PESTICIDE UTILIZATION PRACTICES, EXPOSURE AND VULNERABILITY OF
THE COCOA FARMING COMMUNITY OF IKWUANO IN ABIA STATE, NIGERIA

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For the Degree of
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in Sociology
University of Regina

by
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Martins Samuel Onyejieke, candidate for the degree of Master of Arts in Sociology, has presented a thesis titled, *Pesticide Utilization Practices, Exposure and Vulnerability of the Cocoa Farming Community of Ikwuanoin Abia State, Nigeria*, in an oral examination held on April 7, 2016. The following committee members have found the thesis acceptable in form and content, and that the candidate demonstrated satisfactory knowledge of the subject material.

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ABSTRACT

The pesticide utilization practices, exposure and vulnerability of farmers to pesticide hazards were investigated in the Ikwuano community of Abia state in Nigeria. The social vulnerability theory, as developed by Wisner et al., (2003), was adopted as the theoretical framework, with an emphasis on the Pressure and Release (PAR) and Access Models (AM). A qualitative research approach was used which included interviews and focus group discussions. The study indicated that the awareness of pesticide hazards needs to be raised for farmers and the government.

Farmers still use banned pesticides and they are seriously affected by these chemicals. It was also observed that the farming community lacks access to important resources such as education, training facilities, information and hospitals. These resources would have helped them to cope, adapt and recover from the impacts of pesticide hazards. The research also revealed that institutional limitations, such as government neglect, ineffective pesticide regulations and a lack of efficient agro-extension services are the contextual causes of the farmers’ vulnerabilities to pesticide hazards. These limitations consistently put ‘pressure’ on the farmers, while the Nigerian government has done little or nothing to ‘release’ this pressure. There should be more effective pesticide regulations and control in order to prevent the use and misuse of banned pesticides by farmers. In addition, the existing agro-extension services should be strengthened and made more effective in reaching out to farmers in rural areas, providing them with training and information on the safe handling and usage of pesticides.
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# TABLE OF CONTENTS

Abstract........................................................................................................................................... i
Acknowledgements ......................................................................................................................... ii
Table of Contents ............................................................................................................................ iii
List of Tables ....................................................................................................................................... vi
List of Figures ...................................................................................................................................... vii
List of Acronyms .............................................................................................................................. viii

CHAPTER ONE: Scope and purpose................................................................................................. 1
1.1. Introduction ................................................................................................................................. 1
1.2 Global cocoa industry .................................................................................................................. 1
1.3 Overview of research issues ......................................................................................................... 5
1.4 Problem statement ....................................................................................................................... 8
1.5 Study objective and research questions ...................................................................................... 9
1.6 Study significance and justification ............................................................................................. 10
1.7 Structure of the thesis ................................................................................................................ 11

CHAPTER TWO: Theoretical framework............................................................................................ 12
2.1 Introduction ................................................................................................................................. 12
2.2 Vulnerability ............................................................................................................................... 12
2.3 Natural hazard perspectives ...................................................................................................... 14
2.4 Social vulnerability ..................................................................................................................... 15
2.5 Definitions of vulnerability .......................................................................................................... 16
2.6 Theoretical development of social vulnerability ........................................................................ 19
2.7 Wisner’s conceptions of social vulnerability .......................................................................... 22
2.8 The Pressure and Release model ............................................................................................... 23
2.9 The Access Model ....................................................................................................................... 28
2.10 Adaptive capacity ...................................................................................................................... 32
2.11 Determinants of adaptive capacity ........................................................................................... 34
2.12 Synthesizing vulnerability perspectives ..................................................................................... 37
2.13 Relationships between theoretical framework, research questions and interview guide ........... 40
CHAPTER THREE: Methodology ..................................................................................43
3.1 Introduction ........................................................................................................43
3.2 Study area ...........................................................................................................44
3.3 Research design and strategy ............................................................................45
3.4 Sampling .............................................................................................................47
3.5 Data collection ....................................................................................................49
3.6 Data analysis .......................................................................................................50
3.7 Validation strategies ............................................................................................52
3.8 Ethical issues .......................................................................................................52
3.9 Data protection and the privacy of the participants ............................................53
3.10 Limitations .........................................................................................................53

CHAPTER FOUR: Discussion of findings ..................................................................55
4.1 Introduction ..........................................................................................................55
4.2 Organization of sections that answered the research questions .......................55
4.3 Demographic background of participants ..........................................................56
4.4 Pesticide utilization practices, exposure and the vulnerability of farmers ..........59
4.5 Usage guidelines, farmers’ sensitivity and risk of contamination .....................62
4.6 Pesticide regulations in Nigeria ..........................................................................66
4.7 Agriculture extension services in Nigeria ............................................................68
4.8 Access to information in regard to farmers’ exposure and sensitivity ...............70
4.9 Adaptation issues ..................................................................................................71
4.10 Local adaptive strategies in the study area .........................................................72
4.11 Access to resources and other determinants of coping capacity .......................74
  4.11.1 Economic resources .....................................................................................75
  4.11.2 Knowledge and skills ...................................................................................76
  4.11.3 Institutional supports ....................................................................................77
4.12 Vulnerability mitigation methods .......................................................................79
  4.12.1 Public awareness/education .........................................................................80
  4.12.2 Networks of social capital ............................................................................81
  4.12.3 Social programs ...........................................................................................83
  4.12.4 Sustainable development ............................................................................84
CHAPTER FIVE: Conclusion ........................................................................................................87
5.1 Introduction ..........................................................................................................................87
5.2 Summary of research results ...............................................................................................87
5.3 Recommendations for future research .............................................................................90
5.4 Policy recommendations .................................................................................................91
5.5 Conclusion ........................................................................................................................92

REFERENCES............................................................................................................................95

APPENDIX I: Interview guide for participant farmers .............................................................102
APPENDIX II: Interview guide for representatives of government agencies .......................104
APPENDIX III: Interview guide for pesticide merchants .....................................................105
APPENDIX IV: Interview guide for focus group discussions ...............................................106
APPENDIX V: Research Ethics Board Certificate of Approval ..............................................107
LIST OF TABLES

Table 1  List of chemicals currently approved for cocoa production in Nigeria...........3
Table 2  List of banned pesticides, never to be used for cocoa production in Nigeria ....4
Table 3 Working definitions of vulnerability ..................................................................17
Table 4 Relationship between research questions, theoretical framework and interviews.........................................................................................................................40
Table 5 Relationship between discussion of findings, research questions and theoretical framework ..................................................................................................................56
Table 6 Participants' matrix and abbreviation; interviews..............................................58
Table 7 Bio-data information of the participants ............................................................58
Table 8 Pesticide commonly used by farmers in the study area......................................60
LIST OF FIGURES

Figure 1. Pressure and Release Model - Progression of Vulnerability ..................................25

Figure 2. The Access Model of Vulnerability ........................................................................29
LIST OF ACRONYMS

AM Access Model
CRIN Cocoa Research Institute of Nigeria
EU European Union
FAO Food and Agricultural Organization
FL Farm Labourers
FO Farm Owners
ICCO International Cocoa Organization
PAR Pressure and Release
RGA Representatives of Government Agencies
WACRI West African Cocoa Research Institute
WHO World Health Organization
CHAPTER 1: Scope and Purpose

1.1 Introduction

The thesis is oriented to explore and discuss the pesticide utilization practices and vulnerabilities of local cocoa farmers in Nigeria to the adverse impacts of these chemicals. It is based on a field study carried out in the Ikwuano community in Nigeria, where the issues of pesticide exposure, farmers’ sensitivity, adaptive capacity and the underlying factors generating their vulnerabilities were examined.

1.2 Global cocoa industry

Cocoa is a valuable crop and its byproducts serve as raw materials for industries. They are utilized in the production of food products such as beverages, chocolates, drinks, biscuits and animal feeds (Fajewonyomi, 1995, p. 101). According to the International Cocoa Organization (ICCO), cocoa is planted in 57 countries, covering up to 6.5 million hectares of land across these countries (ICCO, 2007/2008, p. 5). Cocoa is originally from Central America, where it has been planted for many centuries, being relatively new in other continents such as Asia and Africa.

It is estimated that world production of cocoa beans reached 4359 million tons in 2013/2014 (ICCO, May 2015, p. 87). The African continent produces about 70% of the world's total cocoa production (The Statistics Portal, 2015). Among the African countries, Côte d'Ivoire occupies the first position in the world with about 35% of the world production, followed by Ghana at 15% and Nigeria in fourth place with 7%. According to The Statistics Portal (2015), in the 2012/2013 crop year, Nigeria produced 238,000 metric tons of cocoa and over 90% of the product was exported to Europe and America.

Cocoa gives an average annual yield of 400kg of beans per hectare (ICCO, 2013) and it is a very profitable agricultural crop. Its form of production varies from continent to
continent. In Africa, cocoa production is largely a smallholding crop and its production is not well mechanized, which is the case in Nigeria as was supported by the research findings. The major limitations are the infestations of pests and diseases, which requires an intensive use of pesticides. This becomes problematic to local farmers because of their high levels of exposure to the hazards associated with the use of pesticides and the underlying social factors generating their vulnerabilities to these chemicals.

It is estimated that cocoa generates up to 60% of the total dollar amount obtained annually from agricultural exports in Nigeria (Nkochi, 2012, p. 48). This shows the significance of cocoa to the Nigerian economy. In recognition of this contribution, in 1964 the Nigerian government established the Cocoa Research Institute of Nigeria (CRIN) to replace the Nigerian arm of the defunct West African Cocoa Research Institute (WACRI). Since its inception, the Institute has conducted research into a greater utilization of cocoa not only for export, but also for the manufacture of local products (CRIN, 2005). WACRI has also encouraged the use of pesticides in cocoa production, but has done little to nothing about farmers’ exposure to pesticides and its negative effects on their health.

Growing cocoa in Nigeria has recorded remarkable growth since it began in the late 19th century (CRIN, 2005, p. 17). Even though Nigeria is the fourth largest cocoa producer in the world, as stated above, cocoa production has always faced some challenges concerning quality and quantity as a result of the prevalence of pests and diseases in cocoa production and the indiscriminate use of toxic chemicals as a remedy (CRIN, 2005, p. 17).

The World Health Organization (WHO) and the European Union (EU) have banned some of these chemicals due to their toxicity levels. The ban took effect in
September 2008 and the EU regulations were made compulsory for all cocoa producing countries to conform or face sanctions (Jones, 2008). Nigeria, as one of the cocoa exporting countries, faces serious challenges to adhere to these regulations because of lax oversight on the use of these agro-chemicals. Given that 90% of Nigerian cocoa and its byproducts are exported to Europe and America, the consequences of noncompliance with the EU regulations may affect the income of many cocoa farmers and that of the government. Accordingly, the Nigerian government has taken some steps aimed at mitigating the use of some pesticides but these steps have never been effective.

One of them was the formation of a Nigerian national cocoa extension program, which aimed at providing education and training to cocoa farmers on the safe methods of agro-chemical usage. Another important decision was to enforce the ban on the use of some agro-chemicals previously used in cocoa farming. However, ineffective implementation procedures and low level compliance by the chemical manufactures, importers, merchants and end-users remains the problem.

Some of the pesticides recommended by the government are listed in Table 1, but others such as those listed in Table 2 are banned from cocoa production.

**Table 1: Chemicals currently approved for use in cocoa production in Nigeria (Bateman, 2008)**

<table>
<thead>
<tr>
<th>Trade name</th>
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<tbody>
<tr>
<td>Actara 25WG</td>
</tr>
<tr>
<td>Champ DP</td>
</tr>
<tr>
<td>Clearweed</td>
</tr>
<tr>
<td>Esiom 150 SL</td>
</tr>
<tr>
<td>Funguran OH</td>
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<tr>
<td>Kocide 101</td>
</tr>
<tr>
<td>Nordox 75 WP</td>
</tr>
<tr>
<td>Phostoxin</td>
</tr>
<tr>
<td>Ridomil Gold 66 WP</td>
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<tr>
<td>Roundup</td>
</tr>
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</table>
According to Asogwa and Dongo (2009), the chemicals listed in Table 2 leave a high residue on cocoa beans and also impact negatively on the health of the farmers. Therefore, an embargo has been placed on them for toxicological reasons but it was reported by Bello (2009) that these banned chemicals are still in circulation in Nigeria and farmers still use them. The continued exposure to these chemicals has resulted in the increasing vulnerability of Nigerian farmers to contamination and other innumerable health problems. Sosan and Akingbohungbe (2009) did a residue analysis on the blood samples of some cocoa farmers and domestic sources of water in Osun State, Nigeria. Residues of the following banned chemicals endosulfan, lindane propoxur, DDT, dieldrin, aldrin and diazinon were found in the blood samples of 42 of the 76 selected farmers. About 47% of 76 farmers had more than 20 years of exposure. According to this report, the residue levels in their blood serum were significantly above the ‘no observable...
effect level’ (p. 186), which is the amount of pesticide residue that may stay in the human body without producing harmful effects.

There have been a series of international interventions in pesticide regulation and control in order to remedy its enormous impacts on human health and the environment. Many international organizations, such as the Food and Agriculture Organization (FAO), the EU, and the WHO, have consistently provided advice and support for pesticide regulatory programs and have also formulated international guidelines on pesticide importation, exportation, distributions and usage across the world. A major reason for this international concern on pesticide regulations and monitoring has been to reduce human exposure levels in order to mitigate the health and environmental effects. Many Western nations have established reliable mechanisms for pesticide regulations and monitoring. However, the technical nature of implementing these mechanisms makes it difficult to be effectively enforced in a developing country such as Nigeria, where banned chemical products can enter through unsecured national borders.

1.3 Overview of the research issues

According to the World Health Organization, the rate of pesticide poisoning has increased dramatically and it is more problematic in developing countries where farmers lack the knowledge of safety (Asogwa and Dongo, 2009). Many farmers in Nigeria are ignorant of the fact that pesticides ought to be applied at specific times, in specific dosages and in the appropriate manner in order to be effective (Ayim, 2003). This ignorance has resulted in continued abuse and misuse of pesticides and therefore, increased their chances of being affected.
Nigerian farmers lack knowledge about safety and do not have access to appropriate training that could help them cope with pesticide hazards. After handling pesticides, they do not wash their hands properly before eating, drinking or smoking. They also do not properly dispose of any pesticide residue in containers or the containers themselves. Oftentimes, these containers are used for domestic purposes without being carefully washed. Also, there have been numerous cases of mismanagement and lack of maintenance of the application equipment among cocoa farmers in Nigeria. This has led to hazardous situations and increasing levels of human vulnerability.

The government is supposed to play a central role in the provision and distribution of safe agro-chemicals, and also in educating farmers on safe ways to handle the chemicals, but it has not been effective in carrying out this important role. The majority of farmers in Nigeria still use outdated or counterfeit spraying equipment, some have fallen prey to mock and banned pesticides due to the inaccessibility of real pesticides. Government oversight of pesticides is needed in an effort to mitigate the unsafe working condition of farmers.

As a result, farmers lack effective local strategies to cope with the impacts of pesticide hazards. Consequently, they have suffered a wide range of contamination ranging from serious acute headaches to ongoing poisoning of several human organs. At the time of the interviews that support the study, some participant farmers were still living with diseases and disabilities caused by exposure to pesticides. The lack of availability and access to good health services in the community has worsened their condition.

In spite of the seriousness of the situation there has been limited research on the area of pesticide exposures and its effects on local farmers in Nigeria. This thesis should
contribute to filling this gap and, perhaps, it may contribute to behavioral changes among farmers and the government.

The research that supports this thesis explores farmers’ exposure to the adverse effects of pesticides in a local context, the Nigerian Ikwuano community. The study assessed the farmers’ local decision-making process regarding the use of pesticides, their exposure levels, sensitivities, and their local coping strategies to the impacts of these chemicals, including access to resources (financial, information/training and infrastructure). It also examined the social circumstances that contribute to the vulnerabilities of the farmers and their personal views of the possible mitigation strategies that could reduce their vulnerability to these chemicals. To this end, the study adopted a social vulnerability theoretical framework in the investigation because it helps to unravel the extent to which social circumstances have put Nigerian farmers at risk of pesticide contamination, the contextual causes of their vulnerability, and their adaptive capacity and coping strategies.

The thesis follows the theoretical arguments of Wisner et al., (2003) in relation to social vulnerability, especially the Pressure and Release (PAR) and Access Models (AM). The Pressure and Release model put forward by Wisner et al., (2003), and initially developed in a first edition of the book produced by Blaikie et al., (1994) shows the progression of vulnerability from its root causes, dynamic pressures, and unsafe work conditions to the actual impacts. Hazards, in this model, are the result of the intersection between socio-economic pressures (dynamic) and exposure to perturbing events. In this sense, risk is seen as a function of these stressors and susceptibility of the exposed system or community (Wisner et al., 2003). The Access Model, on the other hand, stresses
explicitly the sociopolitical and economic processes generating vulnerability and highlights how these processes influence allocation and distribution of important resources at the local level.

