An Assessment of Land Tenure Security on Haiti’s Central Plateau: Implications for Farm-Level Investments

by

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ABSTRACT

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This thesis provides an empirically based description of the de-facto character of land ownership in rural Haiti and empirically examines the consequences of land tenure structure on farm-level investment decisions. A randomly sampled, door-to-door survey was conducted between July and December 2013 in a remote region of central Haiti. My results indicate that both men and women view purchased land as relatively secure compared to inherited land. However, men and women differ considerably with respect to their expectations regarding their ability to use inherited land. Importantly, men and women appear to make very different land use decisions. Though the de jure law suggest these rights are equal, only 30 percent of women viewed their rights as secure compared to 80 percent of men. The information put forward in this thesis is critical to current policy efforts in Haiti which set out to assess and reform the existing land tenure system.
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This thesis is dedicated to the memory of my brother, Darren James Kelly, who has always pushed me and motivated me to be my best, now more than ever.

Frè mwen, kè mwen.
Chapter 1 – Introduction

The Food and Agriculture Organization (FAO) of the United Nations (UN) estimates that 75% of the world’s 1.2 billion extremely poor\(^1\) people reside in rural areas and largely depend on agriculture, forestry, fisheries, and related activities for survival (Anriquez and Stamoulis, 2007). Development experts commonly cite land tenure\(^2\) insecurity as a key constraint – sometimes the key constraint – to agricultural intensification and rural development (Smucker, White, and Banister, 2000; Arnot, Luckert, and Boxall, 2011). De Soto (2000), among others, argues that the slow pace of economic development in many low-income countries can be largely attributed to poorly documented and insecure property rights to resources, particularly land.

Secure, inalienable, and transferable property rights have long been associated with efficient resource use. In fact, in 1776 Adam Smith voiced concern over the possibility that fears of expropriation or loss of control may deter individuals from investing in their land. In a review of the recent literature on tenure security, Arnot et al (2011) concludes that secure property rights incentivize long-term investment and in some cases have been shown to increase the efficient management of natural resources. Yet, they argue that there is a great deal of variation in how tenure security is defined and measured. Bubb (2013) contends that the definition of tenure security is multi-dimensional in many countries because of the overlapping legal and customary institutions that exist.

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\(^1\) The World Bank (2014) defines extreme poverty as those living on less than $1.25 per day, adjusted for purchasing power parity at 2005 prices.

\(^2\) The FAO (2002) defines land tenure as “the relationship, whether legally or customarily defined, among people, as individuals or groups, with respect to land. Land tenure is an institution, i.e., rules invented by societies to regulate behaviour. Rules of tenure define how property rights to land are to be allocated within societies. They define how access is granted to rights to use, control, and transfer land, as well as associated responsibilities and restraints.”
The recognition that tenure insecurity is constraining development, particularly in the agricultural sector, has led many governments to pursue land tenure reform. Land tenure reform can take many forms and does not have a single definition. This study is primarily concerned with those land reforms that seek to improve tenure security by documenting and formalizing land ownership. This process often involves the distribution of formal land titles, as well as the documentation and clarification of land rights (Aldashev, Chaara, Platteau, and Wahhaj, 2012). Galiani and Schargrodsky (2011) argue that “well-defined property rights fundamentally improve resource allocation and increase investment in a given society by limiting expropriation and facilitating market transactions” (Page S329). Yet, there are countless modern examples of land tenure reforms failing and in some cases actually eroding tenure security\(^3\). Consequently, the debate on the efficacy of land tenure reform continues.

In 2012, the Government of Haiti announced the launching of national land reforms (“Laurent Lamothe officially launches,” 2012). In the announcement, the Prime Minister of Haiti, Laurent Lamothe, argued that Haiti suffers from what he termed ‘land disorder’ and that the current land tenure system is a barrier to economic development in the country. The dysfunction of Haiti’s land tenure system became especially apparent after the catastrophic earthquake of 2010, when rebuilding efforts were curtailed by land disputes (Ferreira, 2013). There are three stated objectives of these reforms: to improve the identification of legal landowners, which will improve the resolution of land disputes; to increase access to credit and mortgages, which will facilitate the growth of business and industry; and to improve tenure security which will improve environmental protection and rural development.

\(^3\) See, among others Platteau, 1992.
This study provides an empirically based description of land tenure in a rural area of central Haiti and empirically examines the consequences of land tenure security on farm level investment decisions. This research is done within the context of Haiti’s current land reforms. Critically, I examine landowner perceptions of tenure security and assess whether these perceptions align with the legal definition of tenure security. I pay particular attention to gender differences in these perceptions. Furthermore, the issue of inheritance has not been properly addressed in the literature and appears to be a significant factor in the rural land tenure system. The last study to examine land tenure in Haiti was Smucker et al (2000), but their study only reviewed past literature and did not sufficiently address the issues of gender or inheritance.

In order to quantitatively assess these issues, I developed a randomly sampled, door-to-door survey that addresses questions of landownership, land use, property rights, land disputes, documentation, and demographics. A copy of the survey is available in Appendix A. Between July and December 2013, I conducted this survey in a remote region of central Haiti. Specifically, this area is referred to as the 4th Section (Aguahedionde) of the Commune of Hinche of the Central Department. This area lies in-between the larger urban areas of Pignon, Hinche, and Maïssade. Figure 1 provides a map of Haiti with the research site identified. The survey approach generated one-hundred and fifty-two responses from ninety-eight households in eight localités4. The survey provides data that allows for an empirical analysis of the relation between a number of covariates – including gender and land tenure – and land investment decisions. Also, using this data I am able to critically analyze landowner perceptions of tenure security. The information put forward in this study is relevant for current policy efforts in Haiti which set out

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4 A localité is the lowest administrative division in Haiti. A localité is equivalent to a village and can consist of several to several hundred households.
to assess and reform the existing land tenure system. Importantly, the Canadian and American Governments are major partners with the Haitian Government in this land reform process.

1.1 Purpose and Objectives

Currently, the Haitian Government, in collaboration with its international partners, has prioritized national land reforms. Improved landowner identification, increased access to credit, and better environmental protection were cited as the intended outcomes of these reforms. Nevertheless, there is limited information on the influence of customary arrangements, gender, or inheritance on land use. The purpose of this study is to empirically examine customary landownership practices and the importance of gender and inheritance in a rural area of central Haiti. More specifically, the objectives of this study are:

1) To characterize land tenure in the 4th Section of Hinche, with a particular focus on inherited land and gender

2) To compare landowner perceptions of tenure security and determine whether these perceptions vary by gender or the mode of land acquisition

3) To assess the influence of formal and informal documentation on land use decisions

4) To understand whether the adoption of specific agricultural practices (land terracing, land fallowing, and agroforestry) varies by gender or land tenure

1.2 Thesis Organization

The remainder of this thesis is organized as follows. Chapter 2 provides a brief background on Haiti and some of the conditions faced by rural landowners. This chapter considers the current

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5 Gender is defined in the Oxford Dictionary as “the state of being male or female (typically used with reference to social and cultural differences rather than biological ones).”
situation of land ownership in Haiti, within the context of Haiti’s social, environmental, economic, and political realities. The legal and customary systems of land tenure will be characterized and contrasted. Specific attention will be paid to the importance of inheritance. In addition, past research on land ownership and land use in Haiti will be reviewed in order to better position the current research within the existing literature on land issues in Haiti.

Chapter 3 discusses the key literature that motivates the objectives of this research. This chapter reviews literature on the importance of tenure security and the varying theoretical and empirical definitions employed in the literature. In addition, the importance of property rights and the distinction between de jure and de facto rights is presented in this chapter. Finally this chapter reviews literature that addresses gender inequality in land rights and the role of land reform. Chapter 4 presents and develops a theory to explain the adoption of long-term agricultural investments using a two period mathematical model. This conceptual framework is then used to generate a hypothesis regarding the influence of tenure status on farm-level investments.

The survey instrument and sampling method used to gather data for this study are described in Chapter 5. Chapter 6 provides a descriptive view of land ownership in the area of rural Haiti where the data for this study was collected. In addition, an empirical model is developed to test the hypothesis developed in the previous chapter. A variety of model specifications are explored and a discussion of the costs and benefits of each is provided.

Chapter 7 presents the regression results from the empirical model. A discussion is presented on the statistically significant factors that influence the adoption of the different agricultural techniques examined in this research. The final chapter provides a summary of the
thesis and presents some of the policy implications of this research. In addition, the limitations of
this study and future areas of research are identified in this chapter.
Figure 1: Map of Haiti with Modern Administrative Divisions and Research Site Identified

Chapter 2 – Rural Land Tenure in Haiti

The Republic of Haiti\(^6\) is considered to be the poorest nation in the western hemisphere (United States Agency of International Development [USAID], 2010), although this was not always the case. The country was first discovered by Columbus in 1492, but was ceded to France in 1697. France deforested large areas of the country and developed the land into sugar plantations using thousands of slaves from Africa. In the 1700’s Haiti was the wealthiest colony in the Caribbean because of the lucrative sugar and lumber industries (Sepinwall, 2013). In the late 18\(^{th}\) century, Haiti’s nearly half million slaves revolted against their colonial oppressors. This culminated in Haiti becoming the first post-colonial slave-led nation in the world, declaring its independence in 1804. Still, the excitement of the revolution was short lived as the realities of a highly stratified, economically underdeveloped, and environmentally damaged society became apparent. Constant political turmoil and recurrent natural disasters have limited the economic potential of Haiti for well over 100 years. (Sepinwall, 2013).

The extractive policies implemented initially by France, and continued by the Haitian population have resulted in widespread deforestation and environmental degradation in most areas of the country. According to the World Bank (2011), only 3.6% of Haiti’s land area is forested. The bareness of Haiti’s steep terrain perpetuates the continual loss of fertile soil into the country’s rivers and oceans, damaging the country’s fisheries in the process. The poor quality of Haiti’s soil continues to limit the country’s ability to achieve food security and economic development. Still, the country has managed a relative peace since 2004, when the democratically elected President, Jean Bertrand Aristide, was deposed in a coup (Fatton Jr.,

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\(^6\) The Republic of Haiti is the official name of the country, but for the remainder of this thesis Haiti will be used.
2013). In the last decade, the Haitian Government has begun rebuilding key infrastructure and improving the services provided to the population.

Despite the progress made over the last decade, Haiti’s institutions remain weak. Eighty percent of the population lives below the poverty line and over half of the Government’s annual budget is supplied by foreign donors (Central Intelligence Agency [CIA], 2014). In general, the government lacks the capacity to enforce the rule of law and is unable to provide core services to most of the population. This was exasperated by a catastrophic earthquake in January 2010, which killed an estimated 300,000 people and left over one and a half million others displaced and homeless (CIA, 2014). Outside of certain zones in key urban areas, the Government has only limited influence on daily life. The inadequacy of the government’s authority is particularly apparent in the rural areas, especially in the capacity of land administration.

Currently, no comprehensive land tenure system exists in Haiti. The National Cadastral\(^7\) Office (ONACA) has mapped approximately five percent of the country and it is estimated that the vast majority (approximately 95\%) of rural land transactions are completed without regard to formal legal procedures or requirements (INARA\(^8\), 1997). The Government, in collaboration with its international partners, has identified modernizing and formalizing of the land tenure system as a priority (“Laurent Lamothe officially launches,” 2012). There are three stated objectives of these land reforms: to improve the identification of legal landowners, which will improve the resolution of land disputes; to increase access to credit and mortgages, which will

\(^7\) The term cadastre refers to a comprehensive registry of a countries land. Information on ownership, tenure, location (GPS), size, dimensions, and value may be included in a cadastre. Cadastres are used around the world and often in conjunction with other records systems, such as a land title registry.

\(^8\) INARA refers to the Institut National de la Réforme Agraire or the National Institute for Agrarian Reform. This institute is the primary government agency concerned with reforming the countries land tenure system.
facilitate the growth of business and industry; and to improve tenure security which will improve environmental protection and rural development. Thus far, progress has been limited and customary systems continue to dominate in the rural areas.

2.1 Rural Land Tenure

This study focuses on landownership and land use in Haiti’s rural areas. I have omitted any significant discussion on urban land for the sake of simplicity and focus. In Haiti, the majority of rural land is owned by individuals who cultivate both food and cash crops on small, mostly hillside farms (Lundahl, 1983). Historically, peasant agriculture has been the country’s primary economic activity (Smucker et al., 2000), but this has been replaced in recent years by the service industry (CIA, 2013). Still, over 80% of the country’s land is used for agriculture, despite the fact that 63% is considered too steep for production (Library of Congress, 2006). Increased population pressures and poor land use planning have strained an already ill managed land tenure system, which has led to increased deforestation, soil erosion, and land conflict in most rural areas (Earth Institute, 2012). Consequently, agricultural productivity and rural development have stagnated across the country.

According to a fairly recent World Bank survey, conducted by Wiens and Sobrado (1998), the average Haitian farmer owns 1.7 hectares of land. It is common for this to consist of several non-contiguous parcels. Purchase and inheritance are the primary ways to obtain land in Haiti’s rural areas, although lease, rental, sharecropping, and usufruct arrangements are used as well (Smucker et al., 2000; Bloch, Lambert, and Singer, 1988). According to both the Haitian...
Civil Code\textsuperscript{9} and the Haitian Rural Code\textsuperscript{10}, men and women have equal rights to own, inherit, and use land, although there are a few small exceptions to this rule. Still, Murray (1977) and Smucker (1982) provide evidence that women have fewer and less secure rights to land, particularly when land is obtained through inheritance.

2.2 Customary vs Legal Land Tenure

The limited capacity of the Haitian Government, as well as the cost and complexity of the legal system have led to the emergence of customary systems of land tenure. Therefore, in Haiti there exist two separate systems of land tenure – one statutory (legal) and one customary (Bloch \textit{et al}, 1988; Smucker \textit{et al}, 2000). Customary and legal property rights are referred to as \textit{de facto}\textsuperscript{11} and \textit{de jure}\textsuperscript{12} property rights, respectively. This distinction will be elaborated in the next chapter.

Customary systems originate from within a community of resource users and rely heavily on measures of social capital (Bruce and Migot-Adholla, 1994). In Haiti, these systems are largely governed from within the family (Smucker \textit{et al}, 2000). As such, they lack the documentation and registration requirements of the notarial-based legal system. Also, disputes and conflicts are handled within the family and may be influenced by social and familial biases (i.e. gender and age biases). Consequently, land owned based on customary arrangements is more prone to conflict, interference, and insecurity (Earth Institute, 2012).

\textsuperscript{9} The Haitian Civil Code is closely modeled on the French Napoleonic Civil Code and was first introduced in 1825 and is the principal source of property law in Haiti.
\textsuperscript{10} The Haitian Rural Code was first introduced in 1962 by François Duvalier and is strictly concerned with rural activities.
\textsuperscript{11} \textit{De jure} rights are property rights that exist because of formal law and are backed by a central authority. De jure is a Latin term meaning “concerning the law”.
\textsuperscript{12} \textit{De facto} rights are property rights that exist in practice but are not ordained by law. De facto is a Latin term meaning “concerning fact”.
In Haiti, the cost and complexity of enforcing legal rights excludes most peasant landowners. Smucker et al (2000) reports, consistent with my own observations, that most “peasant land transactions reflect skepticism of notaries, land surveyors, and virtually all agents of the state including the judiciary” (Page 7). Statutory (legal) land transactions rely heavily on documents prepared by notaries, surveyors, and the judiciary to prove ownership. Conversely, customary transactions rely on social and familial relationships, as well as privately drafted documents (Bloch et al, 1988). These informal documents lack the strength of law, but may still provide sufficient proof of ownership. These types of documents are particularly prevalent for inherited land because of the large discrepancy between the de jure and de facto rights for most inherited land.

Occasionally, peasant landowners will update title, but since rural landownership stems primarily from transactions that contradict the law they may be unwilling to incur the necessary costs of updating title (Smucker et al, 2000). In 1997, INARA released a study that estimated that 95 percent of rural land transactions avoid the formalities and documentation requirements prescribed by Haitian Law. Importantly, the avoidance of the legal system does not necessarily ensure insecurity. Smucker et al (2000) provides a useful summary of the dichotomy between the legal and customary systems: “in the Haitian context of legal pluralism, formal title is not necessarily more secure than informal arrangements, although it is demonstrably more expensive and considerably less flexible than the informal system” (Page 8).

2.3 The Complexities of Inheritance

Purchase and succession (inheritance) are the primary methods for obtaining land in rural Haiti, although lease, rental, sharecropping, and usufruct arrangements are common as well (Smucker
As previously mentioned, most Haitian peasants own several non-contiguous parcels of land. As such, it is common for a landowner to own land obtained from several sources (i.e. inheritance, purchase, lease, etc.). A further consideration is the granting of usufruct\textsuperscript{13} rights to children of living parents. Parents who are unable to work their entire land can grant these rights to their children for all or a part of their land (Bloch \textit{et al}, 1988). These rights are normally granted to older male children and may significantly impact the future division of inheritance. Technically, these rights terminate once the parents are deceased, but this may not always be the case.

Most rural areas of Haiti suffer from a severe cash scarcity and few economic opportunities exist outside of agriculture (CIA, 2014). Because of this young people face considerable barriers to purchasing land. As a result, inheritance is an important source of land in rural Haiti. Legal inheritance practices exist and are well documented in the Civil Code, but are mostly ignored in the rural areas in favour of locally developed customary systems (Smucker \textit{et al}, 2000). These customary inheritance practices allow for the redistribution of family land without the excessive costs of the legal system. Nevertheless, these customary systems have been directly influenced by the legal system and have largely maintained the egalitarian distribution of land prescribed in the Haitian Civil Code. I will first describe the legal system of inheritance.

In Haiti, it is common for someone to die without first drafting a will and testament (Bloch \textit{et al}, 1988). This is referred to as dying intestate or dying in a state of intestacy. The

\textsuperscript{13} Usufruct refers to the right to use and enjoy the fruits or profits of something belonging to another.
Haitian Civil Code stipulates that, in cases of intestate succession, all legitimate\textsuperscript{14} children inherit the entire estate equally and without regard to sex/gender or primogeniture\textsuperscript{15}. When an estate is largely cash this division is simple, but when an estate is mostly land this division can be very complicated.

When a single parcel of land is inherited by more than one person it results in a form of land ownership termed tenancy in common. In common tenancy, all owners hold an individual, but undivided interest in the whole property. Each owner’s right to use the whole property is subject to the rights of the other owners (Deaton, 2007). In other words, a single parcel of land has several owners whose interests overlap and whose decisions don’t necessarily align. An agreement must be reached by all of the owners before the land can be put to use. If an agreement is not reached, each owner has the right to exclude all other owners from using the land. Deaton (2007), in regards to common tenancy in a particularly poor area of rural Kentucky, states that “failure to reach an agreement may effectively lead to the land not being used at all as the incentive for one person to cultivate the land may be reduced by the right[s] of the other[s] to do the same” (Page 932).

According to Smucker \textit{et al} (2000), land ownership in Haiti is “firmly grounded in the concept of private property” (Page 6). In addition, Murray (1977) asserts that land in Haiti is rarely cropped in common. Yet, peasant landowners have few options for legally exiting common tenancy. Legal partitions, by sale or in kind, are the primary legal methods to exit common tenancy. Deaton (2007) explains that a “partition in kind physically divides the property

\textsuperscript{14} The Civil Code of Haiti makes a distinction between legitimate and illegitimate children. An illegitimate child refers to a child born outside of marriage who has not been formally recognized by the father.

