so highly and it was another forum in which to communicate with their network of agricultural peers. This seeking

of both forms of knowledge simultaneously further emphasizes how they have become tightly coupled on the peninsula.

The benefit of local knowledge is also present in interviewee communication about certified crop consultants who are valued or trusted because of their understanding of the local context from regular farm visits. One crop consultant explained their role in relation to CE and farmers and the value of their regular site visits:

In some areas Extension is very good in some areas Extension has almost fallen by the wayside sadly. I am not saying we [crop consultants] replace Extension because in a lot of aspects we work very well with Extension but we do have the ability to provide a bunch of information to farmers in that we are in their driveway and on their farm on a fairly routine basis. Questions come up and you see things that work well in other areas and situations and you say *maybe you want to look at this* (23).

This interviewee was a Certified Crop Advisor whose company was writing plans for farms that totaled hundreds of thousands of acres to help with conservation planning and ensure they were adhering to state mandates. For this certification, attendance at initial training sessions and a test are required along with continuing education credits which can be obtained at the same meetings as farmers. Their training is extensive - the NM session I attended being only part of it. According to Wolf (2006) there is increased specialization and commercialization of agricultural knowledge as consulting companies work to know about the range of complex regulations, local specificity and new technologies so that farmers do not have to know everything themselves. Several of the interviewees from Maryland did not have all certifications because they were working with specialists - crop consultants and fertilizer and pesticide applicators being the top mentioned. There is some evidence that

commercialization of specialized information through databases and consultants has degraded the “previous localized, informal or publicly facilitated collective structures” of agricultural knowledge production (Wolf 2005 p. 113). What impact this specialization has on the formal and informal networks on the peninsula could not be determined based on interviews, but some participants are outsourcing input application to avoid state education mechanisms.

Local knowledge networks persist however and were especially important for interviewees who were new to farming or new to farming in the area. In reference to use of the local farming community for information, one newer farmer said:

It is huge to have that support. Not that I couldn't figure it out on my own, but it would take that much longer. It is definitely good to have a good community of people it makes anything reasonable (19).

This existing network of local knowledge helped by to reduce the amount of experimentation this farmer had to conduct themselves to adapt practices to their local context. Experiential knowledge was considered all around important through either having a background in farming which helped non-farmers relate to the agricultural community, as indicated by the previous CE quotes, or through use of experimentation to expand existing farmer knowledge as indicated by this new farmer. Similar to results found by Nuthall (2012), farmers who were interviewed for this study are using informal systems based on experience for decision-making, which include a range of individuals from family members to members of sustainable harvest organizations.

Bringing the different knowledges together

As indicated in the introduction and last section scientific and local knowledge are not isolated in their use by the participants of my study. Both have their place and value within the local context and neither are exclusively produced by farmers or state

actors. University extensionists (read scientists) are conducting in-field trials at research stations and on local farms to adapt practices to the local context and farmers are participating in these scientific experiments and going further to develop and implement their own studies. Informal networks persist and this section will start by showing how SCD “champions” combine the three forms of knowledge previously discussed -scientific, local and experimental, to promote the transfer of new information related to BMPs in both directions in an effort to increase the available local knowledge for this region and others across the nation.

Studies have shown that farmers prefer to seek knowledge about BMPs from a respected member of their farming community over government employees and support from these “champions” can increase the diffusion of BMPs (Enloe et al. 2010, p. 151A). These state defined champions were a way scientific, local, and experiential knowledge intersected in this study as they were farmers who produced soil health data through experimentation that contributed to scientific knowledge about how practices function within a range of local contexts. This soil health information will be widely available as part of a national database allowing other farmers access to this locally specific information. Some of these champions were agriculturalists who were also involved with state organizations, but other were farmers just interested in trying new practices. One of the farmers interviewed was considered a Soil Health Champion, although they did not identify themselves as such, but they were actively doing experimentation on cover crops. They claimed they were:

Trying a lot of stuff and not doing it just for myself, but so that others can alleviate my mistakes and bypass what I learned (24).