The study adopted a qualitative approach, using in-depth interviews and focus group discussions as the main data-gathering techniques. This approach provided not only the possibility to explore multiple perceptions and explanations of the subject matter (Auerbach and Silverstein, 2003), but also provided the participants with the opportunity to narrate their lived experiences and perceptions of the subject.

The results of the study are expected to contribute to a better awareness among local farmers on the dangers of these chemical products and improve their pesticide management practices. In this perspective, findings of the study will be summarized and used in a guide for the appropriate use of pesticides by local farmers. The guide will be prepared with the support of Dr Kalu from the Nigerian University of Agriculture, at Umudike. Also, the study will provide recommendations to government agencies on what must be done to improve resilience and adaptive capacities of the farmers in the area of pesticides. The study has identified that effective pesticide regulations and extension services are the keys to preventing abuse and misuse of pesticides. Effective pesticide regulations could not only prevent highly toxic pesticides from entering the country and going into circulation but they could also help to educate, train and enlighten the farmers on the best ways to handle pesticides in order to reduce the chances of contamination.

1.4 Problem statement

There is an increasing use of banned pesticides and their side effects in Nigeria. According to Okeke (2010, p. 142), cocoa farmers are the most affected because of the
levels of chemical requirement in cocoa farming. It was observed by Okeke (2010, p.140) that cocoa pesticides constitute about 37% of total annual agro-chemical usage in Nigeria. However, the expanding use of these chemicals without proper regulations and controls has contributed to an increasing vulnerability of farmers in Nigeria, where;

- Farmers are exposed to these chemicals without appropriate safety measures.
- They are seriously affected by the impacts of these pesticides.
- There is a lack of availability and access to resources that could improve the adaptive capacity of farmers to pesticide hazards.
- Farmers lack effective adaptive strategies or the capacity to prepare, cope and recover from the impacts of pesticide hazards, and;
- There isn't an effective effort in mitigating the impacts of these chemicals on farmers.

1.5 Study objective and research questions

The objective of this study is to examine the farmers’ vulnerability to pesticides hazards in the Ikwuano community of Abia state in Nigeria, as well as the underlying processes informing this vulnerability. In this context, the research questions that inform the study are as follows:

1. To what extent are farmers exposed to pesticides hazards in the Ikwuano community?
2. How are farmers affected by pesticide hazards?
3. What are the contextual causes of farmers’ susceptibility to pesticide hazards in the Ikwuano community?
4. What are the adaptive strategies of these farmers to pesticide hazards?
5. What are the possible mitigation methods to the impacts of pesticide hazards in the Ikwuano community?
1.6 Study significance and justification

Scholars, such as Adger and Kelly (1999) and Wisner et al., (2003), generally agree that the lack of availability and access to important resources, such as education/training, information, infrastructure and institutional supports contribute to the creation of vulnerability. A restricted availability of these resources is an important factor framing the vulnerabilities of Nigerian farmers to pesticides.

Nkochi (2012) noted that few studies have been conducted in Nigeria on the areas of pesticide exposure and vulnerabilities of farmers to its adverse impacts. The Nigerian government, like many other developing countries, has some challenges about implementation and monitoring of agro-based policies and programs. Presently, there are no government-supported pesticide impact mitigation plans available for cocoa farming communities in Nigeria to address their vulnerabilities. Many developed countries have been implementing mitigation approaches that involve enhancing community resiliency to pesticide related hazards, but the Nigerian government is yet to realize the importance of doing so. The result of this government limitation has been the exposure of farmers and their families to the negative impacts of these hazards. This thesis offers an opportunity to examine the views and conditions of farmers, providing insights into their perceptions, exposures, sensitivity, susceptibility and the importance of adaptation.

The study will contribute to a better awareness among local farmers about the dangers of pesticides and offer suggestions for building their adaptive capacity to improve their pesticide management practices. It will also assist in raising environmental concerns among farmers, stakeholders in cocoa industries and beyond. It re-emphasizes the fact that cocoa farming and other agricultural practices should be conducted only in a safe and sustainable manner.
The study will also contribute meaningfully to the body of existing knowledge on the subject, since it can serve as a tool for government agencies and other policy makers in formulating viable strategies for curbing the environmental and health effects of pesticides in Nigeria. The research results may also open channels for further research, since it can serve as a resource for scholars who may want to engage in this subject.

1.7 Structure of the thesis

This work is comprised of five chapters. Chapter 1 serves as an introduction to the study matter. Chapter 2 contains the literature review and the theoretical framework adopted; it explores various perceptions of vulnerability theories, including social vulnerability and other related models. Chapter 3 discusses the methodology and provides background information about the Ikwuano community in Abia state, Nigeria, where the research was conducted. Chapter 4 includes results and discussions of the findings relevant to the research objectives. Chapter 5 concludes the work with a summary of the results, recommendations for future research and the conclusion.
CHAPTER TWO: Theoretical framework

2.1 Introduction

There is a substantial sociological interest in the issues of vulnerability as discussed in this chapter. The first section provides a brief introduction to the concept of vulnerability, followed by a section that discusses the two major perspectives of vulnerability (natural and social). The next section provides working definitions that emerged from the discussion and other authors of vulnerability literature. This is followed by Wisner et al’s. conceptions of social vulnerability and adoption as the framework of the research. The section provides brief overviews of the Pressure and Release model (PAR) and Access Model (AM) put forward by Wisner et al., (2003), and also provides reasons for their adoption. The next two sections offer detailed discussions of the PAR and AM.

Also included in this chapter is a discussion on adaptive capacity as one of the important features of social vulnerability, followed by a brief description of the determinants of adaptive capacity. The next section synthesizes the different vulnerability perspectives discussed in this chapter. The last section presents a table that shows the relationship between theoretical framework, research questions and an interview guide.

2.2 Vulnerability

Vulnerability refers to the possibility of a system or population being harmed when exposed to hazards (Yarnal, 2007). Vulnerable conditions are related not only to natural hazards but can also be linked to multifarious causes entrenched in environmental, economic, social and political factors (Bohle et al., 1994). According to McCarthy et al., (2001) vulnerability is a function of exposure, sensitivity, resilience and the capacity to adapt. These elements are very important in the social vulnerability framework. Exposure
is seen as the magnitude or extent to which a community will be facing dangerous events. Sensitivity is the extent to which a community or population is responsive to hazard sensors or triggers. Resilience is the extent to which a population or community withstands and recovers from the impacts of hazards. It determines the strength of the system to resist, contend and get back faster to normal life after a hazard event. Adaptive capacity is defined as the ability or strength of a community to adjust and cope with the impacts of hazards (McCarthy et al., 2001).

However, the earliest vulnerability researchers argued that vulnerability is restricted to the dynamic of natural hazards, while later researchers argue that vulnerability as related to exposure to hazards is generated by social processes. The earliest vulnerability researchers believed that it is a function of the severity of the natural disaster in which the community is exposed, such as tsunamis, earthquakes, hurricanes, etc. This understanding favours the idea that nothing could be done when a community faces natural disasters because they are natural phenomena and inevitable. This idea presents vulnerability as a result of physical phenomena which produces these natural events.

Vulnerability is the key to understanding the levels of risk people face when exposed to hazardous events. The impacts of these hazardous events could be escalated by the interplay between social processes and the actual hazards. Any human processes that impact resources depletion, poverty and marginalization are likely to produce a vulnerable population in the event of hazards. To this end, instead of seeing hazards primarily as physical events that require pragmatic solutions, as believed by the earliest vulnerability researchers, hazards should be seen as a result of social processes. According to Cannon (1994, p. 14) social processes create unequal exposure to hazards.
This is done by relegating some people to hazard prone conditions that will make them more at risk than others. As to the foregoing, the two major perspectives of vulnerability (natural and social) are discussed below with more emphasis on Wisner et al., (2003) ideas of social vulnerability.

2.3 Natural hazard perspectives

Gilbert F. White and John Haas championed the natural hazards model of vulnerability (White and Haas, 1975). Their model highlights the intersection between environment and social systems as well as who is exposed to hazards and what factors are responsible for increasing the vulnerability of people to natural hazards (White and Haas, 1975). This perspective is based on natural hazards exposure. It implies that it is the intensity and extent of natural hazards that determines its impacts on people rather than the social characteristics. In these terms, natural hazards such as floods, drought, wildfires, earthquakes, hurricanes, and others are dangerous occurrences that may cause harm or damage to humans, their property, livelihoods and the environment (White and Haas, 1975). Some communities or systems are more at risk of certain natural hazards than others due to their location near natural hazard prone areas.

Some communities have a history of being impacted by certain natural hazards. This may be as a result of characteristics of the natural systems and these characteristics determine who is at risk and the extent to which they are at risk. For instance, floods occur in low-lying areas, or areas near water. Earthquakes occur in regions where tectonic plates collide, such as areas near the Pacific Plate where there is a high probability of such occurrences (Smith, 2004).

The natural hazard perspective dominated vulnerability research for many years, until social researchers started querying the validity of event-based ideas. Consequently,
there was an increasing recognition that non-natural factors could also affect people. This marks the shift from a natural event-based vulnerability definition to the idea that human vulnerability could also be a product of underlying political and economic factors.

2.4 Social vulnerability perspective

Social vulnerability is seen as the susceptibility of a system or community to numerous stimuli or stressors that could be generated by social circumstances, such as social exclusion, exploitation and marginalization. These social circumstances are the function of power relations in every society and they make the impacts of hazards even more pronounced. The idea of social vulnerability includes the factors that generate the inability of communities or individuals to withstand or cope with the impacts of hazards. The extent of these impacts is determined by these pre-existing social circumstances, which affect the capacity of the system to prepare, cope and recover from the hazardous events. According to Cutter et al. (2008, p. 243), these social factors influence not only susceptibility but also the ability to respond.

Kelman (2007) reported that one of the earliest advocates of a social construct idea of vulnerability was Rousseau, the French philosopher. After the November 1, 1755 earthquake and tsunami that struck Lisbon, Portugal Rousseau sent a letter to Voltaire, stating that the effects of the earthquake and tsunami were devastating not because of the intensity of the event, but because of the population density, structure and actions of the state toward them before, during, and after the disaster.

In more recent times O’Keefe et al., (1976) championed this argument in a seminal work called ‘Taking the Naturalness out of Natural Disasters’. The work shifted attention to the social causes of vulnerability, a perspective known as the ‘political ecology model’. According to this model, the role of society is significant because of the
socio-political and economic forces that may hinder the ability of the system at risk to prepare, respond to and cope with hazards (O’Keefe et al., 1976). The authors provided empirical evidence to support the argument that the impacts of hazards increase because of adverse influences of sociopolitical and economic processes. This ‘human-centric’ perspective tries to understand why some people are more vulnerable than others. It explains that social resources that make people resilient are not always distributed equally in society. Arguably, this perspective is the most predominant in the field of environmental sociology and other development literature (Forsyth 2004; Zimmerer and Bassett 2003).

The idea of social vulnerability ends the one-dimensional focus on the intensity of natural hazards as the only cause of vulnerability (Yarnal, 2007). Social vulnerability implies that a community or a system is at risk because of political, economic and social factors that increase the negative effects of actual hazard impacts.

The concept of social vulnerability stresses those dimensions which escalate or reduce the impacts of hazards and their social distributions (Tierney et al. 2001). Their presence or absence may determine who is at risk and to what extent those at risk could be affected. In these terms, it is believed that vulnerability to hazards is closely linked to the overall political economy of a society (Adger and Kelly, 1999).

2.5 Definitions of vulnerability

A great deal of the literature has recognized ‘vulnerability’ as a term with a number of perspectives and definitions. For instance, the FLOODsite 2005 Project presents a traditional definition of vulnerability made up of two sides: susceptibility and values. According to this idea, vulnerability is defined by the susceptibility of the community at risk to the impacts of hazards, combined with underlying features of the
community, and the values related to the community. Other definitions of vulnerability appear in Table 3.

**Table 3 Working Definitions of Vulnerability**

<table>
<thead>
<tr>
<th>Source</th>
<th>Definitions of Vulnerability</th>
<th>Area of emphasis</th>
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<tbody>
<tr>
<td>Wisner et al., (2003)</td>
<td>Vulnerability is the susceptibility of a community to possible losses from hazards. This susceptibility results from a lack of resistance and ability to recover from the impacts of hazards. This is influenced by the features of the community and underlying conditions that hinder its ability to prepare, cope and recover from the adverse impacts.</td>
<td>Social characteristics of the community</td>
</tr>
<tr>
<td>Cutter and Emrich, (2006)</td>
<td>Vulnerability is the likelihood of a people or system to be affected by hazards as a result of their demographic location and some underlying social factors, such as social inequalities, lack of access to healthcare services, ‘lifelines’ and social capital.</td>
<td>Social factors</td>
</tr>
<tr>
<td>Yarnal, (2007)</td>
<td>Vulnerability originates from social factors or circumstances that expose people to hazards and influences their sensitivity and capacity to cope or adapt.</td>
<td>People/social factors</td>
</tr>
<tr>
<td>Weichselgartner, (2001)</td>
<td>Defined vulnerability as the inability of a community or system to withstand natural hazard events. This depends on the extent of preparedness, exposure and capacity to cope with impacts of such events.</td>
<td>Natural events</td>
</tr>
<tr>
<td>Smith and Lenhart, (1996)</td>
<td>Vulnerability may also be seen as the probability of a system or community to suffer losses when exposed to hazards. These losses may be human life or economic and the extent of loss is determined by a combination of both the biophysical and the social states of the exposed system.</td>
<td>Biophysical and social</td>
</tr>
</tbody>
</table>

The definitions in Table 3 reveal that the susceptibility of any system or community is a function of its “exposure, sensitivity and capacity to adapt and recover from the impacts of such hazardous events” (Gallopin, 2006). These definitions show that different authors interpret the term vulnerability differently (Adger, 1999). For instance,
Wisner et al., (2003) link the hazard impacts with social characteristics of the community at risk and presented the concepts of resilience. While, Weichselgartner (2001), believes that vulnerability is determined by the extent of exposure to the natural event. Smith and Lenhart, (1996) and Cutter and Emrich (2006) view vulnerability from broader processes that combine the biophysical and social conditions of the system at risk. For Yarnal (2007), the measure is people and how social circumstances put them at risk.

The social factor in the definition of vulnerability involves the argument that society plays a key role in determining the extent of hazard impacts. However, vulnerability is perceived differently because authors may have focused on different drivers and timescales of vulnerability. Given the numerous definitions of vulnerability, the adoption of a particular definition or perspective could be informed by the subject matter or a focus of attention on a certain aspect of vulnerability or society (Green and McFadden, 2007). This study focuses mainly on the social vulnerability perspective because it is a central point of interest for sociology.

In the perspective of this thesis, social vulnerability refers to the possibility of a system –which could be a community, a place, or a certain population of farmers-- being harmed due to exposure to an external factor such as the toxic components of pesticide. This may be influenced by some sociopolitical and economic factors that might affect the ability of the system to prepare, respond to, cope with and recover from the impacts of such chemical hazards (Cutter, 2006). Thus, the external factors or hazard can be defined as natural or human-made events or situations that are capable of causing various degrees of harm or losses to individuals or communities at various times. Examples of natural hazards are earthquakes, hurricanes, and droughts, meanwhile human-made hazards

18
include processes or factors created by humans that have a negative impact on people, such as chemical exposures and pesticides poisoning (Wisner et al., 2003).

2.6 Theoretical development of social vulnerability

The idea of social vulnerability has evolved since the 1980s and various theories have been developed within its context. Chambers (1989) formulated the idea of internal and external processes of vulnerability and defined vulnerability as exposure to hazardous events and the inability of people, as individuals, to cope with or adapt to the adverse effects of such events (p.1). In this study, the internal processes are related to individuals’ inability to cope with hazards; processes which are influenced by sociopolitical and economic factors. The external processes are associated with exposure to external stimuli, for example; sudden outbreaks of disease, chemical contamination, war, extreme weather events, etc. The degree of effects of such exposure is usually influenced by the interaction between social and biophysical processes.

In Chambers’ (1989) perspective, vulnerability is mitigated or reduced through a proper security of livelihoods. Income levels and the amount of resources available to a community or individuals provide a better opportunity to withstand the impacts of hazardous events (Chambers, 1989). However, although Chambers’ model incorporates biophysical and social processes of vulnerability, it is inherently individual-based. It focuses more on the individual and fails to clearly recognize how wider sociopolitical and economic processes determine the allocation and distribution of income and other important characteristics of the individual in society.

Liverman (1990) put forward an approach that can help measure vulnerability. This includes a range of sociopolitical, economic and environmental activities at the individual and larger social levels. This approach emphasizes the interactions between
social (internal) and natural (external) processes in the generation of hazards. Liverman (1990) advances Chambers’ (1989) understanding of vulnerability by including other social processes such as economic and political. However, he fails to clearly emphasize the particular aspects of the sociopolitical and economic activities such as social welfare and institutional supports that could influence the capacity of individuals to respond, cope or recover from the impacts of hazards.