\textsuperscript{15} Primogeniture is the right, by law or custom, of the firstborn male child to inherit the entire family estate.
into shares based on partial ownership interests, while a partition by sale forces the sale of the entire real estate and, subsequently distributes proceeds to each owner according to their partial interest” (Page 936). A partition by sale can be difficult to negotiate if one or more heirs intend to maintain their ownership or if the heirs are unable to find a suitable purchaser. A partition in kind requires a variety of legal and administrative steps that necessitate the services of lawyers, notaries, surveyors, and the judiciary (Earth Institute, 2012; Bloch et al, 1988). A formal partition in kind can take months and the cost can exceed the total value of the land. In order to avoid these costs and delays, rural landowners avoid the legal system and instead rely on customary arrangements to partition the land amongst heirs. After the land has been partitioned, each heir has an individualized parcel of land, but legally the land is still owned in common tenancy.

The ability to partition land extralegally has allowed peasant landowners to continue to use their land without being burdened by the requirements of the legal system. Importantly, there is evidence that once divided by custom these partial shares of land can be sold on local land markets, regardless of their legal status. Bloch et al (2000) argue that these customary divisions of land have led to a problem of fragmentation. Wan and Cheng (2001) discuss the issue of fragmentation in the Chinese agricultural sector. They find that land fragmentation has had a “detrimental, statistically significant, and substantial” effect on crop outputs in China (Page 183). Nevertheless, they argue that the potential improvements in economies of scale are too small to suggest radical land policy changes.

An important consideration of this research is to examine the customary system of land tenure and compare it to the legal system. As Smucker et al (2000) explain, the legal system does not necessarily guarantee tenure security and in fact the customary system may be superior.
Nevertheless, there may be consequences to ignoring the legal system and its requirements. According to a study by the Earth Institute (2012) on land conflict in Haiti, there is a higher frequency of conflict on land that lacks formal documentation and legal registration. They also identify inheritance as the primary source of disputes regarding land. The high frequency of disputes and the consistent lack of legal documentation on inherited land may produce a higher degree of tenure insecurity, compared to other sources of property. This insecurity may make landowners less willing to invest in land obtained through inheritance than land obtained through other means.

2.4 Land Investment in Rural Haiti

In Haiti, poor environmental management and pervasive deforestation has degraded the country’s soil overtime (Dolisca et al, 2007). This has led to widespread poverty and destitution in the rural areas. Because of this, the Haitian farmer must make constant trade-offs between agricultural production and soil management. Most rural areas in Haiti suffer from a severe scarcity of cash (Smucker et al, 2000). In the area where this study was conducted there was very little evidence of purchased agricultural inputs (seed, fertilizer, pesticides, etc.) being used. Farmers understand the importance of maintaining soil quality and fertility, but are constrained by a limited supply of readily accessible cash. Instead, most farmers engage in one or more labour intensive farm-level investments to avoid erosion, maintain soil quality, and ensure the productive capacity of their land for the future. These farm-level investments can also be referred to as conservation practices. In the area where this study was conducted, the primary conservation practices pursued by farmers were: land terracing, agroforestry, and land fallowing. Soil composting, or mulching, was also practiced but was not as prevalent.
2.4.1 Land Terracing

Murray (1980), in a report assessing soil conservation practices in Haiti, discusses the use of contour ridge land terracing as a method to limit soil erosion and increase water absorption on moderate to steeply sloped land. Other forms of land terracing are practiced in Haiti, such as bench terracing, but contour ridge terracing is the most prevalent and was the primary form of land terracing identified in my study area. The International Institute of Rural Reconstruction (IIRR) (2006) defines contour ridge terraces as ridges of soil, stone, or waste materials that run along the land contour, with the purpose of slowing down the flow of water and increasing the retention of sediment before it is washed away. Murray (1980) explains that, in Haiti, these contour ridges take the form of a “constantly-descending ‘S’ – like structure in which the crops [are] placed at the higher outside loop” (Page 13). Therefore, these contour ridges require a trade-off with crop production. Contour ridge terracing is less costly than formal bench terraces but still effective for soil and water conservation (Murray, 1980). Importantly, land terracing is primarily a long term investment, with the majority of benefits accruing in the future. See Appendix B for a visual representation of contour ridge terracing.

2.4.2 Agroforestry

Today, Haiti’s forest cover stands at only 3.6% of total land area (World Bank, 2011). Still, trees and forests are an important source of food, building materials, and cooking fuel. Importantly, 85% of the Haitian population depends on firewood and charcoal for cooking and heating, resulting in approximately 3.3 million m³ of fuelwood used in Haiti per year (Centre de Formation et d’Encadrement Technique [CFET], 1997). Landowners also plant trees to limit erosion and maintain soil quality (Dolisca et al, 2007). During my time in Haiti it became
increasingly clear that rural landowners were acutely aware of the importance of planting trees. Yet, many claimed that they were unwilling to invest significant time into reforesting their land because of concerns that someone would take their land or cut down their trees. Most rural landowners in Haiti can be seen to have some mix of forest and crop production on their land. As important as reforestation is for most rural landowners, it still requires a trade-off with crop production because you can’t plant crops or graze animals where trees have been planted. Planting trees is a long-term investment, with the majority of benefits accruing in the future.

2.4.3 Land Fallowing

According to Goldstein and Udry (2008), a significant portion of land in developing countries is farmed under shifting cultivation. In many of these countries, fallowing continues to be the primary investment in land productivity. In Haiti, most landowners are constantly shifting their land between crop, grazing, forestry, and fallowing purposes (Bloch et al., 1988). The FAO (2014) defines fallow land as the cultivated land that is not seeded for one or more growing seasons; fallowing is done to maintain soil quality. In my study area, the majority of landowners who fallowed their land did so for one to three years. Yet, a primary concern when fallowing is that someone may attempt to take the land during the fallow period. In fact, Goldstein and Udry (2008) used the number of years that a farmer fallowed their land as an indication of their perceived tenure security. Similar to the previously discussed agricultural investments, the benefits of fallowing accrue in the future. Therefore, fallowing is a long-term investment.

2.5 A Review of Past Literature on Land Tenure in Haiti

Considering Haiti’s proximity to North America, the country suffers from a lack of recent academic research, particularly by the economics discipline. Nevertheless, there exists a small
group of dedicated academics who have greatly contributed to the study of land issues in Haiti. Between 1994 and 1996, USAID funded an agricultural study in Haiti called the Baseline Survey. This was a national survey on food security that addressed questions of land tenure, technology adoption, inputs, production, demography, and nutrition. This study covered 4,026 households across the country. In 1998, two researchers from the World Bank, Wiens and Sobrado, analyzed the data set in an effort to better understand the nature of rural agriculture and poverty in Haiti. Their study highlighted a number of important findings, most relevant of which was the fact that tenure was not generally a constraint on technology adoption, agricultural production, or increases in income.

Wiens and Sobrado (1998) provide one of the only studies to address Haitian land tenure at the national scale. A number of other studies have used more localized data collected from one or more communities. One of the most relevant studies is Smucker (1988) which uses six community studies to assess the factors influencing landowners’ decisions to plant tree seedlings provided by a government project. This study found that peasants preferred to plant on purchased and legally divided inheritance land compared to undivided inheritance land, sharecropped land, and rented land. A related study, Conway (1986), argued that planting trees on undivided land was a strategy to enhance individual claims of ownership on land inherited in common tenancy.

More recently, the Earth Institute (2012) out of Columbia University has worked with the Haitian Government and the United Nations Environment Program (UNEP) to assess the country’s land tenure system. They have focused their efforts on the dispute resolution mechanisms, both legal and customary, that currently exist in the country. They provide useful background information and qualitative results but few verifiable conclusions are presented. Dolisca et al (2007) analyze the causes of deforestation in Haiti and conclude that tenure
insecurity is a factor influencing premature deforestation. Yet, they find income and education constraints to be the primary factors influencing deforestation.

Two other specific studies should be discussed: Smucker *et al* (2000) and Bloch *et al* (1988). Smucker *et al* (2000) review the literature on tenure security and technology adoption in Haiti. Many of the past studies addressing land in Haiti were commissioned by governments and large organizations and these reports can be difficult to locate. Smucker *et al* (2000) provides a very clear summary of many of these projects and develops his arguments within the context of land tenure reform in Haiti. Bloch *et al* (1988) is a lengthy, but fairly comprehensive study of land tenure in rural Haiti. The study was conducted by a team of researchers at the Land Tenure Center at the University of Wisconsin Madison. This study provides an overview of the legal framework of Haiti’s land tenure system and addresses the dissimilarities with the customary system. A wide range of summary statistics is presented in an effort to characterize land tenure in Haiti and illuminate key issues.

Both Smucker *et al* (2000) and Bloch *et al* (1988) focus on similar questions: is a cadaster justified? should the government invest in improving the legal system of land tenure? and is the customary system sufficient? Both studies argue that, at present, the decentralized and largely informal customary system of land tenure is sufficient and the government should invest in other areas before engaging in a cadastral survey. This argument is tempered by an important observation – the current system is adequate for the largely subsistence and low-technology agriculture that is prevalent in Haiti. If the agricultural sector develops beyond a subsistence level, the current system will likely prove highly inadequate. Bloch *et al* (1988) points out that past attempts at developing cadasters in Haiti have been focused in the most agriculturally productive regions of the country, the Artibonite valley and the Gonaïves plain.
2.6 Conclusion

Haiti is a complex country. Its history, culture, and language set it apart from the other countries in the Caribbean and Latin American region. Considered to be the ‘Pearl of the Antilles’, in the 1700s, Haiti has never again lived up to this moniker (Sepinwall, 2013). Since gaining independence in 1804, Haiti has been unable to achieve any lasting improvements in economic development. Insecurity caused by an ineffective land tenure system has been identified as a primary constraint to economic and agricultural development. In 2012, the Haitian government announced the prioritization of national land reforms (“Laurent Lamothe officially launches,” 2012).

To date, scholarship on land in Haiti has not directly addressed the issue of inheritance. Also, I have been unable to identify any significant discussion on gender differences in land rights and land use. This thesis will provide a modern characterization of land tenure in a rural area of central Haiti, while also addressing the complexities of inheritance and the importance of gender. The next chapter will review the literature pertaining to tenure security. In addition, I discuss how the structure of property rights can influence resource use decisions and tenure security. I also analyze the issue of gender inequality in land rights. I finish the chapter with a discussion on the role of land reform in developing countries.

Chapter 3 – Review of the Literature on Tenure Security and Land Use

This chapter is concerned with understanding how secure tenure influences the use and management of a resource (i.e. land). First, I review the economics literature pertaining to the concept and importance of tenure security. This leads to a discussion on the differences between legal and customary tenure security. In addition, I discuss the significance of both formal and
informal documents attesting to land ownership. I then present several empirically based definitions of tenure security and discuss the contention surrounding these definitions. Following this, I pay particular attention to how property rights influence resource use. I present a conceptual approach to characterizing the structure of rights for a given resource and examine how the incentives for a resource change based on the structure of rights. Within this discussion, I elaborate on the distinction between *de jure* and *de facto* property rights. Afterwards, I present literature that examines the consequences of gender inequality in property rights and I discuss the implications of gender differentiated perceptions of tenure security. Finally, I review literature that discusses the efficacy of land tenure reform as a pathway to improving tenure security and increasing investment.

### 3.1 The Importance of Tenure Security

Security of property rights, or tenure, is considered a central component of economic development (Arnot, Luckert, and Boxall, 2011). Several recent studies demonstrate this relationship (Scully, 1988; Leblang, 1996; de Soto, 2000; Acemoglu, Johnson, and Robinson, 2002; Landau 2003; Kerekes and Williamson, 2008). More specifically, the literature shows that secure tenure incentivizes investment and promotes efficient resource use. Several recent studies focused on resource issues in developing countries have found that tenure security positively influences the sustainable management of a variety of natural resources, such as: forests (Owubah, Le Master, Bowker, and Lee, 2001), water (Kabubo-Mariara, Mwabu, and Kimuyu, 2006), and soil (Li, Rozelle, and Brandt, 1998). Nevertheless, the literature has failed to produce consistent results in regards to the effect of tenure security on investment and resource

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16 Following Arnot *et al* (2011), the terms tenure and property rights will be used interchangeably.
management. Arnot et al (2011) argue that the lack of a consistent definition of tenure security may explain some of the difficulties that empirical studies have had in linking tenure security with economic behavior (i.e. investment and resource management). Importantly, the definition of tenure security is dependent on the land tenure institutions that exist, both legal and customary.

### 3.1.1 Legal and Customary Tenure Security

In countries where there exist both legal and customary systems of land tenure, the definition of tenure security may be multi-dimensional (Bubb, 2013). Formal tenure security is associated with legal court-prepared documents confirming ownership (land titles/deeds, purchase contracts, land registration documents). Conversely, customary tenure security results from acceptance by the local community and may not be associated with any form of documentation (Stanfield, Murtazashvili, Safar, and Salam, 2013). Toulmin (2006), in reference to land tenure security in sub-Saharan Africa, argues that tenure security results from two key elements: “the rights being claimed must be seen, first, as legitimate by the local population; and second, they must also be ascribed legality by the state” (Page 4). Yet, in countries where the rule of law is not well enforced, such as in Haiti, legal tenure security may be of less importance than local acceptance and legitimacy.

Customary, or informal, tenure security does not necessitate documentation (Stanfield, et al, 2013). Legal documents may improve customary tenure security in some cases, but the absence of formal documentation does not ensure insecurity. Nevertheless, in some situations informal documents and contracts may be drafted between private parties in an attempt to secure ownership, without incurring the significant costs of formalization. In Afghanistan, Stanfield et
al (2013) observe that “informal transactions, mediated by respected community leaders, are the primary mechanism through which individuals secure tenure rights” (Page 267). The authors further explain that many of these informal transactions involve privately drafted customary deeds, transfer documents, and contracts that are witnessed by respected members of the community but never recorded in any government office. In countries where the rule of law is deficient, such as Haiti and Afghanistan, these informal documents are a less costly alternative to formalized legal documents. Williamson and Kerekes (2011) argue that informal institutions are the underlying channels that establish secure property rights to resources. They contend that the current trend in many developing countries towards land tenure formalization overstates the importance of formal institutions and understates the value of customary institutions.

3.1.2 Empirically Based Definitions of Tenure Security

Tenure security is frequently associated with a clear and legal land title, but this definition proves insufficient when legal institutions are less than perfect. In these situations, a focus on property rights is superior. Bruce et al (1994), in a book on land tenure security in Africa, argue that there are three components to tenure security – the breadth of rights, the duration of rights, and the assurances of rights. The breadth of rights refers to which property rights the resource user has, the duration of these rights refers to the length of time each right exists, and the assurances of these rights refers to the risk of losing each right. Sjaastad and Bromley (2000) provide a critique of this definition in claiming that tenure security should be solely determined by the certainty (assurances) of rights. They claim that including the duration and breadth of rights as determinants of tenure security confounds the ability of researchers to clearly investigate the issue. Sjaastad and Bromley (2000) admit that the breadth and duration of rights can influence resource use in a similar way as the certainty of rights, but should not be included in the
definition of tenure security. They claim that focusing solely on the certainty of property rights is a clearer approach to understanding and empirically investigating tenure security.

Empirical studies following Sjaastad and Bromley’s (2000) approach have used concepts such as perceptions of tenure security (Benin et al, 2005), freedom from outside imposition/interference (Braselle, Gaspart, and Platteau, 2002), estimated risk of expropriation (Jacoby, Li, and Rozelle, 2002), and tenure type (Carter and Olinto, 2003) to measure tenure security. Conversely, a number of studies have focused on property rights, specifically the transferability of rights, as the primary factor determining tenure security (Kabubo-Mariara et al, 2006; Hayez, Roth, and Zepeda, 1997; Place and Hazell, 1993). Sjaastad and Bromley (2000) admit that these contrary definitions are highly correlated in many situations. Tenure security is a primary factor influencing resource use and the certainty of property rights is the clearest definition of tenure security. Yet, I disagree with Sjaastad and Bromley (2000) that tenure security should be solely determined by the certainty of rights. The structure of property rights (the breadth and duration of rights) has also been shown to incentivize investment in a resource and should be investigated alongside the certainty of rights.

3.2 The Structure of Property Rights

Property rights are a critical institution in almost every society, modern and historical. Menger (1976) argues that property rights exist because of the disparity between the available quantities of goods and the requirements of men. In other words, property rights exist because of scarcity. This scarcity creates incentives to protect and invest in the resources that you can maintain control over. For example, a landowner who has the right to use their land as they see fit and
feels secure in their right to do so will be more willing to invest because they are more certain that they can recoup their investments in the future.

Alchian and Demsetz (1973) is one of the most influential articles ever written on property rights. The authors provide a framework for analyzing issues of property rights and discuss the transaction costs associated with different property right structures. They focus on two primary components of the structure of rights: which rights exist and who owns those rights. The property rights that exist for a given resource determine the limits of how that resource can be used. For example, a landowner may have the right to cultivate his land, but no one, or perhaps only the government, may have the right to extract minerals from the land. Importantly, the duration of rights is not discussed in any significant way in Alchian and Demsetz (1973). The duration of rights is more relevant when comparing ownership with tenancy, since tenancy arrangements exist for a specific period of time and ownership is normally continuous.

Alchian and Demsetz (1973) provide a clear explanation of property rights and their significance in society. Yet, in order to make comparisons between resource users a more functional framework is needed. Ostrom and Schlager (1992) produce a hierarchical schema for distinguishing between diverse bundles of rights held by users of a resource. Their model defines the bundle of rights and breaks it down into five key property rights – access, withdrawal, management, exclusion, and alienation. They are defined as follows:
Table 1: Definitions of Property Rights

<table>
<thead>
<tr>
<th>Access</th>
<th>The right to enter a defined physical property.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdrawal</td>
<td>The right to extract benefits from a resource.</td>
</tr>
<tr>
<td>Management</td>
<td>The right to regulate internal use patterns and transform the resource by making improvements.</td>
</tr>
<tr>
<td>Exclusion</td>
<td>The right to determine who will have an access right, and how that right may be transferred.</td>
</tr>
<tr>
<td>Alienation</td>
<td>The right to sell, lease, or transfer rights to a resource.</td>
</tr>
</tbody>
</table>

Source: Ostrom and Schlager (1992)

Ostrom and Schlager (1992) argue that these five property rights are strictly hierarchical. In other words, a resource user cannot have alienation rights without first having exclusion rights. While this may hold in many situations, I do not believe that this assumption is universally correct. For example, a person who has purchased or has been granted the right to log forest land owned by a government may have the right to alienate their rights to another party but they may have to accept the government’s rules and regulations regarding forestry practices. In this example the individual would have alienation rights without management rights. Therefore, the assumption made by Ostrom and Schlager (1992) that these five rights are strictly hierarchical is not a valid assumption in all cases.

Ostrom and Schlager (1992) classify access and withdrawal rights as operational level, whereas they classify management, exclusion, and alienation rights as collective choice level. Operational level rights allow an owner to use a resource for everyday activities (such as planting and harvesting agricultural products), whereas collective choice rights allow an owner to decide how the resource should be used now and in the future (Ostrom and Schlager, 1992). According to Ostrom and Schlager (1992), collective choice rights, specifically exclusion and alienation rights, produce strong incentives to invest in a resource. Using these five rights – access, withdrawal, management, exclusion, and alienation – Ostrom and Schlager (1992)
present a hierarchy of four ownership classes that relate to different bundles of property rights.

These ownership classes are defined in Table 2.

<table>
<thead>
<tr>
<th>Table 2: Breakdown of Ownership Classes by Property Rights Bundle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access and Withdrawal</strong></td>
</tr>
<tr>
<td>Management</td>
</tr>
<tr>
<td>Exclusion</td>
</tr>
<tr>
<td>Alienation</td>
</tr>
</tbody>
</table>

*Source: Ostrom and Schlager (1992)*

Importantly, these four ownership classes require the assumption that the five property rights are hierarchical. Nevertheless, there analysis is still relevant to this thesis without this assumption.

