

PESTICIDE PERCEPTIONS IN A SOUTH AFRICAN
AGRICULTURAL COMMUNITY

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Abstract

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Due to the scientific uncertainty of pesticide impacts on human health, limiting pesticide exposure becomes an important task. Socio-economic factors influence individuals' knowledge of pesticides including how to use pesticides, possible effects of pesticide exposure, precautionary measures. Applying a functional approach, I use data from participant observation, informal interviews, and semi-structured interviews with community members in Groblersdal, South Africa, (an intensive irrigation and commercial agricultural community) to examine the influences of people's perceptions of pesticides. I emphasize that research should focus not only on farmworkers but on community members of intensive agricultural communities like Groblersdal. I argue that people in Groblersdal construct risk from the information immediately available to them, and they use pesticides most fitting to their social and economic context. By understanding how and why pesticides are used can enhance pesticide awareness programs that only target individuals' knowledge, attitude, and practices.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND

The scientific uncertainty of the impacts of pesticides on human health makes limiting exposure to pesticides an important task. Socio-economic relations and political influences in addition to how people view their perceived risk to health affect an individual's perception of pesticides. I use data from participant observation, informal interviews, and semi-structured interviews with community members in Groblersdal, South Africa, (an intensive irrigation and commercial agricultural community) to examine the influences of people's perceptions of the use of pesticides.

General Theoretical Approach

I take a broad functionalist approach to examining pesticide use in Groblersdal. Malinowski explains that "functionalism is, in its essence, the theory of transformation of organic-that is, individual – needs into derived cultural necessities and imperatives" (1939:962). With the information that community members have (i.e., provided by the government, pesticide industry, and health officials), individuals use pesticides to fulfill basic needs (e.g., local economic growth, subsistence, decreased agricultural labor, and more comfortable way of life).

Set in this context, I also draw upon economic anthropology in that individuals act as rational actors evaluating available information and acting upon that information. Wilk (1996) provides an in-depth overview of economic anthropology as well as criticism for three broad approaches within economic anthropology (i.e., rational self-interested actors, social actors and moral actors). There has been much debate on economic anthropology, especially regarding

rationality of individuals cross-culturally and determining whether the focus should be on individual or social decision-making. Many studies suggest that humans are not good cost-benefit decision makers. Gintis (2007) provides an in-depth review of arguments against cost-benefit decision-making and rational actors. The proposed research does not delve into the experimental research of rationality of individuals. Individuals, though, behave in a goal-oriented manner that can be influenced by other factors (i.e., social interactions, economic resources, environment). Gintis (2007:2-3) succinctly describes rational actor model as referring to beliefs, preferences, and constraints to avoid misconception of the “rationality” of the model. Moreover, Sandstrom (2007:97) in response to the debate of focusing on individual or social decision-making suggests splitting research strategies depending on the research question at hand; however, Sandstrom emphasizes doing so while explicating causal links between individual rational choice and social systems. In regards to whether individuals are rational actors, it is emphasized that understanding the context in which decisions are made supports the idea that individuals are rational actors. Often times, the use of context as explanation to explicate irrational behavior or varying behavior between groups limits further analyses. Henrich (2002) argues that a focus on cultural transmission, more specifically biased cultural transmission, can further elucidate why these variations occur and why these behaviors exist in spite of individual cost-benefit behavior. While this research is not a cross-cultural examination, I argue that using biased cultural transmission in analysis and explanation further elucidates why certain cost-benefit decisions are subverted (i.e., pesticide-use behaviors).

Sandstrom (2007:83), an advocate of the formalist approach (i.e., rational actors) in economic anthropology, argues that focusing on the behavior of actors among other things complements other anthropological theoretical approaches that focus more on ideologies of

culture. Along these lines, this research focuses not only on ideologies but also on individuals' pesticide use behaviors. This is not to say that the research is only focused on individuals' behavior. In following a formalist approach at one level, I focus on individuals' perceptions and behaviors related to pesticides including pesticide use. The individuals' actions are goal oriented, in this case to fulfill basic needs. In regards to the rationality of individuals in other cultures like in South Africa, the context in which individuals reside and use pesticides needs to be understood to make sense of what decisions they make and why. Within the South African region of Groblersdal, I argue that individuals' actions are based upon rational cost-benefit decisions to an extent. Individuals are also prejudiced by biased cultural transmission, which can influence their cost-benefit decisions.

Even though excessive pesticide use or overlooking risks of pesticides might seem irrational in the long-term, individuals gain immediate benefits. The immediate benefits of using pesticides in terms of economic growth, jobs and bodily comfort might be the more enticing option to people who base their decisions on: (1) the pesticide information available to individuals (i.e., from adverts, pesticide labels, governmental authorities, health experts, agrochemical distributors) and, (2) the uncertain long-term effects of pesticides. Moreover, an individual uses his knowledge to construct his perceptions of household and agricultural pesticides and associated risks with each. In this process individuals weigh costs and benefits of using pesticides. Because of vague or unexpressed long-term costs to individuals' health, immediate benefits take precedence, as there are many, including increased benefits for farmers, regional economic growth, maintenance of familial relations, reduced drudgery, and increased household comforts.

Pesticide Use

Pesticides have become more commonly used since World War II, despite a recent surge in “organic” foods in Europe and the US. Pesticides are used to increase food production, improve health (i.e., reducing pests that could spread disease), decrease agricultural manual labor, and provide a more comfortable environment in which to live with less household “pests.” With advancements in chemistry, biology, and technology, new pesticides can be manufactured that are more specific to the “pest” and less harmful to humans and the environment. Even with these advancements, though, the long-term impact of these chemicals is unknown. Scientists may think that these chemicals are safe and believe that they understand all or most of the processes that affect living organisms besides the “pest;” however, as seen with DDT, understanding the impacts of certain chemicals can be more complex than what was originally thought by scientists.

There are over 200,000 pesticide products and 900 registered active ingredients (Weiss et al. 2004:1030). In 2007, Phillips McDougall estimates that \$33.39 billion was spent on pesticides (e.g., herbicides, insecticides and fungicides) worldwide (CropLife International 2008:9). Also from 2006 to 2007, Phillips McDougall estimates that pesticide sales increased by 8.9% in the Middle East/Africa region (CropLife International 2008:9). With focus on reducing toxicity of pesticides, less toxic pesticides have become available to consumers, especially in developed countries. In spite of that, often pesticides that are banned because of toxicity in developed countries are still available in developing countries. This leaves countries to use the more toxic counterparts (Ecobichon 2001:28). This is not to say that developing countries do not have regulations on pesticides. Even with pesticide regulations in place, enforcing these regulations in developing countries can be another matter.

Lack of epidemiological data of long-term exposure to pesticides and chronic effects of pesticides on humans (World Health Organization 1990) demonstrate the complexity of determining effects of long-term exposure. Also compounding the investigation of long-term exposure effects and chronic symptoms is that humans are not just exposed to a single pesticide. People are exposed to multiple pesticides at low doses through the environment, food, and home. Studies examining toxicity of a chemical like a pesticide rarely include multiple chemicals, and the effects from multiple chemicals at one time can vary from the effects of just one chemical.

Pesticides are not exclusively used in agriculture. People can also be exposed to pesticides through non-agricultural pathways of exposure, such as the use of aerosol pesticides in the household, pesticide-contaminated drinking water, or pesticide drift into urban areas. Research also needs to focus on non-farmers and non-farmworkers. Non-farmers and non-farmworkers who reside in or nearby intense agricultural areas create a unique population in which there could be extensive indirect contact with pesticides other than the contact from their own household pesticide use or from residues on food. Through understanding perceptions of pesticides and risks as well as pesticide use behavior can provide an in-depth understanding of why and how these individuals use pesticides and how non-farmworkers and non-farmers might be exposed to pesticides, including household pesticides.

In southern South Africa, approximately 20% of urban households use pesticides regularly in the home (London 2005:673). Though Groblersdal is not in southern South Africa, and the climate and environment differs, the figure, nonetheless, provides a general figure of how often South African households use pesticides. Groblersdal is a unique community that is surrounded by intensive commercial agriculture (e.g., citrus orchards and table grape vineyards) as well as “small-scale” farms. The town’s people might not have their own vegetable or fruit

garden, but they are continually exposed to agricultural actions like aerial crop spraying, mist blowers, and irrigation schemes.

Pesticide Exposure

The impact of pesticides on human health is still not completely understood. There are two broad types of effects that direct and indirect pesticide exposure have on human health: acute (i.e., immediate impacts) and long-term (i.e., delayed impacts). Acute effects occur more immediately after being exposed to a pesticide and are more easily recognized as being caused by pesticides because of the manifested physical symptoms (e.g., chemical burns, vomiting, diarrhea, respiratory problems, and even death). These incidents often occur through direct exposure when people regularly handle pesticides (e.g., farmers, farmworkers, and pest control operators) or with children who get a hold of the pesticides without the parent knowing. Often actions aimed at reducing acute symptoms have been towards farmers and farmworkers because of the highly concentrated chemicals used in farming and because of the frequency of use of the chemicals.

The second type of impact is long-term. Delayed effects are thought to disrupt development in children and alter fertility in women and men (Bretveld et al. 2006; Bretveld et al. 2007; Bretveld et al. 2008; Guillette et al. 1998; Guillette et al. 2006; Kumar 2004; Massaad et al. 2002; Sallmen 2006). Pesticides have different chemical mechanisms of action, but most insecticide affect the nervous system (Weiss et al. 2004:1030). Organophosphates and carbamates, for example, act as acetylcholinesterase inhibitors, which can then affect neural transmission (Weiss et al. 2004:1030). Regarding humans, some studies have suggested a

possible neurological effect and may affect neurological development (Guillette et al. 1998; Handal et al. 2007).

Indirect exposure to pesticides can be more difficult to recognize and the more immediate symptoms may resemble other common illnesses or health problems. Sometimes pesticide exposure effects are mild and can be attributed to other sources like genetics, other chemicals, stress, allergies, other illnesses (e.g., the common cold and the flu), or physiological processes, and the effects might go unrecognized as caused by pesticides (Karr et al. 2007).

There is also concern that pesticides could affect the function of the endocrine system and fertility. Kumar et al. (2004) and Massaad et al. (2002) explain how certain chemicals, possibly some pesticides, are endocrine disrupting chemicals and create reproductive dysfunction and can affect fertility. Endocrine disrupting chemicals can either mimic or block hormones like estrogen or testosterone. Latent effects of pesticide exposure are more difficult to ascertain. DDT, for example, like other persistent organic pollutants, bioaccumulates. The initial low doses of these pesticides released into the environment do not produce the same effects as when the pesticides have accumulated. The multiple pathways of low dose exposure hinder the association of symptoms to pesticide exposure since effects are not as apparent as chemical burns, vomiting, or skin irritations. Other chemicals in the environment can cause similar effects. Chronic exposure and its effects can take years to manifest, and determining the source of the proposed effects is difficult. Many studies have examined whether pesticides can have deleterious long-term effects on humans and the environment. Some studies suggest that pesticide exposure influences hormonal function, male fertility, and male and female reproduction (Bretveld et al. 2006; Bretveld et al. 2007; Bretveld et al. 2008; Sallmen 2006), but making a definite connection is difficult. In developed countries, like the US and Canada, pesticide regulations have become

stringent, which decreases the utility of results in epidemiological studies in these countries because odds ratios (ORs) are low and confidence intervals often overlap or are close to OR=1.0. (Ecobichon 2001:30-31).