Watts and Bohle (1993) expanded on Chambers’ vulnerability model through their definition of vulnerability as a multi-dimensional and multi-layered social process. They included internal and external processes of vulnerability in their approach. The external processes were examined not as geographical or physical features, but as the wider sociopolitical and economic processes that affect individual and community abilities to respond, cope and recover from the impacts of hazards (Watts and Bohle, 1993).

This approach also recognizes the availability, control and access to sociopolitical and economic resources as key processes affecting vulnerability at all levels of society. In this sense, groups or individuals who have control or access to key resources have a better adaptive or coping capacity to hazardous events (Villagran, 2006).

Hewitt (1997) argues that vulnerability is a product of the conditions that put people at risk of certain hazards and make them incapable to withstand, cope and recover from the impacts of such hazards (p.167). For Hewitt, the degree of impacts of hazardous events is based on the prevailing sociopolitical circumstances. Unlike Chambers, and Watts and Bohle, Hewitt stresses that vulnerability is influenced by a lack of access to political power. He links the major causes of vulnerability to a power struggle. To build further on this understanding, Hewitt emphasizes the distribution of power. According to Hewitt, (1997), disaster events unduly affect communities and households who have less
access to political power. In this sense, power is an important element to improving adaptive capacity. It is difficult for individuals at risk to have the abilities to influence decisions and actions that determine the security of their lives and livelihoods. Here, the main cause of vulnerability becomes the condition of powerlessness.

In a related idea, the ‘hazard-of-place’ model of vulnerability theory combines the ideas of political ecology approach and risk/hazards. This model was championed by Cutter (1996). It effectively explains the natural and social factors combined to produce vulnerability. This ultimately produces unequal impacts on people and changes across time and space as a result of differing social practices (Cutter, 1996). The “hazard-of-place” model is useful in both qualitative and quantitative assessment of vulnerability. This approach has been useful in assessing social vulnerability that involved multiple stressors using variables such as, population, geographical location and availability of resources (Cutter et al., 2008).

Turner et al., (2003a) formulated the vulnerability/sustainability approach. The model offers a different explanation about vulnerability to global environmental change. It places emphasis on the larger system that affects processes which function from the regional to the global stage such as how human agricultural and industrial processes are contributing to global climate change. Many of the ideas involved in the human dimension of global environmental change are derived from the study of hazards and disasters. The vulnerability/sustainability model calls for a more sustainable mitigation approach to vulnerability. This approach seeks and supports policies and programs that will aim at development, to ensure more ecological methods of production and resource management at all levels of society. Turner et al. (2003b) adopted the framework with
little variance to examine the vulnerability of people to climate change in different regions of Mexico (Eakin and Luers, 2006).

These different conceptions of vulnerability offer narrow explanations about social causes of vulnerability and reasons for the differential impacts of hazards. In these terms, we opted for the approach suggested by Wisner et al., (2003)

2.7 Wisner’s conceptions of social vulnerability

Wisner et al., (2003) put forward the Pressure and Release Model (PAR). This model demonstrates vulnerability progression from root causes, dynamic pressures, and unsafe work conditions to the actual impacts. The model presents hazards as emanating from the intersection between socio-economic pressures (dynamic) and exposure to events. In this sense, vulnerability is seen as a function of stressors that caused the susceptibility of the exposed system or community (Wisner et al., 2003).

Wisner et al., (2003) also formulated the Access Model (AM), which states explicitly that sociopolitical and economic processes generate vulnerability and highlights how these processes influence the allocation and distribution of important resources in society. The inherent sociopolitical and economic dominance results in an uneven allocation and distribution of resources. These translate to the differential vulnerability of communities as well as the impacts of hazards and the capacities to prepare, cope and recover. Thus, the PAR and the AM developed by Wisner et al., (2003) were adopted as a framework for this thesis due to the following reasons.

First, they offer an in-depth explanation of how sociopolitical and economic circumstances contribute to the vulnerability of people, which are the main areas of interest for sociology in vulnerability studies. The models allow an all-inclusive approach and analysis to understanding those at risk and how to channel mitigation activities.
Secondly, these vulnerability perspectives help to assess vulnerability levels of farmers and how it is related to their lack of access to important resources, as well as how vulnerability to pesticide is understood among the members of the farming community.

Third, these vulnerability models—which are closely related-- are inherently dynamic; they acknowledge the links between social conditions and access to resources in generating vulnerability and resilience. In the perspectives of these models, there is recognition that effective mitigation efforts would involve changes in the existing social processes. By making resources available to all and practicing an all-inclusive social system, vulnerability would be reduced in society. This idea shows that individuals and communities are active contributors in the process of vulnerability and therefore, sustainable development may be one of the most viable mitigation options.

Lastly, other previous vulnerability models discussed above could not be adopted in this work because they do not account for numerous factors and variables in the social fabric that can help in the analysis of overall vulnerability of the cocoa farming community in Nigerian. The variables include: age, gender, education, occupation, and residential area. Unlike PAR and AM, the previous models also do not account for factors difficult to measure using a quantitative approach, such as perceptions, practices and real-life vulnerability experiences of the community and their observable coping strategies. Thus, the PAR and AM support the use of a qualitative method in the analysis and explanation of pesticide utilization practices, perceptions, and vulnerability of the farming community to pesticide hazards as discussed in the next section.

2.8 The Pressure and Release model

This model is one of the major theoretical developments in the understanding of human vulnerability. It was put forward in the first edition of the book *At Risk: Natural*
Hazards, People’s Vulnerability and Disasters (Blaikie et al., 1994) and its second edition (Wisner et al., 2003). This is a social-centred theoretical approach, which tries to understand the progression of human vulnerability from social factors to natural stressors; it examines how social and natural factors interact to produce vulnerable conditions. The Pressure and Release Model (PAR) points out that vulnerability to hazards are not only a product of natural events but also of socioeconomic and political environments (Wisner et al., 2003). It is a strategic expression of the multifaceted interactions between social processes that generate vulnerability and the hazardous event itself. The idea is constructed through the confrontation of these two opposing factors. Thus, the 'pressure' in this model forms as a result of increasing vulnerability through continuous exposure to hazards and a lack of adaptive capacity, while the 'release' aspect, implies mitigation actions or efforts made to reduce the effects of hazards (Wisner et al., 2003). However, in the analysis of research findings in Chapter 4, the language of ‘pressure’ was represented by vulnerability, while the ‘release’ aspect is represented by mitigation. Figure 1 below provides a diagrammatic representation of the PAR model.
As shown, the determinants of social vulnerability are distributed into three areas: ‘root causes, dynamic pressures, and unsafe conditions’. According to Wisner et al., (2003, p.24) the root causes (underlying economic and political conditions, and limited access to resources) are “widespread and well-established processes within a society”. The sociopolitical and economic ideologies influence allocation of resources and reflect how power is shared in society. The “dynamic pressures form parts of the processes and
events, which translate the effects of root causes into unsafe conditions, to produce vulnerability” (Wisner et al., 2003).

The dynamic pressures convert the root causes into unsafe conditions which in turn result in unsafe work environments and increased vulnerability of the farmers. Thus, abuse or misuse of pesticide creates unsafe work conditions and increases the risk of pesticide poisoning. When pesticide is incorrectly applied, the impacts are far more harmful than the intended action.

The PAR model demonstrates the progression of vulnerability from root causes to its appearance as unsafe conditions. These root causes include limited access to power and resources, as well as the vulnerabilities generated by political, economic and institutional ineffectiveness. The institutional ineffectiveness and lack of other forms of government supports to the farming community in Nigeria are seen, in this study, as some of the contextual causes (root causes) of farmers’ vulnerability to pesticide hazards. These root causes are the prevailing practices that influence the allocation and distribution of resources that would help the farmers prepare, cope with and adapt to the impacts of pesticide. They reflect patterns of power distribution and social domination in a society (Wisner et al., 2003). In this perspective, any community or group who suffers marginalization and lack of power, which could be political, economic or social, is exposed to vulnerable situations (Hughes, 2010) to the extent they have reduced access to important resources and secure livelihoods. Normally, such groups have less priority for government intervention and agendas, so agencies pay less attention to their vulnerable situations (Wisner et al., 2003).

The dynamics of pressures "direct the root causes into particular forms of insecurity”. In other words, they manifest as unsafe conditions (Wisner et al., 2003, p.
24). The unsafe conditions here could be the "specific circumstances in which the vulnerability of the farming community manifests" (Wisner et al., 2003 p. 25). This implies that every manifestation of vulnerability could be traced back to the larger social systems. For example, the vulnerability of farmers in Nigeria to pesticide contamination can be traced back to the weakness of the post-colonial government which translates into an inability to provide basic resources and other social amenities to rural communities.

The PAR model also offers an approach where vulnerability is assessed using the existing social conditions of a given community, instead of emphasizing only the intensity of hazardous events (Wisner, et al., 2003). These social conditions are important because they contribute significantly to the actual hazard impacts. For example, hazards always have more effects on socially disadvantaged populations than others (Adger, 1999). The extent of the effects is determined by the existing social circumstances, which may include the availability or lack of institutional support, government emergency preparedness, access to resources, and structures of domination in society (Alexander, 2006).

Figure 1 also demonstrates how the root causes of vulnerability could be traced to the underlying sociopolitical and economic systems. It also shows the hierarchy of factors that form the pre-conditions for hazards. According to Wisner et al., (2003, p. 87), this can be called the “pathway or progression of vulnerability or chain of causations”. It is the summation of causes and the routes from unsafe conditions to hazards. Thus, the argument is that the structure of the social system relegates some sections of the population to marginal positions, which exposes them to a greater risk of hazards. This vulnerability model was adopted for our assessment and explanation of the vulnerability of Nigerian farmers to the impacts of pesticides.
The PAR, as it is illustrated in Figure 1, has some limitations, which include its overemphasis on the 'pressures', it should be thought of as a complement to the Access Model, which focuses on the 'releases' that could increase resiliency and overall coping capacity. The PAR is a structural model, so it requires the specifics developed in the Access Model.

The Access Model is basically an extended analysis of the PAR and was built on its core components. The Access Model of vulnerability, essentially, examines the sociopolitical and economic processes creating vulnerability, and emphasizes the hazards themselves as part of the process generating vulnerability. The model is cyclical; it shows how some communities and households experience unequal access to resources, which results in differential impacts of hazards and takes place under the dominant economic, social and political scenarios (Wisner et al., 2003). The Access Model of vulnerability is formulated to demonstrate the influences of sociopolitical and economic relations in producing vulnerability (Wisner et al., 2003, p. 59).

2.9 The Access Model

The Access Model provides more of an in-depth perspective of vulnerability's progression and how peoples’ everyday lives become affected. The model emphasizes what occurs between social processes and hazard events at specific pressure points (Wisner et al., 2003). This helps to explain the complexity in social processes, trigger events and peoples' vulnerability levels. Most importantly, it elucidates the route of vulnerability from its fundamental stages to the differential ways in which individuals and communities are affected and the role of government and other social institutions in abating the furtherance of human vulnerability (Wisner et al., 2003, p.88). Nigeria, like every other colonialized country, has numerous institutional challenges. These have
resulted in neglect of the agriculture sector, which has placed people, who are engaged in agriculture as a livelihood, in a vulnerable position. Figure 2 demonstrates different events and processes as they relate to each other.

Figure 2 Access Model

Source: Wisner et al., (2003, p. 89)

Each of the figure's eight boxes signify interrelated ideas that are interconnected to each other by arrows, which represent cause and effect relationships demonstrating how institutional challenges have caused the vulnerability of the farming community in Nigeria. (Wisner, 2003, p. 89). For example, the hazard in Box 3 which could link to pesticide contamination manifests in specific time/space in Box 4 (unsafe exposure to
pesticides) and could result in a ‘trigger event’ in Box 5. The households (farmers) in Box 1, make their livelihoods in unsafe conditions represented in Box 2. These unsafe conditions are those specific situations that exposed the farmers to pesticide contamination, such as the use of banned pesticides and incorrect deployment without precautions due to the lack of availability and access to resources, education and training facilities. The provision of these resources is a function of social relations as determined by the political economy under the structure of domination in Boxes 1a and 1b (Wisner et al., 2003, p. 90). Social relations could be seen as an interaction or relationship between communities, individual agencies and government. These social relations form the basis for social structure and are influenced by the structure of domination, which is the probability, that specific group will have an advantage over others, and make others obey their commands.

However, the trigger event in Box 5, takes place and affects social relations in a transitional disaster as represented in Box 6. The disaster here represents deaths of some farmers and numerous ailments and diseases they suffer from as a result of pesticide contamination. The thick black arrow signifies an overflowing layer that could be called ‘social protection’. The impacts of pesticide hazards and human reactions to it happen through time as represented in Box 7. The last box, 8, presents the question ‘To the next disaster?’ (Wisner et al., 2003, p. 90). This is a pointer to a condition of increasing vulnerability (‘pressure’) of the farmers with little or no mitigating actions (‘release’) for reducing the impacts of pesticide hazards (Wisner et al., 2003).

The Access Model views patterns of resource allocation in society as very important in the overall understanding of the vulnerability of a community. Access, in this context, refers to the ability of community members to use those resources necessary
for life and the maintenance of their livelihoods, during and after exposure to hazards (Wisner et al., 2003). Such resources may include economic, political, social and material resources. The socioeconomic and political relations include occupation, gender, residential location, ethnicity and others-- and are always influencing the access to resources (Wisner et al., 2003).

The unsafe conditions which lead to peoples' susceptibility to a hazard are generated by economic, social and political processes (Hughes, 2010). These are the root causes of vulnerability, because they determine patterns of social relations, which influence the degree to which people are affected by hazards. The AM combined with the PAR explains the progression of vulnerability from root causes to the actual hazards, and how patterns of social, economic and political processes generate vulnerabilities. This demonstrates the nature of everyday farm practices of Nigerian farmers which expose them to pesticide and make them vulnerable to its adverse impacts.

Social vulnerability exists because social structures shape unequal opportunities. This is the case in Nigeria where farmers have less access to resources and are relegated to marginal positions that expose them to unsafe working conditions. These marginal positions deny them access to important resources that could help build resilience and capacity to absorb shocks and recover from the impacts of pesticide contamination. Resources context can be referred to as the material and non-material assets that are necessary in maintaining everyday life and livelihoods. They are very important elements in boosting the adaptive capacity of any population at risk, such as the farming community in Nigeria.
2.10 Adaptive capacity

Adaptive capacity is an integral part of social vulnerability. Identifying and mitigating vulnerability is intrinsically related to boosting the adaptive capacity of the individuals or communities at risk. The term adaptive capacity came from the ecology literature, based on the study of ecosystems in the 1960s (Folke, 2006). The earliest understanding presented adaptive capacity as the ability of a system to cope or withstand pressures from stimuli capable of impacting negatively on the system (Holling, 1973, p. 17). The toxic nature of pesticides is a good example of stimuli which is capable of causing harm. A closely related word that has been used interchangeably with adaptive capacity in vulnerability literature is ‘resilience’. Thus, resilience is seen as an inherent capacity of a community to bounce back to normal life after a hazard event (Villagran, 2006; FLOODsite, 2005).

Thus, adaptive capacity is the ability of a community or system to adjust and be able to cope with the impacts of hazards. The major difference between resilience and adaptive capacity is that resilience involves the strength to recover quickly from the impacts of hazards, while adaptive capacity involves the strength to adjust and cope with the impacts of hazards. Given the similarity between these two terms, in this thesis, we will use “adaptive capacity” to refer to the processes related to the capacity of a community to adjust to the impacts of an event.

Foster (1995) stated that the extent of losses to hazards and the ability to cope with the impacts of such hazards are seen as the indicators of the adaptive capacity of the system to that particular hazard. It is necessary to mitigate vulnerability by building resilience and adaptive systems that are able to absorb the shocks of hazards and thereby reducing the impacts of such hazards on the community. Therefore, identifying the
adaptive capacity of a community at risk can help determine the extent of susceptibility (Wisner et al., 2003). The knowledge of adaptive capacity of a system in the context of social vulnerability helps us determine the attributes or characteristics of the system, which would enhance its coping ability to hazardous events. One definition of building the adaptive capacity is effectively empowering the individuals or communities to be able to prepare, cope, adapt and recover from hazardous events.

Coping with impacts of hazards involves the availability of material and non-material resources (Wisner et al., 2003). These resources vary from community to community and translate to adaptive capacity and vulnerabilities due to their role in determining the ability of a community or individuals to prepare, cope, adapt and recover from the impacts of hazardous events. Ferrier (2008) described adaptive capacity as the varied abilities of communities to cope or withstand the impacts of hazardous events and return to normal life shortly thereafter.

There are several publications which focus on adaptive capacity and the processes of returning a community to normal life after hazards (Folke, 2006). Kumpfer (1999), for example, argues that building adaptive capacity is a strategy to promoting positive growth of a community at risk. He maintains that there exist three differing levels of adaptive capacity as an outcome of a hazardous event:

1) Community reintegration, which is concerned with returning the community to its previous normal life and adapting to the impacts of such hazard events through proper mitigation actions.