Ostrom and Schlager (1992) contend that owners have the greatest incentive to invest in a resource because of their complete bundle of rights. Still, they do not find that owners are the only resource users making long-term investments. This is a critical argument of their study.

According to Ostrom and Schlager (1992), individuals with less than complete sets of rights and less than complete tenure security can still be seen making long-term investments.

A final component of the bundle of rights, is the identification of the ownership structure (i.e. who owns each property right). For a given resource, some rights may be privately owned, some may be owned by a group, some may be owned by the government, and some may be available on a first-come-first-serve basis (open access). Different property rights regimes will have different structures of ownership. Bromley (1989) contends that a poor understanding of property arrangements has led policy makers to condemn property regimes that don’t closely resemble private ownership (i.e. complete bundle of rights). Ostrom and Schlager (1992) support this claim by arguing that there is ample evidence of resource degradation by private owners and there are numerous cases of efficient use of common property resources. A clearer understanding of the structure of rights should be pursued before condemning less-than private property
regimes as inefficient. Importantly, the legal, or *de jure*, structure of rights may vary considerably from the customary, or *de facto*, structure of rights.

3.2.1 *De jure* and *De facto* Rights

Ostrom and Schlager (1992) also discuss the distinction between *de jure* and *de facto* rights. *De jure* rights are legally recognized rights that are enforced by a government. Conversely, *de facto* rights originate from within a group of resource users and are not recognized or enforced by a government. Customary ownership leads to *de facto* rights, whereas legal ownership leads to *de jure* rights, although this distinction is not always so clear. Importantly, *de jure* rights are not necessarily more secure than *de facto* rights. In Haiti, Smucker *et al* (2000) argues that the legal system is more expensive and complicated than the customary system, but not always more secure.

The lack of a statutory enforcement mechanism may make *de facto* rights less secure than *de jure* rights, but this may also make *de facto* rights more adaptable and less rigid (Alston, Harris, and Mueller, 2009). When properly organized, groups of resource users who have developed *de facto* rights may act as if they have *de jure* rights by enforcing these rights amongst themselves (Ostrom and Schlager, 1992). Therefore, in some situations, properly enforced *de facto* rights can offer tenure security in the absence of *de jure* law. Also, if a government decides to legitimize and enforce *de facto* rights they become *de jure* rights, which is what happened with homesteading rights on the American frontier in the 19th century (de Soto, 2003). Importantly, the structure of rights for a resource may consist of an assortment of *de jure* and *de facto* rights which may “overlap, complement, or even conflict with one another” (Ostrom and Schlager, 1992, Page 254).
Customary, or *de facto*, rights emerge because of the incongruence of *de jure* rights with the needs and desires of resource users (Alston *et al.*, 2009). In other words, resource users are constrained by *de jure* law and choose to operate under a more flexible set of customary institutions. Davis and North (1971) argue that market forces, or the demand for profit, can erode existing property rights institutions that are unable to respond to new economic opportunities. This explains the prevalence of customary land rights in most developing and post-Soviet countries. Ostrom and Schlager (1992) argue that *de facto* rights can be more locally appropriate than *de jure* rights and may lead to more efficient resource use. Yet, the decentralized nature of *de facto* rights may allow for certain groups to maintain control and influence the division of property and the rules governing its use for their own benefit.

### 3.3 Gender Inequality in Rights

In an article discussing male dominance of property, Braunstein and Folbre (2011) claim that Becker’s (1991) argument for natural altruism within the family has discouraged the consideration of problems of efficiency or distributional inequality within the household because the household is seen as a unitary agent. Braunstein and Folbre (2011) argue that gender inequality in property rights to resources owned within the family is common in most countries, even when women have perfect legal equality with men. Therefore, in countries where equal *de jure* rights to resources are guaranteed by law, women may still lag in terms of *de facto* rights. Importantly, this gender inequality usually benefits the male members of the household (brothers, fathers, husbands, uncles, etc.) at the expense of the female members. Rittich (2005) argues that this disparity in rights may translate into a sense of insecurity and uncertainty. It has been hypothesized that this inequality results in women being less willing to undertake
investments on their land. Also, this inequality may contribute to the comparatively lower economic standing of women in many developing countries (Deere and Leon, 2003).

There are two primary components of this inequality. First, in most countries of the world, women own and have access to less land than men (Deere and Leon, 2003). This is often attributed to laws and social or familial norms that view women as dependents to the men of their family (husband, father, brothers, uncles, etc.). Second, women often have less secure rights than men and may be restricted from exercising certain rights (Meinzen-Dick, Brown, Feldstein, and Quisumbing, 1997). Therefore, not only do women have less physical access to land, but they are constrained in their ability to use the land that they already own. This thesis is more concerned with disparities in property rights and perceptions of security than disparities in the quantity of land owned.

Many academics who study gender judge this disparity in rights on grounds of fairness, but this overlooks the importance of efficiency. Insecure property rights may discourage investment, resulting in less efficient resource use. In her critical look at gender inequality in land rights in South Asia, Agarwal (1994) argues for equality in land rights on the basis of welfare, efficiency, and empowerment. Meinzen-Dick et al (1997) argue that these arguments are beginning to resonate in the thinking and practices of international agencies. For example, the 2001 Rural Poverty Report released by the International Fund for Agricultural Development (IFAD) states that “reducing barriers to women’s control of rural assets, especially land, is crucial for policy against poverty” (IFAD, 2001, Page 85). In many countries, Haiti included, women own large quantities of land but are unable to fully utilize their land because of the constraints levied against them. Land reform has the ability to enforce women’s land rights, but
more often than not land reforms ignore women’s claims of ownership and further deteriorate their economic capacity (Agarwal, 1994).

3.4 Can Land Reform Promote Tenure Security?

Land tenure reform is frequently promoted as an effective strategy to improve tenure security and stimulate economic development in low-income countries (Sikor and Müller, 2009; Besley and Burgess, 2000; Bromley, 1989). Yet, there are a variety of ways to approach land reform, each serving different objectives. For example, many post-communist countries in Asia and Eastern-Europe have focused on shifting ownership from state or collective units to individuals; governments across Asia, Africa, and Latin America have concentrated on formalizing customary rights by issuing formal titles to landowners; and some policy makers in Africa and Latin America have prioritized transferring ownership from large, wealthy landowners to poor and landless people (Sikor and Müller, 2009). Besley and Burgess (2000) argue that the majority of land reforms in developing countries are intended to improve the poor’s access to land, although this objective is often “hindered by political constraints on implementation” (Page 389).

This thesis is primarily concerned with those types of land reforms involving the formalization and registration of customary rights to land, such as those being proposed in Haiti. According to Sikor and Müller (2009), these reform efforts are often top-down, state led initiatives that operate on the assumption that customary arrangements do not provide the necessary tenure security for agricultural investments and increased land productivity. Yet, Place (2009) provides evidence that state-led reforms are often unsuccessful and he argues that the assumption of customary insecurity is unfounded. Interestingly, Sikor and Müller (2009) argue that state-led formalization efforts may actually be a source of tenure insecurity in some cases.
Also, this insecurity may disproportionately affect women. Agarwal (1994) argues that formalization efforts in India have distributed land rights to (typically male) heads of poor and landless households, neglecting the legitimate claims of women, particularly single, widowed, and divorced women. Through these and similar practices, land reforms may enforce long-standing social biases against minorities, women, and youth (Agarwal, 1994).

Land reforms require significant modifications to the existing judicial and legal institutions governing land (Sikor and Müller, 2009). Consequently, land reform requires a comprehensive understanding of a country’s existing institutions, both legal and customary. Yet, according to Place (2009), many governments pursue land reforms without a complete understanding of these divergent institutions. Land reforms have the ability to improve tenure security, facilitate the availability of credit, reduce conflict, and encourage economic development. Still, many land reforms fail to deliver on these objectives. Therefore, while land reform is an effective tool, it should be approached with caution.

3.5 Conclusion

This chapter has reviewed several important areas of the economic literature on security of land tenure. Primarily, this chapter was concerned with understanding how secure tenure influences the use and management of a resource (i.e. land). I reviewed the economics literature pertaining to the concept and importance of tenure security and focused on the distinction between tenure security and the structure of property rights for a resource. Importantly, I addressed both legal and customary definitions of tenure security and property rights. In addition, I discussed the use of both formal and informal land documents as measures of proof of property ownership. Afterwards, I presented literature that examines the consequences of gender inequality in
property rights and I discussed the implications of gender differentiated perceptions of tenure security. Finally, I reviewed literature that discusses the efficacy of land reform as a pathway to improving tenure security and increasing investment. The following chapter will develop the theory and conceptual framework I use to assess the influence of tenure security on the adoption of farm-level investments.

**Chapter 4 - Conceptual Framework**

This chapter will develop and present the conceptual model that will be used to assess the influence of tenure security on the adoption of farm-level investments. This model is specific to farm-level investments that help to maintain or improve soil quality. These farm-level investments can also be referred to as conservation practices or conservation investments. This model is relevant to all three farm-level investments discussed in this thesis – land terracing, land fallowing, and agroforestry.

**4.1 Conceptual Model**

Besley (1995) and Soule, Tegene, and Wiebe (2000) provide theoretical models to test the hypothesis that owners with greater tenure security are more likely to invest in their land when the benefits occur in the future. Importantly, the model provided by Soule et al (2000) is specific to conservation investments that improve soil quality in the future period. With the help of Dr. James Atsu Amegashie\textsuperscript{17}, I have modified these existing models to help explain the influence of tenure security on the adoption of conservation activities.

\textsuperscript{17} The development of this model benefited greatly from the guidance of Dr. James Atsu Amegashie. Dr. Amegashie developed this model and allowed me to use it for the purposes of my thesis.
In this model, a farmer is faced with a decision to invest in conservation practices in the current period in an effort to maximize the present value of net returns. Investment is denoted by $I$ and non-investment is denoted by $N$. This investment in conservation practices will result in improved soil quality and increased future returns. Therefore, this is a long-term investment because the benefits occur in the future and not in the current period. Let:

- $\pi_N$ be the payoff in the current period if the farmer does not invest in conservation practices.
- $V_N + \mu$ be the (expected) present value of the future payoff if the farmer does not invest in conservation practices, where $\mu$ is a random variable which is intended to capture the uncertainty of future payoffs. It has an expected value of zero. Assume that $V_N \geq 0$.
- $V_I + \varepsilon$ be the (expected) present value of the future payoff if the farmer does invest in conservation practices, where $\varepsilon$ is a random variable which is intended to capture the uncertainty of future payoffs. It has an expected value of zero. Assume that $V_I \geq 0$.
- $X$ be the cost of investment, which results in $\pi_I = \pi_N - X$.
- $\delta$ be the probability that the land will be secure in the future. $\delta = 1$ for a farmer with complete tenure security and $0 \leq \delta < 1$ for a landowner who does not have complete tenure security and is uncertain about their ability to maintain ownership and control over the land in the future period. As $\delta$ decreases, the landowner’s incentive to increase the future value of the land through current period investments is reduced.

In addition, I assume that $\mu$ and $\varepsilon$ are independently distributed. I also assume that the expected payoff in the case of investment is higher than the corresponding expected payoff in the case of no investment. That is, $E(V_I + \varepsilon) > E(V_N + \mu)$, which gives $V_I > V_N$ because $E(\mu) = E(\varepsilon) = 0$. 

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The payoff when the farmer does not invest in conservation practices can be written as:

\[ \Omega_N = \pi_N + \delta(V_N + \mu) \]  
(1)

and the payoff when the farmer does invest in conservation practices can be written as:

\[ \Omega_I = \pi_N - X + \delta(V_I + \varepsilon) \]  
(2)

The farmer will invest in conservation practices if \( \Omega_I > \Omega_N \). This can be rewritten as:

\[ \varepsilon - \mu > \frac{X}{\delta} - (V_I - V_N) \]  
(3)

From this, I define the probability of investment in conservation practices as:

\[ \rho \equiv \text{probability of investment} = \left( \varepsilon - \mu > \frac{X}{\delta} - (V_I - V_N) \right) \]  
(4)

Note that I define \( y \equiv \varepsilon - \mu \). Importantly, \( y \) is a random variable because it is the sum of two independent random variables. Also, it has a continuous density function \( g(y) > 0 \) for all \( y \) and distribution \( G(y) \). Finally, the probability of investment can be defined as:

\[ \rho = 1 - G \left( \frac{X}{\delta} - (V_I - V_N) \right) \]  
(5)

Taking the derivative of (5) with respect to \( \delta \) gives:

\[ \frac{\partial \rho}{\partial \delta} = \frac{g(\theta)X}{\delta^2} > 0 \]  
(6)

Where \( \theta \equiv \frac{X}{\delta} - (V_I - V_N) \)
This result indicates that the probability of investment in conservation practices decreases as tenure security decreases. In other words, tenure secure landowners will be more willing to invest in conservation practices than tenure insecure landowners.

4.2 Conclusion

A mathematical model was used to assess the influence of tenure security on farm-level investments. The following chapter will provide an overview of my survey instrument, my sampling method, and my experiences with data collection.

Chapter 5 – Survey Instrument and Data Collection

This chapter provides a description of the survey questionnaire, the sampling methodology, and the methods used for data collection. Importantly, the data collected by the questionnaire is summarized in the following chapter in an effort to provide a descriptive and empirical view of rural land tenure in Haiti.

5.1 Research Site and Time Frame

Between July and December 2013 I lived in a remote area of Central Haiti for the purposes of data collection. This area is completely rural and consists of several dozen small localités, which are equivalent to villages. Specifically, this area is referred to as the 4th Section (Aguahedionde) of the Commune of Hinche of the Central Department. This area lies in-between the larger urban areas of Pignon, Hinche, and Maïssade. See Figure 1 for a complete map of Haiti with the research site identified. In addition, Figure 2 provides a map of the Central Department of Haiti with the research site identified.
This thesis was conducted in this location because of my familiarity with the area. My adopted sister was born in this area and my grandfather worked in the north and central regions of Haiti for roughly forty years. This enabled me to work on my survey questionnaire in situ for three to four months before administering the survey. During this time period the questionnaire was refined based on discussions with several hundred landowners in the local area, as well as lawyers, notaries, surveyors, and NGO’s in the nearby urban centers of Hinche, Pignon, and Cap-Haitien. Also, during my first few months in Haiti I worked on developing a basic registry of households to be used for sampling purposes.

In September 2013, I completed my draft questionnaire and began pretesting with several households in the area. After making changes based on the results of my pre-testing, I began visiting households and interviewing landowners in October 2013. The data collection process was completed between October and December 2013. On average, these months do not suffer from severe rainfall. This allowed me to conduct my survey by foot, without the threat of rain. Also, because of the intricate network of rivers and streams in this area, large rains make accessing certain locations very difficult. Importantly, the data for this study was collected over only one period of time because of time and budget constraints.
Figure 2: Map of Central Department with Research Site Identified in Red
Source: http://emergency.cdc.gov/situationawareness/haiticholera/map_6.asp
5.2 Description of Survey Questionnaire

A survey questionnaire was used to gather information from a random sample of households in eight localités in central Haiti, from October to December 2013. The sampling procedure is detailed in the next section. I used Groves et al (2009) as my primary reference when developing this questionnaire. The questionnaire includes sixty-four questions and can be generally divided into the following categories: landownership, land characteristics, tenure security, land use, and demographics. The majority of these questions are multiple choice, but some of the questions regarding quantities and distance are open ended and fill-in-the-blanks style questions. A copy of the survey questionnaire is available in Appendix A.

The landownership category asks questions regarding the ownership of land obtained through purchase, inheritance, and usufruct. In addition, I included questions which ask the quantity of land rented, sharecropped, leased, and obtained by gift. For inherited land, several additional questions address the source of the inheritance (i.e. mother, father, etc.), the number of heirs, and the division of the land. For purchased land, I asked whether the land was a private parcel before being purchased or if it was an informally divided parcel of inherited land. I decided to include this question based on an observation I made during my preliminary fieldwork. During my discussions with landowners it became apparent that buying and selling informally divided parcels was common.

The land characteristics category focuses on the quality, size, and location of the land in question. It is important to note that I was unable to collect reliable data on the slope of each land parcel. Instead I collected data on landowner perceptions of land quality and I specified that steeply sloped land be considered low quality and flat land be considered high quality.
I was also unable to collect data on land prices. During my early fieldwork, before beginning the survey, I asked many landowners about land prices. I asked general questions about the price of land in the area and in some cases I asked questions about the price of land an individual had purchased. In most cases, I was met with wildly varying estimates and general mistrust. Because of this I am unsure if I can trust the responses of the few people who were willing to discuss the price of land. Nevertheless, based on the responses from a few key people and several more recent telephone conversations, I believe that the average price for one carreaux (3.19 acres) of land in this area is $2,000 - $4,000. Importantly, this is also the approximate value of a cow in this area. Numerous landowners told me that they had either traded or sold a fully grown cow to purchase their land. Several landowners explained to me that selling a piece of land was easy, but it was often more involved than simply an exchange of cash for land. Often the transaction involved exchanges of livestock or harvested crop, in addition to cash. Also, one landowner told me that in some cases a person will allow the seller to cut a predetermined set of trees on another parcel of land owned by the purchaser. This same landowner explained that grazing rights can be involved in the transaction as well. For example, a person can sell their land but maintain their grazing rights on a section of the land for a certain number of animals, either permanently or for a set number of years.

For the perceptions of tenure security section, I included questions to assess landowner perceptions of property rights, specifically exclusion and alienation rights, as well as perceptions of the stability and security of ownership. For exclusion rights, I asked whether the landowner decided who could and could not use the land. I also asked whether the landowner has the right make someone stop if they are using the land without permission. In addition to these questions I asked about past instances when someone had taken land, used land, or attempted to change the
borders of the land, without permission. For perceptions of tenure security I asked each survey participant to classify their ownership as completely secure, some level of insecurity, or no ownership security. This section of the survey also includes questions regarding the existence of formal and informal land documents, as well as past instances of conflict or dispute.

The land use category asks questions regarding crop, livestock, forestry, and housing activities, as well as farm-level investments. The primary investments included in the survey are: land terracing, agroforestry, land fallowing, soil composting, irrigation, and fertilizer use. There were no instances of irrigation or fertilizer use in the study area and only limited instances of soil composting. The final section of the survey addresses demographics – gender, age, education, children, and marital status.

5.3 Sampling Method

Cadastral and registration data for land in Haiti is limited. No central registry of landowners exists, making data collection a difficult task. During the early months of my field work, I contacted a number of local organizations and government agencies in an attempt to secure records of landowners that could be used for sampling purposes. I was never successful in this attempt. Luckily, during my time in Haiti the government was in the process of conducting a census of households in the area. After collecting the necessary data, the interviewer would write a reference number on the side of each house in a thick black pen. This reference number was unique to each household (RGPH followed by a three digit number).

After the completion of the Government’s census, I visited every household in the area to introduce myself and request permission to document the reference number that the government had left behind. Importantly, only some of the localités in this area had been included in the
census during my time in Haiti. The government’s census allowed me to develop a simple registry for every household in eight specific localités. These eight localités were selected based on physical location and inclusion in the government’s census. Several localités required in excess of five hours to reach by foot and there were no transportation options in this area besides walking. Therefore it was not plausible to include them in the study. My sample consisted of one hundred and ten houses randomly and proportionately sampled from the eight localités using a simple randomization process in Microsoft Excel. When possible, I surveyed both the male and female head (husband and wife) from each randomly sampled household, although in many cases only one person was available to be surveyed. These surveys were conducted separately so that survey responses were independent of each other.

