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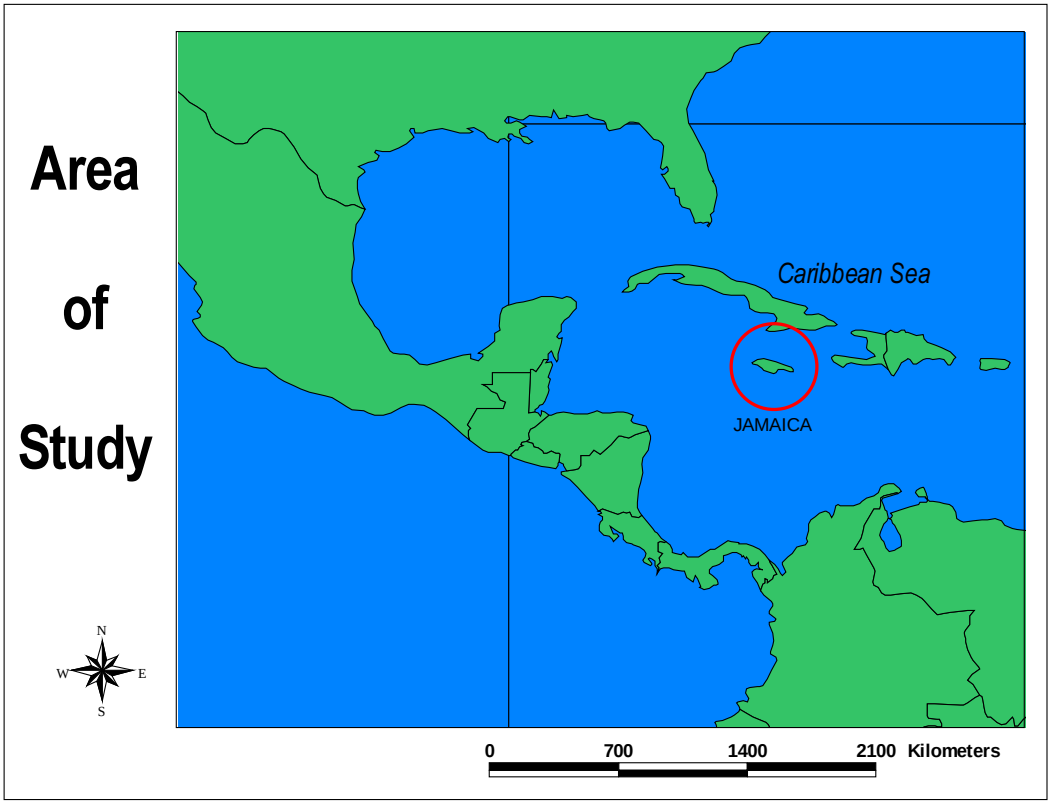
CHAPTER 1: INTRODUCTION

In response to environmental degradation, pesticide residues on export crops, and human pesticide poisonings, an alternative known as Integrated Pest Management (IPM) was developed during the early 1970s by researchers. In brief, IPM promotes a variety of cultural, genetic, biological and, as a last resort, chemical means of pest control with lesser adverse impact to the neighboring environment. According to Hansen (1987), "Integrated Pest Management is really a philosophy of pest control that focuses not on the pest, but on the whole agro-ecosystem" (1987: 41). A tenet of IPM is the concept of economic injury threshold to the crop before the application of a pesticide. In practice, IPM is location-specific as it is dependent on many environmental factors. IPM is also a very fluid technology, changing its approach to meet different situations in the pest/crop complex. IPM also takes advantage of locally available, low-input technology. The adoption of IPM is said to have many benefits, including less income spent on the purchase of pesticides, a lesser chance of pests developing resistance to pesticides, lesser amounts of chemical runoff into waterways, and fewer cases of human pesticide poisonings.

IPM is being promoted on the Caribbean island of Jamaica (see Map 1-1). However, in Jamaica IPM has not become an established, island-wide alternative to pesticides. Pesticide usage at both the plantation and small-scale levels predominates. Since the 1980s, Jamaica has been shifting its attention to consider nontraditional agricultural exports (such as sweet potato, mango, and papaya) as export crops. In 1994, nontraditional export crops amounted for US$18.5 million in sales (Planning Institute of Jamaica, 1995). However, due to high aesthetic standards of United States consumers and high value of nontraditional export crops, large amounts of pesticides are used. At the same time, the United States Food and Drug Administration (FDA) screens for pesticide residues that exceed US standards on imported crops. For example, between 1984 and 1994, the United States detained 150 shipments of fruits and vegetables from Jamaica, a loss of US$583,000 for Jamaican exporters (Thrupp,

et al., 1995: 7). In response to this development, scientists from the Caribbean Agricultural Research and Development Institute (CARDI), based in Kingston, Jamaica, have been researching IPM since 1994 in three nontraditional agricultural exports (NTAEs), callaloo (*Amaranthus viridus,* a leafy green vegetable), "Scotch Bonnet" hot pepper (*Capsicum chinense*), and sweet potato (*Ipomoea batatas*).

Map 1-1: Area of Study, Jamaica

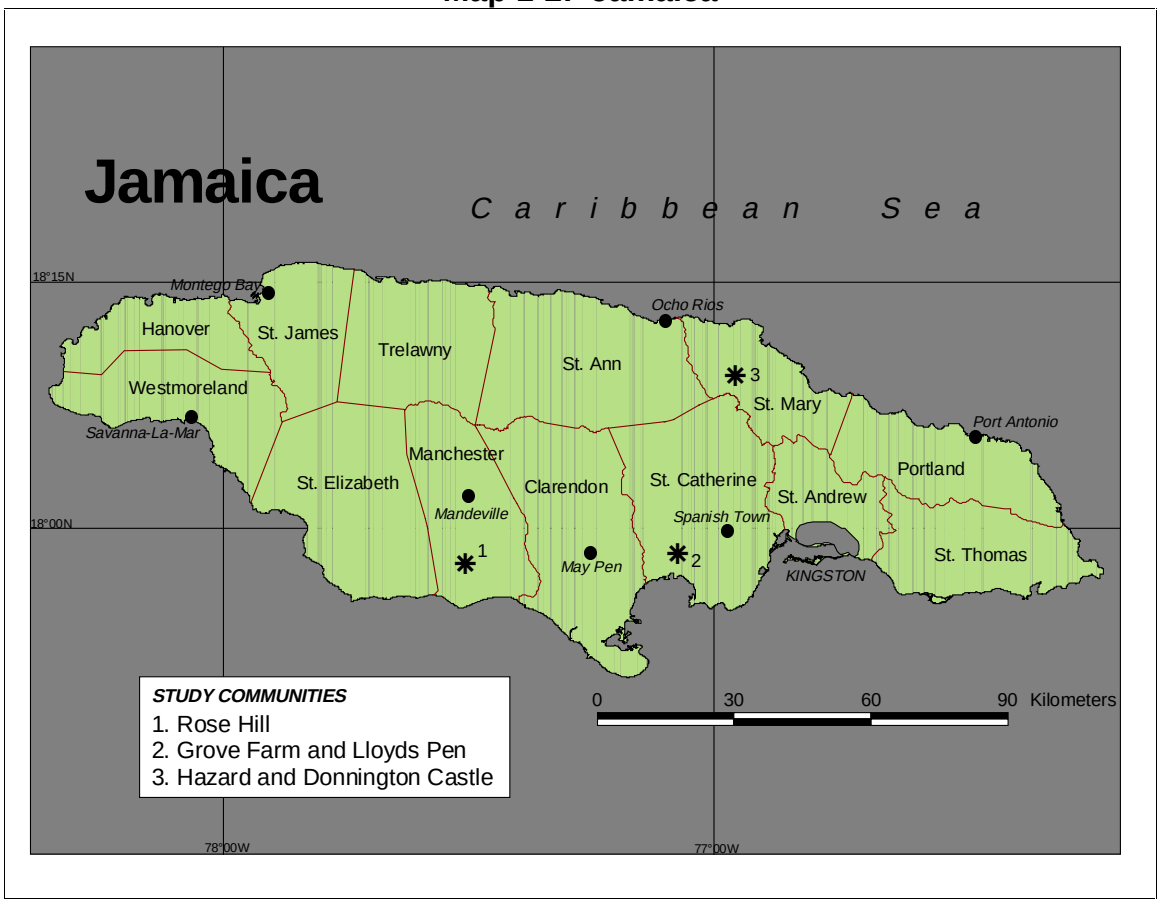


(Source: John Boyer, 1999)

CARDI is attempting to introduce and expand IPM throughout Jamaica. Much of their research is focused on areas near the communities Grove Farm, St. Catherine parish, Hazard, St. Mary parish, and Rose Hill, Manchester parish (see Map 1-2). Grove Farm and Lloyds Pen, St. Catherine, are located in the southern lowland of the island. Hazard and Donnington Castle, St. Mary, are located in a mountainous and heavily vegetated region of the interior. Rose Hill,

Manchester, south of Mandeville, is located in an area of rolling hills and pastures.

Map 1-2: Jamaica



(Source: Baseline data from IPM CRSP)

At the present, CARDI's extension activities have been concentrated on the participation of male farmers. There is a lack of baseline data describing the role of women and the extent of their participation in farming and pest management. As part of the effort to broaden participation in IPM, I examine the contribution of women and men small-scale farmers in the production, marketing, and decision making about vegetable crops in three farming communities (Grove Farm/Lloyds Pen, Hazard/Donnington Castle, and Rose Hill). In addition, I look for the inter-village variation in women's and men's abilities to identify key pests of three crops, as well as the pest management methods men and women

employ. The purpose of determining farmers' knowledge of pests (and beneficial insects) is that IPM cannot be implemented if farmers (or researchers) do not know which pests are causing the major damage. Pest knowledge includes naming the insect, knowing the insect's lifecycle (including the stages when it causes the most damage), and control tactics.

The thesis has three main objectives. The first is to provide quantitative and qualitative data that document gendered roles in farming, decision making, and local pest knowledge in each community. For extension agents, gendered and local pest knowledge could serve as foundations upon which IPM can be built. At the present, while the literature on gender in general has been well-documented, the body of literature on the issue of gender and IPM is limited; not to mention that little or no research on this subject has been carried out in the Caribbean. The second is to compare the results from three locationally-different communities to determine variations in how much women are involved in farming and what kinds of tasks they are responsible for. The third objective, hopefully accomplished by synthesizing the information collected, is to recommend an improved approach to IPM in Jamaica.

The thesis is divided into seven chapters. Chapter 2 provides a brief introduction by outlining some of the events that led to plantation farming and small-scale farming in Jamaica. Furthermore, this chapter looks at changes to local farming practices when confronted with the onset of agrochemicals (such as pesticides and fertilizers) and other Green Revolution technologies. It next discusses the contribution of Jamaican women to agricultural production and marketing and examines their role in decision-making. Chapter 3 reviews the Integrated Pest Management (IPM) strategies currently promoted by CARDI in Jamaica. The bulk of Chapter 3 expands upon the concepts of local Jamaican farmers' knowledge in relation to pest management, gendered roles in pest management, and constraints to farmers' adoption of IPM in Jamaica. Chapter 4 presents the methodology and research questions. In Chapter 5, the results are presented. Each section begins with a description of the research community, and the results of data gathered on land profile, production tasks, decision-

making, and pest identification and management are presented. At the end of each section in Chapter 5, two case studies of individual farmers are also provided. Case studies aim to contextualize the results from data analysis. Chapter 6 discusses the results and the implications for IPM adoption in the three communities. Chapter 7 forms the conclusion and contains recommendations for the inclusion of women in IPM. Furthermore, this chapter discusses barriers to the widespread adoption of IPM and offers a holistic approach to IPM extension.

CHAPTER 2: SMALL-SCALE FARMING IN JAMAICA

A. CHALLENGES OF SMALL-SCALE FARMING

To provide an overview of small-scale farming in Jamaica, I begin by describing the importance of farming and how farming is tied to the history of the country. In rural Jamaica, farming predominates not only as the number one source of employment, it also symbolizes the history and struggle of the Jamaican people. In 1655, soon after Jamaica became an English colony, the slave trade began to transport thousands of people from Africa to work on Jamaican sugar plantations.

On plantations, slaves, while adding to the profits of plantation owners, were also an expense to feed; however, importing food was not always a viable option (Barker, 1993). Plantation owners, faced with the cost of feeding slaves, often allowed slaves to cultivate their own crops. In instances, slaves were allowed to sell their production surplus (Mintz, 1966). As slaves farmed, the knowledge and skills were passed on from generation to generation (Mintz and Price, 1985). In fact, some of the land use practices that small-scale farmers in Jamaica use are from slave descendants from Africa (Innis, 1961). After emancipation in 1838, the ex-slaves took these farming skills and moved to peripheral, often marginal lands for farming. As farmers, they sought to become economically independent of the plantations, and brought small parcels of land into cultivation (Thomas, 1988; Brierley, 1991). This marked the beginning of independent small-scale agriculture in Jamaica.

Almost immediately during post-emancipation, as a strategy for surviving independently of plantations, a system of passing land from generation to generation evolved and spread throughout much of the Caribbean (Mintz, 1984; Besson, 1987: 18; Besson, 1988). This land tenure system, known as family land, would come to be one of the characteristics of the Caribbean (Besson, 1987). The conditions under which the land became the property of the family were established by the founder of the property, and later the conditions were "reiterated" by successive generations (Besson, 1988: 43). "During slavery," as

Satchell (1990) argues in the case of Jamaica, “land was the symbol of freedom” (1990: 27). Besson (1987) researching in the Jamaican village of Martha Brae, Trelawny, points out that family land, in addition to symbolizing freedom, also acts as a means for creating family lines (Besson, 1987: 18). An important facet of family land is that both sexes have equal access to the land. And, as family land is divided among family members, it works to create a bond for a greater number of people to the land. For example, Mintz (1984) has shown in Jamaica that the ownership of family land maintains a “deep significance to the Jamaican peasant” (1984: 223).

In general, most small-scale farmers survive on less than five acres (Mintz, 1989; Thomas, 1988), but the definition of a small farm also includes up to ten acres (Mintz, 1989). More recently, Innerarity (1996) found that, in a survey of 150 women farmers in Jamaica, that approximately 80% of farms had less than two hectares (4.94 acres) whereas 5% had more than four hectares (9.88 acres). The most recent source I have come by, the 1997 Statistical Yearbook of Jamaica, still relies on 1978/79 survey research. From this, roughly half of the total 183,988 farms included have one to less than five acres but amount to less than 15% of total acreage. In contrast, 295 farms, or 0.01% of the total, have land of 500 acres or more and control 44% of total acreage.

In depending on small and scarce amounts of land for the production of crops, Jamaican small-scale farmers have had to develop many skills to survive. With respect to Caribbean small farmers as a whole, Hills (1988) states that there “exists a considerable body of agronomic knowledge” (1988: 23). As an example, in the Jamaican Maroon village of Accompong, an offshoot of an African tradition of kitchen compound farming has been observed (Barker and Spence, 1988). Another example in Jamaica is found in the seasonally dry Green Park valley (near the north coast), where a study examined the small-scale farmers’ indigenous knowledge of fodder trees. Researchers also discovered which fodder trees farmers preferred for their cattle, particularly those species which could withstand extended drought (Morrison, *et al.*, 1996).