2) Homeostatic reintegration – returning the community to normal life and not adapting to the impacts of such hazardous events.
3) Maladaptive reintegration – when it appears difficult returning the community to its previous levels of normal life, and perhaps creating more sociopolitical and economic problems in the community. This is usually due to the lack of availability and access to resources that would have helped the community adapt to the impacts of hazards.

However, if community reintegration is successfully applied after a hazard, a hazard event could be seen as a facilitator of transformation and a test of the community’s ability to adjust to an unfavorable condition. Many scholars have discussed how communities can take advantage of processes of reintegration in the aftermath of hazards (Villagran, 2006). This work suggests possible ways to build adaptive capacity in the Nigerian farming community. These suggestions focus on practical and adaptable approaches for increasing the capacity of the cocoa farming community to withstand, cope and recover from the impact of pesticide hazards. While, vulnerability applies theoretical approaches toward identifying those at risk, it is through building adaptive capacity that practical approach mitigation becomes possible.

2.11 Determinants of adaptive capacity

Social researchers have reported that the adaptive capacity of a community can be improved in numerous ways. It has been observed that public education and enlightenment programs are important tools in equipping communities and households with information that would enable them to prepare and respond appropriately to hazardous events (Galderisi et al. 2010). Availability of information is a key to building adaptive capacity; however, Nigerian farming communities are not given access to extension agents who are in the right positions to educate/train them on pesticide utilization and safety-handling. Foster (1995) selected some elements that could enhance adaptive capacity of individuals and communities as follows:
- Economic resources
- Equitable allocation and distribution of compensation and other social benefits
- Institutions
- Technology
- Good information networks
- Infrastructure

The above elements are very important determinants of adaptive capacity. The economic condition of a community or group undoubtedly determines its sensitivity, resilience, and the ability to adapt and recover from the impacts of hazards (Kates, 2000). It is generally believed that developed countries which have a better and more widespread distribution of access to resources, with less poverty, are likely to have improved adaptive capacity moreso than developing countries with uneven distribution of economic resources (Burton, 1996).

Individuals and communities that have diverse livelihoods or income sources are likely to have increased adaptive capacity. The economic and political systems work collaboratively to make resources available to individuals and communities. Governments should fund projects that would provide benefits to all, including those in the rural communities. There should be well-structured networks between individuals, communities and government agencies to enhance the exchange of information to boost adaptive capacity (Buckle et al., 2000).

It has been proven that groups who hold power and are able to blend or accommodate various value systems and meet the needs of different groups are likely to have societies with improved adaptive capacity (Foster, 1995). Societies with equitable allocation and distribution of resources always enhance peoples' adaptive capacity by giving them equal access to important resources and technology (Buckle et al., 2000).
The absence of technology in a community can hinder the efforts to improve their adaptive capacity (Liverman, 1990). This could also limit the range of possibilities in using science to improve peoples' lives and well-being. Thus, technology may help to ensure an effective early warning system and prompt responses during emergencies. However, uneven access to technology may generate differential adaptive capacities, and this could increase vulnerabilities of those with less access to technology.

The ability of a society to provide compensation and other social safety nets to people who suffer losses during hazardous events help those involved to adapt or recover faster from the impacts of the events. This is a boost to the adaptive capacity of the community, because it helps return them more quickly to normal life.

Social institutions play important roles in helping a society adapt or cope with the impacts of hazards. They also make society aware of the adaptive options available and also provide other essential services that help determine adaptive capacity. A system or country with strong and functional institutions is likely to have the possibility of higher adaptive capacity (Smith and Lenhart, 1996). However, some developing countries are characterized by widespread institutional failures. This exposes the people to vulnerable situations. According to Kelly and Adger (1999), a lack of institutional support hinders access to information and other essential resources necessary for building adaptive capacity.

Accessibility of important information and knowledge can enhance individual and community resilience. Public education programs and enlightenment campaigns go a long way in boosting community resiliency. Creating public awareness about hazardous events enables individuals and communities to learn about the actions required from them before, during and after the hazardous events (Foster, 1995). The availability and
accessibility of important information boosts the coping capacity of individuals and households in society. For instance, efficient agricultural extension services can help increase the capacity of a farming community to cope with the impacts of pesticide and other related hazards. This can be done by educating them on the use of safe pesticides, application methods, equipment, and timing. Their knowledge of the dangers inherent to the abuse and misuse of pesticides would help prevent or reduce incidents from happening as well as the farmers’ susceptibility.

Critical infrastructures such as hospitals, schools, roads, electricity, pipe borne water and telecommunication networks have been proven to be enhancers of individual and community adaptive capacities. These infrastructures/amenities help to increase the capacity of a community to absorb shocks or adjust to the impacts of hazards. They also help the community recover and return to normal, functional levels. However, Buckle et al., (2000) stressed the significance of social capital and social networks in building adaptive capacity. Social networks and capital are significant at various levels and degrees, including communities, where there are shared values and aspirations. This also includes other social organizations such as religious, social clubs and economic organizations where ideas can be shared providing opportunities for inventions and growth in society. Increased participation in social organizations is likely to increase peoples’ access to information. This will help improve their resilience and adaptive capacity.

2.12 Synthesizing vulnerability perspectives

As discussed, there has been increasing interest in understanding human exposure to hazards and scholars have conceptualized this exposure differently. Historically, vulnerability researchers viewed humans as passive victims affected by natural hazards.
Under this idea, people’s vulnerabilities were determined by the scale and extent of natural hazards to which they are exposed. This view has since shifted to the social vulnerability perspective, which recognizes humans and social system as active contributors in the processes generating vulnerability (Hewitt, 1997; Wisner et al., 2003). The earliest approach to vulnerability, while incorporating only the physical features saw it as the major determinant of the extent to which people could be affected by hazards.

As the literature expands to a more detailed exploration of vulnerability, there is a quest for an understanding of social vulnerability that acknowledges the complex interactions between social processes and how they put people and their livelihoods at risk. Several researchers have attempted to formulate social vulnerability perspectives that resolve these issues.

Cutter (1996) advanced the 'Hazards of Place' perspective of vulnerability as an effort to provide a vulnerability idea that combined social and biophysical factors, but this formulation was “geographically centred” (Cutter, 1996). In this approach, Cutter (1996) observed that numerous existing ideas of vulnerability were either "too limiting or too diffuse to be of practical use" (p. 77). However, Cutter attempted to integrate different ideas of vulnerability literature in order to form an understanding of vulnerability with a greater emphasis on 'place'. Vulnerability ideas have developed further to include approaches that incorporate resilience and coping capacities.

Birkmann (2006) examines how vulnerability studies have expanded to include a wide range of terms such as exposure, susceptibility, resilience and adaptive capacity. Also included are such areas as, social, environmental and institutional vulnerability (p. 21). Some of these terms relevant to this work, have already been explained and used.
Wisner et al., (2003) put forward the Pressure and Release (PAR) and the Access Model (AM) of social vulnerability. As stated previously, the PAR demonstrates the intricate interactions between the underlying social conditions that generate vulnerability and the actual hazard event. The idea of PAR is built on the combination of these two forces (social processes and hazard itself). The 'pressure' forms through increasing exposure to hazards, while the 'release' aspect involves actions taken to build resilience and adaptive capacity in order to reduce the impact of hazards (Wisner et al., 2003). The PAR has some inadequacies; these include its explicit emphasis on the 'pressure' or vulnerability aspect of the model, with little focus on the 'release' aspect, which could enhance resilience and coping capacity of the community at risk. Also, there is too much emphasis placed on the idea that hazard is independent of the social processes generating vulnerability (Wisner et al., 2003, p.22). The PAR offers a stagnant description of vulnerability because the factors generating vulnerability are not adequately incorporated with the way hazards affect people. For these reasons, Wisner et al., (2003) also formulated the Access Model (AM) which is an extended analysis of the basic components of the PAR.

The AM explores the specific sociopolitical and economic conditions generating vulnerability, and emphasis on hazards themselves as a factor in generating vulnerability. The AM, as shown in Figure 2, demonstrates how the lack of availability and access to important resources expose people to vulnerable conditions under the domination of sociopolitical and economic schemes (Wisner et al., 2003). The AM shows how the social processes or relations have created vulnerability.

However, in order to understand human vulnerability to hazards, either natural or human-made, social causes must be given significant attention as well as the triggers.
This is due to the level of risk faced by different populations, which is a product of the combined influence of the underlying social conditions and the actual hazards (Wisner et al., 2003). In this context, the study focuses only on the social causatives of the vulnerability of cocoa farmers due to the chosen field of sociology. Focusing on the social causatives helped to unravel the contextual causes of the vulnerability of the farmers to pesticide hazards.

2.13 The relationship between the theoretical framework, research questions and interview guide

This section demonstrates the links between the theoretical framework, research questions and interview guide. Social vulnerability theory, as adopted in this research, generally discusses issues of vulnerability that cuts across exposure of people to hazards, sensitivity, impacts, adaptive capacity/resilience, coping mechanisms and the root causes of vulnerability. These issues are directly linked to the research questions and were expanded in the interview guide to include direct questions posed to the participants. See Table 4 below.

Table 4: Links between the research questions, theoretical framework and interview guide

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Link to theoretical framework</th>
<th>Issues discussed</th>
<th>Interview guide (expanded questions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent are the farmers exposed to pesticides hazards in Ikwuano community?</td>
<td>Exposure</td>
<td>Farmers’ exposure to pesticides.</td>
<td>How do you apply pesticides on your farm?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Apart from farming, where else you have used pesticide?</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>What are the names of the pesticides commonly used in your community?</td>
</tr>
<tr>
<td>Question</td>
<td>Category</td>
<td>Description</td>
<td>Question</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>What type of pesticide use training have you had?</td>
<td>Sensitivity</td>
<td>The extent to which the farmers are responsive to pesticide contamination.</td>
<td>What kind of discomfort have you felt after handling pesticide?</td>
</tr>
<tr>
<td>Why do you still use banned pesticides?</td>
<td></td>
<td></td>
<td>In what ways have pesticides affected your family members, friends or fellow farm workers?</td>
</tr>
<tr>
<td>How are farmers being affected by pesticide hazards?</td>
<td>Sensitivity</td>
<td></td>
<td>What are your views on pesticide contamination?</td>
</tr>
<tr>
<td>What are farmers’ adaptive strategies to pesticide hazards?</td>
<td>Adaptation</td>
<td>Methods used by the farmers to cope with pesticide contamination.</td>
<td>Have you noticed any changes in your surroundings after deploying pesticide?</td>
</tr>
<tr>
<td>What are the contextual causes of the farmers’ susceptibility to pesticide hazards in the Ikwuano community?</td>
<td>Contextual causes of vulnerability</td>
<td>The underlying social factors generating the farmers’ susceptibility to pesticide hazards.</td>
<td>How did you learn the basic knowledge of pesticide application?</td>
</tr>
<tr>
<td>What is your view on pesticide contamination?</td>
<td></td>
<td></td>
<td>What degrees of restrictions do you experience when buying pesticides?</td>
</tr>
<tr>
<td>Have you noticed any changes in your surroundings after deploying pesticide?</td>
<td></td>
<td></td>
<td>How has pesticide regulations in Nigeria increased your chances of being affected by pesticide?</td>
</tr>
<tr>
<td>Contextual causes of vulnerability</td>
<td></td>
<td></td>
<td>In what ways have the agro-extension services in Nigeria increased the effects of pesticide on your community?</td>
</tr>
<tr>
<td>How do you think training in proper pesticide utilization practices will help you?</td>
<td></td>
<td></td>
<td>How do you think training in proper pesticide utilization practices will help you?</td>
</tr>
<tr>
<td>What are the protective measures you apply before and after handling pesticides?</td>
<td></td>
<td></td>
<td>How has your community been involved in sensitizing farmers to the proper use of pesticides?</td>
</tr>
<tr>
<td>What are the possible mitigation methods to the impacts of pesticide hazards in the Ikwuano community?</td>
<td>Mitigation</td>
<td>Methods that could build resilience and reduce the vulnerability of farmers.</td>
<td>How often do you visit hospitals due to injuries from exposure to pesticides?</td>
</tr>
<tr>
<td>What do you think can be done to reduce the negative impacts of pesticides on your community?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In what ways can government help to improve farmers’ access to information in your community?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 demonstrates the bearings of the research questions from the theoretical framework and their links to the interview guide. Social vulnerability theory, as adopted in this work, was an essential tool in the investigation of Nigerian farmers’ vulnerability to pesticide hazards.
CHAPTER THREE: Methodology

3.1 Introduction

This chapter discusses the methodological approach that informed the study of pesticide utilization practices, and the exposure and the vulnerability of a cocoa farming community in Nigeria to the adverse impacts of pesticide. A qualitative research data gathering approach was adopted as the most reliable method for allowing participants to narrate their lived experiences, knowledge and perceptions of the subject. Patton (2002) asserts that social research requires a methodological guideline that captures and elucidates how people experience, describe, perceive, judge and feel about the study phenomena. These could be achieved only by undertaking in-depth interviews and focus group discussions with those who have ‘lived experience’ (p.104).

This chapter starts with a general description of the Ikwuano community in Abia state, Nigeria, followed by the study design/strategy, which discusses the methodological approach of the study. This chapter also includes a sampling section that explains how the participants were identified and selected. The data collection section, describes how information was gathered for the study, followed by the data analyses section, which explains how data was transcribed and analyzed.

Also included in this chapter is the data validation section, which describes various information validation strategies that were applied to make the research results credible. The next section discusses the ethical issues and explains how all human subjects were handled. This was followed by a section that describes how the privacy of the participants was ensured. The last section, in this chapter, explains some of the challenges encountered during the research.
3.2 Study area

The study was conducted in the Ikwuano community in Abia State, Nigeria. Ikwuano is situated between latitude 5.5 N and longitude 7.5 E within Nigeria's southeastern plains. Ikwuano is made up of fifty-two villages and communities and is popularly referred to as the “food basket of Abia state” due to its prominence in agricultural food production. Ikwuano literally means the coming together of four. And in Ikwuano's case it was four brothers namely: Ibere, Oboro, Ariam and Ikwu who were great farmers. They came together to form a farming community known as Ikwuano.

According to the 2010 eco-regional program on humid and sub-humid tropics in Nigeria, Ikwuano has between 1600mm and 1700mm of rainfall annually, with a minimum temperature of 26°C and maximum of 32°C. It is approximately not more than 14km away from the Abia state capital, the town of Umuahia, and covers a land area of about 281 square km, with a population of about 61,214, according to the Nigerian National Population Commission (National Census, 2006).

The Igbo language is native to the people of Ikwuano; some also speak English due to the fact that English is the official language in Nigeria. Ikwuano farmers largely specialize in cocoa farming and most of them are smallholders. Cocoa is one of the major sources of income for many families in the area. The Ikwuano community is one of the most prominent in cocoa production in Nigeria due to the fertile soil, a fundamental resource for the cocoa tree. There is remarkable continuity in the cocoa farm business in Ikwuano, many of the farmers inherited their farms from their parents.

There is evidence of traditional religious belief system in Ikwuano and the related cultural ceremonies are well practiced among the people. Though some of the people of
Ikwuano have since converted to Christianity, they still hold their culture in high esteem (FO 6).

Cocoa farming requires a great deal of labour so when there is a shortage of farm labourers, people from neighbouring communities move there to assist with the cocoa farming. Every eight days Ikwuano has a four day market; these market days are very popular among the neighboring communities because this is where people from different parts of the southeast region come to buy agricultural produce.

However, one of the major challenges of Ikwuano people is the lack of good roads. Without proper infrastructure, built by the government, the cocoa farmers have a difficult time selling their products.

3.3 Research design and strategy

The study was exploratory given the limited research on the vulnerability of farmers in Nigeria to pesticide hazards. An exploratory study enables the researcher to gain insight and the familiarity necessary to engage in a rigorous study of the issues of vulnerability and the farmers’ pesticide utilization practices. This was a cross-section study carried out within a short period of time, starting on January 8, 2015 and ending April 20, 2015. The fieldwork was completed in 90 days.

In conducting this research, a qualitative research approach was selected. The qualitative approach contributes to deepening our knowledge of the dynamics of individuals and groups and facilitates our understanding of the impacts of social political and economic issues at the local level (Yin, 2003, p. 2). Qualitative research is carried out in participants’ natural environment, which aids in establishing a comfort zone. As discussed in a previous chapter, vulnerability, exposure, resilience and adaptive capacity are issues that concern the individual and groups and are influenced by social, political
and economic processes prevalent in the society. The qualitative approach was effectively used in the exploration of the impacts of pesticides on farmers in a “real-life context”. According to Creswell (1998, p. 21) a qualitative research approach is a procedure for understanding a phenomenon or human perspectives and relies on methodological inquiries such as in-depth interviews and focus group discussions. These two methods were adopted in the study to enable the researcher to understand and elucidate meanings that participants give to their actions and lived experiences (Yin, 2003).

Various social researchers have recommended the use of qualitative methods in studying complex phenomena such as perceptions and vulnerabilities (Yarnal, 2007). For example, Birkmann, (2007) states that vulnerability studies require the use of qualitative methods to understand, analyze and interpret the prevailing situations.