5.4 Pre-Testing

Pre-testing a survey is an important step in the research process. It was important to determine if all of my questions were clear and would be fully understood by all respondents. During my time in Haiti, I lived with a local family that I had pre-existing personal relationships with. Because of my relationships with these individuals, I did not feel comfortable including them in my sample. Nevertheless, they were keen to help and I decided to ask for their help with pre-testing my survey. Therefore, I pre-tested my survey with ten individuals in three different localités, all of which I had pre-existing relationships with. These individuals helped me to modify my survey and ensure that every question would be answered as I intended. Also, my translator, Donacien Azlen, was extremely helpful in modifying and improving my survey. His abilities in English, French, and Haitian Creole were invaluable to my research and survey design. The following concerns were raised during the pre-test of my survey:
1. Questions regarding quantities of livestock were deemed too intrusive and were replaced with binary questions asking whether or not the landowner had a particular animal on their land, regardless of quantity.

2. Men and women must be surveyed separately, otherwise the man’s responses may influence the women’s, or vice versa.

3. In order for the survey respondents to offer detailed and honest answers, the survey must be conducted as a discussion instead of an interview.

4. Individuals, particularly women, were very uncomfortable discussing their spouses or family members. Several questions relating to inheritance had to be modified in order to be acceptable.

5. Questions regarding income will not be answered and may result in individuals withdrawing themselves from the survey process. I decided to remove questions about income and decided to use secondary measures to control for income and wealth.

6. The question regarding the slope of the land was not well understood and often answered vaguely. In order to collect data on the slope of the land I had to ask landowners to classify their land as high, medium, or low quality and I had to clearly define each of these classes.

7. Asking questions about the price paid for a parcel of land was deemed too intrusive. I removed these questions to avoid people withdrawing from the survey. Instead, I relied on informal discussions I had with numerous landowners that knew me and were more trusting of my research.

After finishing the pre-test of the survey, I incorporated the above concerns and then re-tested the survey. The pre-test of my survey convinced me that my initial estimate of 30 minutes
per survey would be insufficient in many cases because of the need to elaborate on certain questions. Therefore, I budgeted for 45 minutes per survey.

5.5 Data Collection

Using a random number generator in Excel I randomly selected one-hundred and ten houses. Afterwards, I discussed my survey with my translator and ensured that he fully understood my requirements and the intention of every question. I began visiting each randomly sampled house with the help of my translator in October 2013. It was common to return to a single household several times in order to survey both the husband and wife. In an attempt to maximize the chances of surveying both the husband and wife, I visited households throughout the day (i.e. morning, afternoon, and evening) and throughout the week. I did not survey on Sundays because of religious obligations in the community. In a few cases, I was required to visit a single household in excess of 20 times. In Haiti, it is common for many people to live in a single household. I decided that focusing on the husband and wife who own the house was the best way to stay consistent across every household. Many different people may live in a single house, but there is always a clear owner, or owners in the case of a husband and wife. The vast majority of surveys were completed in the respondent’s household. Occasionally we surveyed respondents in other locations.

I completed the survey questionnaire in December 2013. I succeeded in surveying ninety-eight of the one-hundred and ten houses that I randomly selected. I was able to survey both the husband and wife in fifty-four houses. In the remaining forty-four houses I was only able to survey one person. In twenty-one of these houses the landowner was single, widowed, or divorced/separated and therefore there was only one head of the household. In the remaining
twenty-three houses the spouse (usually the male) was living and working outside of the community. This resulted in one-hundred and fifty-two landowners included in my survey – 84 women and 68 men.

The survey questionnaires were delivered and replied to in Haitian Creole and with the help of my translator, I was able to record the responses in English. Therefore, after completing the survey process I did not have to translate each survey.

5.6 Conclusion

This chapter has summarized the survey questionnaire, sampling method, and data collection methods that I used to collect data for my study. I have described the various sections of my survey and I have clearly detailed my approach to sampling and data collection. In addition, I explained my experiences with pre-testing my survey and I highlighted some of the concerns that were raised during this process. The next chapter will summarize the data collected with this survey in an attempt to provide an empirical characterization of rural land tenure in this area of central Haiti. Also, the next chapter will present the empirical model that I use in this thesis.

Chapter 6 – Data and Empirical Model

This chapter summarizes the data obtained through my survey and presents the empirical model I am using to assess landowner decisions regarding farm-level investments. First, I will provide summary statistics to characterize the research site and provide context to my empirical model. Also, an important component of my thesis is my assessment of landowner perceptions of property rights and tenure security allowing for differences between genders and land tenure status. I will present the approach I am using to assess these perceptions and then present the results. Afterwards, I will develop my empirical model and explain the reasons for using this
model in my research. Finally, I will summarize the dependent and independent variables for my empirical model. The following chapter will provide the results of my empirical model.

6.1 Description of Data

As previously mentioned in chapter 5, I collected one-hundred and fifty-two completed survey questionnaires – 68 men and 84 women. Therefore, 55.26% of the respondents are female. According to the United Nations (2014), the male-female ratio of the Haitian population is 0.98, so, on this basis, the male-female ratio in my data is lower than the national average. This difference can be partly attributed to a large number of men working and living outside of their home communities. I was unable to include these men in my survey and this decreased the number of male survey respondents.

My initial sample size was one-hundred and ten households and I was successful in surveying individuals from ninety-eight of these households. The other twelve households were unsuccessful for two main reasons: I was unable to find the heads of the household and some people refused to participate. Overall, on a household basis, I achieved a response rate of approximately 89 percent. On an individual level, my response rate is approximately 79 percent. This is because in some households I was only able to survey the male or female head and not both. In total, I surveyed one-hundred and fifty-two landowners out of an estimated one-hundred and ninety-three included in my sample.

There were a total of one-hundred and seventy-four potential survey respondents in the ninety-eight households that I was able to survey. Based on the demographics of these ninety-eight households, I estimated that there were nineteen potential survey respondents in the remaining twelve households. This equates to one-hundred and ninety-three potential survey respondents in the one-hundred and ten houses included in my sample. I surveyed one-hundred and fifty-two of the one-hundred and ninety-three possible survey respondents. This resulted in a response rate of 79 percent (152/193).
6.1.1 Demographics

Table 3 provides summary statistics for the demographic data collected with my survey. As previously mentioned, over 55% of my respondents were female. Importantly, the age distribution of my sample is fairly representative of the country. The average age of the survey respondents is approximately forty years old. As is common in most developing countries, the vast majority of survey respondents are either married or in a common law relationship. Less than 14% of the respondents identified themselves as single, divorced/separated, or widowed.

Education attainment was low. Over 44% of the survey respondents had no formal education and less than 4% had reached secondary school. There are 14 years of primary and secondary schooling in Haiti’s education system, excluding kindergarten, but few people are able to fully graduate because of costs and the difficulty of the higher classes. The Haitian Government has mandated free primary education, but in practice this has not materialised. In the rural areas parents still pay school fees. In addition, the costs of uniforms and supplies are a significant barrier to poor families who often have five or more children. No survey respondents indicated they had undertaken post-secondary education. Importantly, some survey respondents mentioned informal certificate programs that they had completed through various government, religious, and educational institutions. These unofficial forms of education are not included in the summary statistics in Table 3. Finally, I found that the majority of survey respondents had between five and nine children. Only 6.58% of survey respondents did not have children. The maximum number of children was thirteen. Importantly, these numbers represent living children and do not include children who are previously deceased.

It is important to mention that I was unable to collect data on incomes. Haitians are very private and during the pre-testing of my survey I was informed that questions regarding income
would not be answered truthfully. Also, I was concerned that these questions could convince
some respondents to withdraw themselves from the survey. For these reasons I was not able to
collect quantitative data on incomes. Nevertheless, based on informal qualitative discussions
with landowners, I do have some understanding of income sources in my research site. The
principal source of income in this area was agriculture. Secondary sources of income are limited.
Some households received remittances from family members living in other parts of Haiti or in
other countries (the Dominican Republic, Canada, the United States, etc.), but the quantity of
these remittances was often negligible. Also, a very limited number of individuals own small
businesses (shops, grain mills, motorcycle taxis, etc.) and a very limited number of men and a
few women worked as teachers in one or more of the local elementary schools. Nevertheless,
agriculture was the primary source of income for every household that I spoke with.
Table 3 – Demographic Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Percentage of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male (n = 68)</td>
<td>44.74%</td>
</tr>
<tr>
<td></td>
<td>Female (n = 84)</td>
<td>55.26%</td>
</tr>
<tr>
<td>Age</td>
<td>18-25</td>
<td>5.92%</td>
</tr>
<tr>
<td></td>
<td>26-35</td>
<td>17.76%</td>
</tr>
<tr>
<td></td>
<td>36-45</td>
<td>21.05%</td>
</tr>
<tr>
<td></td>
<td>46-60</td>
<td>34.21%</td>
</tr>
<tr>
<td></td>
<td>60+</td>
<td>21.05%</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single</td>
<td>3.95%</td>
</tr>
<tr>
<td></td>
<td>Divorced/Separated</td>
<td>1.32%</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>8.55%</td>
</tr>
<tr>
<td></td>
<td>Common Law Marriage</td>
<td>23.68%</td>
</tr>
<tr>
<td></td>
<td>Legal Marriage</td>
<td>62.50%</td>
</tr>
<tr>
<td>Education</td>
<td>No education</td>
<td>44.08%</td>
</tr>
<tr>
<td></td>
<td>Primary (Grade 1 – 6)</td>
<td>44.08%</td>
</tr>
<tr>
<td></td>
<td>Middle (Grade 7 – 9)</td>
<td>8.55%</td>
</tr>
<tr>
<td></td>
<td>Secondary (Grade 10 -14)</td>
<td>3.29%</td>
</tr>
<tr>
<td></td>
<td>Post-Secondary</td>
<td>0.00%</td>
</tr>
<tr>
<td>Children (Max = 13)</td>
<td>0</td>
<td>6.58%</td>
</tr>
<tr>
<td></td>
<td>1 – 4</td>
<td>32.23%</td>
</tr>
<tr>
<td></td>
<td>5 – 9</td>
<td>56.58%</td>
</tr>
<tr>
<td></td>
<td>10+</td>
<td>4.62%</td>
</tr>
</tbody>
</table>

*Source: Data collected for this study from Central Haiti, 2013*
6.1.2 Land Ownership Characteristics

Table 4 and 5 provide summary statistics for the landownership data collected with the survey. Specifically, I provide summary data on the primary pathways whereby surveyed individuals obtained ownership of land. The largest category is purchased land. This accounts for approximately 59 percent of the land included in my survey. The second largest category is land acquired through inheritance. Inherited land constitutes approximately 24 percent of the total land. The remaining 17 percent is divided between tenancy arrangements, usufruct rights, and gifts. Importantly, almost half (approximately 48%) of the land acquired through purchase is actually informal purchases of inherited land. This is important because in the absence of an updated formal title, these parcels of land maintain their *de jure* status of common tenancy. However, on the ground, these transactions are perceived as facilitating private-ownership. These exchanges are completed within an active, but informal and fairly localized land market that allows for the transfer of both purchased and inherited land. I found only one instance of an outsider with no family connection to the area purchasing land and moving in. Importantly, this person received land as part of a government program helping earthquake survivors to migrate out of the Port-au-Prince area.

An important consideration of this study is gender differences in landownership and perceptions of security. I will address these differences later in this chapter, but first it is important to mention that women are less likely to own land than men in rural Haiti. My survey results show that on average women own less land than men. Over 60 percent of the men who participated in my survey, compared to less than 49 percent of the women, have legal (*de jure*) rights to inherited land. Also, on average, I found that women inherit smaller parcels of land than men. Men inherit an average of one and a half acres of land, while women inherit less than one
acre on average. Similarly, over 82 percent of men, compared to approximately 65 percent of women own land obtained through purchase. Importantly, of the women who own land obtained through purchase, over 96 percent own their land jointly with their husbands. Consequently, the size of land obtained through purchase does not vary by gender. The average size of land obtained through purchase is approximately three acres.

My results also indicate that landowners tend to increase their land holdings over time. According to Bloch et al (1988), a primary objective of most rural Haitians is to amass land holdings in an effort to cover future burial expenses and provide a land base for their children. Figure 3 presents a graph of average land holdings by age. The figure displays a gradual increase in land holdings over time. Importantly, the final age category included in the figure shows a decrease in total land holdings. This may be explained by the increased likelihood of medical or burial expenses later in life.
Figure 3: Average Land Holdings by Age, measured in acres.

Source: Data collected for this study from Central Haiti, 2013
Table 4: Mode of Land Acquisition in Research Site

<table>
<thead>
<tr>
<th>Mode of Land Acquisition</th>
<th>Total Acres</th>
<th>% of Total</th>
<th>Average Acres (Male)</th>
<th>Average Acres (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase</td>
<td>166.275</td>
<td>30.35%</td>
<td>2.983</td>
<td>3.318</td>
</tr>
<tr>
<td>Informal Purchase</td>
<td>155.431</td>
<td>28.38%</td>
<td>2.987</td>
<td>2.965</td>
</tr>
<tr>
<td>Inheritance</td>
<td>130.140</td>
<td>23.76%</td>
<td>1.364</td>
<td>0.908</td>
</tr>
<tr>
<td>Tenancy</td>
<td>52.236</td>
<td>9.54%</td>
<td>2.366</td>
<td>1.766</td>
</tr>
<tr>
<td>Usufruct</td>
<td>37.084</td>
<td>6.77%</td>
<td>0.522</td>
<td>0.294</td>
</tr>
<tr>
<td>Other</td>
<td>6.580</td>
<td>1.20%</td>
<td>1.296</td>
<td>0.349</td>
</tr>
<tr>
<td>Total</td>
<td>547.746</td>
<td>100%</td>
<td>5.368</td>
<td>4.633</td>
</tr>
</tbody>
</table>

Source: Data collected for this study from Central Haiti, 2013

Table 5: Land Ownership Statistics for Research Site, Presented by Gender

<table>
<thead>
<tr>
<th>Mode of Land Acquisition</th>
<th># of Men</th>
<th>% of Men</th>
<th># of Women</th>
<th>% of Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase</td>
<td>29</td>
<td>42.65%</td>
<td>29</td>
<td>34.52%</td>
</tr>
<tr>
<td>Informal Purchase</td>
<td>27</td>
<td>39.71%</td>
<td>26</td>
<td>30.95%</td>
</tr>
<tr>
<td>Inheritance</td>
<td>41</td>
<td>60.29%</td>
<td>41</td>
<td>48.81%</td>
</tr>
<tr>
<td>Tenancy</td>
<td>30</td>
<td>44.12%</td>
<td>28</td>
<td>33.33%</td>
</tr>
<tr>
<td>Usufruct</td>
<td>15</td>
<td>22.06%</td>
<td>4</td>
<td>4.76%</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>11.76%</td>
<td>8</td>
<td>9.52%</td>
</tr>
</tbody>
</table>

Source: Data collected for this study from Central Haiti, 2013
6.1.3 Physical Land Characteristics

In this section, I discuss the physical characteristics of the land included in my survey. Importantly, the average size of land parcels is presented in the previous section in Table 4. I find that parcels of purchased land are over two times as large as inherited parcels. This may be caused by the practice of dividing inheritance land into smaller parcels, leading to fragmentation. I was unable to assess the physical quality of the land included in my survey because of time constraints. Instead, I relied on landowners’ stated perceptions of the quality of their land. I asked landowners to classify their land as low, average, or high quality. I stipulated that high quality land was relatively flat and highly fertile. Figure 4 displays the results of this assessment. There is a fair degree of reported homogeneity in quality across land types. This is important because there is the possibility that purchased land differs from inherited land because landowners are only choosing to purchase high quality land. I do not find this to be represented in the data. My draft questionnaire included a question that asked for an estimate of the slope of the land. This question was not well received in pre-testing and I decided to remove it from the final questionnaire. Nevertheless, the slope of the land is an important determinant for certain land uses, such as terracing.

Table 6 summarizes the three distance variables included in my survey. I have summarized these variables for land obtained through inheritance, purchase, and usufruct. The results show little variation in distance across the different land types. The exception is the household distance for inherited land. I found that the average distance for inherited land, measured in minutes of walking, is more than three times larger than for any other type of land. This makes sense because some landowners have inherited land in other communities than where they currently live.
Figure 4: Land Quality across Land Types in Research Site
Source: Data collected for this study from Central Haiti, 2013

Table 6: Mean Distances across Land Types in Research Site, Measured in Minutes Walking

<table>
<thead>
<tr>
<th>Land Type</th>
<th>Mean Distance to Market</th>
<th>Mean Distance to House</th>
<th>Mean Distance to Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usufruct</td>
<td>48.84</td>
<td>26.04</td>
<td>3.84</td>
</tr>
<tr>
<td>Inheritance</td>
<td>65.40</td>
<td>106.62</td>
<td>5.10</td>
</tr>
<tr>
<td>Purchase</td>
<td>58.80</td>
<td>28.44</td>
<td>5.22</td>
</tr>
<tr>
<td>Informal Purchase</td>
<td>49.50</td>
<td>19.08</td>
<td>4.68</td>
</tr>
</tbody>
</table>

Source: Data collected for this study from Central Haiti, 2013
6.1.4 Land Use Characteristics

The data collected by the survey shows some degree of homogeneity in land use. While landowners make different decisions regarding what plants to crop and which animals to keep, the vast majority of households are engaged in a similar form of agro-pastoralism with some forestry-related activities. In terms of crop production, most landowners diversify their plantings with a variety of different crops. The primary crops identified by the survey are manioc, beans, corn, and millet – planted by 71%, 64%, 62%, and 62% of landowners, respectively. I did not collect data on the share of the land each crop was planted on and I also did not collect data on crop yields. These primary crops constitute the basis of the Haitian diet, along with rice which is mostly imported. Also, manioc is both consumed in the household and sold for cash in the local markets. In Haiti, manioc is used to make a flat type of bread, called cassave, consumed by most Haitians on a daily basis. Sugar, plantain, and sweet potatoes are other important crops – planted by 42%, 34%, and 25% of landowners, respectively. Sugar is primarily a cash crop and is sold to be used in the production of clairin, a Haitian form of rum that is produced across the country in makeshift distilleries. Plantain and sweet potato can be eaten in the household, but the high value of these crops often results in them being sold at market. While these crops can be exchanged for cash, their cultivation is also more demanding. Most households barely earn enough cash to cover school fees and buy enough rice, oil, and tomato paste to feed the family.

Animal production, or livestock husbandry, is an important component of rural agriculture in Haiti. The majority of livestock is raised as a store of wealth, to be sold when needed. Consumption of meat at the household level is minimal. Also, horses, donkeys, and mules are used for transportation and cows are used for plowing fields. My survey results indicate that goats, cows, pigs, chickens, and horses were the most common animals – owned by
49%, 44%, 40%, 39%, and 25% of landowners, respectively. Several landowners told me that they had purchased some of their land by selling or trading one or more large animals at market.

A final component of rural agriculture in Haiti is forestry. Trees provide fruit, building materials, and cooking fuel and are therefore considered critical to rural survival. The majority of landowners in my survey indicated that they had fruit and/or wood trees on their land – 92% and 91% respectively. Many of these landowners were actively planting and harvesting from these trees, but some landowners do not engage in reforestation and strictly harvest from the trees that already exist. Deforestation is a critical problem for Haiti (Dolisca et al., 2007), but many landowners stated that they were unwilling to commit too much land to forestry activities because of the trade-off with crop and livestock production. Interestingly, while land is considered scarce in Haiti, over 21% of landowners indicated that they had some land that was not regularly in use for any purpose.