Moreover, children appear to be more vulnerable to pesticides than adults. Children's susceptibility may be due to higher intake of food and water compared to body weight, possible exposure *in utero*, higher metabolism and differing behavioral factors (i.e., hand-mouth behavior and play behavior) (Cantor and Goldman 2002; Goldman and Koduru 2000; McConnell et al. 1993; Murray et al. 2002).

Precautionary Principle

Much research focus has been on acute exposure to farmworkers and immediate impacts of pesticides on human health. Lesser known are the long-term impacts of pesticides on human health, especially with low-dose, chronic exposure.

Because of the uncertainty of impacts on human health, it is best to use the precautionary principle in which the goal is to limit an individual's exposure to pesticides as much as possible. In order to limit exposure, it is important to understand the pathways in which individuals are exposed. Understanding a person's risk of exposure to pesticides and knowledge of pesticides may reveal pathways of exposure. It is important to understand people's pesticide perceptions who are exposed indirectly to pesticides because many times these individuals do not perceive themselves at risk even when they are (Rao et al. 2007; Quandt et al. 2006).

The uncertainty of impacts on human health generates an urgent need to recognize the pathways of exposure to these chemicals through understanding the individuals' perceptions.

Explanatory Models (EMs) in General

In regards to health, Kleinman (1980:105) explicates explanatory models (EMs) in that they explain: the etiology, the time and mode of onset of symptoms, physiological process, the course, and appropriate treatment for an illness. Kleinman stresses the cultural construction of illness. In effect, each culture and sub-culture has an EM corresponding to each illness. The EMs of laypersons do not necessarily correspond directly to healers or biomedical physicians, though they may share similarities. Laypersons may emphasize characteristics of Kleinman's construction of EMs while omitting other characteristics. Since laypersons and healers have different life experiences and health education, the EMs may differ. Healers, biomedical physicians specifically, may have a more comprehensive set of EMs for diseases corresponding to laypersons' illnesses.

Even though EMs are rooted in the overall health belief system, EMs relate to specific illness events that an individual experiences. Therefore, a layperson's experiences influence the EM for a particular illness that the layperson constructs. Using this framework, EMs provide a way of understanding perceptions of pesticides as well as broader cultural factors that influence these perceptions. Since these models are culturally constructed through the individual's personal experiences and are socially transmitted between individuals, using an anthropological approach provides a better way of understanding illness explanatory models.

With the aim of implementing the precautionary principle, EMs of pesticide exposure help illuminate an individual's understanding of pesticides through an individual's pesticide perceptions and knowledge of health risks. In the end by understanding the culturally constructed EMs of pesticide exposure, these data can further enhance pesticide awareness programs.

Utilizing EMs of pesticide exposure can further elucidate ways in which precautionary or prevention measures can be implemented.

Risk and Vulnerability within Health Beliefs

In order to use the Precautionary Principle, understanding one's perception of risk is important to reducing health risks and harm reduction. Similar to explanatory models, it is argued that risk is socially constructed through personal and community experience (Douglas 1970; Douglas 1992; Harthorn 2003; Lupton 1999a; Lupton 1999b; Nelkin 1989; Nelkin 1985; Nelkin 1992; Nichter 2003; Oaks and Harthorn 2003). Risk is even constructed differently between health practitioners, laypersons, and health organizations (e.g., CDC and WHO). Health organizations and biomedical physicians often construct risk based upon epidemiology using statistical probabilities to determine the likelihood that an individual exposed to a certain risk will have a specific illness compared to a reference population. The individual may perceive this given risk differently. Nichter (2003:14) explains that the individual's and other's actions can influence if the individual identifies with being considered at risk. Since there are perceptual differences regarding risk between health "experts" and laypersons, there may be dissonance between the varying perceptions of risk. This dissonance can represent itself in power relations, including what consists of acceptable risk for particular groups of people, and transfers into health inequalities (Farmer 2001; Farmer 2005; Farmer 2006; Harthorn 2003; Nelkin and Brown 1984; Nelkin 1985; Slovic 2000; Sobo 1995).

Nichter (2003) explains that health beliefs influence one's idea of risk to an agent, substance, and becoming ill because peoples' conceptions of how one becomes ill and one's perception of illness severity are influenced by overall health beliefs. This construction of risk

plays an important role in health behavior in that one chooses a course of action that minimizes one's risk of becoming ill. For example, Harthorn (2003:147) argues that immigrant farmworkers' personal experience with the lack of immediate adverse health events associated with pesticide exposure decreased their perception of risk of pesticides even though blood toxicity levels were high. This is not to say that one avoids all risk; there is a varying threshold of risk that one accepts.

Nichter 2003 argues that medical anthropology's focus in preventative health should be on harm reduction, focusing not only on risk but vulnerability as well. Nichter (2003:14) describes vulnerability as the "susceptibility to illness or misfortune." Since vulnerability is constructed from one's perception of risk, I view vulnerability and risk as intertwined. Nichter (2003:15-18) argues that vulnerabilities (e.g., from symptoms of a given illness, from the environment, from the worsening or flare-ups of symptoms, from the accumulation of negative substances, and from information about risk) influence individuals' harm-reduction actions.

Along these lines, Gifford (1986) explores how uncertainty in defining risk to chronic illness or disease (in this case benign lumps and breast cancer) differentiates risk perceptions of epidemiologists, biomedical physicians, and laypersons. Gifford argues that the uncertainties can be shared between the different stakeholders to improve the understanding of risk for individuals. Gifford (1986:238-239) argues that since many chronic illnesses are associated with socio-environmental factors and related to larger macro-level issues, which are more difficult to change, the focus shifts to "preventive" measures (e.g., special medications, diets, and exercises) for the individual. Gifford emphasizes the importance of minimizing the reduction of risk to only the individual and stresses the importance of the broader socio-cultural influences on chronic illness.

The uncertainty of an illness and the inability of an individual to receive a recognized diagnosis also generate problems. Japp and Japp (2005) explore how individuals with biomedically unrecognized illnesses (e. g., Chronic Fatigue Syndrome, Fibromyalgia Syndrome, Chronic Pain Syndrome and Multiple Chemical Sensitivity) seek legitimacy for their illnesses and how these individuals' illness narratives provide a view into the socio-cultural and political context of the individual and the illness. I argue that the ambiguity of long-term effects of pesticide exposure and the uncertainty of risks to pesticide illnesses create a similar environment to that of when diseases are not recognized by biomedical practitioners. Since there is a lack of definitive scientific evidence of long-term effects of pesticides on humans, individuals who link pesticide exposure to their long-term and chronic illnesses seek to legitimize their illnesses through narratives.

In regards to agrochemicals it is important to understand individuals' perceptions of risk and vulnerability. Learning people's perceptions can shed light on useful harm reduction measures, which would reduce individuals' exposure thereby reducing the possibility of ill health.

Research on EMs and Risk in Regards to Pesticides

Several studies in different countries have focused on pesticide use, perceptions of pesticides and pathways of exposure. Many of these studies have focused on farmworkers, especially immigrant farmworkers in the US, and the immediate family of farmworkers in particular mothers and children.

In the US, the focus is on populations that appear to be the most vulnerable to pesticide exposure. Research centers on migrant farmworkers' perceptions of risk of pesticides (Arcury et

al. 2002; Halfacre-Hitchcock et al. 2006; Hunt 1999; McCauley et al. 2006; Rao et al. 2007; Salazar et al. 2004) and exposure pathways (Coronado et al. 2006; Curwin et al. 2005). In regarding perceptions of risk to exposure of pesticides, Rao et al. (2004) broaden the scope by including farmers' and agricultural extension agents' views of farmworkers' exposure to pesticides and compare differences of views that farmworkers have. Moreover, with much concern focused upon farmworkers' direct exposure to pesticides, other researchers have considered the risk and vulnerability to pesticide exposure that the farmworker family members, especially women, mothers, and children, might face (Black et al. 2005; Fenske et al. 2000; Harthorn 2003; Rao et al. 2006; Rao et al. 2007). Other research has explored the differences in perception between government groups and different cultural groups (i.e., Native Americans and non Native Americans) and why there are differences among these interacting groups (Norgaard 2007).

Similar to research in the US, research concerning pesticides in other parts of the world has been with farmers and farmworkers. Many of the studies focus on the trio of knowledge, attitude, and practices of farmworkers (Mekonnen and Agonafir 2002; Salameh et al. 2004; Zhang et al. 2007; Atreya 2007; Recena et al. 2006). Some studies have focused on pesticide label comprehension (Demalas et al. 2006). Other studies approach pesticide issues differently by focusing on the perceptions of pesticides and the risks of pesticides (Isin et al. 2007; Ibitayo 2006; Peres et al. 2004; Peres et al. 2006; Recena et al. 2006).

In South Africa, Leslie London and Andrea Rother have investigated multiple facets of pesticide knowledge and use among farmers and farmworkers and environmental justice for women and children (London et al. 2002; London 2003; London et al. 2005a; Rother 2006). Rother (2005) also focuses on pesticide label comprehension. There has also been some research

of economic consequences and factors of agricultural and residential pesticide use in South Africa (London et al. 2005b; Templeton et al. 1998). Most importantly, Rother (2006) emphasizes understanding the farmworkers' social context for comprehending risk perceptions and perceptions of pesticides. Rother (2006) argues that understanding the contexts in which pesticides are used improves understanding individuals' pesticide use behavior (i.e., how often pesticides are used or precautionary measures taken or not). This is important because the focus is not just on the individual's knowledge of pesticides, attitude towards pesticides, and pesticide use behavior as other farmworker pesticide research has done. Rother (2006) centers research on understanding what influences individuals' pesticide use behavior and possible underlying reasons, not simply individuals' pesticide knowledge.

CHAPTER TWO

SETTING: GROBLERSDAL AGRICULTURE AND HEALTH

Geography and Broad Description of the Groblersdal Area

Groblersdal lies approximately 90-100 miles Northeast of Johannesburg, the largest city in South Africa, and Pretoria, the executive capital of South Africa. Groblersdal is located in the southern region of Limpopo Province in northeastern South Africa. Within Limpopo Province, Groblersdal is one of five municipalities in Greater Sekhukhune District Municipality and then Elias Motsoaledi Local Municipality (formerly known as Greater Groblersdal Local Municipality). Groblersdal previously was in Mpumalanga Province until 2006. As of the 2001 census, there were 220,748 peoples residing Elias Motsoaledi Local Municipality consisting of Black African (98.89%), Coloured (.00093%), Indian or Asian (.00055%), and White (.0096%) (Greater Groblersdal Municipality [GGM] 2004:24). Out of the 11 official languages in the Republic of South Africa in the Groblersdal region, Northern Sotho, Zulu, Afrikaans, and English are the most common languages spoken.