The qualitative method was well-suited in investigating the vulnerability of the farmers to the impacts of pesticide. Every local vulnerable group and their living conditions are influenced to a large extent by the prevailing sociopolitical and economic circumstances. The use of qualitative methods was crucial in allowing the researcher the opportunity to test the validity of the Pressure and Release and Access Models of social vulnerability in a real-life context. The researcher empirically observed the low level of resources and social amenities available in the Ikwuano community and related this to the basic arguments of both models. This follow-up observation provided in-depth information on how the government has relegated the farmers to vulnerable positions by not making resources available to them. This deepened my understanding of how vulnerability is created, what factors influence vulnerability and the type of mitigation techniques to be recommended.
All primary data was collected using semi-structured (open-ended) questions, administered through face-to-face interviews and focus group discussion. A field guide was organized and used during the interviews to ensure that the data collected covered all the necessary aspects of the study.

3.4 Sampling

A non-probability sampling approach was used in selecting participants for interviews and focus group discussions. This way of sampling allows the researcher to study a small number of people in order to gain an in-depth understanding of the study subject, with an overall objective of collecting rich and valid data (Rubin and Babbie, 1997, pp.385-386). Patton (2002, p. 230) asserts that the reason for non-probability purposive sampling is to select respondents who are knowledgeable in the study phenomenon.

The participants were selected paying special attention to their degrees of experience in cocoa farming, as well as the dimensions of age, gender and education. Approximately twenty-five potential participants were initially identified for interviews. However, the number of actual participants who were interviewed was only twenty as a result of data saturation, which is defined as the point at which no new information is coming from the interview participants (Rubin and Rubin, 2005, Creswell, 1998). Because the issues of pesticide in Nigeria involve three actors; farmers, merchants and the government, the twenty respondents were made up of sixteen cocoa farmers (FO), two pesticide merchants (PM) and two government agency representatives (RGA) (the Pesticide Regulatory Agency and the Agro-Extension Agency).

All participants were identified with the help of a key informant and later contacted by phone or personal visits by the researcher. Potential respondents were
provided with a brief, oral description of what was involved in the interviews, the relevance of the study, and of their rights as participants (confidentiality, contacts to verify the request for the interview, and other issues). Those who agreed to participate were asked to identify the best time and venues for the interviews. Prior to the interviews, the principal researcher reiterated the research objectives, the nature and duration of the interview, as well as the voluntary nature of participation and the confidentiality of the responses. The participants were provided with the consent letter before the interviews and asked to read and sign it. All the participants signed the consent form and provided their home addresses for sending their transcripts for review. The formal memorandum of the Ethics Review Board is attached as Appendix IV.

In spite of the fact that women in the Ikwuano community are not actively involved in cocoa farming, given the nature of the work and some underlying traditions, five of them participated in the interviews. They were widows who inherited their husbands' cocoa farms. Eleven respondents inherited their cocoa farms from their parents or spouse, while the other five acquired their farms by lease. All the interviews were conducted in the participants’ homes.

Focus group discussions were conducted as a result of repeated references made by the farmer participants about hired labourers. The farmers reported during the interviews that this group of farm workers is more at risk to pesticide contamination because they do odd jobs on the farm (ie. using pesticides, cleaning up after use). This prompted the decision of the researcher to conduct focus group discussions for these farm workers in order to get their own perspectives and lived experiences on their susceptibility to pesticide hazards. Thus, twelve hired farm labourers were initially identified for focus group discussions but only five took part voluntarily. The others
turned down the invitation to participate. In relation to those who took part in the focus
group all of them are hired farm workers, four of them live in farm houses on the
outskirts of town and only one lived within the community. The focus group discussion
was organized in one of the farm houses.

3.5 Data collection

The data collection process involved initial contacts with the community, which
were made with the support of Dr. Kalu from the University of Agriculture at Umudike, a
city in the Abia state in Nigeria. During these initial contacts, a key informant was
identified for the purpose of gaining a basic understanding of the dynamics of the
community. In addition, we discussed with the key informant the protocols to be followed
during the interviews, we reviewed with him the field guide to identify potential difficult
issues that may arise as a result of the questions, and finally he identified potential
participants.

All primary data was collected using semi-structured (open-ended) questions,
administered through face-to-face interviews and focus group discussions. All interviews
and focus group discussions were audio-taped. The confidentiality of the responses was
protected by disguising the names of the respondents, such that no one could identify
them or link them to any statements. The duration of each interview session was between
65 and 90 minutes, while focus group discussions lasted approximately 130 minutes.

All interviews took place in the participants’ homes, where they were most
comfortable, which afforded the researcher a unique opportunity to observe natural
occurring behaviors and their living conditions. The interview sessions were conducted
using field guides (see Appendices I, II and III) and consisted of broad open-ended
questions and probes for further clarification from participants. Appendix I listed the
questions used in the in-depth interviews and were asked of participant farmers in a flexible manner in order to accommodate unexpected situations and new information that may arise in the course of the interviews.

Appendix II questions were used for the interviews we conducted with the two government representatives, the Nigerian Pesticide Regulatory Agency and the Nigerian Federal Agricultural Extension Unit in Abia state. These interviews provided the opportunity to assess the roles that government agencies play in pesticide regulations and monitoring their use. The Appendix III questions were administered to the pesticide merchants who participated in the study.

The questions in Appendix IV were used to obtain information from the focus group. The focus group was made up of hired labourers, who were identified as one of the most vulnerable groups to pesticide hazards. The focus group participants reported that the information was significant and indicative of their experiences, as they provided only minor modifications.

In addition to these interviews and focus group discussions, the researcher collected secondary data on the local use of pesticides which was available at government agencies and the universities. This data helped to contextualize the analysis of the primary data collected in the interviews and focus group discussions.

3.6 Data analysis

The content analysis method was used in contextualizing and analyzing the collected information. According to Babbie (2001) cited in Okeibunor and Anugwom (2005, p. 107) the study of “recorded human communications is fundamentally a coding process”. This is a process that leads to transforming qualitative data into standardized
data in a manner that could help researchers establish patterns and findings based on such data.

As indicated above, both the responses of the interviews and the focus group discussion were recorded. The recorded information was transcribed by the researcher into computer files, a decision made to gain familiarity with every set of data. A copy of each transcribed file was printed which I reviewed in order to make notes in the margins to reflect my views and impressions. Once more, I reviewed every set of data word by word to prepare it for coding.

After I completed reading through the transcriptions; I left the document for a number of days in order to set aside my thoughts about the data. When I resumed work on the data, I read them twice, all over again for greater understanding of the whole. I followed Tutty et al., (1996) suggestion and resisted the temptation of identifying themes or assigning categories at this point.

Next, I commenced the ‘first level coding’ process as I went through each transcript again identifying every meaning unit (Tutty et al., 1996). I assigned codes to all meaning units and brought together units that have similar meanings into categories. I was constantly comparing the meaning units to ensure systematic rigor and carefulness in the coding process (Patton, 2002). I went through the data thoroughly searching for categories and consistently compared every newly emergent category with the ones identified previously (Creswell, 1998). This continued until all categories were identified and every meaning unit was assigned to a category.

At the end, every category was underlined in the transcripts with different color codes. I chose to write a highlight of each interview making reference only to the meaning units. By doing this, I arrived at a more holistic summary of the data. For clarity and
simplicity in the discussion of my findings, I discussed each one of the themes under a different subtitle in Chapter 4. Also, participants' narratives were cited from time to time in the discussion of the findings. This is because qualitative approach believes individual perspectives of the phenomena are valid (Rubin and Rubin, 2005).

3.7 Validation strategies

The credibility of every qualitative research effort is determined by the ability of the researcher to apply a range of validation strategies. According to Grinnell, (1997, p. 523), it is essential to achieve credibility because of its reliance on human perspectives of the studied phenomenon. In this work, the perspectives of rural farmers in the Ikwuano community, pesticide merchants and government agencies in the assessment of the farmers’ pesticide utilization practices and issues of vulnerability in the study area were relied upon. For this reason, several data validation strategies were applied to make the findings credible. The process of self-reflexivity was used to check the researcher's personal biases, which helped to ensure that the researcher's personal thoughts and feelings did not influence the results. Secondly, all the data collected was triangulated; comparing data obtained from the interviews and focus group to make sure the information collected was valid. Lastly, the researcher used different participants to validate data collected from others. This was done by asking some of the participants their opinion about what another participant had said. All these helped to ensure that the findings were valid and credible. Also, this research followed criteria provided by Hudson and Ozanne (1988, pp. 514-515) for any qualitative research to be valid.

3.8 Ethical issues

The research received approval from the Ethics Committee of the University of Regina (Appendix V). All human subjects were handled in conformity with ethical
guidelines of the University of Regina. However, no risk was identified during the study. The researcher was mindful of his safety and that of participants throughout the period of fieldwork.

3.9 Data protection and the privacy of participants

All data collected from participants was treated with maximum confidentiality. The researcher made serious efforts to ensure participants’ names and their responses were disguised so that no participants could be linked to any comments or quotations. The researcher used different names and symbols to represent all the participants in the interviews and focus group discussions. Most of the descriptions used in the discussion of findings were the exact information provided by several participants.

The original data was stored in password protected files. All electronic records, handwritten notes, transcriptions and other files related to the interviews and focus group were properly secured during transport. All data collected is expected to be stored for only four years, after which it will be destroyed in line with University of Regina ethics guidelines.

3.10 Limitations

Every social research is faced with one form of challenge or another. This work faced serious challenges in participant recruitment. Most of the farmers were adamant about not participating due to the lack of familiarity with the researcher which led to repeated calls and visits. As previously noted, twenty-five participants were initially contacted, while only twenty took part in the interviews and focus group discussions.

Again, no data was found on similar projects in the study area that could be used for comparison. The findings of the research were based on the information collected from the interviews and focus group discussions. Gaining information concerning
individual perceptions, at times, could be difficult because any form of bias or insincerity from the participants could affect the results of the research. However, the researcher was diligent in overcoming these challenges by applying various data validation methods as previously stated.
CHAPTER FOUR: Discussion of findings

4.1 Introduction

This chapter discusses the research findings and establishes the links between the findings, the research questions and the theoretical framework.

4.2 Organization of sections that answered the research questions

As demonstrated in Table 5 below, the first section subtitled “pesticide utilization practices and vulnerability of farmers”, provides answers to the question “To what extent are the farmers exposed to pesticide hazards in the Ikwuano community?” This section is linked to the theoretical issue of exposure.

The second section discusses the answers to the question “How are the farmers being affected by pesticide hazards?” This was discussed under the subtitle “usage guideline, farmers sensitivity and risk of contamination” and it is linked to the theoretical issue of sensitivity.

The third section provides answers to the question “What are the contextual causes of the farmers’ susceptibility to pesticide hazards in the Ikwuano community?” which was discussed under three subtitles, and include; “pesticide regulations in Nigeria and the vulnerability of farmers”, “agriculture extension services in Nigeria and the vulnerability of farmers” and “access to information, farmers’ exposure and sensitivity”. These three subtitles are linked to the theoretical issue of contextual causes of vulnerability in the study area.

The fourth section discusses the issue of adaptation and provides answers to the question “What are the adaptive strategies of the farmers to pesticide hazards?”

Lastly, the fifth section discusses vulnerability mitigation methods and provides answers to the question “What are the possible mitigation methods to the impacts of
pesticide hazards in the Ikwuano community?” This section is linked to the theoretical issue of mitigation (‘release’).

**Table 5: Relationship between discussion of findings, research questions and theoretical framework**

<table>
<thead>
<tr>
<th>Section</th>
<th>Research question discussed</th>
<th>Theoretical issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4 Pesticide utilization practices, exposure and vulnerability of farmers.</td>
<td>To what extent are farmers exposed to pesticide hazards in the Ikwuano community?</td>
<td>Exposure</td>
</tr>
<tr>
<td>4.5 Usage guidelines, farmers’ sensitivity and risk of contamination</td>
<td>How are farmers being affected by pesticide hazards?</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>4.6 Pesticide regulations in Nigeria and the vulnerability of farmers.</td>
<td>What are the contextual causes of the farmers’ susceptibility to pesticide hazards in the Ikwuano community?</td>
<td>Contextual causes (root)</td>
</tr>
<tr>
<td>4.7 Agriculture extension services in Nigeria and the vulnerability of farmers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8 Access to information, farmers’ exposure and sensitivity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.9 Adaptation issues and the vulnerability of farmers.</td>
<td>What are the adaptive strategies of farmers to pesticide hazards?</td>
<td>Adaptation</td>
</tr>
<tr>
<td>4.10 Local adaptive strategies in the study area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.11 Access to resources and other determinants of adaptive capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.12 Vulnerability mitigation methods</td>
<td>What are the possible mitigation methods to the impacts of pesticide hazards in the Ikwuano community?</td>
<td>Mitigation (release)</td>
</tr>
<tr>
<td>- Public awareness/education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Network of social capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Social programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Sustainable development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**4.3 Demographic background of participants**

As indicated in the previous chapter, sixteen participants who took part in the interviews were farm owners (FO); two participants were pesticide merchants (PM), and two were government agency representatives (RGA), one each from the Nigerian Pesticide Regulatory Agency and Nigerian agro-extension agency. Five hired farm labourers participated in the focus group discussions (see Table 6 below).
All the participant farmers had a large household; each has at least five children. Only five out of the sixteen participants were women. We had a small number of women respondents due to their limited involvement in cocoa farming in the Ikwuano community. Most of the participants were heads of their families at the time of interviews. Almost all the participant farmers had completed some level of education. Five of the sixteen farmers had completed elementary education and more than half (eleven) had secondary education. None of them had higher education.

The ages of the participant farmers ranged from 30 to 78 years. It was observed that young people are not actively involved in cocoa farming in Nigeria. FO1 and FO5 stated that most of the farm owners inherited their farm land and the young people may not have had such an opportunity. Again, FO7 stated that no young person in the community would wish to be a farmer, as most of them dream of becoming professionals and prefer to live in urban areas where there are social amenities such electricity, good roads, pipe borne water and good healthcare services.

The farmland sizes of the participant farmers ranged from 1.35 hectares to 14 hectares, which shows the predominance of small holdings in cocoa farming in the study area. Five of the sixteen participant farmers had employment in addition to farming. Two were civil servants and three combined petty trading with cocoa farming. Eleven participant farmers have no other occupation other than farming.

The two participant government representatives had some form of higher education (college or university). Their ages ranged between 45 and 55. Both have worked in their respective agencies between 15 and 25 years. The two pesticide merchants had only secondary education. Their ages ranged between 35 and 45 years. Both have experience ranging between 10 and 15 years in the pesticide business.
The five participants who took part in the focus group discussions were mainly farm labourers. Five of them had completed primary education and all are married with at least three children each. All of them stated they have applied/used pesticides for a number of years, ranging from three to twenty years.

**Table 6: Participants' matrix and identification code**

<table>
<thead>
<tr>
<th>Participant category</th>
<th>Number</th>
<th>Identification code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers owners (interview)</td>
<td>16</td>
<td>FO1-FO16</td>
</tr>
<tr>
<td>Hired farm labourers (focus group)</td>
<td>5</td>
<td>FL1-FL5</td>
</tr>
<tr>
<td>Government agency representatives</td>
<td>2</td>
<td>RGA1-RGA2</td>
</tr>
<tr>
<td>Pesticide merchants</td>
<td>2</td>
<td>PM1–PM2</td>
</tr>
</tbody>
</table>

**Table 7 Participants' bio-data**

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Farm owners (FO)</th>
<th>Farm labourers (FL)</th>
<th>Government agency representatives (RGA)</th>
<th>Pesticide merchants</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-45</td>
<td>Male</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>45-55</td>
<td>Female</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-60</td>
<td>Male</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>60-78</td>
<td>Female</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>20</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Male</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College/university</td>
<td>Male</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm size</td>
<td>Male</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(hectares)</td>
<td>0.5-2</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-5</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-7</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-14</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farming</td>
<td>Male</td>
<td>4</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>experience (number of years)</td>
<td>Female</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-15</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It is important to emphasize that the information received from both the farm owners (FO) and the farm labourers (FL) was very similar.

4.4 Pesticide utilization practices, exposure and the vulnerability of farmers

The information obtained from the respondents shows that all of the farm owners and the labourers have been exposed to pesticides to varying degrees and have been affected in several ways. All the participants stated that they have used agro-chemical products in many ways and at different levels for both cocoa production and the production of other agricultural products for domestic consumption. They apply a wide-range of chemicals “depending on the degree and nature of pests or disease attacks”.

When asked about the specific brand of pesticides used by them the response data revealed that many of them use both banned and approved chemicals.

More than half of the participant farmers (thirteen) said that they have used banned and approved chemicals alongside each other. They have also combined both chemicals at different times during application. Three of them declined to comment if they have used banned chemicals, but none of the farmers admitted to using only the approved pesticides. Most of the farmers were of the view that the approved pesticides are always scarce and come with exorbitant prices in the marketplace. Some of the chemicals are not easily accessible to farmers due to rigorous procedures necessary to get
them from the merchants. This often discourages farmers who prefer to go for easily accessible chemicals, which are mainly the banned pesticides.