6.1.5 Tenure Security

A primary objective of this study is to assess landowner perceptions of tenure security and to determine if these perceptions vary by gender and the mode of land acquisition. I focus on three different measures of landowner perceptions of tenure security: security of exclusion rights, security of alienation rights, and general perceptions of tenure security. As previously mentioned, my decision to focus on exclusion and alienation rights is based on Ostrom and Schlager’s (1992) argument that these rights produce strong incentives to invest in a resource. In order to assess perceptions of exclusion rights, I included the following question in my survey:

\[ Q31 \text{ and } Q54: \text{If someone accesses/uses this land without your consent can you force them to stop/leave without difficulties?} \]
Based on the survey respondent’s answer, I placed them into one of three categories: secure exclusion rights, insecure exclusion rights (known restrictions or barriers to exercising right), or no rights of exclusion. Individuals who responded that they had no exclusion rights were individuals who had very little say in how the land could be used and were treated more as tenants than as owners. The results of this assessment are summarized in Figure 5 below and in Appendix C.
Figure 5: Perceptions of the Security of Exclusion Rights, in Research Site

Source: Data collected for this study from Central Haiti, 2013
The majority of the survey respondents (approximately 97%) perceive their exclusion rights for purchased land as secure. Importantly, these perceptions do not vary by gender.

Conversely, for inherited land, less than 30 percent of women perceive their exclusion rights as secure, compared to over 80 percent of men. This translates into a higher proportion of women having experienced some violation of their exclusion rights on their inherited land (i.e. trespass, unauthorized use, changes to borders, etc.). Approximately 36 percent of women have experienced some violation of their exclusion rights on their inherited land. This compares to approximately 26 percent of men. I find similar results for alienation rights. In order to assess perceptions of alienation rights, I included the following question in my survey:

Q34 and Q57: If you wanted to, do you believe you could sell, lease, rent, or transfer your share of the land without first seeking permission from anyone and without difficulties?

Similar to exclusion rights, survey respondents were placed in one of three categories: secure alienation rights, insecure alienation rights (known restrictions or barriers to exercising right), or no rights of alienation. Individuals who responded that they had no alienation rights were individuals who, in most cases, were able to use their land as they chose but had no ability to transfer or sell their ownership to another party. The results of this assessment are summarized in Figure 6 below and in Appendix C.
Figure 6: Perceptions of the Security of Alienation Rights, in Research Site

Source: Data collected for this study from Central Haiti, 2013
My results show that over 95 percent of men and women perceive their alienation rights for purchased land to be secure. For inherited land, I find that less than 37 percent of women perceive their alienation rights as secure, compared to over 75 percent of men. Based on these two results it is clear that survey respondents perceive inherited land as less secure than purchased land. Also, women perceive inherited land to be less secure than men. Before drawing conclusions, I must present my assessment of respondents’ general perceptions of security. In order to assess general perceptions of security, I included the following question in my survey:

*Q25 and Q48: Do you feel secure in your ownership of this land?*

This question required the landowner to respond that they felt completely secure, somewhat insecure, or completely insecure. In order to improve the quality of these responses, I ensured that the questions and the three possible responses were fully explained in detail before the landowner responded. The results of this assessment are presented below in Figure 7 and in Appendix C.
Figure 7: Perceptions of Tenure Security, in Research Site
Source: Data collected for this study from Central Haiti, 2013
Finally, when asked about their general tenure security, women perceive themselves to be less secure than men, although the difference is more pronounced on inherited land. 60 percent of women perceived their purchased land as secure, compared to 75 percent of men. For inherited land, I find that 49 percent of women perceive their ownership as secure compared to 61 percent of men. While these results are somewhat different from my assessment of exclusion and alienation rights, the general trends are maintained. Primarily, survey respondents perceive inherited land as less secure than purchased land and women perceive their ownership as less secure than men, especially on inherited land. These results provide insight and motivation for the empirical model developed later in this chapter.

In addition to the three survey questions already discussed, I included questions that focused on the landowner’s past experiences with conflict and dispute. I also assessed the proportion of landowners who had previously relied on the legal system to aid in the resolution of a dispute. I found that only 8.5% of landowners had previously used the legal system to aid in the resolution of a dispute. This makes sense because of the high costs of the legal system and the general mistrust of the government by the rural population. Importantly, only 1.3% of landowners had a legal title to their land and only 8.5% of landowners had an informal title to their land. While less secure than a land title, purchase and inheritance contracts can also provide sufficient proof of ownership. Over 21% of landowners had a legal purchase or inheritance contract and almost 55% of landowners had an informal purchase or inheritance contract. Before continuing, it is important to mention that a landowner is less likely to have documentation for inherited land than for purchased land. Only 24 percent of landowners have documents, formal or informal, for there inherited land. This compares to over 95 percent for purchased land. Importantly, land documentation does not vary by gender.
Landowners’ limited use of formal dispute resolution mechanisms does not indicate that they are not experiencing disputes or violations of rights. 18% of men and 16% of women complained that the borders of their land had been purposely changed by neighbouring landowners; 16% of men and 23% of women explained that they had had at least some of their land taken from them; and 26% of men and 36% of women described having their land used without their permission and against their will. Interestingly, for inherited land the most common perpetrators were other heirs and other family members and the majority of the perpetrators were men. Conversely, for purchased land the most common perpetrators were previous owners.

The results presented so far indicate two main things. First, there is a measurable difference in perceptions of security between land which was inherited and land which was purchased. Second, women perceive their ownership as less secure than men’s, except in cases when they own their land jointly with their husband. It seems that a primary source of insecurity for inherited land and for women comes from conflicts with other family members. The remainder of this chapter will describe my empirical model and the variables being used in the regression analysis.

6.2 Empirical Model

In this section, I describe the empirical methods I am using to investigate the probability that a landowner will invest in his/her land. I will detail my dependent and explanatory variables in the next section. I have several dependent variables to choose from, some of which are binary and some of which are multinomial. For the binary variables I use a general probit model and for the multinomial variables I use an ordered probit model. Importantly, I am using an ordered probit
model because all of my multinomial variables can be easily ordered in a hierarchical form to match the requirements of the ordered probit model specification.

The general probit model for this study is:

$$P(Y|X) = G(\beta_0 + \beta X)$$  \hspace{1cm} [7]

where $P(Y|X)$ is the probability of $Y$, the decision to invest, taking on the values of a function ($G$) of a vector of regressors ($X$) and their associated coefficients ($\beta$). $G$ is the cumulative distribution function of the normal distribution. For regular probit models, $Y$ is modeled as a binary variable. For ordered probit models, $Y$ is modeled as an ordinal variable that can take on more than just 0 or 1 values. An ordinal variable is a variable that can be clearly ordered in a hierarchical manner. For example, “bad”, “good”, “excellent”, could be described by “0”, “1”, “2”.

The estimated model for this study is:

$$P(Y|X) = G(\beta_0 + \beta_1 DEMP_{GENDER_i} + \beta_2 LAND_{INHERITANCE_i}$$

$$+ \beta_3 LAND_{USUFRUCT_i} + \beta_4 DOCS_{FORMAL_i} + \beta_5 DOCS_{INFORMAL_i} + \beta_6 SIZE_{CX_i}$$

$$+ \beta_7 DIST_{HOME_i} + \beta_8 DIST_{MKT_i} + \beta_9QLTY_{HIGH_i} + \beta_{10}QLTY_{LOW_i}$$

$$+ \beta_{11}WEALTH_{COW_i} + \beta_{12}DEMG_{AGE_i} + \beta_{13}DEMG_{EDU_i} + \beta_{14}DEMG_{CHILD_i}$$

$$+ \beta_{15}DEMG_{MRG_i})$$  \hspace{1cm} [8]

where $DEMG_{GENDER}$ is a dummy variable representing the survey respondent’s gender. The variable will equal one when the respondent is identified as a female. $LAND_{INHERITANCE}$, $LAND_{USUFRUCT}$, and $LAND_{PURCHASE}$ (this variable is dropped from the above model because of the dummy variable trap) represent the three main modes of land acquisition that exist in my data. Importantly, I find no difference in land use practices between *de jure* purchased land and
purchased shares of inherited land divided by custom. Therefore, they are represented by the single variable $\text{LAND}_{\text{PURCHASE}}$. $\text{DOCS}_{\text{FORMAL}}$ and $\text{DOCS}_{\text{INFORMAL}}$ are dummy variables that indicate whether the survey respondent has formal or informal documents associated with their land. $\text{SIZE}_{\text{CX}}$ is a continuous variable that represents the size of the respondent’s land parcel measured in carreauxs$^{19}$. Importantly, this variable indicates the total size of the parcel of land where the decision to invest is being considered. This variable does not account for the total landholdings owned by the landowner. I explored including a variable for the total land holdings in my regressions, but I found that including this variable had very little effect on the sign, magnitude, and significance of the other variable. Instead I used a measure of wealth, which will be described later in this section.

$\text{DIST}_{\text{HOME}}$ and $\text{DIST}_{\text{MKT}}$ are continuous variables representing the distance, measured in walking hours, between the respondents land and their home, and between their land and the closest market. $\text{QLTY}_{\text{HIGH}}$ and $\text{QLTY}_{\text{LOW}}$ are used to control for the parcels of land considered high quality (flat with fertile soil) and low quality (steep with rocky or sandy soil). $\text{WEALTH}_{\text{COW}}$ is a dummy variable indicating whether the landowner has a cow. I use this is a measure of wealth. A cow is a significant asset for rural landowners in Haiti and there I observed a clear distinction between landowners who owned a cow and those that did not. The final four variables $\text{DEMG}_{\text{EDU}}$, $\text{DEMG}_{\text{CHILD}}$, $\text{DEMG}_{\text{MRG}}$, and $\text{DEMG}_{\text{AGE}}$ are demographic variables representing the education, number of children, marital status, and age of the survey respondent. Importantly, I make the assumption that this model will hold for every dependent variable. Therefore, I am assuming that the factors that influence the decision to invest in land terracing, fallowing, or planting trees are the same.

$^{19}$ The carreaux is the standard unit of measurement for land in Haiti. One carreaux is equal to 3.19 acres.
I use the above model to assess the degree to which these variables influence a landowner’s decision to invest in their land. Importantly, I make the assumption that this empirical model can sufficiently explain the decisions to invest in land terracing, land fallowing, and agroforestry. The use of both a binary and an ordered probit model is justified by the characteristics of my dependent variables. The next section will describe every variable that I use in my empirical models. I used STATA 12.1 to perform the statistical and regression analysis of the data in this study. Both the binary and the ordered probit model are estimated using maximum likelihood estimation.

6.3 Variables

My empirical model is used to assess the factors that influence the adoption of certain farm-level investments. Specifically, I am interested in how these decisions are influenced by tenure security, or factors associated with tenure security. In order to test this relationship empirically in a regression model, the dependent variable must represent the decision to make a farm-level investment. I have three dependent variables that each represent an independent decision to invest in a specific conservation activity – agroforestry, land terracing, and land fallowing. In addition, I aggregate my data for these three land investments into a single variable that identifies whether or not the landowner has engaged in any of the above investments. I use a binary specification of this variable to assess whether a landowner has invested in land terracing, land fallowing, or agroforestry. This variable takes the value of one if the landowner has made any of these investments. I also use an ordinal specification that represents how many of these investments the landowner has made. For example, if a landowner has invested in land terracing and land fallowing, but not agroforestry this variable will take the value of two. Lastly, I did not collect data on the proportion of the land that the landowner has terraced, forested, or fallowed. I
only know whether the landowner has made these investments. In the case of land fallowing I know the number of years that the land is kept fallow. For agroforestry, I know how often the landowner plants trees and an estimate of the number of trees planted on average. For land terracing, I only know how often the landowner rebuilds their terraces. I model land terracing as a binary variable because there is limited variability in how often landowners rebuild their terraces. Table 7 presents the specification of each of the dependent variables and Table 8 presents summary statistics for each dependent variable.
### Table 7: Specifications of Dependent Variables for Land Investment Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agroforestry</td>
<td>- <strong>Multinomial</strong> 0 if respondent has never planted trees on their land</td>
</tr>
<tr>
<td></td>
<td>1 if respondent has only planted trees on one or two occasions</td>
</tr>
<tr>
<td></td>
<td>2 if respondent has planted many trees on many different occasions</td>
</tr>
<tr>
<td></td>
<td>3 if respondent regularly plants many trees on their land</td>
</tr>
<tr>
<td>Land Terracing</td>
<td>- <strong>Binary</strong> 0 if respondent does not terrace their land</td>
</tr>
<tr>
<td></td>
<td>1 if respondent has terraced their land and the terraces are still functional</td>
</tr>
<tr>
<td>Fallowing</td>
<td>- <strong>Multinomial</strong> 0 if respondent does not fallow any of their land</td>
</tr>
<tr>
<td></td>
<td>1 – 4 represents the number of years that the landowner fallows a section of land</td>
</tr>
<tr>
<td>Investment</td>
<td>- <strong>Binary</strong> 0 if respondent has never invested in terracing, fallowing, or agroforestry</td>
</tr>
<tr>
<td></td>
<td>1 if respondent has engaged in any of these three investments</td>
</tr>
<tr>
<td>Investment</td>
<td>- <strong>Multinomial</strong> 0 if respondent has never invested in terracing, fallowing, or agroforestry</td>
</tr>
<tr>
<td></td>
<td>1 – 3 represents the number of investments made</td>
</tr>
</tbody>
</table>

*Variable maximum set at 4

### Table 8: Summary Statistics for Dependent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations</th>
<th>Mean</th>
<th>St. Dev.</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agroforestry</td>
<td>212</td>
<td>1.184</td>
<td>1.180</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>- Multinomial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Terracing</td>
<td>212</td>
<td>0.717</td>
<td>0.452</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>- Binary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fallowing</td>
<td>212</td>
<td>1.165</td>
<td>1.268</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>- Multinomial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment</td>
<td>212</td>
<td>0.835</td>
<td>0.372</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>- Binary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment</td>
<td>212</td>
<td>1.892</td>
<td>1.098</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>- Multinomial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There are a variety of factors that affect the decision to make the previously discussed investments – land terracing, agroforestry, and land fallowing. One of the key variables of my model is gender. Based on my previous review of the literature, the results previously presented in this chapter, and my understanding of Haitian society and culture, I know that women often perceive their rights as less secure than men. I anticipate that these lowered perceptions of security negatively affect women’s decisions to invest in conservation activities. The next set of variables represents the different ways that survey respondents gained ownership of their land. I only collected data for three modes of land acquisition: inheritance, purchase, and usufruct. I associate these variables with varying degrees of tenure security. The previously presented results on landowner perceptions of security directly influence my expectations regarding these key variables. The final variable that I believe is directly related to tenure security is a variable representing the ownership of documentation proving landownership. As previously mentioned, there are two kinds of documentation: formal and informal. Therefore, I include in my model a variable for formal documentation and a variable for informal documentation.

The remaining variables in my model are included in an effort to control for other factors that may influence the decision to invest in conservation activities. I control for two measures of distance. First, I control for the distance between the respondents household and their land (See Table 6 for a summary of these distances). As this distance increases, I expect a landowner to be less willing to invest in conservation activities. Next, I control for the lands proximity to a market. The closer the land is to a market, the higher the value of the land. I also control for the size and quality of the land (See Table 4 and Figure 4 for summaries of the size and quality data, respectively). As the size of the land increases, the relative scarcity of the land decreases and the respondent may be more willing to make one or more of these investments. For quality, it is
important to mention that I was unable to collect data for the slope of the land. Instead, I have relied on landowner perceptions of the quality of their land. Importantly, land classified as high quality was explained to be flat and highly fertile and land classified as low quality was explained to be steep and of poor quality.

Finally, I control for several important demographic factors – education, age, marriage, the number of children, and wealth. Table 3 provides summary statistics for the first four demographic variables. I was unable to collect reliable income data with my survey because of issues of estimation and trust. Instead, I am using a dummy variable that indicates whether the landowner owns a cow. I believe this variable is closely correlated with wealth. Owning a cow allows a landowner to more effectively work their land and transport their produce. In addition, a cow serves as a significant store of wealth that can be exchanged at market for cash when the need arises. Approximately 44%, of landowners own a cow. In the next section, I will discuss hypotheses for some of the more important variables discussed in this section.

6.4 Hypotheses

Based on the assessment of landowner perceptions of tenure security presented previously in this chapter, I am able to make hypotheses about some of the key variables of my model. Table 9 summarizes these hypotheses. On average, female survey respondents perceived their tenure security as less secure than men’s. Therefore, I hypothesize that my gender variable will be negatively associated with a landowner’s decision to invest in their land. The literature review presented in chapter 3 makes it clear that tenure security, when properly defined, positively influences investment. Therefore, women’s perceptions of insecurity may discourage them from making investments, when the benefits accrue in the future.
The majority of landowners perceive their inherited land to be less secure than purchased land. I hypothesize that my land variable representing land obtained through inheritance will be negatively related to the dependent variable. Similar to my hypothesis for the gender variable, I believe that the comparatively lower perceptions of tenure security will result in landowners being less willing to invest on inherited land than on purchased land. Conversely, I expect a positive relationship between land obtained through usufruct and investment. This is based on my observation that the majority of usufruct rights are granted to the older, male children of living parents. These children invest in their parents land in hopes that one day they will inherit that land and their investments will improve their claim to ownership over other siblings who were not granted usufruct rights.

I expect my two variables representing formal and informal documentation to be positively related to land terracing investments. These documents provide proof of ownership and therefore should increase a landowner’s willingness to invest in their land. I expect that formal documents will have a stronger relationship than informal documents because formal documents are recognized by law, whereas informal documents are normally drafted extra-legally. The results of these variables will provide valuable insights for Haiti’s current land reforms.

The size of the parcel of land is also expected to have a positive effect on investments. As the size of the parcel of land increases, I expect a landowner to be more willing to invest because it is easy to diversify a larger piece of land. Land terracing, fallowing, and reforestation require a trade-off with crop production. If the parcel of land is too small the landowner may focus their efforts on one activity and not make these investments. Lastly, I expect both of my distance variables to have a negative relationship with investment. As the distance between the
respondent’s land and household increases, the opportunity cost of transportation increases and the willingness to invest may decrease. Also, landowners may perceive more distant parcels of land as less secure because of the difficulty in maintaining control from a distance. In Haiti, rural markets are centered around rural population centers and near transportation links. Several landowners in Haiti told me that land close to a market was much more expensive than land farther away. Therefore, I hypothesize that as the distance between the respondent’s land and the closest market increases, the landowner will be less willing to invest because the land is of less value.
Table 9: Explanation of Hypotheses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$DEM_{GENDER}$</td>
<td>Neg (-)</td>
<td>Women perceive ownership as less secure than men and may make different</td>
</tr>
<tr>
<td></td>
<td></td>
<td>investment decisions</td>
</tr>
<tr>
<td>$LAND_{INHERITANCE}$</td>
<td>Neg (-)</td>
<td>Landowners perceive inheritance as less secure than purchase and may make</td>
</tr>
<tr>
<td></td>
<td></td>
<td>different investment decisions</td>
</tr>
<tr>
<td>$LAND_{USUFRUCT}$</td>
<td>Pos (+)</td>
<td>Landowners invest to improve future ownership claims of parents’ estate</td>
</tr>
<tr>
<td>$DOCS_{FORMAL}$</td>
<td>Pos (+)</td>
<td>Formal documentation provides proof of <em>de jure</em> ownership</td>
</tr>
<tr>
<td>$DOCS_{INFORMAL}$</td>
<td>Pos (+)</td>
<td>Informal documentation provides proof of <em>de facto</em> ownership</td>
</tr>
<tr>
<td>$SIZE_{CX}$</td>
<td>Pos (+)</td>
<td>Larger parcels of land allow for greater diversification, which increases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the likelihood of investing in terracing, fallowing, or forestry</td>
</tr>
<tr>
<td>$DIST_{HOME}$</td>
<td>Neg (-)</td>
<td>The opportunity cost of transportation increases and perceptions of security</td>
</tr>
<tr>
<td></td>
<td></td>
<td>may decrease with distance</td>
</tr>
<tr>
<td>$DIST_{MKT}$</td>
<td>Neg (-)</td>
<td>Land values decrease as the distance to market increases and landowners may</td>
</tr>
<tr>
<td></td>
<td></td>
<td>be less willing to invest in lower valued land</td>
</tr>
</tbody>
</table>
6.5 Conclusion

This chapter has provided summary statistics for the data I collected using my survey. I have also described my empirical methods and clearly presented my empirical models. The variable descriptions and the specifications of my model presented in this chapter lead clearly to the empirical results presented in the next chapter. The final chapter of my thesis will summarize this study and provide policy implications for land reform in Haiti and abroad.