Another farmer that had a previous tie to SCD through being a board member for a time, but was not a “champion” claimed to be conducting experiments to learn

something new while reducing inputs. They were very excited about their experimentation and its environmental benefits:

With corn it's common knowledge, and this has been University recommendation for many, many, years. It takes about 1.2 pounds of nitrogen to produce a bushel of corn. Well if you use a more efficient fertilizer and instead of putting it on one time at planting and put it on at different growth stages of the plant you can grow, and I have proven this . . . I have gotten that nitrogen to bushel ratio down to $\frac{3}{4}$ of a pound of nitrogen per bushel of corn because I am not losing the nitrogen to volatilization because I am putting it on once the corn shades over, and I am not losing it to leaching because I use an additive in the nitrogen that prevents it from leaching. and lets the nitrogen breaks down slower so it is not all available to the plant at one time. It works well and enhances my program with doing more with less still growing a nice crop protecting the environment keeping what I don't want in the water from going in the water and then protecting my groundwater, you know, to keep from having nitrate levels high in my ground water. So, it all goes hand in hand just basic conservation practices (31).

This quote emphasizes several key aspects of this study in relation to the knowledges used for agriculture. First is the idea that university recommendations are common knowledge (even if this one was indicated to be wrong), which relates to this organization's directive of imparting scientific knowledge to the agricultural public. Furthermore, this farmer has recognized this as the source despite the informal network of knowledge exchange, which may hide the origins of such information. Second, this farmer is increasing the effectiveness of state prescriptions for nutrient reduction, and is conducting experiments to this end in a similar way and at seemingly the same level of rigor as experiments by the state. This differs from state science in that it is local science conducted in a context most relevant to them, which is their farm, and I cannot speak to its repeatability. This farmer is not driven to experiment for governmental reasons or even financial ones as they claimed to spend a similar amount despite input reduction due to the added expense of the selected inputs.

Instead, they chose to improve state strategies based on their own interest and moral ethic. Such intersection of these knowledges was also found in other studies (Blaikie et al. 1996) and such weaving of science and the local into local science may facilitate farmer acceptance of scientific knowledge.

The types of agricultural knowledge blend together into networks of information that is being accepted or rejected by interviewees based on state agricultural organizations, regulatory guidelines, facilitating relationships, personal experimentation and the drive to either change or maintain the status quo. As the above experimenter said:

I am constantly going to different schools - different seminars. Just last week I was up at Penn State to Ag Progress Days, and they will have different seminars and I will pick which ones I want to go to. And through the winter I will go down to University of Delaware or University of Maryland they are all times having workshops and stuff. But to tell you the truth most of what I learn is that I am not hesitant at all at trying something different and trying something new and I am constantly looking at what other people are doing. *What is he doing over there? How is he doing that? Did it work or it wasn't so hot?* So just trial and error and seeing what other people are doing in other parts of the country what's working for them and what's not (31).

All forms of knowledge were valued by members of both the scientific and farming community that took part in this research. However, acceptance of the different forms of knowledge was mediated by how they are communicated and recognition of the importance of both scientific and local knowledge for agricultural knowledge production.

The Social Production of Scientific Evidence for BMPs

Researchers have largely found that agricultural knowledge production is facilitated by a heterogeneous group of actors that includes scientists, state actors,

public citizens and private and commercial interests (Gibbons et al. 1994, Henke 2005, Wolf 2005, Granjou 2011, Wood et al. 2014) and this is also true of this research. One extensionist explained about the complex relationships farmers use for agricultural information:

Some farmers use their crop consultant and Cooperative Extension some just use Extension. And then there are people with animals, if it is an integrated system, they are going to use their flock supervisor or flock advisor. There are a lot of people at their disposal and it is kind of a mixed bag of how they choose the people. A lot of it is built on relationships. A lot of it is a trust thing. Some people will get mad at their crop consultant and start calling their Extension agent (10).

As hinted at in the previous section and further elucidated here, a network of information sources is available to farmers based on their agricultural type, but interviewees indicate that farmer use of this web is mediated by trust and the perceived credibility of the information sources it holds. Gibbons et al. (1994) best explain how the use of varied sources and “the interactions among these sites of knowledge [can] set the stage for an explosion in the number of interconnections and possible configurations of knowledge and skill” (p.10).