Although small-scale farmers do not conduct formal, controlled scientific experiments and record the results, Jamaican small-scale farmers have experimented with various crop combinations, including those that make use of plant height, leaf size, and root interactions (Innis, 1983). Further, there are many advantages of local polycropped fields and forests. For example, the total yield per acre is greater in a field of mixed plants as opposed to a monocropped field and could better survive an onslaught of pests (Innis, 1961). Local methods make more efficient use of solar energy, space, reduce erosion, enhance soil fertility through the addition of organic matter, and bring up nutrients by root systems of varying depths (Innis, 1980).

In the early 1980s, a debate developed in Jamaican agriculture. One point of contention was the promotion of local farming practices versus new technology. Innis (1980) argued that the local peasant farmer was more efficient with use of resources and space, while others supported this argument by saying that peasant farming practices created greater ecological diversity as well as contributing to the household's income (Hills and Iton, 1982; 1983). Floyd (1983), in contrast, refuted these arguments by saying that what the small-scale sector needed most, considering their misery and poverty, was a greater infusion of new technology to increase food production. As the debate continued, several researchers began to predict that the unabated momentum of modern farming technologies was threatening to overtake the best traditions of Caribbean small-scale farming (Hills and Iton, 1983).

However, while plantations dominated exporting due to their comparative advantage, the small-scale "traditional" farmer provided for the demands of local markets (Barker, 1993). Commercial plantation agriculture, moreover, had access to resources such as capital, labor, and land. This emphasis on commercial plantation agriculture has led to structural constraints on small-scale farming (Barker, 1993). The small-scale farmer, facing increasing costs in farm inputs, unfavorable markets, and competition from imported products, has suffered tremendously. This has led to local markets in Jamaica becoming less profitable, one of the factors contributing to the stagnation and decline of the

domestic food supply, as well as the rise in arable yet idle land. The arable lands are more likely to be planted in export crops. In the case of Jamaica, this has caused export crops to be overproduced while domestic food crops have been produced below capacity (Innis, 1983). However, domestic consumption has increased, causing food security in Jamaica to worsen (Spence, 1996).

In Jamaica, while small-scale farmers contribution only 7 to 8% of the Gross Domestic Product (GDP), 37% of the total labor force works in small-scale farming (Pariser, 1996). Locally, small-scale farmers have been the main supplier of Jamaica's local markets (Spence, 1996; Barker, 1993). During the 1980s, they also increased the amount of cash crops exported (Besson, 1988).

Since the 1980s, thousands of small-scale farmers have been shifting part or all of their production into nontraditional agricultural exports—crops other than the traditional exports (sugar cane, bananas, and coffee, for example). Additionally, nontraditional agricultural exports are being promoted by governments, both in the Caribbean region and Latin America, to increase living standards of small-scale farmers (Murray and Hoppin, 1992). As Jamaican small-scale farmers see opportunities to earn more income through nontraditional agricultural exports, they will likely use more pesticides (particularly if they are not aware of alternative controls) over other pest control measures in order to meet the stringent product standards of export markets. It is in this context that institutions such as CARDI have become involved to try to implement Integrated Pest Management, and focus on three nontraditional agricultural exports: callaloo, "Scotch Bonnet" hot pepper, and sweet potato. These crops are mainly exported overseas to metropolitan areas, including Miami, New York, Toronto, and London, where large numbers of Jamaican expatriates reside.

B. CONTRIBUTION OF JAMAICAN WOMEN TO FARMING

Historical events also influenced gender roles in Jamaican agriculture. During slavery, men and women worked in plantation fields and provision grounds together (Mintz and Price, 1985). In addition to work in fields, women cared for children and were burdened with household chores (Momsen, 1988). The abolition of slavery brought about new roles for women and men. As many

men left farms to look elsewhere, particularly in cities, for work they left women in charge of the home (Massiah, 1984). In many cases, men traveled for extended periods overseas to work and sent remittances to the rural household. Remittances made a major contribution to households, and many people purchased land and housing upon their return with money earned abroad (Thomas-Hope, 1993). Still, single women, confronted with the prospect of raising children without a partner, had to find ways to support their families. In response, women in Jamaica became self-reliant and, if necessary, participated in unpaid work (Momsen, 1988). As a result, women came to dominate marketing and, in some cases, achieved economic autonomy (Mintz, 1984). This was made possible by the surplus of crops which helped build the internal marketing system (Barker, 1993).

Marketing, or "higglering" as some forms of marketing are known in Jamaica, was found in a 1977 survey of higglers (marketers) to be predominately run (80%) by women (Smikle and Taylor, 1977). The higgler not only markets the produce but also purchases it from the farmer. The buying of crops from farmers is a daily experience for higglers throughout rural Jamaica. Higglers, acting as "middlemen," fill an important niche in linking the farmer to the marketplace. Both higgler and farmer share similarities, for example, both have extremely low margins of profit and usually deal with small amounts of money (Mintz, 1984: 220). While those buying crops in the countryside are not necessarily women, internal marketing in Jamaican made up by a "predominance of women" (Mintz, 1984: 216). In my visit to the island, I had the opportunity to observe women higglers at urban and rural markets and roadsides. There are many local markets for produce with the largest market—Coronation—located in downtown Kingston. Coronation Market is the market for produce from all parts of the island, including the western-most parishes Westmoreland and Hanover. The buying and selling of crops is time-demanding for higglers. In order to participate in markets, women forego days working on the farm and often must travel long distances. But higglers face additional barriers. Many told me that,

as higglers, they are under great difficulty in paying for the transportation to the market and once at the market they must rent a stall before selling produce.

In estimating how much women contribute to agriculture in the Caribbean, Chase (1988) believes this is between 30 to 40% of the agricultural labor force. In the case of Jamaica, however, estimates indicate that there is less female participation, and women comprise 23% of the total employed (wage employment) in the agricultural labor force (Innerarity, 1996), or approximately 65,000 women (Statistical Institute of Jamaica, 1992). However, the inclusion of data from women's participation in the informal sector may provide a more realistic representation. Tinker (1990) asserts "that the statistical discounting of all aspects of women's work is not unique to the Caribbean" (1990: 237). The difficulties in determining women's contribution to farming include the following: women's work is often "discontinuous and fragmented" (Leon, 1984: 14) and, as mentioned earlier in the chapter, unpaid (Momsen, 1988). Typically, members of the household do unpaid or low pay tasks which include weeding and planting crops (Chase, 1988). Even when women are earning money, for example as higglers, their work may be perceived to be of little importance to the island's economy. Mintz (1984) says that higglers make "a significant contribution, not usually recognized, to the functioning of Jamaican society" (1984: 222).

One reason for the omission of much of female participation in farming is that in the field of local economics, the woman was viewed as simply the housewife and was overlooked as giving any positive economic contribution to the household's income (French, 1997). Moreover, in local economics, labor was strictly a homogeneous concept and gender as a separate variable was never considered (White, 1984). Official agricultural census statistics also omitted the contribution of women to farming as she was referred to as the housewife (French, 1988). However, many Jamaican women who participate in the household's farm work do not refer to themselves as farmers. For example, French (1988) mentions a 1981 survey in Jamaica in which only 20% of women said they were farmers, although 76% of these were actually from farming households and working in the farm's production.

Even though women make up some 50% of the rural population in the Caribbean (Gordon, 1986), and in recent years it has been argued that women provide the bulk of labor in food production activities in the Caribbean, female farmers still face prejudice from institutions (Henshall, 1984; Chase, 1988; Barrow, 1993). One reason for this, in the case of Jamaica, is that there is little information describing the gendered division of labor (French, 1988). The FAO, commenting on the lack of data on the gendered division of labor in agriculture, points out that until steps are made to rectify this, the disadvantaged status of women will remain (FAO, 1997). One way that has been recommended to improve the status of women is to collect such data (on gendered division of labor), for example, and include a gender component into research agendas (French, 1997).

In Jamaica, as in other parts of the Caribbean, institutional constraints to small-scale agriculture impact women more than men (Innerarity and Smikle, 1996). For example, female farmers throughout the Caribbean are constrained by lack of access to "capital, land, and labor resources" (Chase, 1988: 32). These long-established, male-biased, institutionally-supported constraints to female farmers make it difficult for women to improve their economic status. Gordon (1986) writes, "In the book-keeping system of development, female farming is not viewed by commercial financial institutions as suitable or viable for venture capital investment. The absence of female farmers from the policy-making bodies of crop lien schemes, revolving loan funds, cooperative credit unions and banks, commodity boards, and self-supporting farmers' loan schemes impedes their access to fixed and developmental capital. In the allocation and delivery of technology, agricultural information, equipment, tools and transport facilities, there is a male-sexist bias which obscures women's needs" (1986: 39).

In spite of the institutional constraints to women's farming work, women have continued to play important roles in rural communities. Researchers have argued that as a result of male migration draining the local labor pool in farming communities, and women becoming responsible for much of the daily farming chores, farming in the Caribbean has become "feminized" (Momsen, 1987: 347).

However, the feminization of farming means that women tend to see farming as an “extension of household responsibilities” so they put effort into growing crops to feed the family over growing crops for export (Momsen, 1987: 345), whereas men are likely to control the sale of export crops (Momsen, 1991: 50). And as women are more often farming for subsistence, they tend to produce local crops (Berleant-Schiller,1977). More recently, a study has shown that the interaction of gendered control and marketing of crops does not always follow these patterns. As Grossman (1993) has shown in the case of banana production in St. Vincent, Eastern Caribbean, though women have more land than men set aside for local crop cultivation, or leave fields fallow, female-headed households as well as male-headed households have the majority of farm land allocated to banana cultivation. As such, both men and women are involved in the production of an export crop. He found that women are involved, though facing greater constraints than men, in all aspects of banana production and harvesting. Furthermore, where women alone head the household, they provide most of the labor in banana production.

Research such as Grossman’s suggests that women in Jamaica may be involved in growing export crops, including callaloo, hot pepper and sweet potato. However, in Jamaica, even if women are involved in export agriculture, female-headed farms still retain a lower economic status compared to men. Men are more likely to rent land for farming purposes (Momsen, 1988: 89; Chase, 1988: 32). Further, the majority of women farmers have an average farm size much smaller than that of men (Momsen, 1987; 1991; Chase, 1988; Innerarity and Smikle, 1996), often on fragmented parcels of land (Massiah, 1984), and farm land of less fertility (Momsen,1987). Momsen (1987) has also shown that where women are the main decision makers, their homes are likely to be more isolated. To ensure that farming remains viable, women who cultivate crops for export (or for local markets) have to succeed with less resources at hand than their male counterparts.

C. DECISION MAKING IN THE HOUSEHOLD

Ethnographic research into Jamaican households is not a recent phenomenon. Edith Clarke (1957) in her book *"My Mother Who Fathered Me,"* was probably the first to document a detailed census of Jamaican household composition and how social and economic processes influence the organization and development of the family, including patterns of family, land tenure, family land, marriage, and kinship roles. The household refers to people (though not necessarily family) who live in the same house, and carry out daily tasks (such as cooking and washing) together (Jaquette, 1993: 48).

Since then, researchers have widened the breadth of ethnographic research, trying to answer questions of control of income, resources, labor, and decision making. Many of the debates center upon the extent to which women are involved in decision making. At the one end of the spectrum, local economics viewed the household as a male-dominated decision making unit (White, 1984). At the other end, for example, in generalizing about decision making in Caribbean households, one researcher claimed that women are the main decision makers in more than one-third of small-scale farms (Henshall, 1981). Chase (1988), on the other hand, suggests that though women are the ones providing much of the manual labor in farming in the Caribbean, either the husband or the male relative makes the decisions concerning the allocation of labor. Still, another important aspect is the control of income derived from farming, as discussed by French (1988). She states, "In the Jamaican situation, it is widely believed that women control the earnings from the marketing of produce sold in the local market while men control the earnings from export crops" (1988: 83). Although not specified by French, she was probably referring to the control of cash, not of money in bank accounts.

While French's study was carried out over ten years ago in Jamaica, it is not known if this is still the case. If true, then men in Jamaica would more likely control a greater proportion of the household's income. Furthermore, if export crops are commanding greater economic returns, men may expand production of export crops over that for the local market.

In summary, paramount to the discussion of introducing a new farming technology is to understand how farming households spend their income. In understanding this, a look at who in the household makes decisions is crucial. For example, in the case of pesticides, one household head may be more averse to the purchase of costly and potentially dangerous pesticides. This household head would, therefore, be more likely to try alternative forms of pest control rather than buy pesticides. Other farm inputs, for example the hiring of labor, are important when considering specific forms of pest management (such as weeding or scouting for pests). The purchase of farm inputs are weighed against the purchase of goods for household consumption and provision. Therefore, as the concerns of men and women may differ, views of both partners should be obtained (Norem, 1988).

CHAPTER 3: INTEGRATED PEST MANAGEMENT IN JAMAICA

Briefly described in an earlier section of the thesis, Integrated Pest Management (IPM) is a concept that uses a holistic approach to pest management, incorporating cultural, biological, and, if necessary, chemical means to maintain pest populations under the threshold which causes a specified economic damage to the crop. It depends on many location-specific factors, for example, crop variety, type and severity of pests, and environmental conditions. One of the benchmark definitions of what would become IPM (then referred to as "Integrated Pest Control"), was jointly developed by the United Nations Food and Agricultural Organization (FAO) and the United Nations Environmental Program (UNEP) in 1967. For them, IPM is a "pest management system that, in the context of the associated environment and the population dynamics of pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains the pest population at levels below those causing economic injury" (FAO, 1967: 2). The early 1970s brought the term IPM into use (Hansen, 1987; Metcalf, 1980). Later, definitions of IPM evolved to address the predominance of pesticide use. As Matteson (1992) explains, "Integrated Pest Management (IPM) programmes seek to minimize the role of synthetic pesticides in pest control systems, emphasizing outbreak prevention in combination with a safer, economical and ecologically sound array of alternative pest control measures" (1992: 293).

In Jamaica, the Caribbean Agricultural Research and Development Institute (CARDI) has been researching and promoting IPM among small-scale farmers for three nontraditional agricultural export crops: callaloo, "Scotch Bonnet" hot pepper and sweet potato. The following is a description of their ongoing IPM research for these three target crops, introducing the kinds of challenges facing CARDI's researchers and extension agents (who include both men and women) in controlling pests through IPM. CARDI does not place as much emphasis on extension as on developing new IPM techniques. CARDI, to my knowledge, does not seek out a particular farm size in extension efforts.

Following this, the next section of the chapter begins with a look at local knowledge of farmers throughout the developing world, and women's roles in pest management. The chapter concludes by a discussion of constraints to IPM adoption.