Chapter 7 – Results

This chapter will present the results of the empirical analysis described in the previous chapter. I will present results for all five dependent variables in this chapter.

7.1 Land Terracing

Table 10 presents a progression of three different specifications of the regression model for the land terracing dependent variable. I estimate this model in this way to highlight an important change in the sign of the variable representing land obtained through inheritance. This process is referred to as general to specific modeling (Charemza and Deadman, 1992). I begin with a very basic model using only three explanatory variables – $DEM_{GENDER}$, $Land_{INHERITANCE}$, and $Land_{USUFRUCT}$; $Land_{Purchase}$ is the dropped variable in this equation. Under this specification, it can be seen that $DEM_{GENDER}$ and $Land_{INHERITANCE}$ are statistically significant and negative. According to this early model specification, landowners are less likely to terrace inherited land than purchased land and women are less likely to invest in land terraces than men.

The second model specification includes two additional variables that control for the existence of formal and informal documents – $DOCS_{FORMAL}$ and $DOCS_{INFORMAL}$. After including
these variables in the model, $Land_{inheritance}$ is no longer statistically significant. Therefore, I find that after controlling for the existence of documents, both formal and informal, landowners are equally likely to terrace their purchased land and their inherited land.

The final model specification includes the control variables for size, quality (slope), wealth, distance, and demographics. As was found in our original model specification, women are less likely to terrace their land than men. In fact, according to our estimated marginal effect, women are over 18 percent less likely to terrace their land than men, all other things held equal. This result is statistically significant at the 1% level. This strong result may be explained by women’s comparatively lower perceptions of tenure security, but it may also be explained by societal norms and the division of labour within the household. Regardless, this result proves that there are potential opportunities for improving women’s agricultural productivity.

When analyzing the various modes for acquiring property, I find an interesting result. My results show that landowners are approximately 26 percent more likely to terrace inherited land than purchased land. Also, landowners are 25 percent more likely to terrace their land acquired by usufruct than by purchase. These results are significant at the 5% and 1% levels, respectively. This is notable considering the results of my assessment of landowner perceptions of property rights and tenure security. Remember that in the first specification of this model, inherited land was found to have a negative significant relationship with land terracing. By using general to specific modeling I am able to highlight this change in the sign of the variable. Importantly, the descriptive statistics show that landowners terrace inherited land less than purchased land, but it appears that this difference is better explained by differences in documentation, size, and distance.
The next two variables to be discussed are concerned with formal and informal documentation. These two variables offer the most valuable insights for Haiti’s current reform efforts. Landowners with formal or informal documents are 28 percent and 40 percent more likely to terrace their land than landowners without documents. Both these results are statistically significant at the 1% level. Documentation is the primary method to prove ownership of property. Formal documents are often assumed to be more valuable than informal documents, but this result contests that assumption.

My two distance variables provided the results that I expected. Both distance variables, distance to respondents home and distance to closest market, were estimated as negative significant at the 1% and 10% levels, respectively. Therefore, as the distance to the respondent’s home or the closest market increases the respondent will be less willing to invest in land terracing. The distance to the closest market is a measure of the value of the land. Therefore, landowners are less willing to invest in land terracing on land that is of lower value. The size variable was estimated as positive significant at the 1% level. For an increase of one carreaux (3.19 acres) in the size of the land, a landowner will be 18.2 percent more likely to engage in land terracing.

In addition to the variables previously discussed, my regression results show that the wealth of the landowner is another important determinant of the decision to invest in land terracing. My wealth variable was estimated as positive significant at the 1% level. Specifically, landowners who were classified as wealthy (i.e. landowners who own at least one cow) are 18.7% more likely to invest in land terraces. This is a fairly significant result and it implies that a primary constraint to the adoption of improved agricultural techniques may be income. The remaining variables of my model proved to be statistically insignificant. Importantly, my dummy
variables representing land classified as high and low quality were both estimated as insignificant. Finally, all four of my demographic variables (age, marital status, number of children, and education) were estimated as highly statistically insignificant.

Before continuing to the land fallowing model, I want to discuss the nature of land terracing. Land terracing is a time-consuming and labour intensive form of investment. The benefits of land terracing are decreased soil erosion and increased water retention, which leads to improved soil quality in the future. Importantly, land terraces require annual maintenance to maintain their effectiveness. Women may be less likely to terrace their land because of these time requirements. Also, in Haiti, most heirs use mounds of dirt and grass, which closely resemble terraces, as the borders between each informally divided parcel. This may explain the increased probability of landowners terracing land acquired through inheritance.
Table 10: Probit Regression Results for Land Terracing Variable, Reporting Marginal Effects and Robust Clustered Standard Errors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model #1</th>
<th></th>
<th>Model #2</th>
<th></th>
<th>Model #3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marginal Effect</td>
<td>Robust SE</td>
<td>Marginal Effect</td>
<td>Robust SE</td>
<td>Marginal Effect</td>
<td>Robust SE</td>
</tr>
<tr>
<td>$DEMG_{GENDER}$</td>
<td>-0.197***</td>
<td>0.061</td>
<td>-0.204***</td>
<td>0.060</td>
<td>-0.181***</td>
<td>0.066</td>
</tr>
<tr>
<td>$LAND_{INHERITANCE}$</td>
<td>-0.253***</td>
<td>0.069</td>
<td>0.081</td>
<td>0.105</td>
<td>0.256**</td>
<td>0.110</td>
</tr>
<tr>
<td>$LAND_{USUFRUCT}$</td>
<td>-0.028</td>
<td>0.119</td>
<td>0.242***</td>
<td>0.048</td>
<td>0.246***</td>
<td>0.039</td>
</tr>
<tr>
<td>$DOCS_{FORMAL}$</td>
<td></td>
<td></td>
<td>0.306***</td>
<td>0.053</td>
<td>0.282***</td>
<td>0.053</td>
</tr>
<tr>
<td>$DOCS_{INFORMAL}$</td>
<td></td>
<td></td>
<td>0.383</td>
<td>0.086</td>
<td>0.396***</td>
<td>0.099</td>
</tr>
<tr>
<td>$DIST_{HOME}$</td>
<td></td>
<td></td>
<td>-0.047***</td>
<td>0.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$DIST_{MKT}$</td>
<td></td>
<td></td>
<td>-0.108*</td>
<td>0.062</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$SIZE_{CX}$</td>
<td></td>
<td></td>
<td>0.182***</td>
<td>0.063</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$QLTY_{HIGH}$</td>
<td></td>
<td></td>
<td>-0.085</td>
<td>0.092</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$QLTY_{LOW}$</td>
<td></td>
<td></td>
<td>0.041</td>
<td>0.082</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$WEALTH_{COW}$</td>
<td></td>
<td></td>
<td>0.187***</td>
<td>0.056</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$DEMG_{AGE}$</td>
<td></td>
<td></td>
<td>0.006</td>
<td>0.037</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$DEMG_{EDU}$</td>
<td></td>
<td></td>
<td>-0.010</td>
<td>0.011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$DEMG_{CHILD}$</td>
<td></td>
<td></td>
<td>-0.004</td>
<td>0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$DEMG_{MRG}$</td>
<td></td>
<td></td>
<td>0.093</td>
<td>0.106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudo R$^2$</td>
<td>0.1014</td>
<td></td>
<td>0.1766</td>
<td></td>
<td>0.3214</td>
<td></td>
</tr>
<tr>
<td>Number of Observations</td>
<td>212</td>
<td></td>
<td>212</td>
<td></td>
<td>212</td>
<td></td>
</tr>
</tbody>
</table>

Statistical significance at the 1% (***) , 5% (**), and 10% (*) levels.

a Robust errors clustered by respondent reference number because single respondent can have multiple parcels of land.
b Omitted variable is $LAND_{PURCHASE}$
c Omitted variable is no documentation
7.2 Land Fallowing

The results of the land fallowing model provide valuable insights into land use decisions in rural Haiti. The decision to fallow your land is often directly associated with tenure security (Goldstein and Udry, 2008). An individual with insecure tenure may be unwilling to leave their land fallow for any significant period of time because of fears that the land will be taken during this time. Table 11 presents the results of the land fallowing regression analysis. Importantly, the land fallowing dependent variable is ordinal. Therefore, I can’t calculate marginal effects and instead I can only interpret the sign and the magnitude of the estimated coefficients.

In contrast to the land terracing model, the results show that men and women are equally likely to fallow their land. In other words, the variable representing gender was estimated as statistically insignificant. This is a very important result considering that the majority of women classified their tenure security as lower than the majority of men. One possible explanation may be the comparatively lower cost of land fallowing. Terracing land and planting trees requires labour and in some cases money. In addition, there is the opportunity cost of foregone crop production where the land has been terraced or forested. For fallowing, the only cost is the opportunity cost. There is no specific outlay of cash or labor required to fallow land. Women may be more willing to fallow their land because it does not require cash or labour. Another potential explanation is that in my research area women were the primary producers of charcoal. It was common for an older woman, especially a single or widowed woman, to fallow the majority of their land to let the soil regenerate and the tree saplings grow. Therefore, tenure security may not be a significant factor influencing a woman’s decision to fallow their land.
The results also show that there is no difference between inherited land and purchased land, in terms of fallowing practices. Interestingly, the results show that individuals are more willing to fallow land that has been obtained through usufruct than land that has been purchased or inherited. The distance to the respondent’s household was found to be negative significant, but the distance to the closest market was estimated as statistically insignificant. Importantly, both formal and informal documents were found to be positive and statistically significant at the 1% and 5% levels, respectively. Yet the estimated coefficient for formal documentation is much larger than the estimated coefficient for informal documentation. Therefore, formal documents are more important than informal documents when making decisions regarding fallowing. This was not the case for land terracing.

The size of the parcel of land was also estimated as positive and statistically significant at the 1% level. This makes sense because fallowing requires a landowner to forego agricultural production on a large portion of their land and as the size of the land increases the landowner may be less concerned with this foregone production. Also, the wealth of the survey respondent was found to be positively related to land fallowing and estimated as statistically significant at the 1% level. The remaining variables were not estimated as statistically significant. Interestingly, marital status was shown to have a strong positive relationship with fallowing, but is only statistically significant above 10.6%. Marital status was not found to have a statistically significant relationship with land terracing.
Table 11: Ordered Probit Regression Results for Land Fallowing Variable, Reporting Robust Clustered Standard Errors\textsuperscript{a}

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated Coefficient</th>
<th>Robust Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>$DEMG_{GENDER}$</td>
<td>-0.097</td>
<td>0.180</td>
</tr>
<tr>
<td>$LAND_{INHERITANCE}$ \textsuperscript{b}</td>
<td>0.201</td>
<td>0.270</td>
</tr>
<tr>
<td>$LAND_{USUFRUCT}$ \textsuperscript{b}</td>
<td>0.660\textsuperscript{*}</td>
<td>0.344</td>
</tr>
<tr>
<td>$DOCS_{FORMAL}$ \textsuperscript{c}</td>
<td>1.080\textsuperscript{***}</td>
<td>0.378</td>
</tr>
<tr>
<td>$DOCS_{INFORMAL}$ \textsuperscript{c}</td>
<td>0.602\textsuperscript{**}</td>
<td>0.270</td>
</tr>
<tr>
<td>$DIST_{HOME}$</td>
<td>-0.123\textsuperscript{***}</td>
<td>0.171</td>
</tr>
<tr>
<td>$DIST_{MKT}$</td>
<td>-0.077</td>
<td>0.171</td>
</tr>
<tr>
<td>$SIZE_{CX}$</td>
<td>0.435\textsuperscript{***}</td>
<td>0.126</td>
</tr>
<tr>
<td>$QLTY_{HIGH}$</td>
<td>-0.188</td>
<td>0.254</td>
</tr>
<tr>
<td>$QLTY_{LOW}$</td>
<td>-0.146</td>
<td>0.265</td>
</tr>
<tr>
<td>$WEALTH_{COW}$</td>
<td>0.412\textsuperscript{***}</td>
<td>0.161</td>
</tr>
<tr>
<td>$DEMG_{AGE}$</td>
<td>-0.032</td>
<td>0.107</td>
</tr>
<tr>
<td>$DEMG_{EDU}$</td>
<td>-0.022</td>
<td>0.027</td>
</tr>
<tr>
<td>$DEMG_{CHILD}$</td>
<td>-0.003</td>
<td>0.038</td>
</tr>
<tr>
<td>$DEMG_{MRG}$</td>
<td>0.416</td>
<td>0.257</td>
</tr>
</tbody>
</table>

Pseudo $R^2$ \hspace{1cm} 0.1078

Number of Observations \hspace{1cm} 212

Statistical significance at the 1\% (***) , 5\% (**), and 10\% (*) levels.

\textsuperscript{a} Robust errors clustered by respondent reference number because single respondent can have multiple parcels of land.

\textsuperscript{b} Omitted variable is $LAND_{PURCHASE}$

\textsuperscript{c} Omitted variable is no documentation
7.3 Agroforestry

Agroforestry is an integral component of peasant agriculture in Haiti. Table 12 contains the ordered probit regression results for the agroforestry dependent variable. Importantly, this dependent variable is ordinal. Therefore, I cannot calculate marginal effects. I can only interpret the sign and magnitude of the estimated coefficients. The results show that women are less likely to plant trees on their land than men. In other words, the coefficient for the gender variable was estimated as negative significant. Interestingly, there is no difference between inherited land and purchased land, in terms of agroforestry activities, but landowners are more likely to plant trees on land obtained through usufruct. Individuals with usufruct rights may be planting trees to improve their claims of ownership in the future.

Importantly, both formal and informal documents were found to be positive and statistically significant at the 10% and 5% levels, respectively. Informal documentation has a smaller standard error and a slightly larger estimated coefficient. Furthermore, both distance variables were found to have a positive and statistically significant relationship with planting trees. The distance to the respondent’s house was significant at the 10% level and the distance to the nearest market was significant at the 5% level. Interestingly, the size variable was estimated as statistically insignificant. Therefore, decisions related to planting trees are not influenced by the size of the property. The wealth of the respondent was the only other variable to be estimated as statistically significant. It was found to have a positive significant relationship at the 10% level. Finally, both quality variables and all four demographic variables were found to be statistically insignificant.
Table 12: Ordinal Probit Regression Results for Agroforestry Variable, Reporting Robust Clustered Standard Errors\(^a\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated Coefficient</th>
<th>Robust Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>(DEMG_{GENDER})</td>
<td>-0.819***</td>
<td>0.219</td>
</tr>
<tr>
<td>(LAND_{INHERITANCE})(^b)</td>
<td>0.029</td>
<td>0.285</td>
</tr>
<tr>
<td>(LAND_{USUFRUCT})(^b)</td>
<td>0.791*</td>
<td>0.374</td>
</tr>
<tr>
<td>(DOCS_{FORMAL})(^c)</td>
<td>0.690*</td>
<td>0.389</td>
</tr>
<tr>
<td>(DOCS_{INFORMAL})(^c)</td>
<td>0.701**</td>
<td>0.314</td>
</tr>
<tr>
<td>(DIST_{HOME})</td>
<td>-0.161*</td>
<td>0.083</td>
</tr>
<tr>
<td>(DIST_{MKT})</td>
<td>-0.374**</td>
<td>0.173</td>
</tr>
<tr>
<td>(SIZE_{CX})</td>
<td>-0.086</td>
<td>0.158</td>
</tr>
<tr>
<td>(QLTY_{HIGH})</td>
<td>-0.084</td>
<td>0.218</td>
</tr>
<tr>
<td>(QLTY_{LOW})</td>
<td>-0.276</td>
<td>0.228</td>
</tr>
<tr>
<td>(WEALTH_{COW})</td>
<td>0.299*</td>
<td>0.165</td>
</tr>
<tr>
<td>(DEMG_{AGE})</td>
<td>-0.113</td>
<td>0.324</td>
</tr>
<tr>
<td>(DEMG_{EDU})</td>
<td>-0.017</td>
<td>0.032</td>
</tr>
<tr>
<td>(DEMG_{CHILD})</td>
<td>0.042</td>
<td>0.041</td>
</tr>
<tr>
<td>(DEMG_{MRG})</td>
<td>-0.250</td>
<td>0.264</td>
</tr>
</tbody>
</table>

**Pseudo R\(^2\)** 0.1300

**Number of Observations** 212

Statistical significance at the 1% (***) and 5% (**) levels.

\(^a\) Robust errors clustered by respondent reference number because single respondent can have multiple parcels of land.

\(^b\) Omitted variable is \(LAND_{PURCHASE}\)

\(^c\) Omitted variable is no documentation
**7.4 General Investment**

The previous three sets of results each corresponded to a single farm-level investment – land terracing, land fallowing, and agroforestry. Conversely, the current results correspond to a landowner’s decision to invest in any of three previously discussed farm-level investments.

Table 13 presents binary and ordinal results for the general investment model. Importantly, for the binary results I am reporting marginal effects and for the ordinal results I am reporting estimated coefficients. I report robust standard errors for both model specifications.

Both the binary and the ordinary model report similar results. Firstly, women are less likely to invest in their land than men. The gender variable was estimated as negative significant for both the binary and ordinal variables. The binary results are significant at the 5% level and the ordinal results are significant at the 1% level. Also, in both models there is no difference between purchased and inherited land; the variable representing land obtained through inheritance was estimated as statistically insignificant under both models. Similar to previous results, land obtained through usufruct was found to have a positive and statistically significant relationship with investment.