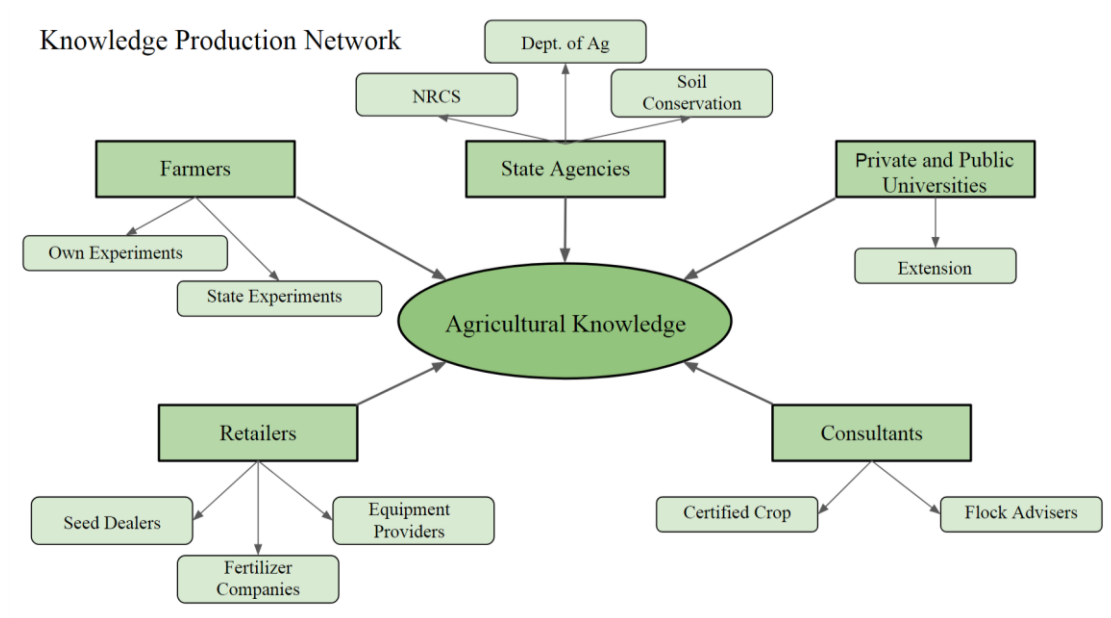


Figure 4 Diagram of the information sources mentioned by interviewees as contributing to their agricultural knowledge.

Expanding relationships

Establishing relationships for the creation of agricultural knowledge and to facilitate its exchange was a common narrative throughout this study. For instance, one of the governance strategies mentioned in the last chapter was for state personnel to establish relationships to facilitate the transfer of knowledge in both directions. This was accepted by all state employees interviewed as part of their role, but the level of difficulty in fulfilling this role was based on farmer trust. The resultant web of knowledge sharing through these relationships can encourage the community to adopt BMPs and, as state interviewees hinted at ensures that even with practice saturation there is a living network through which to transfer the next practice. Sometimes

interviewees established relationships through answering farmer questions and others through an initial planning session and/or an on-site extended analysis of what a farmer's needs are for their business and conservation. These relationships tend to be state directed and focus on the transfer of scientific knowledge.

Agricultural knowledge networks are expanding beyond these state mechanisms to include a range of organizations outside the laboratories and traditional forums of scientific study (Gibbons et al. 1994, Frickel and Moore 2005). Lay people, in this case farmers, are especially important in agricultural knowledge production because their experiential knowledge fine tunes general prescription to the local context (Wolf 2005). The popularity of farmer observations among interviewees (21), including summer farm tours which further facilitate knowledge exchange, is evidence of the value of farmers in the generation and transfer of agricultural knowledge. In this and other studies (Woods et al. 2014), knowledge networks were found to be of importance to most farmers interviewed - even if, in this study they did not identify them as networks, but rather conversations with farmers and observations of their operations. One farmer said this about their learning process:

You get to a point that you are implementing all the things you read about and learned about and once you get to that point you start making it your own. That is where we are, we are tweaking things every year trying to make it better and our resources are our colleagues (03).

This was true for farmers interviewed that were relatively new and those with decades of experience as these relationships facilitated the transfer of locally specific knowledge about physical conditions like planting times and economic concerns such as labor conditions. Newly established farms and subsequent social networks also exemplified how knowledge can evolve due to changes in circumstance. The same

interviewee as the previous quote stated of their move from doing organic internships to setting up their own operation:

We have a unique perspective because we came from not being farmers and not understanding anything about farming and how it worked and how economic pressures and other factors can influence your decisions on what you do on your farm. My views were influenced by organic is good and chemicals are bad. It is presented as black and white but now after doing it for 10 years you realize there is an ideal way to do this. We are not doing it the way I would want to do it, but if we did it that way we wouldn't be in business (03).

In another study, farmer to farmer communication pathways proved to be “particularly effective when it comes to communicating complex information whose practical value typically relies heavily on tacit knowledge” and that “farmer knowledge exchanges are expressions of their social solidarity” (Wood et al 2014). However, not all social learning is beneficial especially when incorrect information is circulated (Stone 2012).