CALLALOO

To date, CARDI has identified major pests of callaloo (*Amaranthus viridus*), including several caterpillars species (Lepidoptera), beetles (Coleoptera), leafhoppers (Homoptera) *Empoasca* spp., and mites (Acarina) *Tetranychus* spp (Clarke-Harris and Fleischer, 1998). The Lepidoptera complex has been identified as the number one problem (Clarke-Harris, 1998, personal interview). Farmers are spraying at intervals (calendar spraying) but lack knowledge of which pests are causing damage to callaloo. For the control of caterpillar larvae, and to minimize the amounts of pesticides applied to callaloo, a sequential sampling plan based on the incidence of larvae has been developed. One crucial aspect of pest management is that farmers need to regularly scout their fields for pests and base their spraying schedule on number of caterpillar larvae (or other pests) encountered. However, in St. Catherine, some pests, especially Lepidoptera species may have developed resistance to at least one pesticide. Presently, CARDI is researching the resistance of pests to several widely-used pesticides in St. Catherine.

Also recommended by CARDI is the removal of weeds and discarded callaloo (field sanitation), purchasing good quality callaloo seeds, growing callaloo seedlings in a nursery covered by mesh, sufficient watering and fertilizing of crops, and proper mixing of pesticides with attention to dosage (Clarke-Harris, 1998). CARDI has also experimented with botanical pesticides (*Azadarachta indica*, or Neem) but has found that Neem oil is not effective (Clarke-Harris, 1998, personal interview). CARDI is also working on developing insect growth regulators, pheromones, and light traps.

SCOTCH BONNET PEPPER

Two of the major pests for the “Scotch Bonnet” variety of hot pepper have been identified as virus complexes and mites. The viruses, including Tobacco Etch Virus (TEV), Potato Virus Y (PVY), and Tobacco Mosaic Virus (TMV), have been found to be transmitted by aphids (*Monellia* spp. and *Monelliopsis* spp.). Aphids are soft bodied insects that colonize the underside of leaves (Davis *et al*., 1995). After aphids transmit viruses, hot pepper leaves turn yellow, often with a mosaic (light/dark) pattern, and leaf ends curl under. Among Jamaican farmers, such leaf damage is commonly called “Jherri curl.” Viruses also cause a reduction in leaf area (IPM CRSP, 1997), and eventually the plant may die. Viruses have been found to be the number one problem in St. Mary (Martin, 1998, personal interview). Work has been conducted to assess the impact of viruses on hot pepper yields.

Hazard and Donnington Castle, St. Mary, are two communities where CARDI has been carrying out extension work. To protect hot pepper from aphids, CARDI has been promoting the use of low-cost mesh screens over seedlings grown in nurseries. CARDI provided the screens to a few farmers as part of the project. However, seedlings are no longer protected by mesh screens once they are transplanted to fields, and aphids could transmit viruses. The purpose of the mesh screens was to produce healthier seedlings which are better able to withstand virus damage.

In addition, CARDI has assessed the amounts of fertilizers, mainly nitrogen, on pest incidence. One finding was that the increased amount of nitrogen leads to greater numbers of aphids (Martin, 1998, personal interview). To reduce aphid populations, CARDI recommends adequate amounts of fertilizer on hot pepper.

The spread of aphid-transmitted viruses is difficult to control as aphids move easily from field to field, and once their presence is detected, viruses are already transmitted. The application of pesticides is not an effective way to control the spread of viruses due to the mobility of aphids.

Another major pest of hot pepper are mites (*Tetranychus* spp.), which are responsible for damage that can easily be confused with virus damage. Mites cause leaves and fruit to darken and both are substantially reduced in size. As with viruses, mite damaged hot pepper leaves also curl under. To many Jamaican farmers this darkening of leaf and fruit is commonly called "Browning." With "Browning," the fruit may become unmarketable and mite damaged plants may die. During the summer of 1998, CARDI was recommending using lower amounts of pesticides as a way to protect predatory mites (Martin, 1998).

SWEET POTATO

For the sweet potato growing community of Rose Hill, Manchester, sweet potato weevil (Apionidae: *Cylas formicarius*) and soil grub (Chysllelum: *Typhorous* sp. *Negritis*) cause major damage to sweet potato. Both of these insects cause the most damage when in the immature (larval) stage. Along with cultural practices (including crop rotation, field sanitation, planting sweet potato slips free of larvae), CARDI promotes the use of sex pheromone traps. Sex pheromone traps are usually made from plastic bottles (milk jugs) with one side cut out, leaving an opening for the pheromone to transmit into the field and, in turn, allow adult male sweet potato weevils to enter the trap. As the sex pheromone hangs from the top of the jug, and with soapy water in the bottom, males in trying to reach the pheromone fall into the solution and drown. In addition to sex pheromone research, CARDI has also carried out baseline research on the incidence of soil grub populations and USDA resistant sweet potato varieties to multiple pests.

LOCAL KNOWLEDGE IN PEST MANAGEMENT

The purpose of beginning with a look at the local knowledge of farmers in pest management is based on one concept: what do farmers know about crop damage? Can farmers recognize which pests are causing damage to each crop, know which insects are harmless organisms or natural enemies, or differentiate damage due to a mineral deficiency disease (Inzet, 1990)? In the tropics, in general, recognition of pests is low (referring to local names) (Inzet, 1990). This

is because many of them have not received any formal training (Inzet, 1990). And, at the first sight of insects (pests or beneficials), some farmers carry out calendar sprayings. Due to indiscriminant spraying, pest populations can also increase as natural enemy populations cannot recover. In Jamaica, the farmer's ability to recognize pests can greatly enhance the introduction of IPM. IPM can use this knowledge as a basis for the transfer of other pest management concepts. However, if farmers cannot recognize pests, then the first step is for extension agents to teach farmers how to identify pests. Next, extension agents and farmers consider the type of damage the pest causes and establish a damage threshold (Inzet, 1990). After the damage threshold is surpassed, intervention (spraying or other means) is implemented.

The previous paragraph pointed out the possibility that farmers cannot identify pests or beneficial insects. On the other hand, while research into alternative methods to the conventional, single-minded adherence to pesticides has been a subject of research for some time, researchers have taken renewed appreciation into traditional knowledge of farmers and used this as the basis of improved pest control (van den Bosch, 1975). I use the term "local" knowledge as a substitute for "traditional" knowledge in the subsequent sections of the thesis based on observations from the research communities. In these communities, I did not find "traditional" knowledge in the same sense as one would find in, say, indigenous societies in Guatemala due to distinctly separate histories.

Local pest knowledge and management practices can facilitate the introduction of effective and appropriate control strategies for alternative forms of agriculture (Atteh, 1984; Matteson *et al.*, 1984; Alghali, 1991; Altieri, 1993a, 1993b; Chitere and Omolo, 1993; Adensina, *et al.*, 1994; Malena, 1994; Bottenberg, 1995). Local methods, for example, include trapping insects, treating seeds with warm water, diversifying crop cultivation, and intercropping (Kotschi *et al.*, 1989). In addition to this rich resource for pest management, when researchers extend the scope of their pest control efforts to include local

knowledge, they will increase communication between farmers, researchers, and extension agents (Bottenberg, 1995).

Local pest knowledge is innovative in that it adapts, through ongoing experimentation, to aid local pest control (Altieri, 1987; Atteh, 1984; Biggs, 1980; Biggs and Clay, 1981; Lightfoot, 1987; Richards, 1989; Uzozie, 1981). As farmers experiment, they use resources that are technically simple and found locally (as opposed to imported pesticides). To their credit, small-scale traditional farmers are able to increase the sustainability of agriculture (Altieri, 1987).

Traditional cropping systems may have built in pest suppression mechanisms (Litsinger and Moody, 1976). One aspect of traditional agriculture is the maintenance of surrounding shelter belts of natural vegetation for habitat of pest predators (Price, 1976) which would lead to enhanced biological control due to the increased plant diversity of an agroecosystem (Altieri and Letourneau, 1982). Youm, *et al*. (1990) point out that multiple and/or mixed cropping, widely practiced in Africa, "are good alternatives to heavy pesticide use" (1990: 173).

However, quantitative data are lacking about the effects of various cultural practices on pest dynamics or ecological mechanisms involved in the regulation of specific pests (Matteson *et al*., 1984). Farmers' knowledge about insects and the roles they play varies from country to country and often regionally as well. For example, small farmers in western Kenya could not match the adult sweet potato weevil (*Cyclas* spp.) with the larvae which are responsible for making tubers unpalatable (Smit and Matengo, 1995). Or, farmers may not understand that some insects are beneficial. In a farming community in Nigeria, only one farmer understood that ladybugs feed on aphids and farmers were more likely to view ladybugs as pests (Bottenberg, 1995). In contrast, research from Kabba State, Nigeria found that farmers had a deep knowledge of all insects and breeding cycles (Atteh, 1984). If researchers were able to increase understanding of local agricultural systems, including farmers' attitudes and behaviors in pest management, technological intervention could be improved.

These are aspects which fall under the banner of the human factor in relation to pest management (Gabriel, 1989).

Farmers may not agree with researchers which insects are the pests and which ones are the beneficial insects. Similarly, in the Philippines a survey found that farmers were not aware that some pests were considered as problems by entomologists (Litsinger, *et al.*, 1980). Furthermore, in local systems, farmers may also tolerate relatively high losses to pests (Brown and Marten, 1984). Therefore, farmers should rank each pest relative to other constraints through a system of problem identification (van Huis and Meerman, 1997). For example, farmers in Kabba State, Nigeria, could rank pests according to the degree of damage they caused to crops (Atteh, 1984).

While a previous section of the literature review discussed the local aspects of Jamaican farming and how many of these techniques were carried over from the history of slavery, I came across no articles pertaining to small-scale farmers' cultural practices and pest dynamics, farmers' perceptions of insects and pests, or how farmers view IPM. In short, the literature on pest management in Jamaica and the Caribbean in general is limited. One example of research into pesticides and attitudes includes work done by Grossman (1992). He researched the structural forces that influence patterns of pesticide use in St. Vincent and the Grenadines. While farmers on these islands appear to be pesticide dependent, there is variability and cautiousness in pesticide use (Grossman, 1992). If little or no local pest knowledge is found in the Jamaican communities, then the IPM extension agents may need to infuse, through teaching about non-chemical pest control, alternative pest control methods.

WOMEN'S ROLES IN PEST KNOWLEDGE AND PEST MANAGEMENT

As women and men possibly undertake different roles within production, processing and marketing of farm produce, both genders may develop unique bodies of knowledge relating to identifying crop damage, pest recognition and pest management. Do women know more about pests and beneficial insects than men, or vice versa? If a specialized set of information exists, it could be used in order to better design an IPM program. For example, in the case of

African agriculture, both genders are responsible for specific tasks, maintain their own communication networks, and thus possess a unique knowledge of local methods of pest control (Malena, 1994). However, this rigid gender division of labor may present itself as an impediment to equal participation in IPM. If IPM does not address how the gender division of labor may influence men's and women's technological needs, it will probably fail in Jamaica. This is due, in part, to women's limited access to "land, labor, finance and education" (Malena, 1994: vii). The thesis seeks to uncover, through local-level data, whether men and women in Jamaica have the same access to such resources. Unfortunately, while the issue of resource constraints to female farmers in Jamaica has been discussed, there is nothing in the literature which describes how women (or men, for that matter) are able to identify and manage pests in ways different from that of men.

In the Philippines, an IPM project which originally only included men found that women were involved in planting, maintaining crops, purchasing pesticides, marketing, and other aspects of small-scale agriculture (Hoque and Adalla, 1993). Also of importance was that women decided on hiring labor (Adalla and Hoque, 1990). After the research ended, women were incorporated into the adoption of IPM (Logarta, 1989).

In Malaysia, another IPM project found that women were present at meetings but did not actively participate. After the village council allowed the women to join IPM extension training, women were observed to more often meet, share ideas, and be overall better participants than men (Rengam, 1997). It was also discovered that men were not sharing IPM information they had learned from training with their wives. One conclusion was that women are potentially the main users of IPM but numerous barriers jeopardize the wide-spread adoption of a new technology (Malena, 1994).

In African agriculture, research highlights women's considerable work in agricultural production and pest management in particular. Women are responsible for pest management and devote more time to this than men (Malena, 1994). African agricultural gender division of labor tends to be task-

specific where women weed and do post harvest work, and men plow the land and plant the crops. Based on research from West Africa, it has been suggested that IPM has the potential to function best in its ability to enhance farmer's food self-sufficiency by targeting women's crop production systems (Russ, 1996).

The purpose of this section was not to assert that what has been observed in Africa, the Philippines, and Malaysia is how women participate in small-scale agriculture in the Caribbean. Yet it shows the variability in the gendered participation in matters pertaining to pest knowledge and management in several tropical areas, and therefore may be the source of useful questions to ask in the Jamaican case.

CONSTRAINTS TO IPM ADOPTION

With IPM, farmers in developing countries can produce stable crop yields more cost effectively than by using conventional pesticides. However, political, socio-economic and environmental factors need to be addressed (Youdeowei and Service, 1983). In developing countries, IPM is not a concept that has widespread acceptance. It could not be said that low adoption rates of IPM is due to lack of IPM techniques; rather, IPM barriers include communicating an easily understood message (Bentley and Andrews, 1996). For example, in St. Mary, Jamaica, three-fourths of small farmers surveyed preferred a natural means of control; however, only 17% believed it would be possible (Himes *et al.*, 1996). An explanation for the farmers' doubt in IPM stems from its weakness—IPM is not an "off-the-shelf" product. "Off the shelf" products include brand name pesticides which, through aggressive marketing by manufacturers, have won the trust of farmers in many parts of the world with the appearance of having no deleterious effect on crops or human health. IPM, in contrast, requires that farmers become educated in learning concepts such as scouting techniques, construction of mesh screens for nurseries, and other alternative control measures. IPM also requires basic understanding of pest phenology (insect life stages), economic threshold, and pesticide usage. How season or stage of plant development is impacted by insects is also drawn into consideration (Stoll, 1986). The determination of when the economic threshold for a crop has been

surpassed is difficult to determine under cropping systems typical of resource poor farmers (van Huis and Meerman, 1997). The crucial steps in transferring IPM concepts can evolve into a barrier to IPM adoption if extension agents do a poor job in communicating to farmers (Gabriel, 1990). Is the IPM message that CARDI is promoting in the three Jamaican research sites not getting across to farmers due to a badly communicated message, and/or complicated IPM tactics?

In addition to the threshold concept (and other control tactics) being difficult to convey, IPM can, moreover, mean additional labor and time is needed to monitor the fields for infestation. Labor is often a scarce resource in many rural areas, and places limits on the size of land that can be worked. Another viewpoint is that small holdings actually contribute to labor scarcity (Collins, 1986). An increase in the amount of labor demanded for IPM will not provide incentive for women's involvement. Malena (1994) points out the great need for the development of time-saving technologies for women farmers. Further, the FAO (1997) cites the need for women's access to labor-saving technology. According to Waibel (1990), an alternative would be to help farmers understand the threshold concept but allow them to establish their own threshold. Other alternatives, which can save the farmer labor and time, include the use of pest-resistant varieties and classical biological control (CBC). CBC, by introducing natural predators into the agroecosystem, is also not scale dependent so it would work the same for larger-scale and smaller-scale farmers (Malena, 1994).