Groblersdal is an agricultural area, located 20 miles from Loskop Dam located near the Olifants River and multiple other rivers, which provide water for intensive irrigated agriculture covering 28,800 hectares of 366,833 hectares square kilometers (Greater Sekhukhune District Municipality [GSDM] 2004b; GGM 2004:11). The climate in this region has a mild and dry winter while the summer (late August to late April) is rainy and hot with maximum temperatures around 100 degrees Fahrenheit. The average annual rainfall is around 22 inches (GSDM 2008). Due to the climate of the region and the irrigation schemes farming can occur year round.

Regarding land, it is important to know that much of the land is in land disputes, up to 75% in the Sekhukhune region (GSDM 2004a:28).

The 0-14 year age group comprises 40% of the population (GGM 2004:14-15). The population is expected to grow slowly over the next few years because of a high incidence HIV/AIDS cases and deaths (GGM 2004:14). However, there is no HIV/AIDS information for the GGM (GGM 2004:23). It is estimated that about 50% of the population is illiterate (GGM 2004:16). It is also estimated that 16.8% of individuals over 20 years old have completed grade 12 or higher and 39.3% of individuals over 20 years old have some high school education or higher education (GGM 2004:17). Around 5,300 adults (~4% of individuals 20 years old and older) have gone through higher education (GGM 2004:17-23). It is estimated that 7.8% of Groblersdal's population resides in urban areas and 92.2% in rural areas (GSDM 2004c).

Economic distribution reflects planning from the apartheid time period. The formerly 'white' areas are more "affluent" while the formerly 'black' areas have high rates of poverty and unemployment (GGM 2004:34). The 2004/2005 Integrated Development Plan considers the GGM's economy "underdeveloped" with over two thirds of employable individuals being unemployed (GGM 2004:34). Commercial agriculture is an important industry in the Groblersdal area. Commercial agriculture and government services provide the most employment (GGM 2004:35). The opportunities with government services, however, have decreased leading to a migration of peoples with more education to urban centers, such as Johannesburg and Pretoria (GGM 2004:35). The employment opportunities in Agriculture/Forestry/Fishing increased by 914 jobs (GGM 2004:35). Eighty percent of the population in the GGM does not receive a monthly income (GGM 2004:37), but this number includes reportable income and most likely does not include the income gained from street vending.

The town of Groblersdal is commercially developed with several retail clothing stores, grocery stores, restaurants (fast-food and casual dining), bed and breakfasts, banks (e.g., ABSA, Standard Bank, FNB, and NedBank), and agricultural stores (e.g., O'barro and OTK). The southeastern part of town is considered the "old" town with older houses in the neighborhood. The northeastern section of town is considered "new" town with newer neighborhoods. In the northeastern section there are two divisions: one neighborhood that has predominantly white households with intermingled black households; and a more predominantly black neighborhood in which the remodeled houses resembled community development houses.

South Africa has been part of the United Nations Development Programme (UNDP) promoting sustainable development, by especially focusing on economy (UNDP 2006). Local Economic Development program, sponsored by the UNDP, in the Greater Groblersdal Municipality strives to make the area economically sustainable (UNDP 2006; Tapela 2005). Since agriculture is one of the largest economic sectors, pressure has been applied to promote production and sustainability of this sector. The use of DDT has also been reintroduced in northern Limpopo province to control for mosquitoes and fight malaria. Controlling for mosquitoes by chemicals in the area could be affected by pressure on the area to be tourist friendly and achieve economic stability. Groblersdal resides in the "Cultural Heartland" of Mpumalanga, even though Groblersdal is now in Limpopo province (Mpumalanga Tourism and Parks Agency 2007). This area also includes the Loskop Dam and reservoir. The Loskop Dam and neighboring rivers are water resources that Groblersdal relies on for subsistence and commercial agriculture, tourism, and recreation. Agriculture, tourism, and the drive to become economically sustainable could influence the pathways of exposure and perceptions of pesticides.

Agriculture in Groblersdal

The Groblersdal region has two types of agriculture: commercial and “small-scale.” The majority of the commercial agricultural farms are owned and managed by white Afrikaners. Commercial agricultural farming focuses on producing citrus (e.g., oranges and lemons), table grapes, and wheat. Commercial farmers focus on exporting their produce, especially oranges and table grapes, to Europe. Many of these farmers are certified by GlobalGap, an overall regulating organization, in order to export to countries in the European Union. Other crops include cotton, groundnuts, soybeans, corn and tobacco. The produce that is not eligible for export is then sold at local markets.

Small-scale farmers or “emerging” farmers are typically “black” South Africans. In the immediate Groblersdal region during winter 2008, many emerging farmers (i.e., members of the Hereford Farming Association) had economic difficulties that translated into problems with their irrigation system (i.e., paying for electricity to run the irrigation pump and the physical irrigation system). The small-scale farmers produce foods for self-subsistence and the local market. Another distinct difference between commercial farmers and small-scale farmers is that the commercial farms are much larger than the plots owned by small-scale farmers. In addition, the larger Afrikaner farms have access to the Hereford irrigation scheme fed from the Loskop Dam.

Department of Agriculture and Pesticides

Within the Department of Agriculture, extension officers are employed to work with community members. Most often the non-white farmers and “emerging” farmers utilize the services of the extension officers, though the extension officers have worked with some commercial farmers and their farmworkers.

The main legislation regulating agriculture remedies (e.g., registering new pesticides, fertilizers and livestock remedies) is the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act No. 36 of 1947 (often referred to just Act 36 of 1947). Act 36 of 1947 sets up a governing body for agricultural and stock remedies through the office of a Registrar that nationally regulates the registration, importation, sale, application, and disposal of agricultural remedies.

The range of chemicals used for agriculture varies from country to country, since each country has sovereignty to decide what chemicals are acceptable for use. In South Africa, the Registrar has the authority to permit the use of an agricultural remedy (e.g., a pesticide). The remedy is usually tested many times over by chemical companies often in other countries and determined “safe” to use with given prescriptions. The Registrar then makes a decision of whether to authorize the use of a remedy based on the toxicity of the remedy to humans and the environment and the benefit received from using a remedy. In South Africa, as with the US and EU countries, there is increasing pressure to minimize the toxicity of the remedies and to reduce the harmful effects on humans and the environment. Removing a remedy from the accepted list, however, can be a long process. Since there is no internationally accepted standard of acceptable toxicity levels and each country regulates what remedies can be used, the list of acceptably remedies varies from country to country. South Africa is not the most stringent or liberal in regards to acceptability of remedies. Some pesticides banned in other countries (e.g., US and European countries) are still legal in South Africa. Likewise, some pesticides banned in South Africa are still legal in other countries (e.g., Zimbabwe). However, in order for farmers in South Africa to be able to be competitive in a global market and export food products, farmers must adhere to importing countries’ regulations. Organizations (e.g., GlobalGap) help regulate the use

of acceptable pesticides that follow the importing countries' guidelines for successful exportation.

The Registrar's authority seems to be focused on the authorization of use of agricultural remedies, the control of imported remedies into South Africa, and the control of sale of remedies. In this regard the Registrar investigates the possible illegal importation of remedies and the sale of illegal remedies through the national level office. Implementation of regulations (e.g., regulating pesticide application) seems to be less of a focus, possibly due to department understaffing and under-funding.

Health Beliefs in South Africa

Since 1994 health and healthcare in South Africa are in a state of flux. After years of colonial rule by the Dutch and British and later apartheid, repressed forces, mostly black South Africans, greatly increased by the late 1980s and formed a successful liberation movement. By 1994, democratic elections were held, and the African National Congress overwhelmingly won. In this process of transitioning governments, from apartheid to post-apartheid, many social changes and democratic reforms are being issued and implemented from the top-down (Leven and Weiner 1997:3). Despite the liberation, there are still many inequalities in South Africa.

Van der Merwe explains that the Cartesian dualism has pervaded professional health care in South Africa replacing the "traditional African view of health and well-being" (2008:246). Van der Merwe (2008) also stresses that biomedicine and science, emphasizing positivism, positions itself as a dominant medical system in South Africa. Similarly, many people in Groblersdal seek biomedical care either from private physicians or at the government-run clinic and hospital. In addition, there are a few *chemists* (British English for drugstores) in town.

Individuals also have the option to visit traditional healers who might advertise their services in town or in the region. Although there were no *amayeza* stores ('African chemists'), there was one street vendor in town selling herbal remedies and animal artifacts. Pharmaceuticals seen in street markets and sold by *injectionists* appearing in other areas of Africa do not occur as much in South Africa due to governmental policies regulating pharmaceuticals (Cocks and Dold 2000:1513). Cocks and Dold (2000:1506) suggest that the coexistence of multiple cultural groups influences the availability of numerous cultural remedies to South Africans offer medical pluralism to individuals.

CHAPTER THREE

METHODS

The research was performed from during 12 weeks (June to early August 2008) of fieldwork in Groblersdal, South Africa, in which participant observation, semi-structured interviews and informal interviews were performed.

Participant observation has long been a part of social sciences and anthropology. Bernard (2006:342-450) explains the history and establishment of participant observation as a research tool in anthropology, including taking field notes during participant observation and indirect and direct observation. Due to my limited fieldwork time, I used rapid assessment technique, which is a more rapid and focused method of participant observation (Bernard 2006:352-353). Rapid assessment techniques have been extensively used to investigate problems in a short period of time, especially concerning topics of health (Bentley et al. 1988; Guerrero et al. 1999). Since much focus with pesticide perceptions has been with farmers, farmworkers and their families, my focus was on how other individuals in an intensive agricultural community perceived pesticides, constructed risk perceptions of pesticides, and how individuals constructed illness due to pesticide exposure. Though my fieldwork occurred during South African winter some limited agricultural activities were occurring as well as household and workplace pesticide use. Though the mild temperature allows for growing year-round, winter crops are limited and being harvested during this time.

To become more familiar with the community, I visited a commercial agricultural farm and farmworker community a couple of times. I visited several primary schools throughout the area. Being that many of my informants were mostly educators, this experience helped in gaining

rapport with educators in the community. Furthermore, I performed indirect observation, which consisted of many time allocations (Bernard 2006:425-435) focusing on the street market area and along the Hereford canal.

In addition to participant observation, I conducted semi-structured interviews, which were performed in English, recorded, and transcribed. Bernard (2006:212) explains that semi-structured interviews are similar to unstructured interviews but utilize an interviewing guide that consists of specific topics and questions to cover during the interview. Because of the potential sensitivity of pesticide issues and the private nature of households within the community, I used snowball sampling for interviewee recruitment. Using this method, I was able to gain interviewees specializing in a few different areas in the community (e.g., educators, farmers, and individuals with specialized pesticide knowledge). Most interviews were conducted at the individual's home. Other interviews were performed at the individual's place of work in a private location (e.g., an office with a closed door). Interviews were occasionally interrupted by the interviewee's children or a cleaning lady if the interviews were performed at home or by an occasional phone call.