The flow of information

Agricultural information flow in this region was bi-directional - as evidenced by the Soil Health Champions program. Several farmers interviewed were actively doing research about different aspects of cover cropping from delivery mechanisms and seed mixes to planting green (into the cover crop before herbicide application). This research contributed to a national database established by SCDs to expand federal and state knowledge of how practices fared in different locally specific conditions. Additional to incorporation of their data, I witnessed champions being actively sought out for information - one of them served as an informal source of specific information about cover crops during the soil health workshop I attended. These innovative farmers are also asked to be speakers at meetings and seminars put on by CE and SCD. An employee from NRCS said this of their importance to knowledge diffusion:

We rely on the people trying the cover crop mixes to tell them how they work - that is how you get a lot of buy in to the program - with the guys that are doing it - that put on paper - the economics. Once you hear farmers say it can be done, I have no inputs other than my cover crop and yields are out the roof, and then guys that have traditionally not even thought about that concept - they start to experiment (29).

Robbins (2000) also concluded in his study about local political economy that “knowledge alliances” between state personnel and local actors have the power to facilitate transfer of knowledge and ultimately changes in land use. The presence of the themes “trying new things” and “own research” throughout the interviews exemplifies how just the subset of the agricultural community, that participated in my study, can serve as both a user and creator of scientific information. Farmers interviewed were also volunteering their land to CE for field trials both long- and short-term. Unfortunately, farmer involvement in state research on the peninsula could not be substantiated with specific data because there is no central database and the number of experiments that farmers are a part of differs from year to year depending on the funding and need for agricultural space (in communication with Amy Shober). As seen in the previous section not all experimentation was tied to the state, but still valued by farmers and their peers. Farmers doing these different forms of research are just some examples of how science about BMPs is socially produced. Interviews and observations indicated that as state agencies and institutions lack the personnel, funds or land to do the experiments themselves they have to depend on farmers.

Keeping up with the John Deeres

In association with and at times resulting in CE’s inability to keep up with changes in the agricultural industry, seed and fertilizer companies and equipment dealers act as another source of agricultural information. These retailers provide up-to-

date information of their advancing technologies and new products which farmers use in their decision-making. More than one interviewee talked about the relationship between farmers and private commercial interests. Farmers were identified as being very loyal to a particular company and this is largely based on their level of and continued trust in the brand. One CE agent talked about the relationship between their role in information transfer and agricultural use of new products:

I think some things we do well and they come to us. I know we are not always the first point of contact. In a lot of cases, we are may be second or third tier up from the question or the problem. In other words, the grower talks to their seed salesman and their fertilizer salesman or their crop consultant first if it's a normal problem. . . And then as far as new technology goes though - industry is the player here -the Trembles, the John Deeres. They're developing the technology - growers are using it. Yes, Extension can evaluate some of those technologies and can have a somewhat input, but ultimately I think the growers they want to use it so it doesn't really matter what we say. . . But we don't have enough people to evaluate every single practice or product that comes out (13).

As this interviewee indicates CE does not appear (based the dominant narrative) to have sufficient personnel to keep up with the new technology available to farmers as equipment and seed providers seek to be on the cutting edge of innovation. Farmer participants are very interested in the potential of agricultural innovations to increase their production, as evidenced by several farmers mentioning the need to modify and diversify for financial security. A farmer corroborated both the use of equipment providers and the limits of CE and further elucidated the benefits to farmers of using retailers:

I mean, with precision [agriculture] and John Deere and Case and all these different companies, I mean, they are putting the technology to us right away how would you be an Extension agent and ever keep up. . . [The equipment companies] and the seed companies and chemical companies they do a tremendous amount of research. When you are on

their team it's in their best interest to guide you in the right direction. If you don't make money of their products then you don't buy them (22).

That this farmer considers these retailers as “part of their team” and a “guide” elucidates how much commercial interests have become a part of agricultural knowledge production. In combination with the previous quote, it is evident that commercialization has altered the experimental forums and transfer pathways of agricultural information on the peninsula. With all the available avenues for agricultural knowledge farmers have the option, when not regulated, to choose what information best benefits them, which may be the state, their fellows or commercial enterprises on the cutting edge of new technologies.

Role reversals and collaborations

Interviews and participant observations indicate that farmers' information is valued by all other groups within the knowledge network for its local specificity, but farmers also serve as educators to groups unfamiliar with agriculture. Reversals of learning are actively happening with the Delmarva agricultural community as environmental groups and school groups seek out and start to work with some of the farmers in this study (at least three outright said they worked with these groups) to learn about agricultural production. This can be both good and bad as one state employee articulated:

Everyone wants to work with farmers now - all these watershed groups - environmental groups that don't typically work with farmers, even EPA, want to get out on farms and want to meet farmers and talk to them and do projects on farms and they always come to the district to say *Who's the farmer? Who can we go talk to?* and sometimes they have farmers on their boards - each district has their go to farmers that always get used for everything and I think that will exhaust itself at one point. You can't keep coming back to the same people all the time (28.3).