There are other constraints to IPM adoption, such as that IPM is not designed to equally meet men's and women's needs. For example, as women are busy with household chores, the additional labor needed for some IPM techniques may be prohibitive for women's participation. Support of an initiative such as IPM would need to be based on understanding farmers' perceptions of their needs and uses of local resources (Altieri and Anderson, 1986). For example, Patterson (1996) examined the non-technical constraints to the adoption of IPM in Debigh Kraal and Mocho, Clarendon, Jamaica. She discovered that political-economic factors, both nationally and internationally, influenced to some degree the farmer's willingness to adopt IPM. In Debigh

Kraal and Mocho, environmental constraints including low rainfall means that farmers must purchase water for irrigation. As many farmers cannot afford to do this, their agricultural production becomes limited. Moreover, worries about lack or high cost of water may supercede farmers' interest in IPM.

If IPM is to be widespread and of lasting impact, it must be a properly planned and coordinated activity in the community (Page and Richards, 1977), or the benefits go to the large-scale, richer farmers (de Groot, 1995). For small-scale farmers, IPM must become the better alternative to pesticides, and it must be able to overcome years of marketing by pesticide manufacturers. When resource-poor are facing the prospect of losing the entire crop to pests, farmers often buy pesticides. However, pesticides do not always work and farmers are increasingly battling pesticide resistance pests. In response, many farmers spray pesticides other than those recommended by the manufacturer for the intended crop and pest, mix two or three pesticides together, or increase the intensity of application. As a result, each step the farmer takes in this direction means undoing natural means of pest control, an aspect of IPM.

CHAPTER 4: RESEARCH QUESTIONS AND METHODOLOGY

A. METHODOLOGY

This chapter presents the methodology used in field research along with research questions. Before beginning field research, in order to better understand why IPM is not widely practiced by small-scale farmers, I reviewed pest management strategies advocated by CARDI. As this thesis attempts to describe the roles of men and women in farming, decision making, and pest management, I decided that the best way to approach this would be through a household survey. The basis was administering a household survey to farmers in three communities located in the parishes St. Catherine (Grove Farm and Lloyds Pen), St. Mary (Hazard and Donnington Castle) and Manchester (Rose Hill). Myself and another graduate student from Virginia Tech, Tina Schlosser, began fieldwork July 1, 1998. Fieldwork lasted approximately three months. By using the same survey, we interviewed 96 households and 140 people total in the three communities. Of these, I interviewed 62 people. Sixty-nine respondents (49.2%) of the survey were female, and 71 (50.8%) were male. In most cases, Tina would interview the female decision maker and I would interview the male decision maker. In this way, we collected data from two sources, and thereby could look at intra-household decision making processes. In the case of no male partner present, we alternated who interviewed the female decision maker. Tina used sections of the survey for her own research on pesticide poisoning.

1. SITE SELECTION

The choice of communities for conducting this research was made by myself and other field researchers with recommendations by CARDI staff. The three communities have unique characteristics (such as ecological zones, type of crops grown, and geographic locations) which provided the opportunity to experience a variety of factors in farming. While the staff at CARDI mainly conducts entomological research pertaining to IPM, such as varying the amount

or type of pesticide for a target crop or seeking non-chemical pest control, they did not have any indication of the socio-economic reasons for the low rate of IPM adoption by small-scale farmers. Most of the research that CARDI conducts is on-station in Kingston or Bodles Research Station, Old Harbour. Their work with on-farm trials is more limited.

2. SURVEY DESIGN

With consideration of limited time and resource constraints, I decided on using a probabilistic sampling design in order to represent the research population. The survey was designed to be administered, by simple random sampling, to at least thirty households in each community. First, I drew a rough map of each community, locating each house and main roadways. Secondly, I assigned each house a number and, from this, randomly drew a sample. To determine the extent to which the communities relied on farming and to understand the different activities people engaged in to make a living, I did not limit the selection to farming households, although the majority of persons in the communities did farm. However, if both the male and female decision makers were in the random sample and both declined an interview or were unavailable to talk, I drew another household number at random. If someone from outside the random sample wanted to participate in the survey, I interviewed them as well. Those from outside the sample range from one to three depending on the community. Statistical analysis revealed that their responses were similar compared to those in the random sample, so I included them in the analysis. For the sake of protecting the identity of the interviewee, I recorded no names.

While parts of original survey design were from CARDI's previous socio-economic survey, designed by Peter Espeut, I created new sections as well as amended existing sections pertinent to my research questions. Field research in Jamaica took place between June 15 and August 16, 1998. Before beginning the major portion of field research, I field tested the survey on farming families in Grove Farm, St. Catherine. After I made revisions to the survey, fieldwork in the first community, Grove Farm and Lloyds Pen, began July 1, 1998 and lasted until

July 10, 1998. I spent July 19 to 29, 1998 in Hazard and Donnington Castle, and from August 4 to 12, 1998 in Rose Hill. In addition to the first trip to Jamaica, we returned to the island January 10 to 20, 1999 in which I had the opportunity to re-visit the communities and to interview faculty at the University of the West Indies, Mona.

a) Quantitative

I used survey questions that were both interactive/open-ended and closed-ended, structured to provide the interviewee sufficient opportunity to describe aspects of farming, such as land profile, production and marketing roles, intra-household decision making processes and control of income, and gendered and local knowledge of crop pests.

For production and marketing roles, I asked both decision makers (or, if there was only one decision maker, one person was asked) who does the work for each typical farming task (nursery preparation, weeding, spraying pesticides, post harvest, and marketing). By asking decision making questions, for example, I sought to identify who controls income derived from farming, who decides to hire workers, and how much money is set aside to pay workers.

An important facet of interviewing people in the three communities was that some did not feel comfortable answering all questions, others felt they did not know enough about the subject matter, or yet others would steer the topic away from the questions on the survey. As a result, the number of responses to particular questions in tables is sometimes lower than the total number of farmers interviewed.

For gendered and local knowledge of pest questions, I first consulted with entomologists at CARDI and discussed major pests, based on their experience, for each of the target crops. As no preserved pest specimens were available, I chose a set of pictures from their photo collection that showed each pest, and separate photos (without the insect) that showed the type of damage they cause to callaloo, sweet potato, and hot pepper. I also included a picture of a beneficial insect (ladybug). For each photograph, the interviewee was asked if he or she

had seen the insect, secondly to give its name, describe the damage it causes, and to give the particular pest control methods. Based on their combined responses, I determined if they correctly or incorrectly identified the insects.

After fieldwork ended, I entered data from the quantitative components of the survey into Excel and the Statistical Package for the Social Sciences (SPSS). Data analysis was mainly in the form of frequency distributions and cross-tabulations.

b) Qualitative

In order to gain a clearer understanding of constraints to vegetable production and implementation of IPM, I gathered additional biographical information from female farmers to form the basis of six case studies. Case studies provide the opportunity for the quantitative data to be contextualized. In addition, field observations supplement the qualitative data. As with the quantitative sections of the survey, the information given to me by informants was confidential, and pseudonyms are used.

B. RESEARCH QUESTIONS

In reviewing the literature on farming in the Caribbean, and keeping in mind the limited scope and time to complete a Master's thesis, I focused my research questions on three basis areas: gendered roles in agricultural production and marketing, decision making, and gendered knowledge in pest management. In total, I developed three research questions, and two hypotheses which I addressed with data from field research. (I was not able to interview a substantial number of farmers to formulate a hypothesis on gendered knowledge in pest management.)

- Research Question: What are the roles of women and men in each community relating to crop production and marketing?

The literature review presents evidence that women are predominant actors in the marketing of agricultural produce in their role as higglers. But it has been

argued that women's involvement in agriculture extends beyond marketing. As Chase (1988) states, one-third to almost one-half of the agricultural labor force in the Caribbean is made up of women. Furthermore, except for the findings by Grossman (1993), the literature shows that even when women are involved in farming activities, they are more likely to work in subsistence agriculture. However, official statistics often do not reflect the contribution of women to farming. Determining the contribution of women remains difficult as women's work is often unpaid and involves crop maintenance (such as weeding, planting crops), as opposed to men's involvement in the wage-earning, and export agriculture (Boserup, 1970). In talking to agricultural researchers in Jamaica, many told me that women "help out" on the farm but do not engage in crop production aspects to a noticeable extent compared to men.

Hypothesis 1: Women farmers in the three Jamaican communities are involved in all aspects (planting, weeding, spraying pesticides, harvesting and marketing) of crop production to an extent equal to that of men farmers.

- Research Question: To what extent are women involved in the decision making and control of income derived from farming activities?

One of the debates in the literature centers on women being main decision makers. Henshall (1981) says women are more important in one-third of small-scale farms in the Caribbean. In contrast, Chase (1988) argues that while women do much of the manual labor on farms, it is the men (husband or male relative) who decide about hiring of labor. The decision to hire labor is one of the major decisions for farming households. If men decide on the hiring of labor, would they also decide on such important aspects such as the purchase of pesticides or setting the price for sale of an agricultural product? The responsibility for decision making may also be dependent on crop type. For example, income derived from crops sold locally may be controlled by women; income from export crops may be controlled by men (French, 1988). One question that remains to be answered, are crops (such as callaloo, hot pepper, and sweet potato) that have been sold at local markets for some time more likely

to be under the control of men or women? If it is found that men control the decision making of these crops, then it would probably also be the men who are in charge of the purchasing and application of pesticides, as they would more likely be better aware of the stringent quality standards of export crops. Moreover, crops destined for export would probably have higher amounts of pesticides applied, in order to pass the quality standards set by exporters.
Hypothesis 2: Main decisions dealing with crops (such as callaloo, hot pepper and sweet potato) are most likely to be made by both men and women decision makers together (Joint Decision Makers).

- Research Question: What kinds of gendered and local pest knowledge exist in the three communities?

In reading the vast literature on local knowledge in pest management, it is suggested that farmers in many parts of the developing world use cultural practices to control pests, although quantitative data for specific crop/pest complexes is lacking (Matteson *et al.,* 1994). Depending on the specific region, while farmers are not always able to correctly identify pests and breeding cycles, they have practical experience in farming that can be of use to extension agents promoting IPM. Could it be said that in Jamaica there still exists a "considerable body of agronomic knowledge" (Hills, 1988: 23)? Or, has it been the case that modern technologies, including pesticides and fertilizers, caused the best traditions of Caribbean farming to be replaced, as Hills and Iton (1983) suggest? If the latter proves to be the case, this kind of information could be of value to extension agents to plan for an introduction of pest control concepts as a precursor to IPM.

The literature on gender and pest management suggests that women, as well as men, develop unique bodies of knowledge relating to crop damage, pest recognition, and pest management. Women have typically been found to have technological needs, but lack equal access (Malena, 1994). Even so, if allowed to participate in IPM, women have become better participants than men (Rengam, 1997). As women more often said to be marketers, they probably

have little first-hand knowledge in pest management. On the other hand, as marketers women see pest damage on crops; women suffer economic losses due to pest damage whether or not they are directly involved in crop production. For this reason, women would be interested in IPM. Women, as they are also more likely to cook for the family, would also be more likely, in her family's interest, to want less amounts of pesticides used on crops.

CHAPTER 5: RESULTS

A. GROVE FARM AND LLOYDS PEN, ST. CATHERINE

Grove Farm (latitude 17° 56' N, longitude 77° 03' W), located about 18 kilometers west of Kingston and adjacent to the A2 highway, is a small community, consisting of approximately 24 houses (see Map 5-1). Branching off the highway is a crescent-shaped, one lane road which connects to the highway from both directions. Homes are built closely together, and most people live on small plots of land (less than one acre). The community has two shops (kiosks).

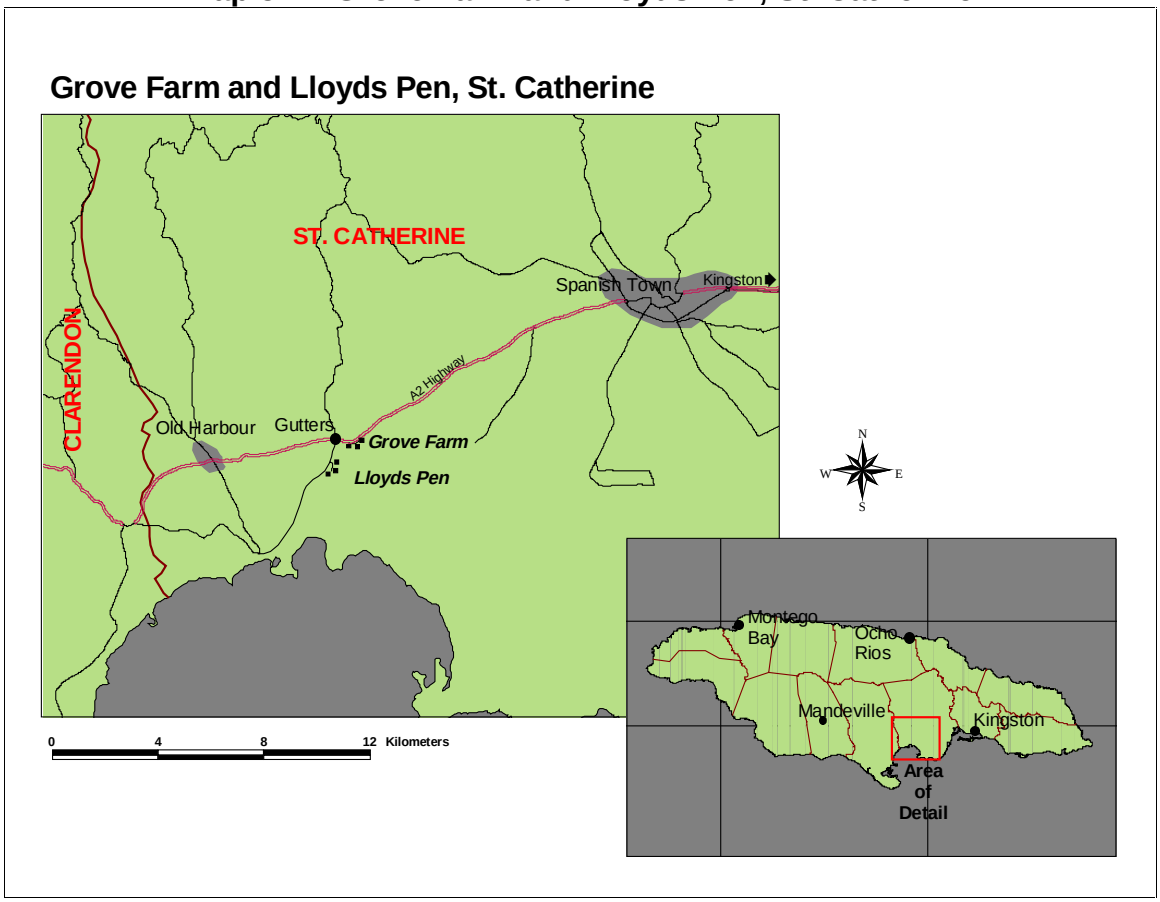
Opposite the homes, and across the highway are most of the farm fields for the farmers who live in Grove Farm. The farm fields are on flat terrain. Many of the fields are planted with one major crop or two fields of different crops. This is one of the island's major callaloo (*Amaranthus viridus*) cultivation regions. In addition to callaloo, farmers also plant okra, tomato, and sweet and hot pepper. Typically, fruit and coconut trees line the perimeters of farm fields.