Overall, I performed 33 semi-structured interviews, in which verbal consent was obtained before the start of the interview. Seventeen interviewees were with women (10 black and 7 white), and 13 interviewees were with men (9 black and 4 white). There were 3 interviews in which 2 people were present for the interview. Two of the 3 interviews were husband and wife, while in the other interview they were sisters. All 3 pair interviews were with Afrikaners. The average interview length was about 56 minutes with an interview length ranging from 37 minutes to 86 minutes. Twelve interviewees are educators, and 6 interviewees either dealt with pesticides as part of their occupation or lived on a farm. I focused on a specific area of town that is mainly

inhabited by educators or former educators. I chose this area because of the individuals' relatively higher level of education – teaching certificates and masters degrees – where as the number of individuals in the rest of the region receiving education past high school was low. They also seemed most unlikely to have worked as a farmworker on a commercial farm. Other informants included a few farm related individuals and individuals working for local businesses in town. On average the interviewees have lived in the Groblersdal area for about 12 years. Many interviewees moved into Groblersdal between 1994 and 1998. There were only 5 Afrikaner households who have lived in Groblersdal for 15 years or longer. This is not to say that others were not living in the Groblersdal region, but non-Afrikaners were not allowed to reside in the town of Groblersdal until after 1994.

As part of my participant observation, I participated in a weeklong pesticide awareness campaign targeted towards the Groblersdal and Marbel Hall region during the week of July 28, 2008. In preparation for the pesticide awareness campaign, there were one meeting and one training session with agriculture extension officers, in which I attended both. The campaign consisted of an opening introduction ceremony on a Monday, with presentations from the Department of Agriculture, Department of Water Affairs and Forestry, and the pesticide industry (represented by Association of Veterinary and Crop Associations of South Africa (AVCASA), a subsidiary of CropLife International). The first day was open to everyone in the area. The following three days were followed by “workshops” or focus group sessions geared toward stakeholders in the Groblersdal region (e.g., agriculture sector, education sector, and health sector). On the fifth day, certain stakeholders and the Pesticide Awareness Committee met to review the events and new information gained during the week. Law enforcement was a newly identified stakeholder on the first day of the campaign, and a special focus group with law

enforcement was held on the fifth day as well. Attendance varied from workshop to workshop with the highest attendance being for the opening ceremony, agriculture sector, health sector, and education sector, respectively. During my fieldwork, I documented several informal and unstructured interviews with community members, government officials, and pesticide industry members.

CHAPTER FOUR

RESULTS

Defining Pesticides and Pesticide Use

Overall, most informants describe knowing pesticides as products used to kill or control insects, “pests,” or “bugs.” Known use on farms is common, whereas use in the community like the municipality is less known. Over two-thirds of informants describe pesticides with the use of specifically protecting “crops,” use of protecting plants, or use by farmers in the region. Only two informants describe pesticides as “detergents” (i.e., as in for cleaning) or as medicines. Fifteen of 18 informants describe a difference between the chemicals or products used to control for insects or animals from those used to control for plants or weeds. The three remaining informants that did not make a distinction explain that there is poison in both the chemicals, and the chemicals stop the menacing of the plant. Twenty-one of 22 informants think that farmers use the most pesticides in the area. The common explanation for farmers using more pesticides is that the farmers have a larger area to cover with the pesticides and need to provide the “most appealing product” for consumers. The high level of use will increase the farmers’ ability to export their product and increase their profits. Along these lines, over half of the informants provide some sort of economic reason behind the farmers’ use of pesticides (i.e., maximizing profits as with exporting farmers or too costly of a production input as with small-scale farmers). The only informant that disagrees with farmers using the most pesticide explains that households use more pesticides, but there is variation between households.

To refer to pesticides in the Groblersdal region, often *gif* – an Afrikaans word – is used, which translates into “poison” in English. When speaking English often people gloss *gif* using the word “poison” instead of “pesticide.”

Household and Lawn/Garden Use

Thirty of thirty-three households report using pesticides in the home. Two of the remaining 3 households report pesticide use on the lawn/garden. The only individual who does not use pesticides in the home or lawn/garden describes herself and her husband as environmentally conscious with environmentally conscious parents.

Common household pesticides include: Doom (an aerosol), Blue Death (a white powder), and Tabard (a lotion insect repellent). Other pesticides mentioned were Target and ByGone, which are varying brand names instead of Doom, mosquito coils, RatX, and plug-ins for mosquitoes. These methods control for: mosquitoes (including flies and bugs), cockroaches, ants, crickets, spiders, termites, rats, mice, and snakes. Non-agricultural related informants seem not to name specific “pests” in the lawn/garden except for crickets, ants, and termites. Agricultural-related informants, however, display their specified knowledge by naming specific mites, aphids, and nematodes. Two informants explain that they do not use any pesticide in the household but that they use a pesticide on their lawn or in their garden. All of the pesticides used on the lawn/garden are concentrated pesticides that require self-mixing with water. Informants explain that they choose one pesticide over another because of the price of the pesticide and the better effect on the “pest.” It became difficult for some informants to explain why they choose the pesticide that they did. Many informants explain that they never really thought about why they choose one pesticide over another one. Many explain that pesticides (e.g., Doom, Blue Death or

DDT) were commonly used by their parents while growing up. The use of pesticides seems like an everyday action for them. Other informants explain that they choose a pesticide because of the adverts or because the pesticide is odorless. Only a few informants reported calling a commercial pest control specialist for use in the household or lawn/garden.

In explanation of how one controls “pests” around the household, a few informants describe non-chemical ways instead of a pesticide that are a cheaper alternative. These methods include: pouring boiling water over the pests, raising ducks, using an ultraviolet light, using old dish or laundry water, and manually killing the pest with a swatter.

Pesticide Use for Comfort, Health and Cleanliness

It is common for informants to describe the use of pesticides to eliminate “pests” in the home (e.g., termites and ants) and “pests” that bother them at night (e.g., mosquitoes). This use is for comfort, health (i.e., the past use of DDT and the reintroduction of DDT to control for malaria in nearby areas) and cleanliness. One informant explains that “you don’t want your house to be infested by mice ... you don’t want ants crawling all over ... I would say it would be better to use the pesticides to control the pests. I don’t say what do the pesticides do to me ... You know, a pest free household is pest free. There are no flies. No this - the house is clean.” Another respondent, a woman (AF32), explains that “for me my problem is solved. If I have cockroaches – ants, then I get rid of them. To me, it’s a good solution.” In AF32’s description, she uses pesticides to keep a clean, unpolluted home. Similarly, one woman describes using Doom for certain spiders that she does not like – the ones with large pincers. Another woman (AF49) also describes having a pest control specialist come to the house to help clean the house but then questions if the pesticide use is really a good idea. She elaborates:

At this stage we have these pest control people who come after winter. They spray the house, and it's like a powder, and you don't see, and then you will see spiders dead and cockroaches – insects you will see them and you think, 'oh, yes, good' and we think the house is clean. No, this was a good thing done, but no, was it really?

Another man (AM21) describes how he uses pesticides to keep his house clean. "I use them more because there's a need to ... because you feel like you've had enough cleaning and seeing cockroaches and you don't have another way of getting rid of them"

Importance for the Economy

Agriculture is important to the local economy. As mentioned earlier, the agricultural sector of the economy – primarily exporting, commercial agriculture – provides the majority of jobs in the area. South Africa has also come under pressure through the United Nations' Development Programme, which emphasizes development of economic sectors to help make South Africa economically sustainable. Informants emphasize that exporting produce is a lucrative business. It is explained that by exporting the produce profits increase greatly. This profit increase is enough to cover the high input, production costs of pesticide use, especially in regards to citrus farming. It is emphasized that without the ability to export the produce the mass production of produce (e.g., table grapes and citrus) would not be possible. Local, regional or even national sale of produce would not provide enough profits to cover the costs of production of the foods. This could be influenced by the climate, which provides good temperatures and rainfall to sustain food production year-around. Small-scale farmers who often do not use the quantity of pesticides that commercial farmers do, which decreases input production costs are able to grow vegetables like cabbage, beetroot, and onions among other foods during the winter. Excess produce grown by small-scale farmers can be locally sold.

Some informants, particularly ones involved with local businesses express concern about the productivity of the local commercial farmers. One informant explains:

No we knew it [pesticide use] was good – good for the plants. They must spray. We never thought of poison. We always thought of fertilizer and that. We never think of poison. We don't think that and be cause, you know, you are in business it's like a circle. You know, if the farmers have a good year - a good season, the businesses also have a good season. If they've got problems – draught or hail or anything – you can feel it. Yeah, it affects the other businesses – the same with Loskop Dam. If it isn't full, the farmers cannot plant. They cannot have people working for them. All those people bring business to town. So yes, you listen to the aeroplane and know it's spraying, but you never thought it's not to the better of us. You think of the crops. You think of the Groblersdal Area.

Another informant explains that her husband questioned speaking up about possible health impacts of pesticide use by the commercial farmers because of fear of losing business from the farmers. People understand that exporting “perfect” produce is in the commercial farmers’ best interests as their livelihood providing economic benefits to the region; to produce that “perfect” product for export, pesticides are needed.

Providing not only economic benefits for exporting farmers, it is suggested by people in town that the doctors are even making a profit from pesticide exposure symptoms. One main symptom of low-dose pesticide exposure is *sinusitis* – blocked nasal passage. Some people suggest that the doctors only view the *sinusitis* in the region as caused by allergies, a cold, or the flu. They ask, “if you are going to say it's the pesticides...with what are you going to heal them? What are you going to prescribe?” The people with “very bad sinus” then receive prescriptions for medications – filled at local pharmacies – to treat the symptoms but fail to address the underlying cause. When the *sinusitis* reoccurs, the cycle continues.

Some informants report going to medical physicians to treat their symptoms. One woman (AF34) who experienced pesticide related symptoms like chronic headaches, blocked sinus, and chronic fatigue visits medical physicians in a nearby town. She explains that the doctors see

many of the kids from the Groblersdal area all having similar breathing and chest problems and think that it is because the kids live in the Groblersdal region. Another man (AM31), an agricultural specialist, describes how less severe symptoms of pesticide exposure can be treated. He describes that “if you can take you to the doctor and give you some medicine to recover.” Similarly, another woman (AF34) treats the pesticide related exposure symptoms that her children have with medication, such as asthma pumps and allergy medication. However, she no longer has to visit a medical physician because she knows how to treat the symptoms.

Maintaining Social Relations

Despite the Groblersdal region having thousands of people, many people that I interviewed feel that Groblersdal is a small and close community. Because of these pressures a few collaborators think that people are afraid of being ostracized by the community since Groblersdal is a small town, if an individual were to speak up. A couple informants express the opinion that the people in the town know that the use of pesticides, especially by the commercial farmers, could impact people’s health, but they decide not to come forward about their concerns about the health risks potentially incurred with the use of pesticides. These sentiments seem to be mostly expressed among white people in the community. The white population in the Groblersdal region is significantly lower than that of the black population. In 2001, the white population did not even consist of 1% of the population – around 2,000 people – in the Elias Motsoaledi Local Municipality (GGM 2004:24). Even though both white and black people live in Groblersdal, the white population is concentrated in the town. There is also limited socialization between white and black people in Groblersdal. One darker colored informant describes the residents of Groblersdal as being secluded in their homes, not knowing how their

neighbors looked. This heightens the importance of maintaining social relations among the white population in the region. Since exposure in the media and involvement of the government, pesticide issues in Groblersdal have become a sensitive topic among the white community and people who have familial relations with commercial farmers.