These reversals, though exhausting in excess, are important as they constitute different relationships, which have the potential to lead to collaborations as mentioned by interviewees in reference to state agencies but also environmental groups:

[My views began to change] through always being open to collaboration and collaborating heavily with environmental groups starting with the Chesapeake Bay Foundation. And walking in the shoes of the environmentalist trying to help the farmer and realizing the problems are all the same - it is just a matter of looking at it through a different lens. No different than any problem in the world. It is just a matter of figuring out how to get on the other side of that problem and look at it and is that person willing to come to your side and look at the problem from the same side as you (22).

This farmer emphasizes the benefits to establishing relationships with different groups and coming to an understanding to work in tandem on knowledge production. In Akerman's (2005) Finnish study, dialogue between locals and policy makers led to policy modification through shared understanding and in greater dispersion of conservation practices. However, as Blaikie et al. (1996) mention and as corroborated by one of the interviewees when working with the agricultural community you cannot expect project objectives to be achieved in a short period of time inconsiderate of the agricultural community's needs and time constraints:

It is also understanding their work cycle as well if you want to try to sit down and have a conversation with a farmer anywhere from March 1 to December 1 you have to you know in the back of your mind. [Think] *okay what's going on today Is it raining what time of the day is it can I actually call this person or talk to this person right now?* . . The way I have seen it, you are setting yourself up for failure if you think you are going to get something done in a month or two months, you know, during harvest season (13).

This especially has to be considered if farmers are collaborating with state personnel to develop guidelines as is the case with the Delaware Nutrient Management Commission (DNMC). The commission includes agriculturalists representing all the

types of agriculture in Delaware and while most of the members were in attendance at the monthly meeting I attended, two representatives were absent. The same happened with the NM certification sessions with some farmers or flock advisers unable to attend due to the threat of flock loss from malfunctioning equipment at high summer temperatures (though they were able to attend the next session). These and similar circumstances make it difficult to attend meetings and thus access the scientific knowledge being offered by state entities and this may be why some farmers are more comfortable with their informal networks based on experience.

Conclusion

This research demonstrated that agriculture is heavily influenced and embedded within the social context both in it being a public profession tied to the land and the importance of local and experiential knowledge to members of the community I interviewed. At the end of the day the farmers I interviewed are interested in making changes to remain profitable and luckily several BMPs are good for that and the environment.

When I began this study I expected that farmer participants would be more likely to seek assistance or information from a respected member of the farming community and this has proven to be the case for many of those interviewed. These farmers often used a knowledge network of their peers and observations of what practices they were using to make practice decisions. The farmers that used state organizations more so than peers tended to be connected to state agricultural agencies or institutions either as part of the organization or through partnerships for information sharing. I also expected that agency and CE personnel interviewed who had established relationship or other connections to the community, via farming

themselves or being a local, would be more successful in their role as scientific information provider to agriculturalists. This also proved to be the case as far as participants were concerned as shown by quotes from all agencies and CE about establishing relationships that facilitate knowledge transfer.

What was unexpected in this area was the lack of persistence of older practices which I hypothesized would be present on operations managed for generations by one family. The practices that did remain are those that are still recommended through the state (i.e. crop rotations), but most () interviewees indicated a need to modify and/or diversify their operation to stay profitable and that there were problems with older practices. Part of this proposed hypothesis was that local knowledge would be important, and this was the case, but primarily as a way to more efficiently use new technologies, through altering them to fit the local context. The final aspects of my expectations related to agricultural knowledge and information sources is the form of locally specific practices developed by farmers, which could be used to augment the BMP program. When asked if they used practices alternative to BMPs for conservation most interviewees either did not know what is already considered a BMP or did not have any to add. Rather the experimentation conducted by these farmers contributed to the BMP program and associated databases by adding site specific data. There was some expectation of resistance with potential alternative practices, but since there were no clear cases of alternatives and there was general resistance from the farming community to some state organizations, this could not be determined in reference to conservation. The general resistance to state information mechanisms was with the expectation that farmers participating in this study already have the tools to farm responsibly in consideration to the environment.