Located on the southern coastal plain (about 100 meters above sea level), Grove Farm and Lloyds Pen do not receive great amounts of precipitation. Judging from a 1997 climate map produced by the government of Jamaica, Grove Farm and Lloyds Pen receive less than 50 inches of rainfall per year (Statistical Institute of Jamaica, 1997). The whole island, however, is plagued by occasional hurricanes and tropical depressions. It is not uncommon for the communities (as well as other parts of the island) to experience drought, especially during the summer months. The island has two wet seasons, May to June and September to November (Statistical Institute of Jamaica, 1997). In all of Jamaica, the timing of rainfall is difficult to predict as it varies each month (Edwards, 1995). Rainfall can be intense, and its harsh impact washes away precious topsoil. Grove Farm and Lloyds Pen are located in an area which has alluvial soil deposits. According to Edwards (1995), alluvial soils, consisting of loam, sand, and gravel, "contain the most productive soil in Jamaica" (1995: 11).

An interesting feature of Grove Farm is how many of the male farmers obtained land. Previous to 1971, local farmers belonged to a Co-op which

owned a large tract of land. Local farmers leased land from the Co-op. According to one of the former members of the Co-op, the management did not run it well, and eventually it went bankrupt. In 1971, the members of the Co-op, in order to raise money to pay off debt, were offered to purchase the Co-op's land. The men who could afford it bought pieces of land at ten acres each. And, according to this same farmer, during this time the government sold part of the Co-op's land to other farmers, however in smaller parcels.

Map 5-1: Grove Farm and Lloyds Pen, St. Catherine



(Source: Baseline data from IPM CRSP)

Farther west, less than one kilometer along the heavily traveled A2 highway, is the community of Gutters. At Gutters, there is a restaurant, a few farm stores, a gas station, and a doctor's office. Gutters is also the site of a major intersection. From the intersection at Gutters, the road south for about 1.9

kilometers leads to the community of Lloyds Pen (see Map 5-1). In Lloyds Pen, there are approximately 59 houses.

During the summer of 1998, on the way to Lloyds Pen the landscape was dotted with acacia trees; but the fields were desiccated. In Lloyds Pen itself, there were several fields planted with okra and callaloo. However, due to the limited amount of rainfall, expansion of crop cultivation proves to be difficult without irrigation. Instead, much of the land not used for cultivation of crops is fenced off for grazing. For many of the farmers in Lloyds Pen, water is collected in a catchment. Irrigation canals are also found in Lloyds Pen but they are infrequently filled with water.

During fieldwork, I counted 24 houses in Grove Farm and 59 houses in Lloyds Pen, a total of 83 households. From the 24 houses in Grove Farm, 12 were randomly selected. From the 59 houses in Lloyds Pen, 22 were randomly selected. From the 34 households that were randomly selected, we interviewed 30 total in Grove Farm and Lloyds Pen. In twenty (66.7%) of the 30 households, there was a male and a female decision maker (but not necessarily husband and wife), 20.0% of households were headed by a single male, and 13.3% were headed by a single female. The average household size was 5.6 members. Average age of those interviewed was 41, median 38 years of age. From the 30 households, a total of 44 people were interviewed in Grove Farm and Lloyds Pen (I interviewed 21). Twenty out of 44 (45.6%) were women and 24 men (54.5%). Of the 44, 32 men and women farmed (72.7%), and 12 men and women (27.3%) earned their income in other ways. Of the 32 farmers, 11 were women (34.4%), and 21 were men (65.6%). One farmer included in the results was not in the simple random sample, but wished to be interviewed.

This paragraph provides some socio-economic information about of the communities. In Grove Farm and Lloyds Pen, during each interview, observations of the housing material were made for the particular home. Most of the homes (76.9%) were constructed of cement, the rest (23.1%) were made of wood. The majority (48.7%) of the homes were small (1 to 2 rooms); 15.9% had 2 to 3 rooms and 5.1% had 4 to 5 rooms. Most homes had electricity (93.0%)

and telephones (83.3%). Televisions were also a household item that most households (88.4%) possessed. The method of cooking food in both communities either was gas alone (54.8%), wood alone (4.8%), or gas and wood in combination (40.5%). In both of the communities, most people (83.3%) in the communities did not have a vehicle. Roughly half of the people interviewed (48.8%) had a bicycle at their disposal.

Whether people in Lloyds Pen and Grove Farm farmed or not, I was interested in finding out the source of their water, and whether or not they paid for it. Out of 42 people who responded (two did not respond), I found that in the two communities combined, most people (71.4%) obtained their drinking water from a public or private pipe and paid for it. Seven people (16.6%) had access to a public pipe and community tank for which they did not pay. A smaller number of people (11.9%) had their own rain tank. All 32 farmers had to pay for irrigation water.

In Table 5-1, occupations of women and men in Grove Farm and Lloyds Pen are displayed. Note that some women and men gave two responses for occupations (such as farming and shopkeeping or carpentry and farming). This is accounted for in Table 5-1 so that N is greater than total responses. From the results, although more than 50% of women farm (including higglers), they did not participate in farming to the extent of men. Nine out of 20 women (45%) did not farm. Also, the range of occupations for women and men varies greatly. Note that in Table 5-1 many farmers gave multiple responses, hence N is greater than the number of people interviewed.

Table 5-1: Main Occupations of Women and Men in St. Catherine

	N	Percent
Women		
Farming	11	55.0
Housewife	5	25.0
Street or Market Vendor	3	15.0
Clerk & other Services	3	15.0
Shopkeeper	2	10.0
Dressmaker	1	5.0
Factory Work	1	5.0
Total respondents	20	
Men		
Farming	21	87.5
Electronics Repair	1	4.2
Factory Work	1	4.2
Mechanic	1	4.2
Day Laborer	1	4.2
Carpentry	1	4.2
Total respondents	24	

(N=44 people)

Land Profile

Farmers and non-farmers were asked, "How much total acreage do you have?" As can be seen in Table 5-2, a large percentage had less than one acre. About a third had between 5.25 and 10.25 acres (previously mentioned in this chapter was how farmers acquired 10 acres). Note that two people did not respond to this question. In Tables 5-2, 5-3, and 5-4, I list acreage for the individual interviewed—not for the entire household.

Table 5-2: Total Acreage in St. Catherine

Acres	N	Percent
0	1	2.4
0.1– 1.0	17	40.5
1.1 – 2.0	5	11.9
2.1 – 5.0	5	11.9
5.1 – 10.5	14	33.3
Total	42	100

(N=42 people)

Next, I sought to find out the size of the first parcel of land (usually where the home is located). For most people, the first parcel was small, between 0.1 to 1 acres (see Table 5-3). Three people did not respond.

Table 5-3: Acreage of First Parcel in St. Catherine

Acres	N	Percent
0	1	2.4
0.10 – 1.0	35	85.4
1.1 – 2.0	3	7.4
2.1 – 5.0	2	4.8
Total	41	100

(N=41 people)

I asked the same question for the second parcel of land (usually the farm field) as well. This time, only farmers said they had a second parcel (see Table 5-4). Twenty-two people (including non-farmers) said they did not have a second parcel. As I was only interested in analyzing the size for those who have a second parcel, the 19 people with no land were omitted from Table 5-4. The reason for the increased size of most second parcels of land is that many of the second parcels are farm fields. Again, many farmers in Grove Farm had ten acres. I did not find any farmer who had more than two fields.

Table 5-4: Acreage of Second Parcel in St. Catherine

Acres	N	Percent
0.10 – 1.0	6	27.3
1.1 – 2.0	0	0
2.1 – 5.0	4	18.2
5.1 - 10.5	12	54.5
Total	22	100

(N=22 people)

After asking about the acreage of the first parcel, I wanted to know who in the household owned land, and combined the first and second parcels into a figure for total land (see Table 5-5). As stated before, no farmer in St. Catherine had a third parcel. I did not ask people if they had a title to the land. Although I

found that some people had family land, it was never specified during surveying whether the land owned was family land. I have added family land into the table below. Also, I do not display data in ranges as it keeps the original data intact and, furthermore, I believe that it is important to look at the size of the individual parcel for the purpose of aggregating totals. Following Table 5-5, I aggregate the responses along gender lines.

Table 5-5: Ownership of Land in St. Catherine, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Other female family	Other male family	Total
0.25	0	1	0	1	1	3
0.5	0	0	1	0	1	2
0.75	1	0	1	0	1	3
1	1	1	0	0	0	2
1.25	0	1	0	0	0	1
2.5	1	1	0	0	0	2
3.25	0	0	0	0	1	1
10	0	1	0	0	0	1
10.5	1	2	1	0	0	4
Total	4 (15 acres)	7 (36 acres)	3 (11.5 acres)	1 (0.25 acres)	4 (4.75 acres)	19 (67.5 acres)

(N=19 people)

In Table 5-5, I introduce terminology which will be used throughout the thesis. For the category, “Female Decision Maker” this female makes decisions independently on a particular issue. She can be the head of her own household or she can be living with a husband or common law spouse, but on the particular topic considered in the table, she makes the decisions independently on that topic. In a table (such as Table 5-5 on Ownership of Land), the same female can own land and be a “Female Decision Maker” while in another table, such as decisions about pesticides, she can be included in the category “Joint Decision Makers.” “Male Decision Maker,” is a male who makes decisions independently on a particular issue. “Joint Decision Makers” refers to cases in which both the male and female jointly make the decision together on a particular issue. “Other

female family" or "Other male family" means another family member (other than the household head) who make decisions on a particular issue, own or rent/lease land, or provide labor for a production task.

Looking at Table 5-5, it becomes clear that men controlled most of the land. For the ownership of the land the total was five women owned 15.25 acres and 11 men owned 40.75 acres. Three separate couples "Joint Decision Makers" owned 11.5 acres. Five women from the total were equal to 26.3%. Men comprised 57.9% of owners of land and the three couples comprised 15.8%. Now, looking at the proportion of land (from the total amount) which is owned by women and men, I found men alone owned 60.4% of land and women alone owned 22.6%. The three couples owned 17.0% of land. In sum, men owned almost two-thirds of land, women less than one-fourth.

Important to mention when considering ownership of land is the difficulty women face in inheriting land. Discussed in a case study (at the end of this section), one woman, whose husband died about 20 years ago, was waiting for the title of the land (10.5 acres) to be signed over to her.

Next, I looked at the amount of land that was either rented or leased and divided the responses based on gender (see Table 5-6). An important finding is that no women alone rented or leased land. One couple "Joint Decision Makers" leased eight acres. In total, eight males rented/leased 12.8 acres, or 61.5% of the total. As with land ownership, there was a higher number of men than women who rented/leased land and the amount they rented was greater than that of women.

Table 5-6: Areas Rented or Leased in St. Catherine, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Other male family	Total
0.1	0	1	0	0	1
0.2	0	1	0	0	1
0.25	0	2	0	0	2
0.5	0	2	0	0	2
1	0	1	0	0	1
8	0	0	1	0	1
10	0	0	0	1	1
Total	0	7 (2.8 acres)	1 (8 acres)	1 (10 acres)	9 (20.8 acres)

(N=9 people)

The next Table displays the amount of rent free land in St. Catherine and uses the same categories (and labels) as the previous table. First, not many people accessed rent free land. Also, a small portion of land was accessed rent free, and much of it was shared by both the male and female ("Joint Decision Makers").

Table 5-7: Areas Rent Free in St. Catherine, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Total
0.2	0	0	1	1
0.25	0	0	1	1
0.5	0	1	0	1
2	0	1	0	1
5	0	0	1	1
Total	0	2 (2.5 acres)	3 (5.45 acres)	5 (7.95 acres)

(N=5 people)

Crop Production

I was interested in finding out the types of crops farmers cultivated and to determine how much callaloo was grown by women and men. Callaloo was one of the main crops farmers grow (see Table 5-8). I also discovered that many

farmers, especially in Lloyds Pen, cultivated okra. There, callaloo was also grown but to a lesser extent. When questioned why farmers did not grow more callaloo, they usually responded that callaloo needs more water than okra—water to which they did not have access. Okra also did not have the pest problems that typify callaloo cultivation, I was told.

Table 5-8: Frequency of Crops in St. Catherine, by Gender

Crop	Female Decision Maker	Male Decision Maker	Total N	Percent
Okra	7	17	24	75.0
Callaloo	8	12	20	62.5
Cucumber	2	7	9	28.1
Mango	3	4	7	21.9
Sweet Pepper	2	4	6	18.8
Tomato	1	4	5	15.6
Coconut	1	4	5	15.6
Banana/ Plantain	1	3	4	12.5
Citrus	1	3	4	12.5
Pumpkin	1	2	3	9.4
Hot Pepper	0	2	2	6.3
Pakchoi	1	1	2	6.3
Dasheen	0	1	1	3.1
Sugar Cane	1	0	1	3.1
Passion Fruit	1	0	1	3.1

(N=32 farmers)

In Grove Farm and Lloyds Pen, neither men nor women were the sole cultivators of any individual crops, except where only one male or female reported growing this crop. Based on this, I concluded that there was no division of crops according to gender.

Next, I was interested in determining the problems in farming (see Table 5-9). The question was, “What is the major problem you encounter growing crops?” Most farmers complained about the lack of rainfall and insufficient sources (or access) for irrigation. Pest problems (worms, insects, disease, and fungus) were also a major complaint. Surprisingly, even with close proximity to a major highway and urban areas, marketing was mentioned as a problem by one-

fourth of farmers. This indicates that simply having access to the road was not enough. Note that some farmers had more than one response and three farmers did not respond.

Table 5-9: Major Problems Reported in St. Catherine

Problem	N	Percent
Drought	21	72.4
Pests	18	62.1
Marketing	7	24.1
Labor	4	13.8
Expensive Agrochemicals	3	10.3
Low Prices	1	3.5
Theft	1	3.5
No money	1	3.5
No Problems	1	3.5

(N=29 farmers)

Production Tasks

In the cultivation and marketing of crops, I was interested in discovering who in the household engaged in each particular production task (see Table 5-10). For the category "Hire" I did not find out the gender of the workers. "Other male" in this table includes males from within the household but also non-family members within the community. In the paragraph below the table, I aggregate the responses along gender lines.