Familiarity of Pesticide Products

Not only was familiarity of a product a reason for choosing one pesticide over other pesticides but also informants commonly bring up familiarity (i.e., being exposed to it seeing people use it) when discussing pesticide use. Several informants describe their parents using pesticides (e.g., Doom, Blue Death, DDT and Tabard) in or around the home while growing up or themselves using the pesticides for many years. One informant describes transitioning to Blue Death from DDT, “my mother using it after they ban DDT so they had the – because that was also a powder – a similar powder... they look similar, but then the effects are not the same.” Another informant illustrates how Blue Death and DDT are used in a similar fashion, “there's this Blue Death ... used for controlling...and sometimes we mix - when control for ticks we use motor oil. Then we apply it to the animal... helps it to stick... when we were using DDT back then. It was outlawed, and then we used Blue Death.” Another informant describes the familiarity of the pesticide by comparing it to a staple food in the region:

I grew up at a rural area. So I usually saw my mom buy it ... in fact it's a very old brand [Doom]. Yeah, even the olden people are so used to it... here in South Africa when we grew up we see – we find that – a porridge and meat is our staple food so when you grow up you get used to porridge and meat as the staple food. You see... It's just we took it from our Grannies those are the people that have been using it.

Moreover, some informants describe the availability of pesticides to control a pest problem, even with brand name pesticides. They explain that for the household pesticides you do not need a

permit to buy and use them. One informant explains that “it’s [Blue Death] readily available. It’s like you have Coke in a café. I think the President of Coke said, ‘It’s likely that you walk into a corner café and Coke is one thing you’ll find. You might have other brands, but you’ll find Coca-Cola.’” Moreover, another informant describes the normalization of pesticide use, “Normal uses of Doods [with which households are familiar]. As I said, that’s common knowledge – same as hairspray. It’s being used by everyone.”

Frequent use of pesticides generates familiarity with the agrochemicals and can affect pesticide use-behavior. One informant, a farmer, explains how his and other farmers’ familiarity and frequent use of pesticides affected protective measures for himself. It is important to note that certain farmworkers may use pesticides frequently, but existing pesticide regulations pressure farmers to ensure farmworkers use protective measures. The farmer explains:

I think a lot of people are handling – still handling chemicals a little bit too rough. I think they don’t know or maybe they know – just realize what they are doing – mixing and some of the stuff is falling on their hands or their shoes because the workers are wearing protective clothing, and I can guarantee you 80% of the farmers aren’t wearing protective clothing... the people working for them wear masks and overall... I myself don’t do it. My laborers wear masks and shoes and specific overalls, but I myself mix them by hands. So it’s not ignorance. It’s basically you are in a comfort zone. You think it can’t happen to me, and then that’s why I say one day it’s going to catch me. I know it.

Another farm related respondent (AM31) emphasizes that “yeah, there is risk if they are not using them the way they are supposed to be used...think [people are] using correctly because not seeing them [people who use pesticides] in clinics.” He focuses on the acute, severe symptoms of pesticide exposure. Since he does not hear of any cases of people being admitted to clinics with severe symptoms of pesticide exposure – unlike in the 1990s, the use of pesticides is less of a risk to people. Earlier in the 1990s, many people reported acute symptoms to pesticide exposure like vomiting, diarrhea, and severe headaches.

Perceived Costs-Benefits

People seem to compare the costs and benefits of using pesticides in the households. People use pesticides to maintain a clean, pest-free home. Household pesticide use (e.g., of Doom and Tabard) decreases the disturbances of mosquitoes while sleeping and risks of malaria. Even though Tabard is a DEET-based insect repellent, many people report it among other household pesticides. Mosquitoes and other insects increase in density during the summer and become an extreme nuisance to people. Household pesticide use also acts as a health protection measure. Many informants described the farming environment (e.g., stagnant water in irrigation canals and reservoirs and rivers) as a prime area for mosquitoes to multiply. Although malaria is not an immediate health threat to people in Groblersdal, northern parts of Limpopo province and neighboring Mpumalanga province – especially Kruger National Park – are high-risk malarial areas. One informant commented on how everyone in the Groblersdal area has had malaria at one point in his life.

Hindering a comprehensive cost-benefit analysis is lack of information. Many informants in describing risk to pesticides mention that they lack comparison information for the effects caused by the pesticides. Informants emphasize not having access to information about the long-term effects of using household pesticides or from agricultural pesticide use around them let alone what pesticides are used around them in the community. Informants, therefore, base their cost-benefit analysis on information at hand from labels, experience, education, media, advertisements, friends and neighbors. Informants describe being told the benefits of using a pesticide and less about the health impacts of using pesticides. One informant further explains:

It's not about – one doesn't get comparative information about – for instance – the exposure or less dangerous when using this particular – that information is not available – because the advertisement standards – quality – doesn't allow comparative advertising, yeah – one doesn't say that one product is particularly better than another product... not

based on informed decision which one will be better – and they are not promoted on the basis of reducing health they are promoted on the basis on the ability to kills the pest – ...the fact that you inhale some of it – there are no highlights on that

Informants also receive pesticide information from friends and neighbors. Benefits from receiving pesticide recommendations from friends and neighbors can result, as well as negative impacts and misinformation. Another hazard is that the person making the recommendation may unintentionally leave out necessary information, which can lead to a negative result. One informant, for example, explains that he received an agricultural pesticide for household use from a farmer friend. However, the farmer left out important precautionary measures (e.g., wearing a mask, gloves or other special clothes) to take during application of the pesticide in his house. After the informant used the agricultural pesticide is only when he found out the necessary precautions to take.

Similarly, informants report others may lack information about other agrochemicals. A dangerous pesticide often sold illegally in the street markets poses a concern. Tamic, a nematocide – also known as *gale phirime* (glossed as *the day the sun doesn't rise*) – is sold on the street in little clear plastic bags, often by women vendors selling other produce. Tamic – a fine, black powder – is often stolen from farmers. Women transfer the pesticide into smaller plastic bags sometimes touching the tamic with their bare hands. As a result the women can become very ill, even die. This extreme result of handling tamic is reported in describing previous problems of pesticide use and stolen pesticides that occurred in the 1990s.

In similar way, another powder-like substance can be used on cabbage (e.g., Blue Death). If used too close to harvest (which can depend on market demand for the product) it can cause illness in buyers (e.g., diarrhea). This is also seen in the case of “greens” which are grasses or

“weeds” taken from the agricultural fields. The weed can be pulled soon after pesticide application and later used in meals.

Informants that are farmers realize the risks of using pesticides though may not always take the recommended precautions when handling them, as mentioned before when the farmer decided not to follow precautionary measures that he otherwise makes his farmworkers follow.

As mentioned before, not many informants reported or attributed severe impacts or possible long-term effects of pesticide use (e.g., miscarriages or cancers). More common are symptoms that are similar to other illnesses or ailments, such as the flu, cold and allergies.

Costs-Benefits of Educating Farmers and Households

The pesticides that are available at the supermarkets and do not require a permit to buy and use contain directions and precautions on the product container or on a special leaflet inside the pesticide packaging. Some pesticides even provide a little mask or gloves for use during application. Seven informants reported reading the labels and receiving information from the pesticide containers. This, however, does not directly mean that these informants retain all the information or exactly follow the directions from the pesticide containers. There are other side effects listed on pesticide containers like vomiting and diarrhea, which are only reported by 5 informants. Keeping the pesticides away from children is a common precautionary measure retained from this source of information. Six informants explain that they receive information from adverts, magazines, and television. Ten informants specifically recall getting information about pesticides from the media, newspapers, adverts and television. Four of these informants, though, specifically describe seeing 50/50 – a television show – or newspaper articles about pesticide use in the Groblersdal region and in the Western Cape, not necessarily information

concerning information about precautions and how to safely use pesticides. Other informants report seeing adverts for Doom and Target on television. This information, as mentioned earlier, emphasizes the positive impacts of pesticide use rather than possible negative impacts on health. Only one informant – a female educator – describes receiving information from the Department of Health. These pamphlets from the health department, though, were among several that were distributed to the school, at which she works, to be distributed to the school children to give to their parents. One medical physician in town is reported to have posters and pamphlets about avoiding pesticide exposure. Many of the white informants – agriculturally related and non-agricultural related – report knowing about the medical physician who is highly concerned with pesticide use. Few black educators report knowing about the same medical physician or recent media coverage of pesticide use in the region.

The pesticide industry emphasizes the positive aspects of pesticides through advertisements, but the pesticide industry also promotes education among farmers concerning proper pesticide use. The Association of Veterinary and Crop Associations of South Africa (AVCASA) – the organization representing the pesticide industry – performs pesticide-use training for farmworkers on large commercial farms as well as for small-scale farmers.

Through the pesticide education process, responsible use through following the directions is highlighted. In cases where individuals are illiterate, pictures on the labels are emphasized. Some effects like respiratory, vomiting, and nausea might be emphasized, but other possible effects are not stressed. AVCASA recommends using Griffin Poison Information Centre, which is supported by Crop Life International – the parent corporation of AVCASA. The Griffin Poison Information Centre is also available to report pesticide misuse as well as provide information concerning pesticide storage, transportation, and application. AVCASA states that it does not

support misuse of pesticides by individuals or companies. It seems that once pesticide misuse or pesticide poisoning has been reported to AVCASA or Griffin Poison Information Centre the information is reported to the Department of Agriculture.

The investigation into pesticide misuse, though, can be a long and unexplained process. One example is the reported misuse of agricultural pesticides near Groblersdal in 2007. The person who made the initial report has not yet heard back from the Department of Agriculture the result of the investigation or any current status of the investigation, even after several phone and written inquiries. Another more recent example is the incident at a primary school in Groblersdal in May 2008, in which it is reported that pesticides were misused – including banned pesticides – to control for termites in the school building. The person filing the report with the Department of Agriculture and one of the alleged victims of the incident as of August 2008 still had not received an update on the progress of the investigation. There is one other pesticide poisoning center in South Africa run by the Red Cross. The comparison of the two reporting centers is out of the scope of this research, but one center is affiliated with the pesticide industry where as the other center is not. There may be a conflict of interest for the center supported by the pesticide industry.

Industry View

Representing the pesticide industry is AVCASA. AVCASA supports responsible use of pesticides as being the key to sustainable food production and public health. For example, AVCASA supports the use of pesticides against mosquitoes and the tsetse fly protecting people from malaria and sleeping sickness as well as against rodents protecting people from the bubonic plague and other diseases transmitted by rats.

A common theme seen is placing the blame of any adverse health event caused by pesticides on the individual. AVCASA explains that the labels are present for individuals to read and follow. Any use other than what is described on the label is misuse, irresponsible, and may harm people or the environment. AVCASA heavily reinforces this message, during the pesticide awareness campaign. Several different analogies were used in explanation – from an individual with a machine gun to an individual driving a car. It is explained that the pesticides are not harmful unless used incorrectly – not according to the directions. It is only the pesticide user that makes the pesticide dangerous. In this explanation pesticide toxicity is extremely deemphasized.