In a sense much of this chapter constitutes an unexpected development during the course of this research - that of the plethora of information sources and the agricultural knowledge production networks present on the peninsula. The number and strength of interconnections between the science, farming and environmental communities for knowledge production and diffusion, indicated by interviewees, were unexpected. There remains distrust between these groups as evidenced by resistance in farmers to learning from one or more of the other groups. However, the development of a persistent knowledge network and as one farmer emphasized “seeing the perspective from the other side” (22) can lead to collaborations that facilitate further sharing of information and the production of agricultural knowledge which is inclusive of the knowledge and concerns of all parties involved with agriculture.

Chapter 6

CONCLUSION

This study was developed to start to determine how farmers on the Delmarva Peninsula perceived conservation practices. In order to answer questions about farmer perceptions I used agricultural best management practices (BMPs), which are a ubiquitous suite of conservation practices used both nationally and within the study region. Methods included participant observation and semi-structured interviews (n = 30) with farmers and those state personnel working in close association with them on BMP implementation. Analysis of participant operation field notes and interview data focused on farmer motivations for BMP use and their use of information sources for conservation decision-making.

My original expectation was to investigate BMPs as tools of government for environmental subject-making through the lens of governmentality, and more specific environmental governmentality frameworks. I used these frameworks to help me elucidate the mechanisms through which environmental policies are enacted on the farming community on the Delmarva Peninsula, in a similar vein to other governmentality studies (Agrawal 2005, Birkenholtz 2009, Cepek 2011, Jepson et al. 2012, Dressler 2014, Kolas 2014).. Fortuitously, during the research into governance mechanisms, I began to recognize the complex network of information sources used for agricultural knowledge, so I adopted the additional framework of production of knowledge. I use the production of knowledge literature to tie together the different types and valuation of knowledge used on the peninsula for agriculture and to

investigate how they come together to form knowledge networks, as previous scholars did through this lens in reference to agricultural knowledge information sources (Wolf 2006, Henke 2006).

At the onset of my investigation of environmental governance strategies, I expected that BMPs as voluntary practices could indicate whether farmers participating in this research were environmental subjects adhering to state environmental goals of sustainability through conservation. This plan was complicated because BMPs are not strictly voluntary in this region as Maryland and Delaware have enacted nutrient management (NM) laws which require NM planning and initial and continuing education for farmers that use or produce nutrients over state defined limits. This complication makes for an interesting case study of the dual use of governmental and disciplinary governmentalities to reach state goals.

According to interviewees from SCDs and NRCS, the voluntary adoption of BMPs is related to establishing relationships with farmers and/or incentivizing BMPs, economically and ecologically, through use of cost share and emphasizing their long-term benefits for soil health and overall agricultural productivity. Education is another governance tool that state agricultural organizations utilize for environmental subject-making. Unfortunately, these education mechanisms are also complicated by regulation as NM certification requires initial and continued education on BMPs. These requirements are believed by interviewees to be responsible for farmers in Delaware and Maryland being more knowledgeable about NM than farmers in other parts of the country. Some farmer interviewees found these learning experiences to be opportunities to connect to speakers at meetings, or other farmers while others found them useless or irrelevant to their operation. Based on interview responses, tensions,

between farmers and state personnel, that evolved out of the shift to mandated education indicate the limits of tools of government and discipline operating complementary in the same sphere.

The reversal of trajectory from governmental to disciplinary mechanisms for environmental governance was believed and is still believed to be necessary by many of the state agricultural personnel and farmers interviewed. This belief is because it gave those farmers not already implementing NM the direction and motivation to utilize practices that reduce the source and transport of non-point sources of nitrogen and phosphorus. However, the majority of farmers interviewed (64%) claimed they already implemented these practices before they were regulated. Interviewed farmers were using BMPs, prior to regulation, to enhance the performance of their farm and for stewardship reasons as it is “the right thing to do”. The increase in NM practices after regulation and farmer adoption of state philosophies of stewardship demonstrates that both the governmental and disciplinary strategies have been effective on the peninsula

Regardless of farmer feelings about adhering to new regulation, interviewees from the community and the state indicate that they are pressured to change their practices from a variety of sources and at multiple scales (through government at multiple scales and social pressure), due to the visibility of their profession. Pressure is coming from the state to comply with regulation, but also from environmental groups who are watching to ensure farmers are following NM plans. Environmental groups are attempting to establish relationships with members of the agricultural community to further convince them of the value of their environments of interest (i.e. the Chesapeake Bay). The remaining members of the farming and non-farming public are

also a force for change as they perpetuate state philosophies of environmental stewardship and protection.