Table 5-10: Crop Production Tasks in St. Catherine, by Gender

Task	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Hire	Other Male	Total N
Nursery Preparation	1	18	6	4	4	27
Land Preparation	1	12	2	17	3	29
Planting	1	20	5	7	5	29
Spraying	1	22	5	4	4	30
Weeding	1	19	6	10	3	29
Harvesting	1	18	6	7	6	29
Post Harvest	6	13	5	8	4	29
Marketing	9	13	4	6	4	30

For each category, it was not possible to get responses of all farmers, hence you see N=27, 29 or 30. As some farmers gave multiple responses, the numbers (added horizontally for each task) are greater than total N. It becomes clear that more men than women participated in these tasks. For "Nursery Preparation," the aggregate for women is seven [(Female Decision Maker (1) + Joint Decision Makers (6) = 7)], for men it is 28 [(Male Decision Maker (18) + Joint Decision Makers (6) + Other male (4) = 28)]. (Note that the response for "Joint Decision Makers" is counted once for women and once for men.) The same procedure followed for the other categories as well. For "Land Preparation," the responses resulted in three women and 17 men who worked on this production task. For "Planting," six women and 30 men worked in planting crops. For "Spraying Pesticides," six women and 31 men sprayed pesticides. For "Weeding," seven women and 28 men worked in this task. For "Harvesting," seven women and 30 men worked in this task. For "Post Harvesting," 11 women and 22 men worked in this task. Lastly, 13 women and 21 men marketed the crops.

Decision Making

Farmers in St. Catherine were asked who makes decisions for the following tasks: decision making about the (major) crops, allocation of workers (including who hires workers and how much to pay), who decides how to use the income from farming, and who decides how the crops will be sold (see Table 5-11). The actual questions are not listed in the table, rather they are found, in original form, in the text following the table. Following the table, I have added together the responses along gender lines, to understand whether women or men are making the decisions regarding each set of tasks. Note that I have added the category “Joint Decision Makers” to both male and female responses.

Table 5-11: Decision Making in St. Catherine, by Gender

Decision	Women Say	Men Say	Total
Who decides about major crop?	N=11	N=19	N=30
Female Decision Maker	1	0	1 (3.3%)
Male Decision Maker	6	13	19 (63.3%)
Joint Decision Makers	3	4	7 (23.3%)
Other Male Family	1	1	2 (6.6%)
Other Female Family	0	1	1 (3.3%)
Who decides who does the work?	N=11	N=20	N=31
Female Decision Maker	0	0	0
Male Decision Maker	7	16	23 (74.2%)
Joint Decision Makers	2	1	3 (9.7%)
Other Male Family	2	1	3 (9.7%)
Other Female Family	0	2	2 (6.4%)
Who decides about hiring?	N=11	N=20	N=31
Female Decision Maker	0	0	0
Male Decision Maker	7	16	23 (74.2%)
Joint Decision Makers	2	1	3 (9.7%)
Other Male Family	2	1	3 (9.7%)
Other Female Family	0	2	2 (6.4%)
Who decides how to sell crop?	N=11	N=20	N=31
Female Decision Maker	2	0	2 (6.4%)
Male Decision Maker	5	14	19 (61.3%)
Joint Decision Makers	2	4	6 (19.4%)
Other Male Family	2	1	3 (9.7%)
Other Female Family	0	1	1 (3.2%)
Who decides how to use farming income?	N=11	N=19	N=30
Female Decision Maker	4	1	5 (16.6%)
Male Decision Maker	1	8	9 (30.0%)
Both Decision Makers	5	7	12(40.0%)
Other Male Family	1	1	2 (6.7%)
Other Female Family	0	2	2 (6.7%)
Who decides on and chooses pesticide?	N=9	N=18	N=27
Female Decision Maker	0	0	0
Male Decision Maker	5	18	23 (85.2%)
Joint Decision Makers	3	0	3 (11.1%)
Other Male Family	1	0	1 (3.7%)
Other Female Family	0	0	0
Who buys the pesticide?	N=9	N=18	N=27
Female Decision Maker	0	0	0
Male Decision Maker	3	17	20 (74.1%)
Joint Decision Makers	5	1	6 (22.2%)
Other Male Family	1	0	1 (3.7%)
Other Female Family	0	0	0

First, not all farmers responded to each question, therefore sometimes you will see N=31, 30, or 27. Men were the predominant decision makers for all but one category (how to use income from farming), although the category "Joint Decision Makers" needs to be mentioned. Most striking is that for all categories (except for the last), none of the men said that the female made these important decisions. On the same token, women said most of the time that the male made the decisions. But this does not extend to decisions about farming income. For the question, "Who makes the decisions about the major and other crops?," the total was nine women and 28 men. For "Who decides who does the work with the major and/or other crops (plant, weed, harvest)?," there were five women and 29 men. The next question, "Who decides if you will hire workers, and how much will you pay?," there were five women and 29 men. For "Who decides how the crop will be sold?," the total was nine women and 28 men. And lastly, "Who decides how to use income from farming?," there were 19 women and 23 men, roughly equal participation.

Next, I wanted to know who in the household decides, chooses, and buys pesticides? From the table, it can be seen that males were clearly the ones who did this, with a total of 27 males and three females (as part of "Joint Decision Makers"). In addition, men said that they alone decided to use pesticides, chose the pesticide, and bought the pesticide. Women, in contrast, named the male decision maker, joint decision makers, or other male family member.

Moving from decision making, I asked farmers how they marketed their crops (see Table 5-12). Most farmers said they sold their crops to a higgler from the farm gate or they took it to a public market. Note that multiple responses are accounted for so N is greater than the total number of farmers and five farmers did not respond to the question.

Table 5-12: Marketing Method in St. Catherine

Marketing Method	N	Percent
To higgler	18	66.7
To public market	13	48.1
To public at roadside/ farm gate	3	11.1
To exporter	2	7.4
To factory	1	3.7

(N=27 farmers)

Farmers were also asked which type of marketing channel they would prefer (see Table 5-13). Most farmers said they would prefer to sell the crop themselves. The main reasons for this included being able to control the entire marketing process including the money they accepted. Slightly fewer farmers said they would prefer to export their crops. It is interesting that although most farmers marketed via higglers (see Table 5-12), few actually preferred this. One reason was that farmers believed higglers take advantage of them. Six farmers did not respond to the question.

Table 5-13: Preferred Marketing Method in St. Catherine, by Gender

Preferred Marketing Method	Female Decision Maker	Male Decision Maker	Total
Sell it yourself	6	5	11 (42.3%)
Sell to exporter	3	6	9 (34.6%)
Sell to higgler	1	5	6 (23.1%)
Total	10	16	26 (100.0%)

(N=26 farmers)

Pest Identification and Management

Five photos of insects were shown to farmers in Grove Farm and Lloyd Pen. The pests of callaloo included the flea beetle (*Disonyca laevigata* (Jacoby)); beet army worm (*Spodoptera exigua* (Hb.)), in larval and adult stages; leafhopper (*Empoasca* spp.); and the beneficial ladybug (*Hippodamia convergens*). The first point that needs to be made is that after a lengthy interview, few farmers in Grove Farm and Lloyds Pen were interested (or had the

time/energy) to continue into the pest identification and management section. Out of a total of 32 farmers, 11 (34.4%) participated, of which four were women and seven were men. The second point is that from such a small sample, I do not suggest that any of the results would be representative to a larger population.

The first insect that farmers were asked to identify was the flea beetle (see Table 5-14). Most farmers (eight) did not identify it and of those that did, two were men and one was a woman. In describing the damage the flea beetle causes, while four farmers (36.4%) including one woman farmer said that it only eats the leaf, two farmers (both women, or 18.2%) said that it does not harm the crop; and two farmers (18.2%) had never seen it before. Three farmers (two men and one woman or 27.3%) did not know.

The next pest that farmers were asked to identify was the adult (moth) stage of the beet army worm (see Table 5-14). For the most part, farmers knew this insect and almost all farmers, including three women, identified the adult army worm. In describing the damage the adult army worm causes, five farmers (45.5%), including one woman, said that it breeds the "worm." (The larval stage of the army worm is actually the most destructive stage of the insect's lifecycle.) Three farmers (27.3%), including two women, said that it only eats the leaf. Two farmers (18.2%), including one woman, did not know; and one farmer (9.1%) said he has seen it before but did not know the damage it causes.

The same insect (army worm) was to be identified, this time in its larval stage. All farmers identified it (see Table 5-14). For the damage, most farmers (8/11, or 72.7%), including all four of the women farmers, said that the larvae army worm only eats the leaves of the crops. Two farmers (18.2%) said that the worm breeds the adult "bat" army worm. ("Bat" is the local name for moth or butterfly.)

Almost all farmers, except one, were not able to identify the next pest, the leafhopper (see Table 5-14). The one farmer who identified it, a male, called it "striped fly" and was also able to describe the damage it causes. This farmer said that the "striped fly" stripes the leaves, which is true.

I also tried to measure farmers' knowledge of beneficial insects and used the ladybug as an example. All except one farmer (N=10) answered the question. Most were not able to identify it (see Table 5-14).

Table 5-14: Insect Identification in St. Catherine, by Gender

	Recognized	Not Recognized	Total
Flea Beetle (N=11 farmers)			
Women	1	3	4
Men	2	5	7
Total	3	8	11
Adult Army Worm (N=11 farmers)			
Women	3	1	4
Men	6	1	7
Total	9	2	11
Larvae Army Worm (N=11 farmers)			
Women	4	0	4
Men	7	0	7
Total	11	0	11
Leafhopper (N=11 farmers)			
Women	0	4	4
Men	1	6	7
Total	1	10	11
Ladybug (N=10 farmers)			
Women	0	4	4
Men	2	4	6
Total	2	8	10

After determining the number of insects farmers could identify, I asked for the pest management strategy farmers implemented (see Table 5-15). Most farmers did not respond to the question about how to control the flea beetle. Three did not answer the question for the control of the adult army worm. All answered the question about the larvae army worm, however. The predominant pest management strategy for both women and men was to spray pesticides.

Only a couple of farmers destroyed pests manually. Nobody knew how to control the leafhopper.

Table 5-15: Pest Management in St. Catherine, by Gender

	Women	Men	Total
Flea Beetle (N=4 farmers)			
Pesticides	1	2	3
Destroy Manually	0	1	1
Total	1	3	4
Adult Army Worm (N=8 farmers)			
Pesticides	3	4	7
Destroy Manually	0	1	1
Total	3	5	8
Larvae Army Worm (N=11 farmers)			
Pesticides	4	5	9
Destroy Manually	0	2	2
Total	4	7	11

The final question in the pest identification section sought to determine the major sources of pest management information (see Table 5-16). Specifically, I asked farmers, "Who taught you about pests and how to control them?" Farmers provided only one source. It seems interesting that while men mentioned other farmers or extension agents, the two women said that they were self-taught. Note that four farmers did not respond to the question.

Table 5-16: Major Source of Pest Management Information in St. Catherine, by Gender

Source	Women	Men	Total
Other farmers	0	3	3
Self-taught	2	0	2
Extension agent	0	2	2
Total	2	5	7

(N=7 farmers)

Case Studies

Mary is 25 years old. In the small and sparsely furnished three room home she shares living space with a younger brother, his partner and baby, another younger brother, an older brother, and her three children. She has lived in this house with her mother and brothers all of her life. Her mother, a higgler, now lives in Church Pen. While her father lives in Spanish Town (about ten kilometers away) he rarely visits to care for her and her three brothers. When I went to her home to speak to the male and female head of the household, I was told that she and her brothers are all heads of the household.

She has three children: a three-week old boy, a four year old boy, and a nine year old girl. She had the nine year old when she was 17. She spends much of her time in a tiny bedroom caring for the three week old. One of her children is hearing impaired but the J$30,000 (about US$860) for each hearing aid proves to be too expensive considering her income. The father of her first and second child was the same man. He helped pay for her schooling when she was fifteen years old but has since stopped supporting her. Her youngest child has another father. As with her first partner, the second does not support her nor the baby.

Of Mary's three brothers, the younger two do most of the farming. They grow primarily okra due to lesser amounts of pest problems and limited access to water. Mary and her brothers want to plant callaloo in the near future; however, as she said, it demands more energy, pesticides, and water. But they do spray pesticides; and on the occasion when near the application site, she has also felt "dizzy." While the brothers are in charge of crop production, her job on occasion is to market the crops. Sometimes this means that, depending on the amount being sold, she goes alone or with one of her brothers to Coronation Market in Kingston or another local market. When the particular crop is in season, this means three times a week. All of the siblings make farming decisions together, although she has less input compared to the brothers. When crops are sold, she said (and her brothers agreed) that as far as the decisions to spend the income

are concerned, “all negotiate together” and “all are talking.” This case study is an example of a household where the males are doing more of the production tasks in farming but the female decision maker, though still not as important as the male decision makers, makes an important contribution as one of the marketers of crops. Moreover, while having less input in decision making aspects about planting, the female in this example makes an equal contribution (compared to her brothers) in decision making about spending income.

The preferred marketing method is to sell the crops by herself because she does not take credit; she needs the money in advance. Exporting has, however, never come into question as they have never tried to sell to an exporter nor had the opportunity. Besides, an export contract would be nice, she said, but her (and her brothers’) wish to farm additional land would mean that they would have to somehow be supported by a government organization such as the Rural Agricultural Development Authority (RADA) or a Member of Parliament (MP). However, RADA came to Lloyds Pen three months ago and never returned. This feeling of marginality was something I encountered in more than one farmer.

Paula is 52 years old. She lives with her husband, age 43; a daughter, 25; a granddaughter, eight; grandson, three; and the husband’s son, 12, from a previous marriage. On occasion, different nieces and nephews stay with her. Originally from a community in the western part of the island, she has been living in Grove Farm for 30 years. From her first husband, she had five children. Two of them live overseas but neither sends remittances as they face difficult times. Her first husband died 20 years ago. From him, she inherited 10.5 acres of land, but she has been waiting, since his death, for title to the land. She made it clear to me that her current husband (although married to her for 17 years) does not own the land, rather just works on it. On the half acre of land, she built a small home for her oldest daughter and her young son, and rents a room in that house for extra money, which Paula controls.

Her current husband does all of the farming (he grows callaloo, okra, and mangos) and makes all of the farming decisions (such as type of crop, who does

the work, and hiring workers). She sometimes markets crops in Old Harbour. If she had a car, she would sell produce to supermarkets as she does not like to deal with higglers.

Her husband also has cows from which he sells milk. While Paula said that she decides how the income from farming will be spent, both she and her husband decide how to spend the income from cows' milk together. In Grove Farm and Lloyds Pen (as in the other communities), I came across many families in which the decision makers have separate streams of income. However, the perceptions of both partners sometimes differed. While many women said that both decision makers worked together, most men said that they did the work alone. However, the income from farm animals or remittances was usually something that was kept separate from the partner. In the view of Paula's husband, both own the land together, and both decide on how to spend income from farming together (except for cows' milk).

Both case studies support the data that men in Grove Farm and Lloyds Pen are involved to a greater extent in production of crops, but that decisions about expenditures is something that both partners decide together, or in the last case study, something Paula said she decides alone. The case study about Paula highlights the difficulty for women to obtain title to inherited land.

B. HAZARD AND DONNINGTON CASTLE, ST. MARY

About 12 kilometers from Highgate, in the heart of the mountainous and scenic parish of St. Mary, are the communities of Hazard and Donnington Castle (latitude 18° 17' N, longitude 76° 57' W) (see Map 5-2). Benefiting from their locations on the northern side of the island, the communities receive generous amounts of rainfall on average. Based on an analysis of the climate map, I estimate that Hazard and Donnington Castle receive between 70 to 100 inches per year (Statistical Institute of Jamaica, 1997). The principal landforms in this area are dissected karstic plateaus (white and yellow limestone) (Floyd, 1979).