AVCASA also emphasizes that the pesticides used have increased specificity for the target pest rather than being general, broad pesticides affecting a wider range of living organisms. On several occasions the person representing AVCASA questioned participants if whether humans were pests – the same pests that farmers are trying to kill on farms. Because of the higher specificity, the current pesticides do not affect humans or other non-targeted organisms unlike DDT did years ago.

Echoing the industry's view, are the people heavily involved in the sale of pesticides. One respondent (AM19), someone promoting the use of pesticides with farmers, interestingly points out that the same risks for pesticides exist for medications. He states:

You can't be careful enough about this stuff, but I think there is the same risk of overdosing plain medicine. Medicine is also chemicals and if you use medicine in the wrong way it will also destroy your health. So in this regard, I wouldn't say there was no risk, but if you use this stuff as it was meant to be used – don't spray it in your face – don't spray it every day – I think that your damage would be very little.

He explains that the specificity of pesticides is so great that “it doesn't affect other things.” He also explains that “you know – the smell can't kill you – you know what I'm trying to say. The smell can't kill you. An apple smell can't kill you. An apple smells like this. Watermelon smells

like this, and not one of those smells are bad to you. That's the same sense with the poison [pesticides]." AM19 emphasizes how the smell cannot kill you.

Illness Construction

Many of the symptoms identified with pesticide exposure are mild in Groblersdal. Moreover, many of the identified symptoms appear to occur often or chronically and can be attributed to other illnesses or ailments (e.g., the common cold, flu, or allergies). The mild nature of the physical symptoms compounds the difficulty of linking symptoms to pesticide exposure and identifying pesticide exposure as the cause of the pattern of symptoms. This in turn affects healing actions and other preventative health actions.

Symptoms

Many of the symptoms identified from exposure to pesticides are difficult to distinguish from other illnesses because of the generality of symptoms. Informants do not report the same number of symptoms nor do they report the same symptoms. The most common symptoms include sinusitis (*sinus* or *blocked nose*), headache, asthma, stomachache, and other chest and respiratory problems. Other symptoms include flu, nausea, irritated eyes (red or watery), coughing, and rash. More distinguishable symptoms seem to be identified less frequently. For example, nosebleeds, which can be more distinguishable than other symptoms are only reported by a few people. Even more distinguishable from other illness symptoms are reproduction and fertility problems, but are only reported by a few informants. One husband and wife attributed pesticide exposure to two miscarriages. A couple of other informants report other families in Groblersdal having miscarriages emphasizing that commercial farms surround the families'

homes. Not all informants experience symptoms from pesticide exposure, although almost all informants know of possible symptoms. Four informants are unsure what symptoms are caused by pesticide exposure, yet some of them suggest what those possible symptoms could be. Individuals do not possess all the symptoms that others have or the symptom pattern compounding the difficulty of identifying pesticide exposure illnesses by individuals or medical specialists.

Many educator respondents report the idea of “catching” a smell – as with pesticide smells – and that smell can cause illness. AM24 explains that the “smell is so strong that it will actually catch cold and you may also have a terrible headache or a stomachache.”

Coping with Possible Long-Term and Vague Symptoms

One unique characteristic mentioned by two informants is that the pattern of symptoms is not accompanied with a fever. In the case of distinguishing pesticide exposure symptoms from infections that raise the individual’s temperature, identifying the cause of the symptoms can be made easier. Despite this if symptoms are chronic and vague, misidentification by the individual or medical specialist is possible because of the non-distinct symptoms that can resemble other non-fever causing illnesses. One informant, a therapeutic specialist, explains:

It gradually happens to you. It’s – at first it’s just this. Then it’s something else. Then it’s something else. It’s like a frog – a frog in hot water. When the water is cold, you put the frog in, and he gradually gets used to the warm water when you boil a frog like in China when they eat it. It won’t jump out because it gradually gets used to the temperature, and actually, that’s what’s happening – ‘cause people – at first it’s like a headache and it’s sinusitis and it’s maybe asthma or something. Later on it’s like emphysema and it’s like – uhm – cancer and it’s just – ‘oh, it happens to me’ or whatever. And it’s not.

She further explains that the diagnosis of pesticide exposure is easily misdiagnosed as sinusitis or something else, and she does not blame the medical specialists’ misidentification. The

misidentification of symptoms changes the perceived severity and susceptibility from one illness to another illness from allergies to pesticide exposure. She explains that the symptoms worsen, but the more severe symptoms (e.g., cancer) occur later; it is a “gradual deterioration of health.” The less severe symptoms can also become long-term. Similarly, a farmer describes people developing “permanent headaches” after coming into contact with the pesticides.

The duration of a symptom also changes between individuals affecting their construction of pesticide exposure illness. A different woman describes the severity of her symptoms changing within a few days and within a season:

[And you said the third day is the worst?] Yes [Or does it build up to the third day?] It differs. Uh – I think it [commercial farmers] – uh – uses a different sort of pesticides or something, but in three days time, you will be sick. That’s for sure. They use it – at the end of the period – of November the grapes come. Then it’s like your body is full of it. On the first day when they use the pesticide that night I will get sick. That’s – I think – is when your body gets full of it. [So there is a difference in the symptoms from the beginning of the season to the end?] Yes – to the end. Definitely.

Both she and the therapeutic specialist experience varying times of onset of symptoms attributed to pesticide exposure.

Unlike the above-mentioned example, one woman (AF3) associates her children’s illnesses with specific aerial crop spraying. She states:

I think the pesticides – especially certain times of the year. Every time they do spray using your small airplanes then the kids have chest problems and coughing problems – asthmatic sort of similar. They are not really asthmatic. They do have sort of breathing difficulties and coughing...because during a certain time of the year and usually when they do spray over the farms. [And it’s more in October? Or when does it occur?] Well, I’m not sure exactly but I know that every time in a spray I know that the kids will get sick and I need to – I already know what medication to give them so I don’t go to the doctor anymore. But they use your asthma pumps...during the course of the year they don’t have those problems.

Construction of Risk

People seem to construct their perception of risk by identifying their perceived pathway of exposure to pesticides, perceived strength and toxicity of pesticides, and symptoms associated with pesticide exposure. As mentioned before, people use the information at hand – influenced by economic and social pressures – to construct these risks. The protection measures taken or not taken to prevent exposure reflect people’s perceptions of risk to pesticide use and exposure with respect to barriers to personal health action (e.g., socio-economic influences).

Perceived Pathways of Exposure and Toxicity

A pesticide on food – especially fruit or vegetables – was the most common pathway of exposure, with 19 informants identifying this pathway. Inhalation or breathing in a pesticide was almost as common as by being exposed through food, with 18 informants identifying this pathway. Thirteen informants identified people being exposed to pesticides through aerial application and pesticide drift from the agricultural fields. Pesticide residues on hands – especially when eating, pesticides on skin, and pesticides in water were also common identified pathways of exposure. One female respondent (AF32) also recognizes that some people may be exposed to pesticides through the food that is sold from street vendors like *marojo* and cabbage, as she herself has experience.

A common theme among farm related respondents was the mention of pesticide drift or a small radius around the area of application that the pesticide can travel. Three of eight farm related respondents reported that pesticide use in the household is risky because of the lack of ventilation in the home. The home has limited airflow, whereas in the open agricultural fields the wind dilutes the concentrated pesticide in the air.

Several non-agricultural informants communicated concern about drift or pesticides that do not stay on the intended plant or farm. One woman (AF53) mentions a friend who was jogging near a commercial farm that was spraying an agrochemical. The woman describes how her friend came to her with her clothes wet with an unknown agrochemical. Another informant relates his own experience while riding a bicycle by a commercial farm and how he has been sprayed a couple times and now tries to avoid areas that he knows the farmers will be spraying agrochemicals. One female educator describes how while driving to work that some days when there is aerial application her windscreen can become coated with the sprayed agrochemical.

One male educator (AM20) explains, “Something that can kill insects it means they can be harmful to a human being...but [the pesticides used now are] not as risky as in past years... risks have been minimized.” This is partially different from the view of pesticides by the pesticide industry in that the increased specificity allows pesticides to only affect the “pest” rather than affecting other organisms. However, AM20 recognizes a reduction of the harmful effects caused by pesticides to other organisms, possibly due to the increased specificity as the pesticide industry advocates. AM20 also recognizes that the closer to the farms a person is the risks and hazards of pesticide exposure increase for the individual.

Many informants identify the smell of pesticides as a way of determining if a pesticide is present in the environment. It is more common for non-agricultural or non-farm related respondents (12 of 25 respondents) to mention the smell of pesticides affecting the respiratory system (e.g., development of *sinus* or effect on asthma) than for agricultural or farm related respondents (1 of 8). This is interesting in that non-agricultural related respondents seem to notice these less severe symptoms, whereas farm related respondents do not. Often informants have difficulty describing the smell. In general, informants describe the pesticide smell as

“pungent,” “strong,” “distinct” or just “bad.” A few mention that the pesticide might contain sulfur in it, but further description is limited. There is no consistency among informants in whether the smell of a pesticide is an indicator of strength or toxicity of a pesticide. A couple of informants view the more intense smells with pesticide strength while others just view all pesticides as non-pleasant. Even though smell is not a clear indicator of strength and toxicity among informants, the smell becomes associated with any effects that a pesticide might have on human health. The smell becomes an indicator of risk to pesticide exposure with possible resulting negative health impacts.

The smell of pesticides seems to be an indicator of pesticide application because the smell can have an effect on the body. The smell can easily block sinuses causing *sinus* or *blocked sinus*, help generate asthma-like symptoms or even exacerbate the symptoms of asthma for those individuals who already have asthma.

One woman (AF50) describes the familiarity of insect repellent often viewed as a pesticide yet has trouble definitively describing how it smells. She explains:

The smell of Tabard and Peaceful Sleep is familiar because I’ve grown up with it ... the pesticide is a – it’s just a funny, funny smell – a funny – uhm – you smell it – once you experience it you will immediately notice the strange something you smell, but what it smells like I don’t know.

Another woman (AF52) describes how she uses smell to tell if a pesticide has been used but once more has difficulty clarifying the smell, other than it smells like *gif*. In her case, though, she tries to keep her children away from the smell because it aggravates their asthma. She describes how the smell affects the respiratory system, and how this influences what pesticide she chooses to buy:

I was always aware of the smelly ones because I knew smell affects the lungs – yeah – but that is how far I – or that was how I normally judged it – according to the smell. [When you say judged –] I would pick the odorless ones or the one that maybe had a bit

of a lemon smell or whatever or a lavender smell to it, specifically for their [her children's] sake.

AM26 also explains that “with technology you buy the most odorless. You don't even feel it...but you know it's working...killing mosquitoes and things...but what it does to your health – not sure.” He also explains that:

I must take allergy. They are odorless so you can't even feel the smell even if it stays in the air with large quantities... which makes it – I think – more dangerous... you don't smell it. You don't feel it. It's as if it's non-existent so your mind tells you there's nothing wrong...if there's smell then you need to open the windows and get fresh air.