The second expectation for this study was to determine what information sources the farmers interviewed use for conservation and how this reflects their relationship with state agencies and CE personnel. This research elucidated the relationship that farmer interviewees have with these organizations and their available information, but it also demonstrated that agricultural knowledge is socially produced by all the parties involved with agriculture on the peninsula. According to the CE agents interviewed, this organization serves as a primary source of scientific information through association with its land-grant university, and through mandatory education for farmer certifications. Based on participant observation of NM educational requirements and conservation informational material obtained through these experiences and the SCDs, farmers have access to enough scientific knowledge to assess the value of soil health and water quality BMPs for their individual farm circumstances.

The farmers interviewed in this study and their affiliates also served as sources of local knowledge, through their experimentation to improve farm management, which includes determining the relevance of BMPs within the local context. This local knowledge is then fed back into the agricultural community via knowledge sharing networks and farmers observing each other's practices. Results from formal and informal experimentation also contribute to scientific knowledge by filling in gaps that CE does not have the capacity to fill given the increasing amount of information available through other sources. Interviewees and participant experiences indicate that local knowledge generated by farmers, and some specialists, feeds back into databases

set up by state agencies to improve knowledge of BMPs and into databases set up by commercial interests to improve product development. Commercialization and specialization are two other drivers of agricultural knowledge production as retailers and consultants serve as additional sources of agricultural information. Local knowledge and general knowledge of farming practices is also utilized by farmers to educate environmental groups and the public to increase understanding of the demands and constraints of production agriculture.

Based on the interviewee responses which focused on the need to modify practices to remain profitable or the existing practices they would recommend, this research did not demonstrate that farmers were using conservation practices alternative to BMPs. They were adapting BMPs to their management needs with a combined use of endogenous knowledge. Nor did this study demonstrate that farmers maintain practices from the previous generation because most farmers were adopting new practices for economic reasons as mentioned above in relation to why they are not developing their own conservation practices.

I would be remiss in not indicating the limitation of my study, which is the relatively low, but still significant by qualitative standards, number of interviews (n = 30) when the Delmarva Peninsula supports over 6500 farms with farmers from a diversity of circumstances, and with a range of conservation interests. This study can, however, serve as both a case with relation to the theoretical literature used to investigate governance strategies and agricultural knowledge. And in the quantitative realm, this research can serve as a starting point from which to develop a survey that can better the overall circumstances as they relate to my topics on the peninsula. Given the number of farmers, I do not expect I will be able to interview a sufficient amount

to generalize, but I would like to expand this study to include some of the groups involved with conservation that were not represented including members of state environmental agencies and academics beyond Extension that study agricultural impact. This expansion of interviewee groups would offer the opportunity to investigate how scientists who work on agriculture, but not in close association with farmers, perceive agricultural conservation efforts. Also, NM regulation is evolving in the U.S. and a study that incorporates data from this study with similar data collected from other regions that have different NM requirements would further elucidate farmer reactions to different environmental governance strategies. Fletcher's (2010) article on the different governmentalities involved with environmental governance would be an interesting angle through which to investigate different levels and forms of NM governance.

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Appendix A

INTERVIEW GUIDE

Interview Questions:

Demographic Information

- Size of their farm
- Crops and/or livestock
- Length of time they have been farming
 - Number of generations
 - Historic location
- Level of BMP use
- BMPs used
- Length of time they have used BMPs

Why do farmers choose to use BMP programs and why not?

Sub-questions:

What conservation/resource concerns do farmers find the most important?

Do farmers feel they are environmental stewards? In what ways are they stewards?

What are some of the economic benefits to the use of BMPs and how have they influenced farmers' land use decision-making?

Is local knowledge used to develop conservation practices that serve a similar purpose to BMPs?

Sub-questions:

How do BMPs relate to their existing or past management practices?

Are there any practices kept from previous generations?

What practices do farmers recommend?

What information sources do farmers use with regard to conservation practices and why?

Sub-questions:

What prompts farmers to use the sources they have chosen for information?

How do they feel about farmers being considered the number one problem for water quality?

Sub-questions

Did they notice any differences in regulation and management after the Pfiesteria scare?

Appendix B

DEMOGRAPHICS

Table 2 Demographic table of the occupation and employers of interviewees.

Agricultural Role	Total Number Interviewed	Percentage of Interviewed
Farmers	22	73.33%
Cooperative Extension	4	13.33%
Soil Conservation District	4	13.33%
NRCS	1	3.33%
State Department of Agriculture	1	3.33%
All State Employees	10	33.33%
Consultants	3	10.00%

Table 3 Demographics table of the agricultural type of interviewees.