Also, information from the five participant farm labourers (FL) in the focus group corroborated the information of farm owners. Given that FLs have no part to play in the decision to use particular brands of pesticide over another, they use only the chemicals made available by the farm owners. Some of the farm labourers stated that “they have used chemicals such as DDT, Aldrin, Endosulfan and others (as shown in Table 7 below) when they were in need of quick action to repel pest and diseases” (FL2, FL4 and FL5). All three of these chemicals have been banned by WHO and the EU due to their high toxicity. However, farmers who use these banned chemicals argue that some of the approved ones are not strong enough and therefore cannot repel pests quickly. There is no doubt this kind of perception and practice has increased peoples chances of being affected.

When the farmers were asked to mention the names of pesticides they used often, they listed thirteen different pesticides. When these were compared with the lists of approved and banned pesticides obtained from the Regulatory Agency (as shown in Tables 1 and 2), it was observed that only five out of the thirteen brands of pesticides they mentioned were approved, while eight were banned chemicals. Table 8 provides a list of commonly used chemicals.

**Table 8: Commonly used pesticides, by farmers, in the study area**

<table>
<thead>
<tr>
<th>Pesticide Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Champ DP</td>
<td>Approved</td>
</tr>
<tr>
<td>Esiom 150 SL</td>
<td>Approved</td>
</tr>
<tr>
<td>Kocide 2000</td>
<td>Approved</td>
</tr>
<tr>
<td>Phostoxin</td>
<td>Approved</td>
</tr>
<tr>
<td>Roundup GL</td>
<td>Approved</td>
</tr>
<tr>
<td>Pesticide</td>
<td>Status</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Aldrin</td>
<td>Banned</td>
</tr>
<tr>
<td>Carbofuran</td>
<td>Banned</td>
</tr>
<tr>
<td>DDT</td>
<td>Banned</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>Banned</td>
</tr>
<tr>
<td>Fenitrothion (storage chemical)</td>
<td>Banned</td>
</tr>
<tr>
<td>Methyl parathion</td>
<td>Banned</td>
</tr>
<tr>
<td>Resmethrin (for storage)</td>
<td>Banned</td>
</tr>
<tr>
<td>Tetramethrin</td>
<td>Banned</td>
</tr>
</tbody>
</table>

The majority of the participant farmers indicated that they always mix both the banned and approved pesticides together to achieve a better result. However, the participant farmers and the labourers were aware that this abuse or misuse of pesticides has resulted in serious health problems for them. They agreed that though the banned pesticides appear to be more effective than the approved ones, they exposed them to greater health problems.

The pesticide merchants (PM1 and PM2) indicated that they sell banned pesticides, but also stated that sometimes they try restricting farmers’ access to the banned pesticides knowing the enormous health and environmental problems they can cause when deployed incorrectly. However, “it seems farmers prefer the banned chemicals than the approved ones due to their cheap prices and the merchants have no other options than to sell” (PM2). When asked about sources of supply of the banned pesticides, they declined to comment, but stated, “we should blame it on the regulatory agencies who have failed to do their jobs” (PM1).

This research reveals that price is one of the factors that inform farmers’ decision to use particular pesticide brands over others. Most of the participants reported having considered pesticide prices in making final decisions on what product to buy. Accordingly, cost has an edge over efficacy. These people believe cheaper chemicals can
still be efficient at a lower cost. Although the banned chemicals can be effective in repelling pests and disease, their negative impacts on human health and the environment are enormous. These chemicals also leave high residues on cocoa seeds. The majority of the farmers stated that they were aware of the European Union's ban on cocoa seeds that exceed the maximum residue level. But they blamed their continual patronage of the banned pesticides on the issues of scarcity and exorbitant prices of the approved ones.

However, respondents PM1 and PM2 were of the view that the government has failed to put in place effective mechanisms to check the influx of banned chemicals into the country. Also, the government has been unable to provide a favorable policy framework to subsidize these approved chemicals and ensure they are distributed to all parts of the country. The Nigerian government needs to step up in formulation and implementation of agro-based policies that would aim at monitoring the distribution and use of chemicals that may be harmful to farmers and the environment.

4.5 Usage guidelines, farmers’ sensitivity and the risk of contamination

The cocoa farmers in Nigeria are particularly sensitive to the adverse effects of pesticides. Farmers were aware of the risks involved in the indiscriminate use of pesticides. Five of the participant farmers stated that overlooking the involved risks appeared to be one of the only ways to use the chemicals, but the pain caused by the chemicals is always very hard on their bodies. Respondents FL2 and FL5 stated that they have always known which are the dangerous chemicals at the point of mixture. According to them, these chemicals tend to produce disturbing effects on the handlers at that point because of applied pressure to get them ready for deployment.

Participants FO7 and FO9 reported that they have never handled pesticides, especially the banned ones, without experiencing some level of discomfort, such as eye
irritation, skin burns, nausea, acute headaches, vomiting and health complications of various forms. The farmers are highly sensitive to these chemicals mainly due to their lack of training. Most of the participants stated that they have not received any form of training in pesticide safety handling. Only two of the farmers had received minor training in the area of pesticide application methods. They maintained that the training was not sufficient because it was directed at how to operate specific application equipment. According to them, the training was organized by the equipment manufacturer, and not government agencies. The focus group participants stated that they have not received any serious training from any agency of the government, only from the farm owners guiding them on how to operate specific application equipment. Sometimes they engage in muddling, which makes their work difficult and exposes them to more risk of pesticide contamination.

It was observed that the use of protective equipment as a mitigation option is not well practiced among the farmers in the study area, due to a lack of both availability and access to information, education/training and other necessary resources. Some of the participants said they usually wear casual instead of protective clothes when spraying pesticides, sometimes with or without gloves and they rarely use protective hats. Some of the participants also stated that they do not feel comfortable wearing protective eye glasses when spraying pesticide. Few participants indicated that they used safety boots and some of them (FL1 and FL4) openly admitted that they usually spray pesticides wearing casual footwear. For protection against inhalations, the majority of participants demonstrated very limited knowledge of the dangers associated with this practice, as the majority of them said they do not use a mask but handkerchiefs to cover their noses and mouths while spraying pesticide.
Even though all of the farmers have read pesticide label instructions, only a few could understand and follow the instructions. Even worse, some of the participants said they bought pesticides at different times without labels. These unsafe practices have led to several cases of critical poisoning. Their impacts on the farmers were evident, especially the farm labourers whose bodies showed various stages of burns and scars on their legs. Some have recurrent health problems as a result of exposure to pesticides, such as FO5 and FO12 who have been diagnosed with asthma; FO14 and FO1 said they have recurrent breathing problems, while FO7 has heart-related issues. All of these ailments were linked to their exposure to pesticides.

There are unsafe conditions in the institutional context that contribute to this situation of vulnerability. The lack of availability and access to training facilities and other important institutional resources has made the farmers more sensitive to pesticides. Many of the participants were of the opinion that increasing cases of pesticide poisoning and the environmental pollution in their community were the result of government insensitivity and neglect, arguing that this insensitivity has exposed them to vulnerable situations. These statements clearly support the argument of the research theoretical framework about how social circumstances, such as marginalization and government neglect are generating the “pressures” on the local farmers and making them vulnerable to pesticide hazards.

The impacts of pesticides on health conditions are even worse due to the limited access to health services. Not all of those who have recurrent health issues have the opportunity to seek medical help from specialists available in the cities (outside their community). There are no clinics in the community for emergencies, so most farmers
engage in self-medication such as buying medications from local chemist shops on their own without a doctor’s prescription.

As all the participant farmers and the farm labourers acknowledged that pesticide exposure posed a serious threat to their health, they also acknowledged that it posed a serious threat to their livelihoods. More than half of the farm owners (ten) said that they have experienced a total crop loss due to the wrongful use of pesticides. They also stated the fact that pesticides contaminate bodies of water, thereby harming aquatic organisms. FO2 and FO6 were experiencing this water pollution on their farms. FO9 was convinced pesticides caused the deaths of his livestock when they drank from rivers close to his farms. Even with the harmful effects of pesticides discussed during the interviews and focus group discussions, both FO14 and FO16 were not sure if pesticides could cause yield reduction. This is because they lack proper information and education about the dangers inherent in the indiscriminate use of pesticides. The focus group members, FL2 and FL5, stated that they have been held responsible several times for the incorrect application of pesticides, which led to a total crop failure. According to them this resulted in a denial of wages as a form of punishment for them, even though it is not their duty to decide when to deploy pesticides - it is up to the farm owners.

A few participants stated that people they'd known had died after spraying highly toxic pesticides without any form of protection against inhalation. Their deaths, as a result of being exposed to these chemicals, were generally blamed on the abilities of government institutions to carry out their responsibilities; such government institutions include pesticide regulatory agencies and the agro-extension agency. Their responsibilities include reaching out to rural farmers, providing them with training and information on pesticide health issues and safety handling, as well as restricting access to highly toxic
pesticides by monitoring their movements and making sure that people without training do not have access to them.

4.6 Pesticide regulations in Nigeria

The information collected from various participants in the study shows a weak enforcement of pesticide regulations, as well as a lack of control in the manufacturing, importation, distribution and use of pesticides in Nigeria. Weak regulations have directly increased the chances of farmers and other end-users to use highly toxic chemicals due to their cheap prices and, consequently, suffer the dangers associated with them. The pesticide merchants who took part in the study (PM1 and PM2) reported that they have never been punished or fined for selling banned pesticides. According to them “even though the government has banned the manufacturing, importation, distribution and use of certain chemicals (see Table 2), those chemicals still find their way into the market”. When asked if they were duly registered as pesticide vendors, they said; “No, it was not necessary to get registered before becoming a pesticide vendor”.

This statement was directly in contrast with the response received from RGA1, who worked for the pesticide regulatory agency. He said every chemical merchant must be duly registered by the agency and must submit valid addresses of their office locations. This implies that most of the merchants were engaged in the illegal distribution of banned pesticides since they are not registered. However, the regulatory agencies are too weak to be able to monitor such activities. The existence of illegal trading and the ineffectiveness of the regulatory body to monitor them have increased the possibilities of farmers buying the wrong chemicals, and thereby increasing their chances of being affected.
Participants were asked if they have experienced any restrictions buying pesticides of their choice. Most of the farmers indicated that they buy pesticides with little difficulty, especially the banned ones. The pesticide merchants stated that their reason for selling banned pesticide was because of the high demand and they needed to sell product in order to make money. From the perspectives of the merchants, all pesticides are good, but the safety and vulnerability issues are dependent on the utilization practices. These are based on the amount of related knowledge, information, training and access to necessary resources available to the handlers. Thus, any farmer who had received training on pesticide safety handling and also had access to resources such as appropriate application equipment and good hospitals was likely to be less vulnerable to pesticide hazards.

Effective pesticide regulation is one of the most important measures in reducing the level of vulnerability farmers’ face. When asked why the regulatory agency in Nigeria has failed to perform efficiently, it was reported by two government representatives that their agencies are suffering from government neglect, which has resulted in serious challenges such as a lack of funds, equipment, manpower and other resources. This situation has hampered the effective operations of the regulatory agency. Some of the participant farmers and the pesticide merchants were of the view that if only the Nigerian government and the regulatory agencies could work together to stop the manufacture, importation and distribution of the highly toxic chemicals, the vulnerability level may decline, since farmers would no longer have access to those chemicals.

Thus, effective chemical regulations and pesticide safety training remain the most viable options to reducing or mitigating farmers’ vulnerability to pesticides. Farmers can only buy those banned chemicals if they are in circulation. However, if the regulatory agencies are able to prevent the manufacture, importation and distribution of these
chemicals, farmers may not have access to them and their choices will be limited to only approve chemicals. When farmers were asked if they had ever been contacted by a regulatory agency, most of them reported they had never seen the agency agents. FO12 stated that the reasons why the regulatory and extension agencies in Nigeria have failed are because they have no follow-up procedures or actions to ensure that end-users of these chemicals adhere strictly to general regulations and guidelines. The FL3 respondent, in the focus group, stated that they have little knowledge of the regulatory agencies “due to their lack of enforcement actions”.

According to Uwakwe (2009), the risk of exposure to pesticides among farmers in Nigeria is on the increase, especially now that there is an incessant infestation of pest and diseases. Again, the general failure of the pesticide regulatory body is actually putting more pressures (increasing their chances to be affected) on farmers without any form of release (mitigation) from the government. The only remedy for the situation may be the provision of effective regulations and proper orientation for the pesticide handlers, which can be achieved only if the government provides all the necessary resources to make the agency more effective and to meet international standards. The pesticide regulatory agency should be repositioned and make its presence felt among pesticide manufacturers, importers, distributors and end-users, instead of just being there for formalities.

4.7 Agriculture extension services in Nigeria

Agro-extension institutions are very important in every developing country. Its role in educating farmers on best farm techniques cannot be overemphasized (Amera and Abate, 2008). Agriculture extension services involve non-formal educational activities such as dissemination of information, advice and training of farmers in order to promote better and safer farm practices, perceptions, attitudes, knowledge and skills. They also
provide an opportunity to train rural farmers on pesticide safety handling, application methods and use of safer pesticide (approved ones). These contribute positively in the reduction of vulnerability levels of farmers to pesticide hazards. Agro-extension is a very important aspect of rural development and a strategy for resiliency building among rural farmers. Thus, it is very unfortunate to note that this important institution has been neglected by the Nigerian government. This has resulted in an increase in farmers’ vulnerability to pesticide hazards and other related hazards.

The role of agro-extension agents in promoting the exchange and transfer of practical knowledge as a strategy for ‘releasing’ (mitigating) the ‘pressures’ (chances to be affected) on farmers has not been met in Nigeria. When the government representatives were asked why the agencies have been so ineffective in discharging their duties, it was reported that “the agency is grossly underfunded by the government” (RGA1). According to them, the lack of funds resulted in inefficiencies and failure of the agency to reach out to rural farmers who need them most. According to Kalu (2003), effective extension services are known to enhance socioeconomic development and the knowledge base of farmers in rural communities. Farmers in the Ikwuano community are sorely lacking in this area.

When the farm labourers were asked when extension agents last visited them, none of them reported seeing extension agents in their community for the last seven years. This information provided by the farm labourers was corroborated by the accounts of the farm owners on the lack of availability of the extension agents in their community.

When the farmers were asked what informs their decision to use a particular brand of pesticide over another, most of them replied that they rely on the advice from pesticide merchants and fellow farmers. However, some farmers stated that when there is an
outbreak of pests and diseases, they always tackle them through ‘trial and error’. Due to the lack of availability and access to proper training, it always costs enormous resources and energy to repel pest attacks on their farms (FO5). Thus, farmers in Nigeria are lacking in the area of availability and access to information and training facilities.

4.8 Access to information in regard to farmers’ exposure and sensitivity

Lack of availability and access to the right information are part of the major contextual vulnerability conditions that exist among farmers in Nigeria. This situation has resulted in a lack of preparedness and low capacity to cope with pesticide hazards and its consequences. All the participants reported that they have limited sources of information about pesticides. Some of the participants also said they “face difficulty in following the label directions” because most times they do not understand what they are required to do. Seeking help from friends and pesticide merchants is also problematic, because they are often not professionals in pesticide safety handling and application. Respondent FL3 stated that this form of help sought from a friend may not offer the desired results, because the situations experienced by the person may be different in form and degree. Therefore, administering the same solution may not be effective. The situation always results in abuse or misuse of pesticides, thereby exposing the farmers to more risk of pesticide contamination.

However, it is the responsibility of the government to build a strong institutional support program that can provide farmers with the required information. This can be achieved through viable extension services which will reach out to farmers in all parts of Nigeria, including those in rural communities. Lack of information contributes significantly to vulnerability (Adger and Kelly, 1999) and this research has established that a lack of information and proper orientation have been part of the reason farmers in
Nigeria are more vulnerable to pesticide hazards than farmers in the developed world. Every year, farmers in Nigeria suffer significant losses due to pesticide contamination, both physically and economically (Nkochi, 2012). Many have lost their lives as a result of exposure to highly toxic pesticides, though this depends on the extent of exposure.

Farmers in Nigeria lack access to information networks that can guide them in making the right choices when it comes to buying and using pesticides. All of the study participants unanimously blamed the level of losses they suffer due to a lack of information. According to them, when there is an outbreak of pests and disease, their major problems have always been how to identify the right pesticides, where to get them and, how to apply the right dosage in order to achieve the desired results (FO7). This lack of access to information faced by farmers could be blamed on failures of government extension institutions to carry out their responsibilities. It is understandable that farmers in Nigeria have been neglected by the government because of the discovery of oil in commercial quantity in the Niger Delta region of the country. The oil now serves as major foreign exchange earnings for the country, but previously cocoa and other agricultural products were the major foreign exchange earnings for Nigeria. Today agriculture has been neglected and relegated to the background.