AM26, though could not further elaborate on the smell other than mentioning that the pesticide smell is “distinct.”

Informants express much uncertainty in defining the risks for themselves and their families with pesticide use. It seems significantly different that more educators (4 of 12 educators) express uncertainty about knowing the risks for themselves and their families with pesticide use in the household and on farms, whereas farm related respondents are 0 of 8 and non-agricultural and non-educator respondents are 1 of 13. This is interesting and could be related to the fact that educators who live in town must leave town each day to work in schools in the surrounding townships and rural areas, driving by exporting farms often applying pesticides with mist blowers or aerial application. One woman (AF48) describes:

If using it frequently there is a higher risk. Sometimes I like my Doom. It's effective, but sometimes if you use it – sometimes I don't think there's a really – no, I know. I've learned that if you use it sometimes or frequently it does harm you. It's just taking a longer period...Your household and pets – because fish don't live with Doom.

She further explains, “It's easy to use...It's been here for ages, and I grew up with it – really like tradition.” Another woman educator (AF40) also expresses uncertainty about the long-term effects of pesticide use. She explains, “They could – I think so – after a few years – could say maybe inhaled 1, 2, 3, but not right after use.” AM26 also thinks that “the ones on

shelves have been regulated... the risk level is going to be very low or else we wouldn't use the m."

However, almost all informants viewed pesticide use on farms as more of a risk to themselves and their families compared to pesticide use in and around the household. Two informants who are farmers view household pesticide use as more risky than pesticide use on the farms because application in the household is often done in closed spaces whereas on farms it is applied in open fields. Observing the protective measures that farmworkers take (e.g., wearing masks, raincoats, gloves) and being surrounded by so many commercial farms in the Groblersdal area contribute to the construction of this perception. Almost all of the informants who are educators leave Groblersdal in the morning to work at schools in the surrounding townships and rural areas. Very often these informants must drive by and through commercial farms, seeing protected farmworkers applying pesticides with tractors and blowers as well as seeing the aerial crop sprayer. One informant, though living on a farm, describes seeing farmworkers applying pesticides as she drives through the farm, "They've got masks and little things that look like NASA – I always laugh – they look like space men." While driving by fields during these times, sometimes informants smell the pesticide being used or in the event of aerial crop spraying might experience overspray onto their windcreens. Some informants see the farmworkers wearing these protective measures and realize they are not, possibly being exposed to the pesticide. Contrastingly, she (AF47) acknowledges that agricultural pesticides may go into the air and "we breathe [it], but that is the legal stuff, and – you know – what is legal – the thing to us is that EuroGap comes and you're allowed to use these – breathing it in." She acknowledges that people might breathe the pesticide in but minimizes hazards because it is the "legal" pesticides, regulated by EuroGap. AF47 is a wife of a farmer, but unlike AF34 she feels that it is ok to

consume the produce on the farms even before the withholding period for pesticide use. She explains:

So – yeah – if I think if you eat fruit – if I go into – if they spray our grapes and there isn't grapes now but when there is grapes – if I see they've sprayed today and I go and pick for the house or go and cut a few – you know for the house – I have to wash it because the amount of time – maybe the week hasn't gone past.

She does acknowledge that some exposure can occur, but the washing of the fruit minimizes the hazards of pesticide exposure. It is important to note that AF47 does not associate any symptoms for her or her family to pesticide exposure. AF47 also lives on a farm, whereas AF34 has performed extensive work with small-scale farmers. They suffer from *sinus* but attribute it to the dust in the air, since they live on a farm with many dirt roads that when used when they are dry generates much dust in the air and can go into the house.

Also contributing to risk construction, informants seem to express more control over pesticide use around the household. Informants can take precautionary measures or modify pesticide application behaviors to minimize their own exposure and that of their families, whereas they lack the control over pesticide use on farms. One woman (AF49) states, “I think there is high risk [with use on the farm]. They [the farmers] come from a high area where there are no regulations – so they don't give a damn.” This goes along with a common theme in that commercial farmers do not support non-agricultural individuals' best interests and that pesticide regulation and authorities are not protecting people in the community.

One respondent (AF34) explicitly mentioned having lack of control over the use of pesticides the commercial farms and therefore perceived pesticide use on farms as more risky. She states:

I don't have control over it [pesticide use on farms]. The one in the house if I feel that it has negative effects health-wise then – you know – I can decide to stop. But with the one

on the farm I can't go to the farmer and tell him to stop... They wouldn't listen. They would probably choose to chase me out of his farm with big dogs.

It is important to note, though, that in AF34's example she views pesticide use on farms as associated with her children's health problems.

Protection of Self and Children

A few informants explained that following the directions on the labels of the pesticides could minimize the risks of pesticide use. Common reported behaviors to protect individuals and families include: leaving the area after the pesticide has been used for a few hours (8 informants), using less pesticide (5 informants), and cleaning after pesticide use (4 informants). Informants also reported opening windows after pesticide use, using the pesticide away from themselves, storing the pesticide in a special location (i.e., out of reach of children), avoiding use around children, not permitting kids to use pesticides, avoiding known areas where pesticides have been used (i.e., areas where pesticides were not used by the family), and being careful when using pesticides. With many of these protective actions, the individual relies on the smell of the pesticide. Informants leave an area after a pesticide is used allowing the smell to dissipate. In some instances windows are opened to allow "fresh air" into the area where pesticides are used or informants clean the area of application to remove the pesticide residues and lingering smells.

Many female educator respondents report reading the labels and following the directions and other precautionary measures like cleaning after use as AF29 does.

One woman (AF39) reports leaving the area where pesticides have been used as a precautionary measure that she takes to protect herself and her family as well as airing out the pesticide exposed area. She explains that "after using it [in a room] you mustn't sleep in that room. Let's say you spray it in the room. You must not sleep in that room. Maybe you must

leave the room closed for 24 hours. Then clean it. Open the windows and use it there after.

Otherwise, they are harmful to our health.” AF39 also reports cleaning to remove the pesticide smell, which is also described as being hazardous. She describes:

Because I think it’s a – it smells – somehow – is – that’s why I say – I think it’s very toxic...like the if I’ve told you – this one that you use for spraying. It smells for a long time, even if the following day you will clean thoroughly, but a bit of its smell will remain there. But with the room, you spray the room. The following day when you open it – it is not that strong. When you just open the windows and clean up, the smell is over. Yes. And some others are odorless. They just kill, but can feel the smell.

Similarly, another woman educator (AF40) reports leaving and airing out the area where pesticides are used. She explains that “if I wanted to use [the pesticide] in that room I was sleeping in, I have to move to the other room...after I use it for almost 12 hours – whole night – then tomorrow open the windows – get fresh air.”

AM42-, an educator, explains that he uses precautionary measures in that he only uses pesticides outside. It is important to note that this behavior is partly due to his wife and son having a problem “of the sinus” and easily catching the smell. However, he wants his plants in his garden and lawn to look nice. He (AM42), though, expresses uncertainty about the long-term effects. He explains, “I think in the long run we will suffer the consequences of that. I’m not going to tell you what would be the result, but I think maybe somehow – won’t be like people who stay away from using those things [pesticides].”

AM30, another male educator, explains that pesticide use, such as the use of Blue Death, is specifically dangerous for toddlers in the home. The toddler can crawl and pick up the powder. He also mentions that inhaling a pesticide can affect a person who has *sinus* or asthma.

Although some informants take precautionary measures, the measures taken are not consistent with each informant. Avoiding places where a pesticide has been used seems to be the

most common precautionary measure, but this precautionary measure relies on individuals knowing when a pesticide has been used.

CHAPTER FIVE

DISCUSSION

I argue that people in Groblersdal construct risk from the information immediately available to them, and they use pesticides most fitting to their social and economic context. The most available source in which people receive pesticide information is from pesticide adverts (e.g., on television, on the radio and in the newspaper) as well as from the labels on pesticide containers. When certain pesticide information is missing or is unavailable to them as with the case of specific long-term effects of using pesticides in the household or the impacts of using pesticides on farms, people use information from their own experience and from neighbors and friends. People see the pesticides used around them, specifically in agricultural fields. It is important to understand that this knowledge of pesticide use and risks, though, is not transferred directly to pesticide use behavior or can be inaccurate, in that economic and social factors influence pesticide use. Along these lines, pesticide information may still be absent or unavailable to individuals.

Economic and Social Influences

Available knowledge is used to construct risk but is influenced by economic pressures, social relations, cultural views of cleanliness, and familiarity of pesticide products. Using pesticides in commercial agriculture allows for large economic benefits when the produce is exported. People view the success of the exporting farmers as also increasing the economic benefits for other businesses in the region. The prosperous farmers are able to sustain their

lucrative business while providing jobs for the community and generating economic benefits for other local businesses.

The use of pesticides might also be influenced by broader health beliefs. As Green (1999) suggests, this belief of cleanliness also relates to broader health beliefs of being free of pollution in order to maintain wellness and public health practices. The ideas of cleanliness and preventing household pollution are combined with public health beliefs like preventing malaria. People use pesticides to remove pollution or pollution causing agents like insects and rodents. The importance to keep a clean, unpolluted home encourages pesticide use. However, continual pesticide use to remove pollution and pollution causing agents (e.g., cockroaches, rats, and mosquitoes) might normalize the use of pesticides as well as place individuals in further risk of pesticide exposure.

Groblersdal is seen by many as one of the last remaining white areas in the area. Many people comment on how when one black family moves into town often the white neighbors move out. These sentiments might further increase the importance for white community members to maintain social relations between each other. Members of the white community might not feel as comfortable speaking up about pesticide misuse or possible adverse health effects of pesticides in order to maintain current social relations and prevent any dissonance that could affect those social relations.

Moreover, the continual use and normalization of pesticide use as well as the lack of identifiable and severe side-effects – short-term and long-term – might influence individuals to view pesticides as less harmful. Individuals feel less vulnerable to adverse health impacts due to pesticide use because the symptoms are not severe or the individuals do not attribute symptoms to pesticide use. This could become dangerous in the long-term because it allows for continual

use with continual low-dose pesticide exposure. If precautionary measures are not taken or if viewed as unnecessary, as seen in one instance in which the farmer describes using the pesticide without protective measures, normalization and familiarity with pesticides and pesticide use could place individuals at increased risk for latter effects like fertility problems or increased neurological disorders or cancers. The farmer perceives no immediate impact from the pesticides and uses no precautionary measures to prevent pesticide exposure. Possible future health impacts may be realized, but are disregarded decreasing the individual's risk to pesticides because the impacts and risks are not immediate and well defined.

I argue that using biased cultural transmission in analysis and explanation further elucidates why certain cost-benefit decisions are subverted (i.e., pesticide-use behaviors). Respondents gain knowledge and pesticide recommendation through social relations. They receive it from someone that they think knows what they are talking about like a farmer and use it how they think it should be used. However, information can be missing when the practice is transferred to another person. The person might lack important precautionary information and use the pesticide incorrectly without a mask, gloves, or special clothing. Respondents see the pesticide use surrounding them and gather information from what they see. This could influence their knowledge or generate uncertainty or vulnerability for individuals. Seeing the constant pesticide use, though, could generate familiarity with pesticides decreasing a person's perception of risk of pesticides.