The variables representing formal and informal documentation were estimated as positive significant at the 1% for both the ordinal and binary models. In addition, the variable representing the distance to the respondent’s household was found to be negative significant under both models. The size of the parcel of land was found to be positively related to investment. Finally, the wealth variable was found to be positively related to investment. The remaining variables were found to be statistically insignificant under both models. Critically, the binary and ordinal results are consistent with each other.
### Table 13 – Binary and Ordinal Probit Regression Results for General Investment Variable, Reporting Robust Clustered Standard Errors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Binary Results</th>
<th>Ordinal Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marginal Effect</td>
<td>Robust SE</td>
</tr>
<tr>
<td>( DEMG_{GENDER} )</td>
<td>-0.027**</td>
<td>0.023</td>
</tr>
<tr>
<td>( LAND_{INHERITANCE}^{b} )</td>
<td>0.020</td>
<td>0.025</td>
</tr>
<tr>
<td>( LAND_{USUFRUCT}^{b} )</td>
<td>0.015***</td>
<td>0.012</td>
</tr>
<tr>
<td>( DOCS_{FORMAL}^{c} )</td>
<td>0.049***</td>
<td>0.030</td>
</tr>
<tr>
<td>( DOCS_{INFORMAL}^{c} )</td>
<td>0.064***</td>
<td>0.054</td>
</tr>
<tr>
<td>( DIST_{HOME} )</td>
<td>-0.013***</td>
<td>0.009</td>
</tr>
<tr>
<td>( DIST_{MKT} )</td>
<td>-0.023***</td>
<td>0.017</td>
</tr>
<tr>
<td>( SIZE_{CX} )</td>
<td>0.040***</td>
<td>0.029</td>
</tr>
<tr>
<td>( QLTY_{HIGH} )</td>
<td>-0.000</td>
<td>0.0115</td>
</tr>
<tr>
<td>( QLTY_{LOW} )</td>
<td>0.004</td>
<td>0.009</td>
</tr>
<tr>
<td>( WEALTH_{COW} )</td>
<td>0.017*</td>
<td>0.015</td>
</tr>
<tr>
<td>( DEMG_{AGE} )</td>
<td>0.008</td>
<td>0.007</td>
</tr>
<tr>
<td>( DEMG_{EDU} )</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>( DEMG_{CHILD} )</td>
<td>-0.001</td>
<td>0.002</td>
</tr>
<tr>
<td>( DEMG_{MRG} )</td>
<td>0.032</td>
<td>0.036</td>
</tr>
</tbody>
</table>

**Pseudo R^2**  
0.5932  
0.1995

**Number of Observations**  
212  
212

Statistical significance at the 1% (***) 5% (**)  and 10% (*) levels.  
\( a \) Robust errors clustered by respondent reference number because single respondent can have multiple parcels of land.  
\( b \) Omitted variable is \( LAND_{PURCHASE} \)  
\( c \) Omitted variable is no documentation
7.5 Discussion and Conclusion

This chapter has presented regression results for four different empirical models investigating farm-level investment decisions in rural Haiti. Table 14 provides a summary of these results. Importantly, several trends are consistent throughout the models. First, the gender variable was found to be negative significant at the 1% or 5% level across every model except for the land fallowing model. Therefore, it can be concluded with some certainty that women are less likely to invest in their land. Surprisingly, men and women are equally likely to engage in land fallowing.

Table 15 presents the results of three basic regressions with only two explanatory variables – gender and perceptions of tenure security. The purpose of this analysis is to determine whether women’s decreased perceptions of security explain their diminished probability of investment. I find that the negative significant result for the gender variable is only partially explained by perceptions of tenure insecurity. When the regressions are run with only the gender variable, I find that the gender variable is negative significant in all cases. After adding the perceptions of tenure security variable the estimated coefficient for the gender variable decreases very little. This indicates that tenure insecurity is not the primary factor influencing women’s decreased probability of investment.

Land obtained through usufruct was found to be positively related to the dependent variable in every model. Interestingly, land obtained through inheritance was estimated as insignificant in every model except the land terracing model. The dropped variable in these models is purchased land. Therefore, landowners appear to be equally likely to invest in land obtained through purchase and land obtained via inheritance, except for in the case of land
terracing. Also, there is a strong result indicating that landowners are far more willing to invest in land obtained through usufruct than land obtained through purchase or inheritance.

Importantly, every person who indicated they had usufruct rights to land had obtained those rights from their living parents. As previously explained, elderly parents who are unable to farm their entire land holdings will grant usufruct rights to their children; these rights are granted to the older and predominantly male children. By investing in the land that they will one day inherit, these individuals strengthen their claim of ownership over the family estate. Further field work is necessary to understand if individuals who had usufruct rights before inheriting their parents land gain a disproportionate quantity of the estate.

Documentation was found to be a primary factor influencing land use decisions. Both formal and informal documentation were positively related in every model. Critically, informal documentation was found to be just as significant of a factor as formal documentation. Legal land documents are expensive and shunned by most rural landowners. Some individuals record land transactions themselves by drafting hand written documents between both parties and a witness. These documents lack the force of law but still provide significant proof of ownership. In fact, privately drafted land documents are often accepted as admissible evidence in Haitian courts. The value of informal documentation in rural Haiti proves the effectiveness of the customary land tenure system.

The majority of the models show a negative relationship with both distance variables. As previously mentioned, the distance to the respondent’s residence is a measure of the opportunity cost of travelling to the land. The distance to the nearest market is a measure of the value of the land. As the distance increases, the value of the land declines and the opportunity cost increases, and the incentive to invest decreases. Importantly, the distance from to the household is largely
influenced by inheritance practices. The average distance to the household is over three times farther for inherited land than for purchased land. This is because individuals, particularly women, marry away from their home communities. Also, the size of the land was found to have a positive significant relationship in every model except for the agroforestry model.

The final variable that was found to have a significant result was the wealth variable. All four of the models found a positive relationship between the wealth variable and the dependent variable. This result indicates that income and wealth limitations are a key constraint to rural development and agricultural intensification in Haiti. While improving, credit markets are significantly under-developed in Haiti and most rural landowners have only limited abilities to obtain credit at a reasonable interest rate (Thompson, 2006). This is partly due to the inability to use land as collateral in Haiti. Importantly, a primary objective of Haiti’s current land reforms is to increase access to credit, particularly in the rural areas.

The remaining variables were found to be statistically insignificant. The next chapter will summarize the results of this thesis, as well as discuss policy implications and future research opportunities. In addition, the limitations of this model will be discussed.
Table 14: Summary of Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Land Terracing</th>
<th>Land Fallowing</th>
<th>Agroforestry</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$DEM_{GENDER}$</td>
<td>(-Neg) ***</td>
<td>-</td>
<td>(-Neg) ***</td>
<td>(-Neg) <strong>/</strong>*</td>
</tr>
<tr>
<td>$LAND_{INHERITANCE}$ a</td>
<td>(+Pos) **</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$LAND_{USUFRUCT}$ a</td>
<td>(+Pos) ***</td>
<td>(+Pos) *</td>
<td>(+Pos) *</td>
<td>(+Pos) <strong>/</strong>*</td>
</tr>
<tr>
<td>$DOCS_{FORMAL}$ b</td>
<td>(+Pos) ***</td>
<td>(+Pos) ***</td>
<td>(+Pos) *</td>
<td>(+Pos) <strong>/</strong>*</td>
</tr>
<tr>
<td>$DOCS_{INFORMAL}$ b</td>
<td>(+Pos) ***</td>
<td>(+Pos) **</td>
<td>(+Pos) **</td>
<td>(+Pos) <strong>/</strong>*</td>
</tr>
<tr>
<td>$DIST_{HOME}$</td>
<td>(-Neg) ***</td>
<td>(-Neg) ***</td>
<td>(-Neg) *</td>
<td>(-Neg) <strong>/</strong>*</td>
</tr>
<tr>
<td>$DIST_{MKT}$</td>
<td>(-Neg) *</td>
<td>-</td>
<td>(-Neg) **</td>
<td>(-Neg) <strong>/</strong>*</td>
</tr>
<tr>
<td>$SIZE_{CX}$</td>
<td>(Pos+) ***</td>
<td>(+Pos) ***</td>
<td>-</td>
<td>(+Pos) <strong>/</strong>*</td>
</tr>
<tr>
<td>$QLTY_{HIGH}$</td>
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<td>-</td>
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<td>-</td>
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<td>$QLTY_{LOW}$</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$WEALTH_{COW}$</td>
<td>(+Pos) ***</td>
<td>(+Pos) ***</td>
<td>(+Pos) *</td>
<td>(+Pos) <strong>/</strong>*</td>
</tr>
<tr>
<td>$DEM_{AGE}$</td>
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<td>-</td>
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<td>$DEM_{MRG}$</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>Pseudo $R^2$</td>
<td>0.3214</td>
<td>0.1078</td>
<td>0.1300</td>
<td>0.5932/0.1995</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>212</td>
<td>212</td>
<td>212</td>
<td>212</td>
</tr>
</tbody>
</table>

Statistical significance at the 1% (***) , 5% (**), and 10% (*) levels.

a Omitted variable is $LAND_{PURCHASE}$

b Omitted variable is no documentation
Table 15: Analysis of Gender Variable, Reporting Probit Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Agroforestry</th>
<th>Land Fallowing</th>
<th>Land Terracing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Est. Coef. (St Err.)</td>
<td>Est. Coef. (St Err.)</td>
<td>Est. Coef. (St Err.)</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.908 (0.182)***</td>
<td>-0.862 (0.185)***</td>
<td>-0.319 (0.174) *</td>
</tr>
<tr>
<td>Perceptions of</td>
<td>0.428 (0.139)***</td>
<td>0.508 (0.138) ***</td>
<td></td>
</tr>
<tr>
<td>Tenure Security</td>
<td></td>
<td></td>
<td>0.665 (0.143)***</td>
</tr>
</tbody>
</table>

Statistical significance at the 1% (***) , 5% (**), and 10% (*) levels.
Chapter 8 – Conclusions and Policy Implications

In this chapter I will summarize the results of this thesis and identify the limitations of my analysis. In addition, I will discuss the implications of this study and present areas of further research.

8.1 Discussion of Results

Haiti is considered the poorest nation in the western hemisphere (USAID, 2010). Recurrent natural disasters and political instability have constrained economic development since Haiti gained independence in 1804 (Sepinwall, 2013). Experts commonly cite the country’s complex land tenure system as a key constraint to rural development and agricultural intensification (Smucker et al, 2000). Most rural landowners avoid the formalities of law and instead rely on customary arrangements for transacting land. The government agency in charge of agrarian reform in Haiti, INARA (1997), estimates that over 95 percent of rural land transactions are completed without regard to formal legal procedures or requirements. The prevalence of customary ownership has created some concerns of insecurity. In 2012, Haiti’s Prime Minister Laurent Lamothe announced the launching of national land reforms (“Laurent Lamothe officially launches,” 2012). These reforms aim to improve the identification of legal landowners, increase access to credit, and improve tenure security.

The past literature on Haitian land tenure has not adequately addressed the issues of inheritance or gender. This thesis analyzed Haitian land tenure in a rural area of central Haiti. The analysis focused on how tenure security varies by gender and by the mode of land acquisition. I also investigated the prevalence and value of formal and informal documentation.
In addition, I attempted to identify the factors affecting a landowners’ decision to invest in land terracing, land fallowing, and agroforestry.

The results of my analysis in Chapter 6 indicate that landowners perceive inherited land as significantly less secure than purchased land. Also, women perceive their ownership of inherited land to be less secure than men’s. There are several important differences between purchased and inherited land that may explain some of this variation. The practice of dividing land amongst heirs has led to a problem of fragmentation on inherited land. The average size of a parcel of inherited land is approximately one acre compared to approximately three acres for purchased land. Also, the majority of landowners who own inherited land do not have any form of documentation to prove their ownership. Landowners are much more likely to have either formal or informal documentation for their purchased land. In addition, the average distance between a survey respondent’s household and their inherited land is over three times farther than for purchased land. This increased distance may influence landowner perceptions of tenure security because it is more difficult to protect and control land that you live far from. Lastly, inherited land may be divided over several generations and this may perpetuate the occurrence of overlapping ownership claims and conflicts regarding use. My results indicate that land disputes are more common on inherited land than on purchased land. Most disputes regarded disagreements over borders, competing claims of ownership, or prohibited/unauthorized use by family members. These factors may explain the significant differences in perceptions of tenure security between purchased and inherited land.

Based on the results I presented on landowner perceptions, I anticipated that landowners would be more willing to invest in purchased land than inherited land. The regression results I presented in Chapter 7 do not find this to be the case. Only in the case of land terracing was
inherited land found to be statistically different from purchased land. Interestingly, inherited land was positively related to land terracing. This may be explained by the fact that most heirs use mounds of dirt and grass, which closely resemble terraces, as the borders between each informally divided parcel. Several landowners complained of losing land when one of their siblings had built terraces and shifted the border in the process. For land fallowing and agroforestry, I found no difference in investment practices on inherited and purchased land. Also, my general investment model, both binary and ordinal specifications, found no difference between purchased and inherited land. This is a critical result. In my survey, the majority of landowners felt that inherited land was less secure than purchased land, but this did not produce significant differences in land investment decisions. Importantly, landowners are investing in inherited land less than purchased land, but it appears that this is better explained by differences in the size, documentation, and distance of inherited land.

Gender was found to be negatively related with investment in every model except for land fallowing. This was expected based on my review of the literature and my analysis of gender differentiated perceptions of tenure security. I believe that the social norms of Haiti partly explain women’s decreased likelihood of investment. Also, women, on average, have less access to cash and are more time constrained than men because of household responsibilities (caring for children, cooking, cleaning, etc.). In my results, women were also more likely to suffer disputes and conflicts over their land ownership. Interestingly, while women are significantly less likely than men to terrace or forest their land, they are just as likely to engage in fallowing. One possible explanation may be the comparatively lower cost of land fallowing. Terracing land and planting trees requires labour and in some cases money. In addition, there is the opportunity cost of foregone crop production where the land has been terraced or forested. For fallowing, the only
cost is the opportunity cost. There is no specific outlay of cash or labor required to fallow land. Women may be more willing to fallow their land because it does not require cash or labour. Another potential explanation is that in my research area women were the primary producers of charcoal. It was common for an older woman, especially a single or widowed woman, to fallow the majority of their land to let the soil regenerate and the tree saplings grow. After several years, the woman will cut down the trees to make charcoal to be sold in an urban market. Therefore, women’s land use practices appear to be more conducive to land fallowing, regardless of their perceptions of tenure security.

Documentation, both formal and informal, was found to be significantly related to investment in every model, although less so for agroforestry. Formal documents are expensive but provide near perfect proof of *de jure* ownership. Conversely, informal documents are inexpensive but provide only some evidence of *de facto* ownership. The ease of duplication and forgery of informal documents limits the proof that these documents offer. Nevertheless, informal documents are a much less costly alternative to formal documentation. I found it very surprising that more landowners did not draft informal documents for their inherited land. The lack of documentation appears to be one of the main deficiencies of inherited land. Several landowners indicated that forcing siblings to draft informal documents could be seen as a sign of bad faith. In other words, asking your siblings to draft documents for your shared inheritance could be interpreted as a lack of trust in your siblings.

Both the distance to home variable and the distance to market variable were found to have a negative significant relationship with investment in every model, except for the distance to market variable for the land fallowing model. As the opportunity cost of travel between a landowner’s house and land increases, the opportunity cost of an investment increases. Also,
landowners may perceive more distant land as less secure because they are less able to enforce their ownership. The distance to market is a measure of land values. The nearer a parcel of land is to a market, the nearer it is to a point of sale and a transportation hub. Landowners appear to be more willing to invest in land that is closer to a market.

I also found a positive significant result between the size of the parcel of land and investment in every model except the agroforestry model. The size of a parcel of land is an important determinant of the decision to invest. Most Haitian peasants operate highly diversified farms with land devoted to a mix of crop production, grazing area, fallowed land, and forestry. On smaller parcels of land it is more difficult to diversify because of size constraints. The larger the parcel of land, the more likely the landowner will invest. It appears that the size of the land does not influence the decision to plant trees. Trees are critical to rural survival in Haiti. Trees provide food, building materials, and fuel for cooking. I believe landowners plant trees on their land regardless of its size because of the need for a regular supply of fruit, lumber, and charcoal. Finally, I found a positive significant relationship between wealth and investment in every model. This indicates that wealth constraints are a significant factor influencing investment decisions. In Haiti, there are few reliable sources of credit for rural landowners (Thompson, 2006) and land cannot be used as collateral in most cases. The remaining variables were found to be statistically insignificant in every model specification.

The results of this thesis will help to improve the understanding of rural land tenure in central Haiti. Nevertheless, there are some important limitations to my analysis. First, the data for this thesis was collected in only one area of Haiti. There is the possibility that my results do not apply to other areas of the country. Second, most of my results rely on the honesty of the survey participants and may be biased for a number of reasons. I have to assume that some
landowners were not entirely truthful during the answering of the survey questionnaire. Also, the
perceptions of quality may not be robust because they were not verified and rely on the
participant giving an honest assessment of the quality of their land. Another significant
limitation is the lack of a proper income variable. Finally, the data that I collected on land use
and investments does not consider what proportion of the land is used for each purpose.
Therefore, I cannot distinguish between someone who terraces, reforests, or fallows a small
section of their land and someone who terraces, reforests, or fallows their entire parcel of land.
Importantly, for agroforestry, my dependent variable incorporates data on the frequency that
trees are planted and the average number of trees that are planted so the area of land that is
reforested is not as necessary.

The kind of analysis performed in this thesis invariably invites concerns of endogeneity.
Importantly, I believe that many of my key variables are exogenous and should not invite
concerns of endogeneity. Nevertheless, I will discuss the endogeneity concerns of my variables.
Firstly, there is no possibility of gender being endogenous with any of the dependent variables
because gender is determined at birth before any investment decisions are considered. Also, it is
not realistic that the mode of land acquisition would be endogenous with investment because the
investment will occur after the land is acquired. Making an investment does not influence the
way that a landowner obtained their land. The variables representing formal and informal
documentation are also exogenous to the dependent variable. In some cases a landowner may
pursue documentation after obtaining a parcel of land, but it is unlikely that this decision is
influenced by previous investment decisions. Both distance variables are exogenous because the
decision to invest cannot influence the location of a parcel of land. The size of the land is also
exogenous because investment decisions cannot change the size of the land. The wealth variable
could be slightly endogenous because a landowner’s decision to invest may result in him/her being more productive and becoming wealthier through the acquisition of land and livestock. Nevertheless, it is necessary to control for wealth and it is far more likely that wealth influences the decision to invest and not the reverse. There may be some endogeneity in regards to the quality variables. A landowner may perceive the land that they have invested on as higher quality than land that they have not invested on. Still, it is more likely that landowners are first assessing the quality of their land and then making investment decisions based on their assessment. The remaining variables are demographic and are completely exogenous from the dependent variable.

8.2 Policy Implications

This study has made the following contributions to the literature: provided a modern empirical characterization of agriculture and landownership in a specific rural area of central Haiti, assessed perceptions of tenure security allowing for differences across genders and modes of acquisition, investigated the prevalence and significance of formal and informal types of land documentation, and assessed the factors influencing investments in land terracing, land fallowing, and agroforestry. My data and my results are specific to Haiti, but the implications of my analysis are farther reaching.

In my research site, the majority of land parcels were acquired through purchase or inheritance. Importantly, I determined that approximately half of the parcels of land obtained through purchase were informally divided partial shares of inherited land. This is a noteworthy result that has direct implications for the land reforms being proposed in Haiti. The majority of informally divided partial shares of land lack any kind of documentation. Determining the *de jure* structure of ownership for a parcel of land that has been inherited and divided over several
generations may be problematic. Also, accepting the current *de facto* structure of ownership may allow certain biases, such as a bias against women, to be formalized in law. Importantly, my results indicate that customary landownership is not a significant barrier to agricultural investment, regardless of perceptions of tenure security. My results indicate that landowners are just as likely to invest in land acquired through purchase as land acquired through inheritance.

The lack of an official dispute resolution mechanism for land owned customarily may perpetuate insecurity, particularly for women. My results indicate that enforcing the *de facto* structure of rights may be more effective than forcing landowners to abide by *de jure* law.

The influence of gender on tenure security and land use has not been properly investigated in the case of Haiti. Importantly, the issue of gender inequality in tenure security and land rights is not unique to Haiti. My review of the literature on gender and land rights demonstrates that women face considerable challenges to their landownership in most developing countries (Meinzen-Dick *et al.*, 1997). Yet, I was only able to find one study that examined gender differentiated perceptions of tenure security. Ahmed, Deaton, Sarker, and Virani (2008) assess gender differentiated perceptions of tenure security in a wetland in Bangladesh. Their study finds evidence that women perceive their rights as less secure than men’s and they show that this translates into different resource use decisions. In my research site in rural Haiti, I found that women’s perceptions of their tenure security were significantly different than men’s perceptions, especially for inherited land. Importantly, while men and women have equal rights to land in the legal system of land tenure, this has not translated into equality in the customary system. Since the majority of rural land transactions are completed in the customary system, policy changes that affect the legal system may not improve women’s perceptions of tenure security. Recognizing *de facto* rights and allowing these rights to be
defended in formal institutions may significantly improve perceptions of tenure security, particularly for women.