4.9 Adaptation issues and the vulnerability of farmers

Adaptation is seen as adjustments of a community or system in response to exposure to hazard stimuli and its effects. It is encapsulated in the ability of the community to cope with changes brought about by exposure to hazard. A community with improved adaptive capacity remains unaffected while adapting to or coping with hazard stimuli. This situation can be found in developed countries where there is improved adaptive capacity. However, in developing countries such as Nigeria there are farming
communities with low adaptive capacity and high sensitivity to hazard exposures, such as pesticides. The information obtained from participants in the interviews and the focus group shows that the people in the study area are affected seriously, even while adapting to the impacts of pesticide exposure.

Adaptive strategies are conscious responses to hazard stimuli aimed at reducing the impacts of such hazards on the community or individuals at risk (Adger and Kelly, 1999). These responses involve changes in practices or processes to mitigate possible degrees of losses (Smith, 2000). Adaptive measures are important response options to reducing vulnerability. According to Burton (1996), strategies for adaptation depend on the community, information and resources available to them, and the hazard stimuli to which they are responding. For the purpose of this work, the adaptive strategies here are aimed at responding to and coping with the exposure to pesticides and its impacts. These are strategies that have been developed consciously by Nigerian farmers. Many of these responses or strategies yielded little or no results due to the limited access to the resources that these responses require in order to be implemented successfully.

4.10 Local adaptive strategies in the study area

The data gathered in this research, as discussed above, shows that health issues caused by pesticide contamination in the study area are substantial. Therefore, it was expected that those at risk (farmers) may develop some local strategies to cope with the adverse effects, strategies that could be considered alternative to the proper equipment that is required to handle the chemicals. Thus, the farmers were asked what adaptive measures they apply before and after handling pesticides in order to reduce the risk of contamination. Most of the participants in the focus group discussion stated that they always drink and rub palm oil (red oil) on the body to neutralize the effects of pesticides
on their skin based on the idea that palm oil reduces the effects of chemical reactions on the skin. Some of the participant farmers also reported that they wash their hands and shower frequently when spraying strong pesticides (highly toxic pesticide).

FL1, from the focus group, stated that they usually eat ‘bitter colas’ during and after spraying pesticide (Bitter cola is a wild fruit believed to be medicinal and used as an antidote to breathing congestion) based on the belief that bitter cola helps in calming pesticide reactions inside the body. Many participants also reported that they tie a handkerchief across their noses to reduce inhalation when spraying pesticide. The participant farm owners and the farm labourers generally reported that spraying strong (toxic) pesticide during hot afternoons is considered the most dangerous, due to the high chances of the body attracting pesticide residues. The farmers stated that the local adaptive strategy for such a situation is to put on wet clothes and constantly pour water on the body to avoid skin dryness and heat, which can easily attract pesticide residues.

Participants in the focus group and interviews reported that once poisoning has occurred they use some of their local resources to reduce the negative effects. Respondents FL1 and FL4 stated that they had visited herbalists (local medicine men) to seek help when serious poisoning occurred. According to these respondents, the local medicine men (herbalists) are knowledgeable in pesticide poisoning and they know the antidotes. Few participants said they had used conventional hospitals outside their community, when serious poisoning occurred.

However, the above adaptive strategies seem crude and inadequate. They have done little in reducing the chances of farmers being affected as most of them live with permanent diseases and disabilities caused by pesticide poisoning. Farmers in Nigeria are one of the most vulnerable groups, considering the fact that they live in a rural part of the
country where there is no availability and access to information, training facilities, education, institutional supports and government empowerment. The situation has left them with limited capacities to prepare, adapt, cope and recover from the impacts of pesticide hazards.

It is difficult for a community at risk to choose the best adaptation options especially when the system has low resilience and limited adaptive capacity. This is usually due to a lack of availability and access to resources that can effectively reduce the impacts of such hazards (Rayner and Malone, 1998). In most cases, the community at risk faces limited sources of information and knowledge about other better adaptive strategies. The community could also be constrained by institutional inefficiencies (Bryant et al., 2000). This is the case in Nigeria where the institutions responsible for pesticide regulations are weak as stated above. They have failed to effectively regulate and control pesticide manufacture, importation, distribution and use.

4.11 Access to resources and other determinants of adaptive capacity

The availability and access to resources have significant implications in determining coping or the adaptive capacities of a community. This assertion is supported by the Pressure and Release and the Access Models of social vulnerability, which formed the theoretical framework of the research. During the study, most of the participants in the interviews and focus group discussions lamented the lack of availability and access to a number of resources, such as economic; education/training; knowledge/skilled workers; institutional supports, etc.

The above resources could help improve their adaptive capacities. However, the enhancement of adaptive capacities of a system at risk is a pragmatic step in reducing its vulnerabilities and this can promote sustainable development (Smith, 2000). Such effort
underscores the importance of mitigation actions. Most farmers in developed countries are reasonably adaptable to the usage of pesticides and fertilizers due to the availability and access to the above mentioned resources. According to Wisner et al., (2003), coping with the impacts of hazards involves the availability and access to material and non-material resources. However, availability and access to these resources vary from community to community. This translates to differential adaptive capacity and vulnerabilities, due to the role of these resources in determining the ability of a community or individuals to prepare, cope, adapt and recover from the impacts of hazardous events.

The participant farmers revealed that availability and access to some of the resources mentioned are determined by prevailing sociopolitical relations in Nigeria. According to them, oftentimes, resources are not allocated and distributed equitably in Nigeria because of the socially constructed inequalities.

4.11.1 Economic resources

Many vulnerability researchers have revealed that economic conditions of a community or group determine their sensitivity, resilience and adaptive capacity to the impacts of hazards (Kates, 2000). This was found to be valid in the study area; the group of labourers who participated in the focus group discussion seemed to be more at risk of pesticide contamination than the farm owners. This is because of their economic situation and the nature of their work. Generally, the hired farm labourers do the odd jobs such as deploying strong (banned) pesticides believed to have greater negative impacts on the handlers.

More often than not, it is believed that developed countries which have a better and more widespread distribution of wealth and less poverty, are more resilient in the face
of dangers than poorer or developing countries with an uneven distribution of wealth. Burton (1996), stated that poverty is directly responsible for peoples vulnerability. Poverty in this context is an indicator of low income, lower access to basic life needs and its consequent low ability to cope or recover from the impacts of hazards. However, poverty is not synonymous with vulnerability (Burton, 1996).

It was observed during the field work that the farmers dwell in a rural part of Nigeria and are generally regarded as rural poor because farming has been relegated to a level that it is regarded as the occupation of poor people in Nigeria. According to Okeke (2010. p. 112), a farmer is almost synonymous with a poor person (Okeke, 2010). This social label (seeing them as poor) exposes farmers to more vulnerable conditions where they are denied access to important economic resources, such as short- and long-term loans to improve their livelihoods and make them more resilient to the impacts of hazard stimuli. Respondent FO2 and focus group member FL5 reported that “they are being denied access to credit and loans due to the perception that they would be unable to repay”. This situation has increased the vulnerability of the farmers.

4.11.2 Knowledge and skills

For adaptive capacity to be enhanced, knowledge and skills are crucial among the at risk community. People need to have the knowledge of existing adaptive options in the community, and have the ability or knowledge on how to use them for efficiency. For instance, farmers need to be aware of the danger inherent in the use of highly toxic pesticides and the consequences of abuse or misuse of these chemicals. It is also important to educate the farmers on best pesticide management practices and create awareness on how to access the right pesticide and application equipment. These will remedy the rate of unhealthy exposure to pesticides and their adverse effects. As already
stated, the role of government extension agents is important in creating awareness among farmers and impacting the desired knowledge and skills of farmers, in order to achieve operational efficiency. When this is achieved, it will minimize incidents of pesticide contamination and then mitigate vulnerabilities of the farmers to pesticide hazards. Also, when information is made available and understood by the community at risk, formal adaptive measures can be implemented in a way that will enhance the coping capacity of the entire community.

However, the data gathered from the interviews and the focus group revealed that there is an absence of proficient and trained individuals at the occupational level in the study area and this increases farmers’ vulnerability to pesticide hazards. According to Scheraga and Grambsch (1998), the implementation of adaptive strategies can be hindered by a lack of training among the community at risk. It is very important to regularly train farmers in Nigeria on current farming techniques and safer ways of handling agro-chemicals. Thus, any community with a greater number of trained and skilled individuals may likely have a higher adaptive capacity and a lower chance of being affected (Smith and Lenhart, 1996). It is crucial for the Nigerian government to build more effective mechanisms that would help in training and the dissemination of safety information to all parts of the country, especially the rural areas.

4.11.3 Institutional supports

Institutional supports play an important role in helping a community adapt or cope with impacts of hazards. The availability and access to institutional supports make a society become aware of the adaptive options available to them and as well as ‘release’ the pressure on them, and their vulnerabilities to hazards. Institutions provide essential services that help determine the ability of a system to withstand pressure and be able to
bounce back after exposure to hazard stimuli. However, respondent FL3 stated that “they cannot recount anything good that a government institution has done for them as farmers”. A system or country with strong and functional institutions is likely to have the possibility of higher adaptive capacity (Smith and Lenhart, 1996). Most of the participants in the interviews reported that Nigeria is characterized by widespread institutional inefficiencies and failures as demonstrated by the pesticide regulatory and agro-extension agencies. These situations expose those who need their services to greater risks. According to Adger and Kelly (1999), lack of institutional support hinders access to information, education, finances and other essential resources that would have released the vulnerability of a community at risk.

Respondent FO3 reported that “there are general inconsistencies and unsupportive government agricultural policies in Nigeria”. According to her, this was reflected in the existing institutional arrangement where rural farmers are denied access to loans, grants and government subsidies. The institutional inadequacies have made it difficult for farmers to diversify their livelihood and possibly improve their adaptive capacities. It is projected that if the Nigerian government does not formulate agro-policies and programs designed to help farmers build resilience by providing them financial support and improving their access to information farmers may continuously be more at risk (Kalu, 2000).

It was observed that local adaptation options are sometimes constrained by institutional inadequacies (Adger and Kelly, 1999). This is because institutions help deal directly with risks associated with hazard, by serving as a platform for present and future adaptive responses. This research shows there is optimism for the potential of institutional effectiveness in dealing with hazards associated with pesticides. For
example, if government institutions would perform their jobs properly, especially those entrusted with pesticide regulations, extension service (farmers’ sensitization and education), rural infrastructure and medical services; farmers’ adaptive capacity would be improved and vulnerability would be mitigated.

Many farmers in Nigeria have fallen victim to the adverse effects of pesticides; some have died after contact with pesticide. For instance, information gathered in the study revealed the cases of two farmers who died in 2009, when they slept in the same room with harvested cocoa beans treated with pesticides for preservation. A similar incident also happened in 2013. Three hired laborers died after spraying insecticides to control pests on cocoa farms. It was reported that they did not wear any protective cover (Okeke, 2010, p. 142). This could be blamed on a lack of training on pesticide safety handling.

The most recent case of pesticide poisoning happened in April 2015, as reported by the World Health Organization; eighteen farmers lost their lives to pesticide contamination in the rural village of Irele, Ondo state in Nigeria. “These deaths occurred rapidly within three days, 18 persons were already dead” (Sahara Reporters, April 19, 2015). These people were vulnerable because of the lack of information, education, training, and access to good medical facilities. It is a fact that rural farmers in Nigeria are constantly exposed to pesticide hazards. The marginal position they find themselves in has made the impacts of these chemicals more problematic, as they lack the preparedness, capacity to cope, and the ability to mitigate or recover from the impacts.

4.12 Vulnerability mitigation methods

In examining vulnerability mitigation methods and resilience building in the study area, four themes stood out for the participant farmers. These include public
awareness/education, establishing networks in the community, social programs and rural integrated development, which I interpreted to mean sustainable community development.

4.12.1 Public awareness/education

Public awareness and education were generally accepted by the participants as a crucial instrument for reducing vulnerability in farming communities in Nigeria. Through public awareness, education and training, the farmers believe that individuals and groups in the community would be made aware of the hazardous nature of pesticides and take precautions. Ensuring that farmers have the necessary equipment and protective clothing to protect themselves before exposure to pesticides would reduce incidents of fatal contamination. Respondent FO2 stated that “if public awareness and training are available and accessible, we would be able to use the knowledge and skills acquired from such training to better our pesticide utilization practices. I am sure the vulnerability levels would be reduced in the community”. In the above quote, two themes stood out in ensuring the realization of using public awareness to reduce vulnerability. These include the significance of availability and accessibility of public information/training, and as well as following the required steps to use this information.

The participants in the focus group discussion were in consensus on the significance of public awareness in reducing their vulnerability to pesticide hazards. However, they were in doubts about the efficiency of the current extension agencies in Nigeria to render these important services, because of lack of funds and personnel ravaging the organization. Respondent RGA2 pointed out that the two government agencies (agro-extension and the pesticide regulatory agency) are faced with limited resources and this makes it difficult to discharge their duties effectively or organize a
widespread public awareness campaign and training with follow-ups. According to RGA2, even if the agro-extension agency organized public forums and training, the question has always been “How would farmers understand and use the information without follow-up visits from the agency?”.

However, most of the farmers felt that overall indifference and callous attitudes of those in positions of authority are the major causes of their vulnerability to pesticides. The participants in the interviews and focus group discussions were in consensus that individuals or groups that have received training are likely to be less sensitive to pesticide exposure.

4.12.2 Networks of social capital

The significance of building networks and social capital at all levels of the community was mentioned by the all of the research participants. Social networks and capital were generally seen by participants as channels for releasing vulnerability pressures on individuals, as well as increasing their adaptive capacity. The role of formal and informal networks such as social support groups, family, friends and faith groups in vulnerability mitigation cannot be overemphasized. These networks of social capital would likely increase coping capacity by ensuring information sharing, cushioning psychological stress, and allowing families and friends the access to economic and non-economic resources (Smit and Wandel, 2006, p. 288). The availability of social capital would mean that necessary supports and help are received by those at risk and those who have been already affected by exposure to pesticides.

Most of the participants stated that their religious groups have always been supportive whenever they suffered serious pesticide poisoning. According to the participant farm owners and farm labourers, such supports include prayers, health advice
and payments for their medical treatments. There is no doubt that faith-based communities will continue to provide good support mechanisms for people at risk. It is easy for them to help as they know their community members and can find out who has been affected, and who needs help.

At all levels, networks have been recognized as instruments for boosting adaptive capacity and mitigating vulnerability (Smit and Wandel, 2006). Establishing networks of social capital within rural communities was seen by the participants, in the focus group, as a critical role of government agencies to ensure effective channels for information sharing and feedback. These networks enhance the possibilities of effective responses during emergency situations. If there was a good relationship between farmers and the government agencies that provide assistance to them before and during emergency situations, it would increase cooperation between them.

Additionally, networks serve as a conduit for those who need help (at risk or already affected) and those who are available to offer help. Thus, networks and social capital are understood to be tools for providing and distributing access to information. The kinds of information provided by networks and social capital are often based on the experiences of others or popular practice (what others have done when they were affected and which worked for them). This is useful especially for those individuals who may not ordinarily have access to formal sources of information. The importance of networks and social capital in enhancing resilience and adaptive capacity was supported by Murphy (2007). He stated that the pace at which the dissemination of information takes place using community networks is unprecedented. It is now possible to communicate with a large number of people at the same time using existing community channels (p. 301).
Researchers have recognized that incorporating a wide range of organizations may help provide support to people at risk; organizations such as churches, mosques, community groups and non-governmental organizations. Handmer (2003) stated that networks and relationships at all levels are very important because of their roles in building resilience. According to Handmer, the informal networks are more vital in resilience building than formal networks because they are more participatory and nearer to the people (p. 58). Murphy (2007) stressed that as long as social capital is an integral element of informal institutions and relationships, establishing networks at individual and community levels may be the most effective strategy to reducing vulnerabilities through information sharing. This is in line with the information obtained from the participant farmers and the farm labourers, most of them reported that they have received helpful information and advice on pesticide usage from their family members and friends.

4.12.3 Social programs

The significance of viable social programs at the community level was seen by the participants in the interviews and focus group as another strategy for reducing vulnerabilities and increasing the adaptive capacities of the farming community in Nigeria. Most of the programs that focus on improving the day-to-day living conditions of the community were seen as strategies for reducing the vulnerabilities of the farmers and increasing their coping capacity. Such social programs include social welfare, education/training programs, sensitization on safe farm practices, etc. FO10 stated that “If the community can be provided with good social welfare and other support networks, our abilities to prepare, respond and withstand the adverse effects of pesticides will be enhanced”.

83
It is necessary to have improved social programs in communities in order to enhance the resilience of individuals at risk to specific hazards, such as pesticide contaminations. Whether their vulnerabilities were a result of ignorance, they still need to be educated and provided with information to help them cope. However, if their vulnerabilities were caused by the lack of availability and access to resources, the community needs to be provided with necessary resources that can enhance their resiliency. Such programs may include public awareness campaigns on the dangers of unsafe handling of pesticide and training sessions on the safer ways to handle pesticides. It also includes electioneering programs that aim at increasing community representation in the government.