Pesticide Awareness: Possible Avenues

Understanding how and why pesticides are used can illuminate possible ways in which to prevent pesticide exposure. Within the household, a couple of individuals report possible

exposure to pesticides through residues left on plates and utensils inside cabinets. Respondents mention having to thoroughly clean the area after use. Respondents mention smell as an indicator of the pesticide. Importantly, they are not necessarily cleaning to get rid of the pesticide to prevent further exposure. They mention cleaning thoroughly to get rid of the strong, lingering smell of the used pesticide. A switch to odorless pesticides could alter risk perceptions.

A person who promotes pesticides and pesticide use partly contradicts other respondents' view of pesticides especially with relying on smells as a way to tell when a pesticide is used. The statements minimize the impacts that smells have on health by only focusing on severe immediate impacts of pesticides on health (i.e., not killing an individual who uses a pesticide). However, it is important to remember that many respondents report "catching a smell" of a pesticide that can generate or exacerbate respiratory conditions like asthma. They use smell not necessarily as a measure of toxicity between chemicals but to signal that a pesticide has possibly been used. Many informants use smell in determining how much cleaning needs to be done to remove the pesticide (e.g., in cabinets or on eating utensils), when to re-enter an area, and when to avoid specific areas where pesticides have been used.

It is common for the educators to identify smell as an indicator of a pesticide in an area. The individuals transfer the identity of risk from the pesticide to the smell. The informants do not look for pesticides used but distinct smells that remind them of pesticides. The individuals then associate the symptoms with the distinct smell of pesticides to avoid and decrease exposure to pesticides. However, what happens when odorless pesticides are used? Many informants reported switching to an odorless pesticide in order to avoid that distinct smell. As a couple informants explained the individuals do not identify the risk of a pesticide because there is no smell and associated symptoms like causing *sinus* or aggravating asthma. Moreover, some farm

related individuals do not identify pesticide smells as causative agents having of negative impacts on human health.

Some respondents also mention leaving used powder pesticide, such as Blue Death, or pellet-like pesticides, such as RatX, on the floor of their home or in the garage area. A couple respondents report concern about leaving the pesticide on the floor for too long because of the possibility of children coming into contact with the pesticide. Other respondents, though, report telling their children firmly to stay away from the pesticide on the floor and the containers of the pesticides. There are also a few respondents that leave pesticides like Blue Death on the floor even with young children. This might pose a risk to children or other members in the household for coming into contact with the pesticide. Many respondents report storing pesticides away from children to avoid contact with them. These precautions seem to be methods of preventing acute exposure to a toxic substance (i.e., poison) rather than long-term or latent effects. This focus on minimizing immediate impacts might be influenced by the lack of information concerning latent or long-term effects of pesticide exposure.

Many respondents also report using pesticides in or around the household when family members are not around or using a pesticide then leaving the area for a period of time. However, many respondents do not report needing masks or protective clothing for using household pesticides.

An important concern is the use of agricultural chemicals by non-agricultural specialists. This use not only includes stolen chemicals but also chemicals given by farmers to friends for certain household pest problems. Sometimes precautionary information might unintentionally be omitted when the pesticide is given to the friend or neighbor, which can put them at risk. Along the same vein, sources of pesticide information and access to these sources can generate an

unequal distribution of knowledge. In regards to pesticide related information, this is seen not only between the farm related individuals and the non-farm related individuals as is expected but also among non-farm related individuals.

Another concern is with pesticide-drift and overspray from agricultural use. Some respondents report passing alongside agricultural fields with agrochemical spray even landing on the car windscreen or themselves. The individuals riding in the car are protected from the overspray or drift from the agricultural fields, but many people lack vehicles and walk or ride bicycles alongside roadways and agricultural fields or use the roadways for recreation (i.e., bicycling or jogging). In these instances, non-agricultural related individuals can become exposed to agricultural pesticides and other agrochemicals. The concern is that aerial and blower pesticide application can drift to the immediate surrounding area like roadways as well as into the town.

Explanatory Models in General

Kleinman's (1980) explanatory model of illness provides a model to culturally understand illnesses, in this case the symptoms and health impacts of pesticide use. This research mainly focuses on the aspects of identifying pesticide exposure symptoms and prognosis of pesticide exposure using Kleinman's (1980) model. Applying this model allows a better understanding of the emic perspective of an illness and the context in which these symptoms occur and how they are identified, not simply the biomedical construction of symptoms attributed to pesticide exposure.

There are differences in the perceptions of risk and impacts of pesticide on human health between the pesticide industry (AVCASA) and non-agricultural individuals. AVCASA explains

that there are no hazards with pesticides as long as the pesticides are not misused, meaning that the directions on the pesticide labels are followed. However, respondents express some knowledge of risk and uncertainty to pesticide use. Many respondents report mild symptoms to pesticide exposure, such as headaches, nausea and *sinus*. Less reported are long-term effects of pesticide use, such as fertility problems or cancers. This might be reinforced with AVCASA's minimization of hazards of pesticides. I suggest that the non-agricultural related individuals might be acceptably exposed to agricultural pesticides in order for commercial farmers to maximize export production and the pesticide industry to maintain pesticide sales. By minimizing the hazards of pesticides, concentrating on proper pesticide use education, and focusing on the benefits of pesticides, the pesticide industry is able to continue the promotion of pesticide use without explicitly highlighting the negative impacts of using pesticides. This helps enable individuals to become comfortable with pesticide use and continue to use pesticides. Pesticide use on farms, though seen as more risky to individuals and individuals' families, is tolerated and becomes normalized along with household pesticide use.

The pesticide industry minimizes the hazards of using pesticides by explaining that they are not harmful in of themselves but only when they are misused by an individual, essentially placing blame and responsibility on the individual. Pesticides, though, are not inert chemicals in the environment. For example, some pesticides bioaccumulate in the environment or in humans (i.e., fat tissue and central nervous system) or have latter effects on fertility or accelerating the development of neurological diseases like Parkinson's disease. The pesticide industry, in communications to the public, tries to minimize these risks and blame the user for misusing the product instead of placing blame or identifying the possible hazards of these chemicals.

Furthermore, differing views are suggested between individuals and medical physicians in the Groblersdal region. As seen with one informant, she switches between local doctors to treat her and her daughter's symptoms. She reportedly does so because they are constantly ill and need medicines to help treat the symptoms. Other informants report going to a specific physician in town who is the only medical physician that believes that some of their symptoms could be pesticide related and not just a result from a cold, flu or allergies.

Individuals have agency and control over pesticide use in the household, whereas individuals have less control over use on farms. Individuals might feel more at risk and vulnerable to pesticides use on farms because they lack the agency in controlling this pesticide use.

Some individuals who recognize pesticide exposure as the cause of their symptoms have difficulty seeking legitimacy for their illnesses when often times pesticides are not indicated as the cause of the illness. This may further generate uncertainty about pesticide related illnesses. Constructing an illness is key to determining whether or not to take a preventive health action or not. This process, though, becomes difficult when the identified pattern of symptoms is similar to other illnesses and when the pattern of symptoms changes over a short and extended period of time. In Groblersdal the pattern of symptoms associated with pesticide exposure is difficult to construct and identify. Moreover, there are multiple pressures (e.g., social and economic) placed on individuals affecting identification of the illness and health action taken for the illness. Where an individual is in their perceived timeframe of developing symptoms can affect an individual's motivation seek or not seek healing actions for the identified symptoms and can affect the presentation of symptoms to a medical practitioner.

Pesticide Regulation and Pesticide Authorities

Though Act 36 sets up regulation and enforcement of pesticide use, people do not think that it is working to protect their welfare or wellbeing. This sentiment in part reflects a general feeling of distrust in the government's ability to handle problems. The age of Act 36 of 1947 was brought up several times during the pesticide awareness campaign planning meetings and workshops. Some people worried that the act was too old without having been through any major revisions. One individual who previously worked for the Registrar explained that there are loopholes in the act for people to avoid prosecution of pesticide misuse and that the fines for pesticide misuse are too low having not been updated in several years. As a result the fines become minimal to the individual who misuses the pesticide. The benefits of misusing the pesticide outweigh the financial costs of misuse.

CHAPTER SIX

CONCLUSION

The research suggests that individuals' actions seem rational within their own context, given individuals' pesticide knowledge of use and risks and social and economic pressures. Rational actor theory allows for a good method of understanding pesticide use. By focusing on the context of individuals, understanding pesticide use becomes clearer. Since rational actor theory provides a simple method of understanding pesticide use and context, use of gathered information could theoretically be applied to pesticide awareness programs. However, when the context in which pesticide use exists is complicated, alternative approaches can provide further insight. Using rational choice theory provides an appropriate method to understand the contexts in which pesticides are used. By understanding individuals' contexts and influences of pesticide use, broader patterns of pesticide use and pesticide perceptions can be recognized. These data can then be used to improve pesticide awareness programs.

Including Non-Farmers and Non-Farmworkers in Agricultural Communities

It is important to realize that just reading or knowing the pesticide directions from labels are not enough. There can be social and economic pressures influencing application of pesticide use knowledge. It is also important to not minimize individuals' feelings of vulnerability or view of risk, even though the views may differ from the pesticide industry, agricultural specialists or medical professionals. People's perceptions of pesticides are constructed from their knowledge and experience. Non-agricultural individuals in intensive, commercial agricultural communities see extensive pesticide use, influencing individuals' pesticide use. These individuals, though,

may not have same education or access to information about pesticides as agricultural related individuals.

Since perceptions of pesticides might differ between agricultural and non-agricultural individuals even in intensive agricultural communities, it is important to include these differing pesticide perceptions into pesticide awareness programs. Along these lines, the idea of “catching” a smell generates an avenue for further investigation, especially since there seem to be differences between non-farm related and farm related individuals regarding perceptions of how smells of a pesticide or other chemicals can affect individuals’ health. Measuring pesticide residue levels within the household like in the kitchen cabinets, living room floor, and bedrooms as well as actual pesticide use behavior would be interesting to determine if varying pesticide use behaviors decreased the amount of residues in the household or if the amount of residue found is associated with individuals’ pesticide perceptions, precautionary measures taken, or familial health. Moreover, an epidemiologic study of individuals’ health history, life histories, and children’s development in the region might also prove fruitful in illuminating possible associations with pesticide perceptions, pesticide use behavior, residence in relation to commercial agricultural fields, and possible health impacts to pesticide exposure.

Focus has been on awareness and prevention, centering on actions of the individual to prevent adverse impacts of pesticide use. I hope to have illuminated some of the social and economic influences and impacts of using pesticides, in order to recognize that these symptoms or pesticide impacts might not just be the cause of individual misuse. The use of pesticides seems to be influenced by deeper social and economic factors that are culturally influenced in intensive commercial agricultural communities in South Africa. Focus on pesticide awareness and correct pesticide use might not be the only needed measures to prevent pesticide exposure.

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