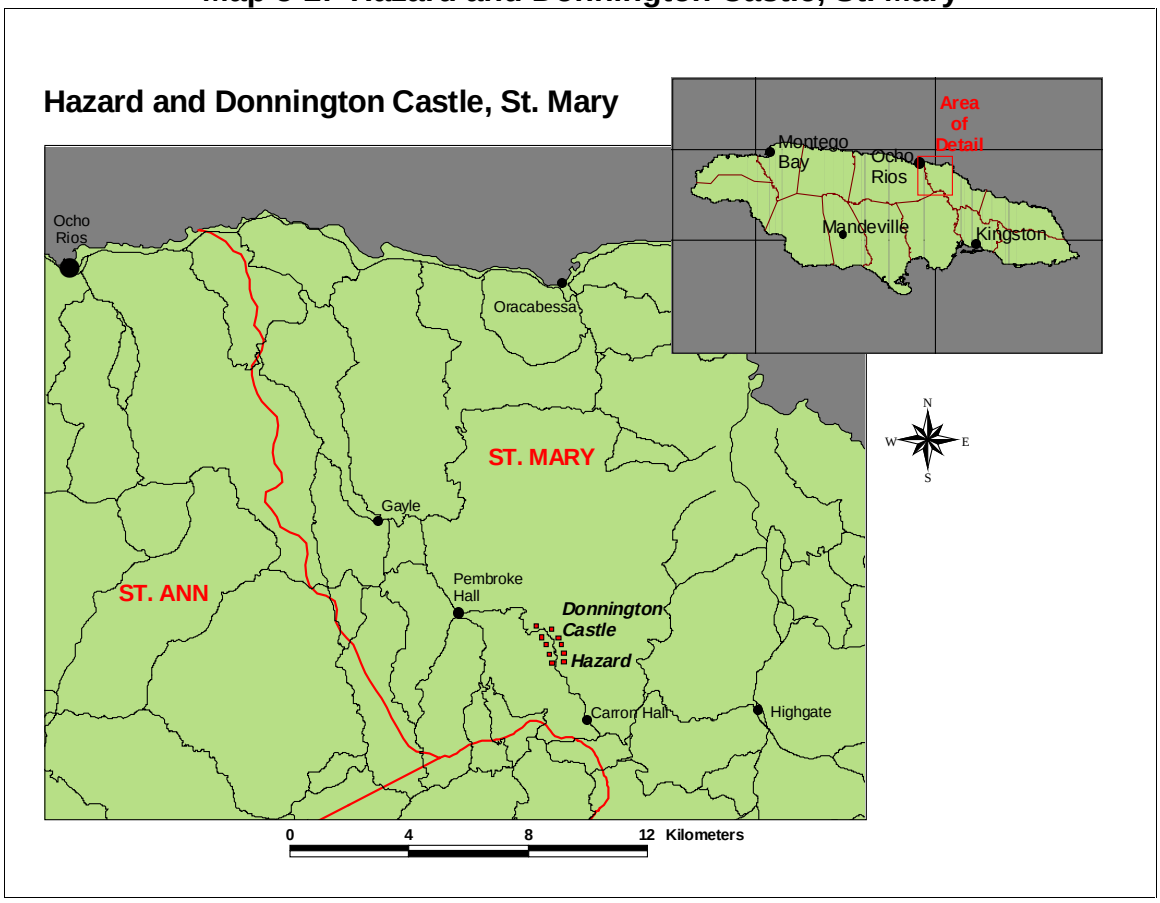
The topography of much of the area is marked by farmland of moderate to steep slopes. Elevation for much of the area is around 500 meters above sea level.

During fieldwork, I counted 43 households in Hazard and Donnington Castle. The bigger of the two, Hazard, has a grocery store (kiosk), and several churches. Homes in Hazard are built on both sides of the road which leads from south to north on the way from Hazard to Donnington Castle, which begins after about one kilometer. Both communities together span about four kilometers (along the road) from the southern boundary at Hazard to the northern boundary at Donnington Castle. Homes in Donnington Castle are generally more spread out than in Hazard. However, the communities are considered by those living in the area to be one in the same.

From the 43 households in Hazard and Donnington Castle, I randomly selected 33. All 33 households were interviewed. In twenty (60.6%) of the 33 households, there was a male and a female decision maker (but not necessarily husband and wife), eight (24.2%) were headed by a single male, and five (15.1%) were headed by a single female. The average household size was 4.7 members. The average age was 51 years and the median 54. From a total of 47 people interviewed (I interviewed 19), all were farmers, of which 24 were women (51.1%) and 23 men (48.9%). Three farmers not in the random sample were included, because they wished to be interviewed. In Hazard and Donnington Castle, I observed on separate occasions women walking to farm fields with a cutlass (machete) in hand, ready to work.

In both communities, most houses (73.8%) were constructed of cement, while others (26.2%) were made of wood. Most houses where interviews were conducted (47.6%) are medium size (2 to 3 rooms), while smaller homes (1 to 2 rooms) were slightly fewer (33.3%), as were larger homes (4 to 5 rooms), at 16.6%. Most houses (76.1%) had electricity, one out of every two households (52.2%) had a television, and almost all homes (97.8%) did not have a telephone.

Map 5-2: Hazard and Donnington Castle, St. Mary



(Source: Baseline data from IPM CRSP)

Out of 46 farmers who responded (one farmer declined to respond), many (89.1%) obtained water from a public pipe and did not have to pay for this. Other farmers (32.6%) said they get their water from a pipe or a spring. There were other ways of obtaining water: two people (4.3%) had private pipes and five people (10.8%) had a rain tank. Out of 42 people (five did not respond), most people (40.5%) used both wood and bottled gas in combination for cooking food. I found that 35.7% of people cooked with wood alone; those who cooked only with bottled gas were 23.8%.

The terrain used for farming in Hazard and Donnington Castle is steeply sloping. Farmers cultivate a mixture of crops, including tomatoes, yams, bananas, and Irish potato. This area of St. Mary is also one of the major producers of "Scotch Bonnet" hot pepper. Rainfall in this part of the island is considerable. However, farmers, due to their inability to capture much of the

rainfall, still contend with drought during certain times of the year. As mentioned before, rainfall is seasonal and occurs most heavily between May to June and September to November (Statistical Institute of Jamaica, 1997). As there are no irrigation canals, farmers relied on other methods for bringing water to their crops, including watering with buckets.

In these farming communities of lush vegetation, many farmers contend with transporting the harvested crops along networks of trails through mixed forest and crop land until they reach the main road. However, this is an area where few automobiles pass through. An occasional taxi or bus plies the road. One option for marketers on a weekly basis is a bus that passes through Hazard in the evening and arrives the following day at Coronation Market, Kingston. According to farmers, higglers passing through is a seldom occurrence. The majority of people (80.4%) in Hazard and Donnington Castle did not possess vehicles. As well, the majority (87.0%) did not have bicycles.

As in St. Catherine, I asked people in Hazard and Donnington Castle the kinds of work they engage in. As shown in Table 5-17, all men farmed. While all women were farmers (including higglers), many were also housewives or shopkeepers. As some farmers gave multiple responses, hence N is greater than the number of total respondents.

Table 5-17: Main Occupations of Women and Men in St. Mary

	N	Percent
Women		
Farming	24	100
Housewife	12	50
Shopkeeper	3	12.5
Teacher	2	8.3
Dressmaker	1	4.2
Carpentry	1	4.2
Total respondents	24	
Men		
Farming	23	100
Carpentry	2	8.7
Total respondents	23	

(N=47 people)

Land Profile

Each person was asked how much land they accessed under different forms of tenure which included land owned, family land, rented, or leased land (see Table 5-18). Most people had between five acres or less. Four people did not respond to the question, so total respondents equals 43. In Tables 5-18, 5-19, 5-20, and 5-21, I list acreage for the individual interviewed—not the entire household.

Table 5-18: Total Acreage in St. Mary

Acres	N	Percent
0.10 – 1.0	6	13.9
1.1 – 2.0	7	16.3
2.1 – 5.0	18	41.9
5.1 – 10.0	5	11.6
10.1 – 15.0	4	9.3
15.1 – 40	3	7.0
Total	43	100

(N=43 people)

Next, I asked for the acreage of the first parcel (see Table 5-19). This is usually where the house is located. Half of farmers had less than one acre. Three people did not respond to the question.

Table 5-19: Acreage of First Parcel in St. Mary

Acres	N	Percent
0.10 – 1.0	22	50.0
1.1 – 2.0	8	18.2
2.1 – 5.0	10	22.7
5.1 – 10.0	1	2.3
10.1 – 18.0	3	6.8
Total	44	100

(N=44 people)

The same question was asked about the second parcel. Fewer farmers (N=32) had a second parcel (see Table 5-20). Most farmers had between 0.1 to one acre.

Table 5-20: Acreage of Second Parcel in St. Mary

Acres	N	Percent
0.10 – 1.0	20	62.5
1.1 – 2.0	3	9.4
2.1 – 5.0	3	9.4
5.1 – 10.0	6	18.7
Total	32	100

(N=32 people)

Still, fewer farmers had a third parcel of land (see Table 5-21). Half of the 14 farmers had between 0.10 to one acre for the third parcel. A lower percentage of the 14 farmers had between 5.1 to ten acres.

Table 5-21: Acreage of Third Parcel in St. Mary

Acres	N	Percent
0.10 – 1.0	7	50.0
1.1 – 2.0	0	0
2.1 – 5.0	2	14.3
5.1 – 10.0	4	28.6
10.1 – 15	1	7.1
Total	14	100

(N=14 people)

None of the farmers in Hazard and Donnington Castle had a fourth parcel. After examining the parcel size and access to land, I determined by adding parcels together how much land each individual owned and separated responses along gender lines (see Table 5-22). I did not ask people if they had title to the land. Here 30 people owned land (or controlled it as family land). Unfortunately, it was not specified in the interviews whether the land owned was family land. Therefore, I have added family land into the Table 5-22. I do not display data in ranges because I want to show the exact number of acres males, females or jointly owned. Following the table, I aggregate the responses along gender lines.

Table 5-22: Ownership of Land in St. Mary, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Other female family	Other male family	Total
0.1	1	2	0	0	0	3
0.2	2	0	0	0	0	2
0.5	1	1	0	0	0	2
0.75	1	0	0	0	0	1
1	2	0	0	0	1	3
1.5	0	1	0	0	0	1
2	0	1	0	0	0	1
3	0	4	1	0	0	5
3.5	0	2	0	0	1	3
4	0	0	0	1	0	1
4.2	1	0	0	0	0	1
5	0	1	0	0	0	1
5.5	0	1	0	0	0	1
8.2	0	1	0	0	0	1
10	0	0	1	0	0	1
10.3	0	1	0	0	0	1
18	0	1	0	0	0	1
33	0	1	0	0	0	1
Total	8 (7.95 acres)	17 (103.2 acres)	2 (13 acres)	1 (4 acres)	2 (4.5 acres)	30 (132.65 acres)

(N=30 people)

From Table 5-22, by adding the totals, nine women owned 11.95 acres in Hazard and Donnington Castle. For men, the total was 19 men owned 107.7 acres. Two couples “Joint Decision Makers” owned 13 acres. The data show men alone owned almost all land (81.2%) in Hazard and Donnington Castle. Women alone owned 9.0% of land.

More information about the situation of single women embellishes simple numbers. One woman, age 58, married her present husband five years ago. When her previous husband died, she inherited approximately 0.2 acres of land but did not have title to the land. Another woman, age 73, whose husband passed away in February 1998, filed to have the title of her husband’s land signed over to her. As of July 1998, she was still waiting for it (and for his

pension) to arrive. Tired and lacking finances to travel to Port Maria to further her case, she doubted she will ever obtain the title.

Next, I looked at the total amount of land men and women rented or leased, and divided the responses along gender lines (see Table 5-23). Fewer people rented/leased land (N=16). Most significantly, men alone rented/leased almost all land (86.5%). Added together, the five women rented/leased a fraction (0.65) of one acre.

Table 5-23: Areas Rented or Leased in St. Mary, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Other female family	Other male family	Total
0.1	1	1	0	0	0	2
0.25	0	1	0	1	0	2
0.3	1	2	0	0	0	3
1	0	0	0	0	1	1
1.2	0	1	0	0	0	1
1.5	0	1	0	0	0	1
2	0	0	2	0	0	2
2.6	0	1	0	0	0	1
3.5	0	1	0	0	0	1
7	0	1	0	0	0	1
12	0	1	0	0	0	1
Total	2 (0.4 acre)	10 (28.75 acres)	2 (4 acres)	1 (0.25 acre)	1 (1 acre)	16 (34.4 acres)

(N=16 people)

Next, I looked at how much rent free land people accessed (see Table 5-24). Most rent free land was used by both the male and female "Joint Decision Makers."

Table 5-24: Areas Rent Free in St. Mary, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Total
0.3	1	0	1	2
0.5	0	2	0	2
1.5	0	0	1	1
3.0	0	1	0	1
7.0	0	0	1	1
Total	1 (0.3 acres)	3 (3.5 acres)	3 (8.8 acres)	7 (12.6 acres)

(N=7 people)

Crop Production

Next, I wanted to determine the types of crops farmers grow, and to what extent each crop is cultivated, by gender (see Table 5-25). Hot pepper was grown, but not to the extent as other crops such as banana/plantain or tomato. Most farmers provided multiple responses.

Table 5-25: Frequency of Crops in St. Mary, by Gender

Crop	Female Decision Maker	Male Decision Maker	Total N	Percent
Banana/Plantain	15	13	28	59.6
Tomato	14	9	23	48.9
Hot Pepper	10	12	22	46.8
Yam	7	9	16	34.0
Sugar Cane	6	6	12	25.5
Coffee	5	6	11	23.4
Cucumber	5	5	10	21.3
Cocoa	4	6	10	21.3
Pumpkin	6	3	9	19.1
Beans	5	4	9	19.1
Coconut	4	4	8	17.0
Cabbage	4	3	7	14.9
Carrot	3	1	4	8.5
Sweet Potato	3	1	4	8.5
Corn	2	1	3	6.4
Dasheen	1	1	2	4.2
Citrus	1	1	2	4.3
Callaloo	0	1	1	2.2
Cassava	1	0	1	2.2
Breadfruit	1	0	1	2.2

(N=47 farmers)

What is interesting about the table above is the diversity of crops that women mentioned cultivating. As in St. Catherine, it does not appear that one crop is grown by only males or females. After finding out the major crops grown, I asked farmers whether the male or female decision makers grew any crops alone, and whether the same household member made decisions about the crops. It appears that where women cultivated their own crops, they alone made the decisions. For example, one woman, age 37, said that her partner, age 40, cultivated banana, coconut and yam alone on his land. On her land (mainly surrounding the house) she alone grew hot pepper, cucumber, and string bean crops. For her crops she decided who works and how to spend income; however, they both marketed together and decided how to spend the income. Another female farmer, age 46, lived with her father (her partner passed away).