The lack of access to political power is seen as part of the underlying processes generating vulnerabilities (Blaikie et al., 1994). Therefore, improving community access to political power might increase their access to resources and information, and these can enhance the community's overall capacity to cope with the impacts of hazards. Also, establishing mechanisms that ensure the equitable distribution of access to resources, reduces vulnerability and enhances resilience at all levels of society; individuals, groups and community levels.

4.12.4 Sustainable development

Most of the participants emphasized the importance of vulnerability mitigation projects at the community level and how these can increase the overall resilience and adaptive capacities of individuals and groups in the community. The participants also noted the need to incorporate rural development (sustainable development) into vulnerability mitigation framework. Sustainable development, in rural communities, such as health clinics, sources of information, training facilities and lending institutions would
encourage the adaptive capacity of those communities. Most importantly, sustainable development may bring about more ecological-friendly production methods (organic or use of only safe pesticides). Sustainable development may also bring about diversification of livelihoods; this could involve economic activities beyond cocoa farming, where people would use fewer chemicals and work in safer conditions. All these could reduce people’s vulnerabilities by improving the overall resilience and adaptive capacities of people in the community. Respondents FO3 and FO8 noted that “their unsustainable practices both in the area of pesticide usage and other unsafe farm practices may be the reasons for increased vulnerability”. They further noted that they use pesticides, generally, without clear directions on the appropriate application and this has increased their chances of being affected.

Many researchers have reported that human conditions such as social inequalities, uneven allocation and distribution of access to resources and development have led to increased vulnerabilities in those areas that are less developed (Wisner et al., 2003). In this context, sustainable development would cut across all parts of the society (rural and urban) and become a core component of hazard mitigation. This approach is an effort to build resilience in all parts of the farming communities and integrate adaptive behaviors and resiliency building activities in their daily farm practices (such adaptive activities may include taking appropriate precautions before, during and after handling pesticides). Sustainable development, as envisioned by the participants, may also bring about shifting production to more ecological methods, providing economic activities beyond cocoa farming and other sustainable changes in how people make their livelihoods and manage their resources.
The Nigerian government would be well advised to adopt a carefully planned and implemented rural development (sustainable development) program since it would bring about the equal allocation and distribution of access to resources and open new fronts for agriculture production methods that would be safe for both human beings and the environment.
CHAPTER FIVE: Conclusion

5.1 Introduction

Through the assessment of the farmers’ pesticide utilization practices, exposure, perceptions and vulnerability, the relevance of the Pressure and Release and Access Models of social vulnerability to understand the situation of farmers in Nigeria was recognized in this study. This research described how the underlying sociopolitical circumstances have generated vulnerable conditions for farming communities in Nigeria. This chapter presents a summary of the research results based on the five research questions and their relationship to the literature review, and also provides recommendations.

5.2 Summary of research results

In answering the first research question “To what extent are farmers exposed to pesticide hazards in the Ikwuano community?” it was discovered that Nigerian farmers are exposed to pesticides in various ways and to various degrees. Many farmers still use banned pesticides which are highly toxic chemicals with the capacity to impact negatively on human health and the environment. Farmers reported mixing together banned and approved chemicals and deploying them in the hope of a maximum result but without regard for the potential danger. The research also revealed that farmers do not take appropriate precautions before, during and after handling pesticides. Some have used pesticide containers for domestic purposes without proper cleaning. All of these behaviours have increased the chances of farmers being affected by pesticide contamination.

As demonstrated in Chapter Four, the second research question “How are farmers being affected by pesticide hazards?” revealed that farmers are highly sensitive to
exposure to pesticide. Many farmers have been affected to various degrees; some have died while others have suffered pain and diseases as a result of exposure to pesticides. During the field work, some farmers were still living with pain and disease caused by their exposure to pesticides. As well, many farmers reported having suffered various levels of crop losses due to the abuse or misuse of pesticides; some have suffered total crop losses, while others had experienced low yields. These abuses or misuses of pesticides include the use of the wrong pesticide, timing of application and overdose (deploying more than required).

The third question discussed the contextual causes of the farmers’ susceptibility to pesticide contamination; it revealed that there is a weak pesticide regulation in Nigeria. This is one of the reasons why banned pesticides were still in circulation and use. It was also observed that agro-extension services in Nigeria are non-existent in the rural parts of the country and this is the area that needs them most. Some of the respondents stated that they had not seen agro-extension agents in their community in the last seven years. This has resulted in the lack of availability and access to information about the safe and correct use of pesticides and other related farm practices in the study area. However, representatives of the extension agency and the pesticide regulation body in Nigeria reported that their various agencies are under-funded by the government and this hinders their ability to carry out their responsibilities. The above situations are part of the contextual causes of the farmers’ susceptibility to pesticide contamination. Other contributing factors include; lack of education/training and infrastructure in the farming community.

The above contextual causes of farmers’ susceptibility to pesticide hazards in Nigeria are seen as reflections of sociopolitical processes which have relegated rural
farmers to vulnerable positions. These conditions also translate to their exposure, high sensitivity, low adaptive capacity and lack of ability to recover quickly from the impacts of pesticide hazards. These also reflect the patterns of sociopolitical relations in Nigeria. The government has virtually no viable policies and programs designed for farmers in the rural areas. Through the study, complexities that exist in the interactions between sociopolitical processes and how they generate unsafe conditions for the farming community were discussed.

The fourth research question asked about the issue of adaptation in a cocoa farming community in Nigeria. The research revealed that Nigerian farmers have low adaptive capacity to pesticide hazards. The farmers are being affected even while applying some local adaptive strategies as discussed in Chapter Four. It was also observed that there is a lack of availability and access to resources that could improve adaptive capacities in the study area. These include economic resources, technology, equity, institutional supports, knowledge/skills, and infrastructure.

Lastly, the fifth question discussed the possible mitigation methods to the impacts of pesticide hazards in the study area. A wide range of mitigation methods were suggested by the participants in order to enhance the community's coping capacity and resilience. These mitigation methods include public awareness/education, networks and social capital, social programs and rural integrated development (sustainable development). It is believed that these mitigation methods would address the underlying causes of the farmers’ vulnerability to pesticide hazards. These mitigation methods, if properly implemented, would decrease vulnerabilities in the farming community and increase their resilience and adaptive capacities.
Through this research, the researcher's knowledge of pesticide utilization practices, perceptions and vulnerability of the farming community in Nigeria has been enhanced.

5.3 Recommendations for future research

This work attempts to fill a gap in existing literature through the assessment and presentation of key variables which have escalated farmers’ risk of pesticide contamination. The work relied on the experience and opinions of farmers, farm labourers, pesticide regulatory agents, merchants and agro-extension agents in Nigeria. However, future research may be needed to determine the nature of the relationships between the variables identified as the contextual causes of farmers’ vulnerability to pesticide hazards. Also, the understanding of different levels of vulnerabilities that exist in the study area and the relevance of social vulnerability models offered by Wisner et al., (2003) need further assessment to help determine how to channel mitigation activities. It may also be important to know if understanding vulnerability from the government's perspective would be useful, in areas of assessing government preparedness to formulate and implement mitigation policies.

Research may also be needed to determine if the complexities that exist in the interactions between social processes undermine mitigation efforts or approaches. Additionally, future studies may help to improve the ways in which farmers handle pesticides and improve their resilience. This could be made possible through a more in-depth examination and analysis of measures that can enhance the pesticide utilization practices of the farming community to minimize their chances of being affected.
5.4 Policy recommendations

There should be a national awareness campaign aimed at educating farmers on the best pesticide utilization practices. The awareness could be championed by the National Orientation Agency of Nigeria (NOA), in collaboration with the pesticide regulation agency and the agro-extension agency.

The Nigerian federal government needs to strengthen its pesticide regulation agency by providing more funds and personnel. This would enable the agency to undertake the enormous task of monitoring/controlling pesticide production, importation, distribution and use in Nigeria. More effective pesticide regulations would help to minimize the influx of banned pesticides into the country and therefore reduce some of the contextual causes of the vulnerabilities of Nigerian farmers to pesticide hazards.

Agro-extension units of the federal and state ministries of agriculture in Nigeria should be revitalized and prioritized by the government. This would be possible by providing more funds and personnel to enable the agency to carry out wide-spread training and education for farmers, especially those in the rural areas.

It is recommended that the government be more involved in the areas of production, importation and distribution of approved chemicals in order to ensure they are available in all parts of the country. The government could also subsidize the prices of the approved chemicals to make them more affordable. This would reduce the chance of farmers buying banned pesticides due to their availability and affordability.

There should be well-structured mitigation strategies aimed at making resources such as information, training facilities, hospitals and lending institutions available and accessible to rural farmers, in order to boost their resilience and adaptive capacities. The
availability and accessibility of the above resources would reduce the vulnerability of rural farmers to pesticide hazards.

5.5 Conclusion

This study offered an opportunity to assess the pesticide utilization practices and the vulnerability issues of a cocoa farming community in Nigeria to the impacts of these chemicals. Through this research, an understanding of vulnerability was reached.

The results of this research were linked to the research questions. The Pressure and Release and Access Models of social vulnerability were found to be appropriate for the study. The contextual causes of vulnerability of the farmers were linked to the underlying sociopolitical circumstances in Nigeria that generated the weak pesticide regulations and poor agro-extension services. This also includes the lack of availability and access to necessary resources among the farming communities in Nigeria, such as information, education, training facilities, hospitals and lending institutions. The lack of these resources have continuously put pressure on the farmers and created the unsafe work conditions in which they operate.

In order to release these pressures, vulnerability has to be “released” (mitigated) (Wisner et al., 2003). This could be achieved by addressing those contextual causes of vulnerability as revealed in this research one of which would be effective pesticide regulations to stop or check the influx of banned pesticides into the country. These are chemicals that have high toxic levels, which could poison farmers and/or the environment with the slightest exposure. Therefore, stopping the production and importations of these chemicals would help prevent farmers from having access to them. Again, the moribund nature of agro-extension services in Nigeria needs to be improved, because an efficient extension system could provide the much needed education and training for farmers. This
would help them improve their use of the right pesticide, the appropriate timing of application, equipment, and protective measures to minimize incidents of pesticide poisoning.

The research revealed that the structure of access to resources and power in Nigeria has led many to pursue their livelihoods in unsafe conditions and opportunities. Access to resources in Nigeria varies between populations based on their occupation, residential locations and their access to political power. These variables were very important to this analysis because the plight of farmers was directly attributed to them. Firstly, farmers live in less developed rural parts of the country that often exist with few or no social services (ie. hospitals, education, electricity, etc.). Secondly, their occupation is not considered in government policies and programs because the country is a mono-economy (oil is the centerpiece of the Nigerian economy). Agriculture is relegated to the background; therefore there are no forms of social protections for farmers. Social protection is a very important condition in maintaining resilience to hazards and includes programs and actions aimed at reducing poverty and vulnerability in a society, such as welfare packages, subsidies and access to credit.

There is also a need for equitable and sustainable development in Nigeria, in order to increase the availability and access to resources in the study area. This would pave the way for social programs that would be participatory and therefore, improve the community’s access to political power. It is important for government to strengthen those activities that would build resiliency at the household and community levels. This will help in reducing the vulnerabilities of the community.

Additionally, a range of mitigation methods were advocated for in reducing the vulnerability of farmers and improving their coping capacities. These ranged from public
awareness campaigns/education to social programs, building social networks and sustainable development. These mitigation efforts aim at reducing vulnerability and increasing community access to the resources they currently lack.

The overall interpretation of social vulnerability in the models adopted was strengthened by acknowledging other layers of vulnerability and the complex interactions that exists between them. For example, it was observed that the government underfunds the regulatory and extension agencies, which makes it difficult for them to carry out their responsibilities effectively, thereby resulting in an increased vulnerability for the farmers. Vulnerability mitigation through resiliency building and improved adaptive capacity were discussed in Chapter 4. Through these, a multifaceted understanding of vulnerability appeared and the links between vulnerability and lack of access to resources were demonstrated.
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Appendix I
Interview Guide: Participant Farmers

Initial questions asked to establish rapport:

- Age, household size/composition (number of people living in the home and their gender including that of the respondent)
- Education
- Farm size - number of acres farmed (owned or leased).
- Type of farm - incorporated or family farm
- Income level

1. To what extent are the farmers exposed to pesticides hazards in the Ikwuano community?
   How do you apply pesticides on your farm?
   Apart from farming where else you have used pesticide?
   How did you get basic knowledge of pesticide application?
   What are the names of pesticides commonly use in your community?
   What type of pesticide use training have you had?
   Why do you still use banned pesticides?

2. How are the farmers being affected by pesticide hazards?
   What kind of discomfort have you felt after handling pesticide?
   How has your family, friend or farm workers been affected by pesticide hazards?
   What are your views about pesticide hazards?
   How have you noticed changes around your surrounding after deploying pesticide?

3. What is the contextual causes of the farmers’ susceptibility to pesticide hazards in the Ikwuano community?
   What degrees of restrictions do you experience when buying pesticides?
   How has the lack of effective pesticide regulations in Nigeria increased your chances of being affected by pesticide?
In what ways have the inefficient agro-extension services in Nigeria increased the effects of pesticide on your community?
How do you think getting trained in pesticide utilization practices will help you?

4. What are the adaptive strategies of the farmers to pesticide hazards?
What are the protective measures you apply before and after handling pesticides?
How has your community been involved in sensitizing farmers to the proper use of pesticides?
How often do you visit hospitals due to injuries from exposure to pesticides?

5. What are the possible mitigation methods to the impacts of pesticide hazards in the Ikwuano community?
What do you think can be done to reduce the negative impacts of pesticides on your community?
In what ways can government help to improve farmers’ access to information in your community?
Appendix II
Interview Guide: Government Agency Representatives

Initial questions asked to establish rapport:

- Education
- Position – Responsibilities in the organization
- Income level

1. What are the procedures for selling, buying and using pesticides in Nigeria?
What are the requirements for registering pesticide manufacturers, importers, distributors and merchants in Nigeria?

2. What are the restrictions on buying certain brands of pesticides?
How do you determine good and bad pesticides?
Have there been any sanctions against any pesticide merchants for selling banned pesticides?

3. How often does your agency visit wholesale and retail pesticide stores?
How often do they follow up by visiting the end-users and educating them on the use of banned pesticides and encouraging them not to buy them?
Have you been penalized by a producer, merchant or end-user for violating the country’s pesticide regulatory laws?

4. In what ways do you think your agency has contributed to reducing the risk of pesticide hazards?
What do you think can be done to make them more effective?

5. Is your agency adequately funded by the government or is it supplemented by private organizations?
How efficient are your personnel at doing their jobs?
How do you think the government can provide more funds for the agency?
Appendix III
Interview Guide: Pesticide Merchants

Initial questions asked to establish rapport:

- Education
- Size of store
- Income level
- Years of experience in the business

1. What procedures did you go through before registering as a pesticide merchant? How reliable is the process of registration?

2. What level of training do you have in pesticide safety handling? How do you periodically update your knowledge of pesticide safety handling?

3. How do you communicate to your customers about good and bad pesticides? How do you ensure that your customers make effective use of the pesticide? What do you think determines farmers' choices of certain brands of pesticide?

4. How do you receive pesticide supplies in your stores? To what extent do you comply with pesticide regulatory laws? Why do you still sell banned pesticides? Have you ever been punished for selling banned pesticides?

5. In what ways do you think the regulatory agencies have contributed to restricting access to the banned pesticides? When was the last time pesticide regulatory agents visited your stores? What are the major challenges you experience in pesticide merchandizing?
Appendix IV
Interview guide: Focus Group Participants

Initial questions asked to establish a rapport:

- Age, household size/composition (number of people living in the home and their gender including that of the respondent.)
- Education
- Farm size - number of acres farmed (owned or leased).
- Type of farm - incorporated or family farm
- Income level

1. To what extent are you exposed to pesticides hazards?
   Apart from farming where else you have used pesticide?

2. How have you been affected by pesticide hazards?
   What kind of discomfort have you felt after handling pesticides?
   How has your family, friends or farm workers been affected by pesticide hazards?

3. What do you think are the contextual causes of the farmers’susceptibility to pesticide hazards in the Ikwuano community?
   How has the lack of effective pesticide regulations in Nigeria increased your chances of being affected by pesticide?
   How do you think getting trained in pesticide utilization practices will help you?

4. What are the strategies you use to cope with pesticide hazards?
   What are the protective measures you apply before and after handling pesticides?
   How has your community been involved in sensitizing farmers to the proper use of pesticides?
Appendix V

Research Ethics Board
Certificate of Approval

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Supervisor
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Funder(s)
Unfunded

Title
Environmental Pollutions and Impacts of Pesticide Use in Cocoa Production in Ikruano Communities, Abia state, Nigeria: Exploring Cocoa Farmers’ Perceptions and Practices

Approval of
Application for Behavioural Ethics Review
Recruitment Letter
Interview Guide
Consent Form

Approved on
November 18, 2014

Renewal Date
November 18, 2015

Full Board Meeting

Delegated Review

Certification
The University of Regina Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol, consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

Ongoing Review Requirements
In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion.
Please refer to the following website for further instructions: http://www.uregina.ca/research/REB/main.shtml

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