Formal documentation is the primary method used to prove *de jure* ownership of land. Nevertheless, the cost of updating formal documents discourages their use. My results found that only 1.3 percent of landowners had a legal title to their land and only 21 percent of landowners had a legal purchase or inheritance contract. Conversely, 8.5 percent of landowners had an informal title to their land and approximately 55 percent of landowners had an informal purchase or inheritance contract. These results indicate that customary forms of documentation are more prevalent than legal forms of documentation. Also, my regression results show that formal and informal documents influence land investment by similar magnitudes. I found that landowners with documentation, formal or informal, were significantly more likely to invest in their land than those without documents. The value of informal documentation in rural Haiti proves the effectiveness of the customary land tenure system. De Soto (2000) argues that governments must find out how and why these informal arrangements work and how strong they actually are before reforming tenure systems. My research supports the use of informal documentation as an intermediate step for improving tenure security before full-scale land titling efforts. In the early stages of land reform, these informal documents, with the support of the government, may effectively promote tenure security. In the future, a complete cadastral survey of Haiti will be necessary, but for now these customary arrangements and informal documents appear to provide sufficient ownership security.

The current land reforms in Haiti seek to formalize land ownership through the clarification of land rights and the issuance of legal land titles. Yet, the results of this thesis question the validity of this approach. While my results are specific to only one rural area in
central Haiti, it is likely that most of my analysis has implications across the country. My results indicate that landownership in this area of central Haiti is largely informal and poorly documented. Landowners do perceive inherited land to be less secure than purchased land, but this does not appear to translate into differences in land use. Based on my experiences in Haiti and the results of my analysis, I believe that implementing a property authority in all rural areas of the country would help to improve tenure security and transition towards a more formal land tenure system. Currently, land administration is only available in major cities. In the Central Department, landowners must visit the capital city of Hinche to resolve any conflicts or transfer land legally. This perpetuates the avoidance of the legal system. A rural property authority would aid in drafting and certifying informal documents and de facto rights. Also, this individual would act as an informal and unbiased dispute resolution mechanism. Finally, these rural property authorities would facilitate future changes to the land tenure system and aid in disseminating information regarding formalization of land rights and other government policies.

8.3 Suggestions for Future Research

My thesis has discussed a variety of issues for land tenure in rural Haiti. Nevertheless, many of these issues need to be researched further. My results indicate that inheritance is a significant factor for rural land tenure in Haiti. Yet, my thesis only applies to one area of central Haiti. Further research should seek to determine the prevalence and nature of inheritance in other areas of Haiti. Also, inheritance may be a significant factor in many other countries, besides just Haiti. Further examples of countries where inheritance leads to tenancy in common landownership would be valuable. A better understanding of the implications of inheritance laws and customs would help to improve policy efforts to reform existing land tenure institutions.
This study also discussed the nature of family-based usufruct rights in Haiti. I believe that this form of landownership deserves further research. It would be particularly interesting to know if individuals who had usufruct rights before inheriting their parents land gain a disproportionate quantity of the estate at the time of succession. There is some evidence that landowners invest in land obtained through usufruct in an effort to improve future ownership claims. Nevertheless, this study did not explicitly test whether this is true.

Based on my discussions with landowners, it became apparent that there was an active informal land market that allowed purchased and inherited land to be bought and sold. My analysis did not investigate the nature of these informal land markets. Based on my finding that informally divided parcels of inherited land can be sold, a better understanding of these informal land markets would help to improve the overall understanding of rural land tenure. Also, I did not collect data on the frequency of land transactions. It would be significant to know how often individuals are buying and selling land in the rural areas.

Finally, this thesis analyzed the value of formal and informal documentation. Informal documents appear to sufficiently prove ownership in the rural areas. Nevertheless, I am unsure if these documents provide any proof of ownership in the legal system. Further research could be done to analyze the value of informal documents in legal land disputes. Also, I have no data on the costs and procedures required to legalize informal ownership. It would be very valuable to have trustworthy estimates of the requirements for formalizing informal forms of ownership.

**8.4 Conclusion**

This study aimed to investigate land tenure in a rural area of central Haiti and determine the factors influencing investments in land terracing, land fallowing, and agroforestry. Specifically, I
analyzed perceptions of land tenure, differentiated by gender and the mode of land acquisition and used these perceptions to inform the specification of my regression models. I found that, despite the significant differences in perceptions of tenure security, landowners were equally likely to invest on purchased and inherited land. I also found that women were less likely than men to terrace or reforest their land, but were equally likely to engage in land fallowing. In addition, formal and informal documents were found to be a significant factor influencing investments in land terracing, land fallowing, and agroforestry. Interestingly, my results indicate that the current customary system of land tenure in rural Haiti is not a significant barrier to agricultural investment. New avenues of research and a broader diffusion of information on land and justice issues could help facilitate a more reasoned debate over agricultural policy and the requirements for land reform in Haiti.
References


Appendix A: Survey Instrument

Introduction:

“Good [morning/afternoon/evening], my name is Liam Kelly. I am a student of agriculture and economics at the University of Guelph in Ontario, Canada. I am doing research on land in the area and I would like to talk to ask you some questions about the land that you own. I am interested in your experiences and insights to help me better understand this issue."

“Would you be willing to talk with me or is there a better time when I can come back?”

a. Yes <Continue with survey and consent process>

b. No <"Thank you, have a very nice day”>

“To ensure that you fully understand your rights and in order to protect your privacy I would like to explain a few things to you before we continue:

1. You are not obligated to participate in this survey, you can refuse to answer any of the questions asked, and you can withdraw from the survey at any time.

2. If you choose to withdraw from the survey you can also request to have the information collected be removed from the study and not used for any purposes. This is your right and you are free to withdraw yourself and your data from the study at any time and for any reason.

3. Your participation is voluntary and there will be no compensation offered.

4. Your name will not be recorded anywhere and there will be no connection between your name and the responses you provide. The data collected will not be given to any organization or person, including the Haitian Government. Your information will be protected and kept confidential in order to protect you from any legal liability that may arise.

5. If you have questions or concerns you can contact Professor Brady Deaton or me at the University of Guelph. I will provide you with the contact information for both myself and Brady Deaton.

6. If you are interested in any information about this study or would like the results of the study you can contact me or Professor Brady Deaton at the University of Guelph."

“If you have questions about the ethics of this study you can contact the University of Guelph Research Ethics Board at 519-824-4120 extension 56606 or by email at reb@uoguelph.ca. When you call, inform them you are calling about the Landownership Survey in Haiti and provide the following REB# 13JN013

“Are you willing to participate in the survey regarding landownership in rural Haiti?”

a. Yes <”Thank you very much”>

b. No <“Thank you, have a great day!”>
Part I: This set of questions is intended to identify and verify that the respondent is a de jure co-owner of inherited land

1. Gender [Question is not asked but simply observed and recorded]
   a. Male
   b. Female

2. Do you currently have access to land that you obtained through inheritance?
   a. Yes <Continue to Question 5>
   b. No

3. If no, do you have pre-inheritance (usufruct) access to land?
   a. Yes <Continue to Question 5>
   b. No

4. If no, why? [circle relevant answer]
   a. Had land but sold it to another heir/family member
   b. Had land but sold it to a non-family member
   c. Lost land to another heir/family member
   d. Lost land to a non-family member
   e. Your parents are still alive and in possession of their land
   f. Your parents had no land to be inherited
   g. You were excluded from your inheritance and did not receive any land
   h. You chose not to claim your inheritance
   i. Other ______________________________

5. From whom did you inherit this land?
   a. Mother
   b. Father
   c. Other relative
   d. Non-family member
   e. Other ______________________________

6. How many people inherited this land with you?
   [For pre-inheritance land: How many people have access to this land?]
   a. ______________________________

7. How many carreaux’s (3.19 acres) was this land in total, before division?
   a. ______________________________

8. What is your relation to the other owners?
   a. Siblings
   b. Aunts/Uncles
Kelly, 2014

c. Cousins
d. Other________________________

9. Are you the:
   a. Oldest heir
   b. Youngest heir
   c. Neither oldest or youngest

10. What kind of documentation do you have for this land [circle all that apply]
    a. Notarized deed
    b. Notarized purchase/inheritance contract
    c. Privately drafted deed
    d. Privately drafted purchase/inheritance contract

Part II: This set of questions is intended to determine the physical location of the land, the division of the land, and the owner’s perception of the economic value of the land

11. How many carreaux’s (3.19 acres) of this land do you own?
    a. ____________________

12. In which area is this land located?
    a. Village___________________
    b. City______________________
    c. Department________________

13. How far is this land, by foot, from:
    a. Your home _______________
    b. The Booyaha river__________
    c. The Cano river_____________
    d. Another water source________
    e. Maissade Market___________
    f. Bohoc Market______________
    g. Pignon Market_____________
    h. Port au Ciel Market_________

14. Overall, how would you describe the quality of the land?
    a. High quality (flat with fertile soil)
    b. Average quality (moderately sloped with fertile soil)
    c. Low quality (steeply sloped with poor soil)

15. Has the land been divided amongst the owners?
    a. Yes, legally
    b. Yes, family agreement
    c. No <continue to question 19>

16. If yes, was the land divided before or after the previous owner’s death?
    a. Before death
    b. After death

17. If the land has been divided, do you believe that your share of the land is the same size as the other shares of land?
    a. Yes
    b. No
18. Do you believe that you have:
   a. The best quality piece of land
   b. The worst quality piece of land
   c. Not the best, but not the worst piece of land
   d. The same land as the other heirs

19. Have you ever purchased another owners share of their land?
   a. Yes
   b. No <continue to question 21>

20. How many carreaux’s is the share of land that you purchased?
   a. _______________________

Part III: This set of questions is intended to identify the respondent’s perception of their
tenure security

21. Has anyone ever [circle all that apply]:
   a. Changed the limits of your land
   b. Taken some/all of your land
   c. Claimed some/all of your land
   d. Used your land without your consent

22. If yes, who? [circle all that apply]
   a. Another heir
   b. A family member
   c. A local person (non-family)
   d. A stranger
   e. Other ______________________

23. If land was taken, did you ever get any of this land back?
   a. Yes, all
   b. Yes, some
   c. No

24. Have you ever been to the justice for difficulties with this land?
   a. Yes
   b. No

25. Do you feel secure in your ownership of this land?
   a. Yes, completely secure
   b. Somewhat secure, but expect some issues
   c. No

Part IV: This set of questions is intended to assess respondent’s perception of their rights
for their inherited land

Cultivation Rights – The right to use, harvest from, and make improvements to the land

26. Are you or have you been actively using this land in the last year?
   a. Yes
   b. No

27. Do you have the right to [circle all that apply]:
   a. Plant, maintain, and harvest the crops that you choose
   b. Use land for pasture and keeping animals
c. Collect water, tree fruit, and wood
d. Cut trees to make charcoal
e. Make changes to the land (Plant trees, cut trees, terracing, etc.)

28. Has any person ever interfered with any of the above rights?
   a. Yes
   b. No
      i. Who? _____________________

29. If you are not currently using the land, do you believe that you can exercise all of the above right without going through negotiations or court?
   a. Yes
   b. No

Exclusion and Alienation Rights – The right to determine who can access and use the land, as well as the right to sell, rent, or lease the land

30. Do you decide who is allowed to access and use this land?
   a. Yes
   b. No

31. If someone accesses this land without your consent (to plant crops, to harvest tree fruit, to harvest wood, etc.) can you force them to stop/leave without difficulties?
   a. Yes, anyone
   b. Yes, but not everyone
   c. No

32. Have you ever sold, rented, or leased all or a share of this land?
   a. Yes I sold land
   b. Yes, I rented or leased land
   c. Yes, both
   d. No

33. Did you require permission from anyone or did you have any difficulties before you were able to sell, lease, or rent your share of the land?
   a. Yes
   b. No

34. If you wanted to, do you believe you could sell, lease, or rent your share of the land without first seeking permission from anyone and without difficulties?
   a. Yes, to anyone
   b. Yes, but only to certain people
   c. No
Part V: Questions regarding investments and uses of the land

35. Please specify the frequency and intensity for the following investments:

<table>
<thead>
<tr>
<th>INHERITED LAND</th>
<th>Long Term</th>
<th>In the last year</th>
<th>In the last five years</th>
<th>Several times since obtaining land</th>
<th>Once since obtaining land</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Planted trees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Built a house/structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Invested in irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Term</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>a) Terraced the land</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>b) Left the land fallow</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>c) Built a fence</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Short term</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>a) Added compost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Used fertilizer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Planted crops that need to be watered by hand</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

36. Please detail and briefly explain your activities on this land:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td></td>
</tr>
<tr>
<td>Animals</td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td></td>
</tr>
<tr>
<td>Fallow</td>
<td></td>
</tr>
<tr>
<td>Tree crops</td>
<td></td>
</tr>
<tr>
<td>Unused</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
Part VI: This set of questions is intended to determine if the individual owns land privately (obtained through purchase) and to gather information on the location of the land

37. Do you currently have land that you obtained through purchase?
   a. Yes, with wife/husband
   b. Yes, with another person __________________
   c. Yes, independently
   d. No

38. How many carreaux’s (3.19 acres) of this land do you have access to?
   a. ____________________

39. In which area is this land located?
   a. Village ______________
   b. City ________________
   c. Department ____________

40. How far is this land, by foot, from:
   a. Your home ______________
   b. The Booyaha river________
   c. The Cano river___________
   d. Another water source______
   e. Maissade Market__________
   f. Bohoc Market____________
   g. Pignon Market____________
   h. Port au Ciel Market_______

41. Overall, how would you describe the quality of the land?
   a. High quality
   b. Average quality
   c. Low quality

42. What kind of documentation do you have for this land [circle all that apply]
   a. Notarized deed
   b. Notarized purchase/inheritance contract
   c. Privately drafted deed
   d. Private drafted purchase/inheritance contract

43. Was land previously divided as part of an inheritance before purchase?
   a. Yes
   b. No

Part VII: This set of questions is intended to identify the owner’s perceptions of their tenure security

44. Has anyone ever [circle all that apply]:
   a. Changed the limits of your land
   b. Taken some/all of your land
   c. Claimed some/all of your land
   d. Used your land without your consent
45. If yes, who? [circle all that apply]
   a. Neighbour
   b. Previous owner
   c. A family member
   d. A local person (non-family)
   e. A stranger
   f. Other __________________

46. If land was taken, did you ever get any of this land back?
   a. Yes, all
   b. Yes, some
   c. No

47. Have you ever been to the justice to solve difficulties with this land?
   a. Yes
   b. No

48. Do you feel secure in your ownership of this land?
   a. Yes, completely secure
   b. Somewhat secure, but expect some issues
   c. No

Part VIII: This set of questions is intended to assess owners’ perceptions of their rights for their purchased land

Cultivation Rights – The right to use, harvest from, and make improvements to the land

49. Are you or have you been actively using this land in the last year?
   a. Yes
   b. No

50. Do you have the right to [circle all that are relevant]:
   a. Plant, maintain, and harvest the crops that you choose
   b. Use land for pasture and keeping animals
   c. Collect water, tree fruit, and wood
   d. Cut trees to make charcoal
   e. Make changes to the land (Plant trees, cut trees, terracing, etc.)

51. Has any person ever interfered with any of the above rights?
   a. Yes
   b. No

52. If you are not currently using the land, do you believe that you can exercise all of the above right without going through negotiations or court?
   a. Yes
   b. No

Exclusion and Alienation Rights – The right to determine who can access and use the land, as well as the right to sell, rent, or lease the land

53. Do you decide who is allowed to access and use this land?
   a. Yes
   b. No
54. If someone accesses this land without your consent (to plant crops, to harvest tree fruit, to harvest wood, etc.) can you force them to stop/leave without difficulties?
   a. Yes, anyone
   b. Yes, not everyone
   c. No

55. Have you ever sold, rented, or leased all or a share of this land?
   a. Yes I sold land
   b. Yes, I rented or leased land
   c. Yes, both
   d. No

56. Did you require permission from anyone before you were able to sell, lease, or rent your share of the land?
   a. Yes
   b. No

57. If you wanted to, do you believe you could sell, lease, or rent your share of the land without first seeking permission from anyone and without difficulties?
   a. Yes, to anyone
   b. Yes, to certain people
   c. No

Part IX: Questions regarding investments and uses of the land.

58. Please answer yes or no and specify the time frame for the following investments:

<table>
<thead>
<tr>
<th>PURCHASED LAND</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long Term</strong></td>
</tr>
<tr>
<td><strong>a) Planted trees</strong></td>
</tr>
<tr>
<td><strong>b) Built a house/structure</strong></td>
</tr>
<tr>
<td><strong>c) Invested in irrigation</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Medium Term</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Terraced the land</strong></td>
</tr>
<tr>
<td><strong>b) Left the land fallow</strong></td>
</tr>
<tr>
<td><strong>c) Built a fence</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Short term</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Added compost</strong></td>
</tr>
<tr>
<td><strong>b) Used fertilizer</strong></td>
</tr>
<tr>
<td><strong>c) Planted crops that need to be watered</strong></td>
</tr>
</tbody>
</table>
59. Please detail and briefly explain your activities on this land:

<table>
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<th>Activities</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>Crops</td>
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<tr>
<td>Tree crops</td>
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</tr>
<tr>
<td>Unused</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Part X: These questions are intended to gather a few extra details about the respondent

60. How many carreaux's (3.19 acres) of land do you have under:
   a. Rented land _____________________________
   b. State land _____________________________
   c. Other _________________________________

61. Can you please tell me your approximate age (years)?
   a. 18-25
   b. 26-35
   c. 36-45
   d. 46-60
   e. 60+

62. Are you married
   a. Yes, legally
   b. Yes, civil union
   c. Widowed
   d. Divorced/Separated
   e. No

63. How many children do you have?
   a. _____________________

64. How many years of education have you completed?
   a. _____________________

“Thank you very much for your time. If you have any questions or concerns please feel free to discuss them now.”
Appendix B: Diagram of Contour Ridge Terracing

Figure 8: Contour Ridge Land Terracing Diagram

Source: IIRR, 2006
Appendix C: Summary Statistics to Support Figures 5, 6, and 7

Table 16: Summary statistics on gender differentiated perceptions of tenure security

<table>
<thead>
<tr>
<th></th>
<th>Inherited Land</th>
<th>Purchased Land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men (n = 41)</td>
<td>Women (n = 41)</td>
</tr>
<tr>
<td>No Exclusion Rights</td>
<td>17.07%</td>
<td>34.15%</td>
</tr>
<tr>
<td>Insecure Exclusion Rights</td>
<td>0.00%</td>
<td>36.59%</td>
</tr>
<tr>
<td>Secure Exclusion Rights</td>
<td>82.93%</td>
<td>29.27%</td>
</tr>
<tr>
<td>No Alienation Rights</td>
<td>17.07%</td>
<td>34.15%</td>
</tr>
<tr>
<td>Insecure Alienation Rights</td>
<td>7.32%</td>
<td>29.27%</td>
</tr>
<tr>
<td>Secure Alienation Rights</td>
<td>75.61%</td>
<td>36.59%</td>
</tr>
<tr>
<td>No Ownership Security</td>
<td>17.07%</td>
<td>34.15%</td>
</tr>
<tr>
<td>Insecure Ownership</td>
<td>21.95%</td>
<td>17.07%</td>
</tr>
<tr>
<td>Secure Ownership</td>
<td>60.98%</td>
<td>48.78%</td>
</tr>
</tbody>
</table>

Source: Data collected for this study from Central Haiti, 2013