Farm Type	Total Counts	Percentage of Interviewed
Grain	7	22.58%
Vegetables	5	16.13%
Fruit	2	6.45%
Poultry	2	6.45%
Beef	4	12.90%
Dairy	2	6.45%
Sheep	1	3.23%
Pig	1	3.23%
Mixed livestock operation	2	6.45%

Organic	4	12.90%
Urban	1	3.23%

Table 4 Demographic table of the sizes of the operations owned or worked by interviewees.

Size of Operation	Total Counts	Percentage of Interviewed
15 acres or less	5	22.73%
16 - 100 acres	6	27.27%
101 - 200 acres	3	13.64%
300 - 400 acres	3	13.64%
600 - 700 acres	2	9.09%
Greater than 1000 acres	3	13.64%

Appendix C

CODES

Table 5 Table of the codes used for analysis and their total frequency.

Codes	Total Frequency
Ag still blamed	3
BMP Use	51
BMPs Do Not Fit	17
BMPs Used	80
Books	10
CAFOs	5
Cannot be a Dumb Farmer	8
Cannot Control Other Sources of Nutrients (North)	10
Certifications	19
Champions	6
Changes in Practices with New Equipment	19
Commodity Sellers	7
Conowingo Dam	4
Conservation Plan	11
Consultant Work	16
Cost Share	61
Cover Crops	62
Crop Insurance	7
Crops/Livestock	99
DA	4
DE Ahead	10

Did Practices Anyway	32
Disproportionate Blame	8
Easy Scapegoat	10
Economic Benefit	37
Environmental Groups	22
Equipment Providers	4
Expense and Margins	83
Experiential Knowledge	48
Extension	43
Farm Kid	2
Farmer Feelings about Mandatory	40
Fertilizer Company	13
FSA	4
Higher Standards	3
Historic Location	11
Increased Yields	23
Internet	15
Knowledge of BMPs	25
Lack of knowledge or understanding	23
Lack of knowledge or personnel of state agencies	15
Land Stewardship	35
Leave Better Than How You Got It	9
Local Knowledge	31
Long-term Benefits	21
Low Parmer Population	9
Magazines	13
Mandated Actions	69
Manure	52
MD Ahead	9
Meetings and Seminars	32

Motto	2
Municipalities as Other Sources of Nutrients	16
Necessary to Diversify	9
Necessary to Modify	14
No More Input than Necessary	39
NRCS	43
Number of Generations	22
NM	93
Observations of other farmers	21
Older Generation Stuck in their ways	4
Only Help Water Quality to a Certain Extent	2
Organic Farming	25
Other Ag Funding	7
Other Land Uses	13
Other sources of nutrients	26
Own Research	14
Paperwork	12
Pfiesteria	10
Poultry	30
Practical to Use BMPs	15
Practices kept from previous generations	23
Problems with Older Practices	13
Production agriculture is a business	16
Profitability	22
Q1-Motivations for BMP Use?	45
Q2-Local Knowledge Use?	35
Q3-Information Sources Used	66
Q4-Ag's Role in Water Quality?	35
Recommended Practices	17
Reduced Input Cost	9

Relationships	68
Resource Concern	42
Right Thing to Do	20
Room for Improvement	26
Scientific Evidence	23
Size of the Operation	53
Soil Conservation	46
Soil Health	56
Soil Samples	29
Take Care of What Takes Care of You	22
They Can Do What They Want with Their Own Land	5
Tillage	62
Timing	10
Trying New Practices	10
University	11
Upkeep to Avoid Waste	8
Upset About	10
Water Quality	35
Years Farming	23

Appendix D

INSTITUTIONAL REVIEW BOARD EXEMPTIONS



RESEARCH OFFICE

210 Halliham Hall
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Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: March 23, 2017

TO: Jaime Barrett, MA
FROM: University of Delaware IRB

STUDY TITLE: [1045015-1] Dueling Conservation Perspectives?: Why Farmers Use Best Management Practices

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: March 23, 2017

REVIEW CATEGORY: Exemption category # (2)

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Nicole Farnese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.



RESEARCH OFFICE

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Ph: 302/831-2136
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DATE: May 1, 2017

TO: Jaime Barrett, MA
FROM: University of Delaware IRB

STUDY TITLE: [1045015-2] Dueling Conservation Perspectives?: Why Farmers Use Best Management Practices

SUBMISSION TYPE: Amendment/Modification

ACTION: DETERMINATION OF EXEMPT STATUS

DECISION DATE: May 1, 2017

REVIEW CATEGORY: Exemption category # (2)

Thank you for your submission of Amendment/Modification materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Nicole Farnese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.