In the past, she grew hot pepper while her partner and brother grew banana, yam, cassava, and coffee. She alone decided on her crops and how to spend her income. Another female farmer, age 52, together with her two sons, ages 23 and 32, said that she helped her sons with the crops they grew (yam, tomato, hot pepper, banana, and plantain). She also had her own crops, including hot pepper, for which she alone did all the work. However, decision making was kept separate as she alone sold her crops and decided how to spend income. For the crops her sons grew, they decided how to market them and spend their income. The last woman I spoke to, age 42, was married. She and her husband, age 47, grew the same crops (cabbage, hot pepper, tomato, cucumber, and sweet potato), sold the crops, and decided about income expenditures together. In addition, she alone grew crops (the same types of crops) but both decided together.

Of the major problems farmers faced, I found that marketing was most frequently cited (see Table 5-26). When considering the distance of Hazard and Donnington Castle to urban centers and bad road conditions, this comes as no surprise. Also a major problem, pests, was cited by slightly fewer farmers than marketing. Expensive agro-chemicals (pesticides and fertilizers) or labor problems were also mentioned. Four farmers did not respond to the question (N=43).

Table 5-26: Major Problems Reported in St. Mary

Problem	N	Percent
Marketing	22	51.2
Pests	19	44.2
Expensive Agrochemicals	10	23.3
Labor	9	20.9
Drought	8	18.6
Low Prices	7	16.3
No money	5	11.6
No transport	4	9.3
Animals	2	4.7
Theft	1	2.3
No Problems	3	7.0

(N=43 farmers)

Production Tasks

The next section examines who performs each crop production task (see Table 5-27). I did not ask for the gender of those in the category "Hire." "Other male" and "Other female" in this table include those from within the household (family) but also non-family members within the community. Note that one farmer did not respond (N=46) and some farmers gave multiple responses.

Table 5-27: Crop Production Tasks in St. Mary, by Gender

Task	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Hire	Other Male	Other Female	Total N
Nursery Preparation	2	21	19	20	0	2	46
Land Preparation	2	21	17	20	0	2	46
Planting	2	19	21	19	0	2	46
Spraying	2	24	14	20	1	1	46
Weeding	2	21	20	20	0	2	46
Harvesting	2	18	23	18	0	2	46
Post Harvest	2	18	22	17	0	2	46
Marketing	4	22	18	11	0	2	46

While there are more women involved in farming than in the first community, Grove Farm and Lloyds Pen, men in Hazard and Donnington Castle outnumber women in all of the production tasks. From Table 5-27, there was a total of 23 women for "Nursery Preparation" [(Female Decision Maker (2) + Joint Decision Makers (19) + Other female (2) = 23)]. (Note that the response for "Joint Decision Makers" is counted once for women and once for men.) There were 40 men involved in "Nursery Preparation." The same procedure applies to other categories. For "Land Preparation," the total was 21 women and 38 men. For "Planting," there were 25 women and 40 men. Seventeen women and 39 men sprayed pesticides. For "Weeding," there were 24 women and 41 men. For "Harvesting Crops," in total, there were 27 women and 41 men. For "Post Harvesting," there were 26 women and 40 men, and for "Marketing," there were 24 women and 40 men.

Decision Making

Farmers in Hazard and Donnington Castle were asked who makes decisions for the following tasks: decisions concerning crops, allocation of workers (including who hires workers and how much to pay), how to use income from farming, and marketing (see Table 5-28). Following the table, I aggregated the responses along gender lines to understand whether women or men are making the decisions regarding each task. Note that I have added the category "Joint Decision Makers" to both male and female responses. Some farmers gave multiple responses (such as the "Female Decision Maker" and "Other Male Family" choose the type of pesticide). In addition, not all people answered the questions, so you will see N=46 or 36, for example.

Table 5-28: Decision Making in St. Mary, by Gender

Decision	Women Say	Men Say	Total
Who decides about major crop?	N=21	N=23	N=44
Female Decision Maker	5	0	5 (11.3%)
Male Decision Maker	5	14	19 (43.2%)
Joint Decision Makers	10	9	19 (43.2%)
Other Female Family	1	0	1 (2.3%)
Who decides who does the work?	N=21	N=23	N=44
Female Decision Maker	5	0	5 (11.3%)
Male Decision Maker	5	14	19 (43.2%)
Joint Decision Makers	10	9	19 (43.2%)
Other Female Family	1	0	1(2.3%)
Who decides about hiring?	N=17	N=18	N=35
Female Decision Maker	4	0	4 (11.4%)
Male Decision Maker	5	13	18 (51.4%)
Joint Decision Makers	7	5	12 (34.3%)
Other Female Family	1	0	1 (2.9%)
Who decides how to sell crop?	N=23	N=22	N=45
Female Decision Maker	7	2	9 (20.0%)
Male Decision Maker	4	14	18 (40.0%)
Joint Decision Makers	11	6	17 (37.8%)
Other Female Family	1	0	1 (2.2%)
Who decides how to use farming income?	N=23	N=23	N=46
Female Decision Maker	8	0	8 (17.4%)
Male Decision Maker	1	9	10 (21.7%)
Joint Decision Makers	13	14	27 (58.7%)
Other Female Family	1	0	1 (2.2%)
Who decides on the pesticide?	N=18	N=18	N=36
Female Decision Maker	5	1	6 (16.7%)
Male Decision Maker	4	15	19 (52.8%)
Joint Decision Makers	8	2	10 (27.8%)
Other Female Family	1	0	1 (2.8%)
Who chooses the pesticide?	N=19	N=18	N=36
Female Decision Maker	6	1	7 (19.4%)
Male Decision Maker	6	15	21 (58.3%)
Joint Decision Makers	5	2	7 (19.4%)
Other Female Family	1	0	1 (2.8%)
Other Male Family	1	0	1 (2.8%)
Who buys the pesticide?	N=20	N=18	N=36
Female Decision Maker	6	1	7 (19.4%)
Male Decision Maker	7	14	21 (58.3%)
Joint Decision Makers	3	3	6 (15.8%)
Other Female Family	1	0	1 (2.8%)
Other Male Family	3	0	3 (8.3%)

What becomes apparent from examining Table 5-28 is that men did not say that the female decision maker made these important decisions (except how to sell the crop). On the other hand, women's responses were split between the female, male, and joint decision makers. Women said that only one male alone decides how to use the farming income. The category "Joint Decision Makers" is very significant as I believe that men's responses were of overstated importance. For the question, "Who makes the decisions about the major and other crops?," there were 25 women and 38 men. The next question, "Who decides who does the work with the major and/or other crops (plant, weed, harvest)?," resulted in 25 women and 38 men. The next question, "Who decides if you will hire workers, and how much pay?," there were 17 women and 30 men. Importantly, for these first three questions (who decides about the crop, work, and hiring), two responses were that on her crops she made the decisions and on his crops he decided. These responses have been added to the results. For the question, "Who decides how the crop will be sold?," there were 27 women and 35 men. Another question, "Who decides how to use farming income?," resulted in almost equal participation, and in total, there were 36 women and 37 men. For pesticides, men alone were making a substantial percentage of the decisions. For example, there were 29 men versus 17 women making the decision that pesticides should be used.

Next, I looked at marketing methods (see Table 5-29). Most farmers sold the crop to a higgler, even as higglers do not pass through the area very often, according to farmers. Fewer farmers sold at a public market. Note that multiple responses are accounted for, so N is greater than the total number of farmers. Also, one farmer did not respond.

Table 5-29: Marketing Method in St. Mary

Marketing Method	N	Percent
To higgler	39	84.7
To public market	13	28.3
To factory	4	8.7
To exporter	2	4.4
To public (at farmgate/ from vehicle)	3	6.6

(N = 46 farmers)

Farmers were also asked which type of marketing they would prefer (see Table 5-30). As in Grove Farm and Lloyd Pen, most farmers would prefer to sell the crop themselves and fewer preferred to an exporter. Also, consistent with Grove Farm and Lloyd Pen, few farmers wished to sell to higglers even though this was the main marketing method. Eleven farmers did not respond to this question.

Table 5-30: Preferred Marketing Method in St. Mary, by Gender

Preferred Marketing Method	Female Decision Maker	Male Decision Maker	Total
Sell it yourself	13	6	19 (52.8%)
Sell to exporter	3	7	10 (27.8%)
Sell to higgler	3	2	5 (13.9%)
Sell at farmgate	0	2	2 (5.6%)
Total	19	17	36 (100%)

(N=36 farmers)

Pest Identification and Management

In this “Scotch Bonnet” hot pepper growing region, mites and viruses cause major damage to crops. Of the total 47 farmers interviewed in Hazard and Donnington Castle, 16 farmers (34.0%) participated in the pest identification and management section of the survey. Of these, seven were women (43.8%) and nine were men (56.3%). Farmers were shown two photographs of hot peppers that were damaged by mites (*Tetranychus* spp.) or viruses (see Table 5-31). In the photograph with virus damage, the actual virus remains unidentified but

probably includes one of the following: Tobacco Etch Virus (TEV), Potato Virus Y (PVY), or Tobacco Mosaic Virus (TMV). Farmers were also shown a picture of aphids (*Monellia* spp. and *Monelliopsis* spp.), the vector of several hot pepper viruses. As with the other two communities, farmers in Hazard and Donnington Castle were shown a photograph of a beneficial insect, the ladybug beetle (*Hippodamia convergens*) which is known to prey upon aphids.

The first photograph farmers were shown was a hot pepper leaf that had been damaged by mites. Most farmers, except three males, did not identify it (see Table 5-31). For the question what causes the (mite) damage, 12 farmers (75.0%), including seven women, have seen the damage but did not know the cause. Responses included: damage was caused by a mite, simply the leaf curled up, and an "insect" caused it. One farmer had never seen it before.

The next photograph farmers looked at was one depicting a hot pepper plant damaged by one or more plant viruses. None of the farmers identified the damage as being caused by a virus (see Table 5-31). As opposed to the mite damage, which turns the leaf brown ("Browning"), virus damage results in a mosaic yellow/green pattern ("Jherri curl"). ("Browning" and "Jherri curl" are local terms to describe damage.) Similarities with mite damage include, however, the curling of tips of leaves and reduction in leaf area. All farmers have seen virus damage on hot peppers, but none knew the cause.

Lastly, farmers were shown a separate photograph of aphids which are known to transmit hot pepper viruses. The pattern was almost identical to the responses for mite damage. Most farmers, except for three males, did not identify it. In describing the damage that aphids cause, of the three farmers who correctly identified the aphids, I was convinced not by the name they gave aphids, but by their description of aphid damage. Two male farmers correctly explained that insects suck on the leaves. The other male farmer said that they make the fruit small. Other responses included: slowed the growth of the tree, caused the leaves to fall off, and it ate the leaf (according to two women). While six farmers (37.5%), including six women, said that although they have seen

these insects before, they did not know the damage they cause. Two women farmers had never seen the insects before.

The last insect that was to be identified was the ladybug (see Table 5-31). All but one farmer (a female) did not recognize it.

Table 5-31: Insect Identification in St. Mary, by Gender

	Recognized	Not Recognized	Total
Mite Damage (N=16 farmers)			
Women	0	7	7 (43.7%)
Men	3	6	9 (56.3%)
Total	3 (18.8%)	13 (81.2%)	16 (100%)
Virus Damage (N=16 farmers)			
Women	0	7	7 (43.7%)
Men	0	9	9 (56.3%)
Total	0	16 (100%)	16 (100%)
Aphids (N=16 farmers)			
Women	0	6	6 (37.5%)
Men	3	7	10 (62.5%)
Total	3 (18.7%)	13 (81.3%)	16 (100%)
Ladybug (N=15 farmers)			
Women	1	6	7 (46.6%)
Men	0	8	8 (53.4%)
Total	1 (6.7%)	14 (93.3%)	15 (100%)

After determining how many farmers could identify the insects, I next asked for pest management strategies. By looking at Table 5-32, half of the sample sprayed pesticides to control mites. Interestingly, the other half did not do anything, basically "do nothing" strategies. The majority of women sprayed pesticides to control mite damage whereas the responses for men were more diverse. Most sprayed pesticides to control viruses. While men gave diverse responses, all women said they sprayed pesticides. Most farmers also sprayed pesticides to control aphids. While not as many men reported using pesticides to control mite or virus damage, for aphids it was the only pest control strategy men mentioned. As with the other pests, women relied primarily on pesticides. In

summary, while pesticides were the number one pest management strategy, the other option was to basically "do nothing." Interestingly, it appears that men, more than women, realized the futility of spraying pesticides on mite and virus damaged hot pepper. For the control of aphids, the majority of men and women relied on pesticides. Note that not all responded to the questions, except for how to control aphids (where N=16). I believe that the reason for this is farmers saw the picture of aphids, knew they were insects, and automatically responded that pesticides should be used.

Table 5-32: Pest Management in St. Mary, by Gender

	Women	Men	Percent
Mite (N=14 farmers)			
Pesticides	5	2	7 (50.0%)
Break off Fruit	0	1	1 (7.1%)
Pesticides do not help	1	2	3 (21.4%)
Do nothing	1	1	2 (14.3%)
Do not know	0	1	1 (7.1%)
Total	7	7	14 (100%)
Virus (N=11 farmers)			
Pesticides	6	1	7 (63.6%)
Throw plant away	0	2	2 (18.2%)
Pesticides do not help	0	1	1 (9.1%)
Do nothing	0	1	1 (9.1%)
Total	6	5	11 (100%)
Aphids (N=16 farmers)			
Pesticides	4	8	12 (75.0%)
Pesticides do not help	1	0	1 (6.3%)
Do nothing	0	1	1 (6.3%)
Never seen	2	0	2 (12.5%)
Total	7	9	16 (100%)

The last part of the pest identification dealt with the sources of farmer knowledge (see Table 5-33). Most farmers said they learned from other farmers, although more men reported learning from extension agents or being self-taught. Two farmers did not answer this question.

Table 5-33: Major Source of Pest Management Information in St. Mary, by Gender

Source	Women	Men	Total
Other farmers	3	3	6 (42.9%)
Self-taught	1	3	4 (28.5%)
Extension agents	1	3	4 (28.5%)
Total	5	9	14 (100%)

(N=14 farmers)

Case Studies

Margaret is 23 years old. She has lived in the community for four years with her partner, age 27. Currently, she lives by herself in a fairly large cement house with her one year old son. The baby's father (her partner) has been living and working in the United States for seven months. He sends remittances to support her and their baby. He is the owner of the house and much of the adjacent farm land, about 18 acres in total. Now and then, the children of friends living in Kingston come to her house to spend their vacation from school.

Margaret grows many crops, including tomato, carrots, beans, corn, and fruit trees. She is responsible for doing all of the farming herself, although she does hire workers or receives help from neighbors. If her partner were there, both would work together on the farm. Preferably, she would sell the crops herself at the market in Linstead but instead markets via higglers, as she must care for her son. She does not export crops, something typical of farmers in Hazard and Donnington Castle. She is an example of women in this community in that she cultivates several crops and does crop production. Also typical is that she would prefer to market crops herself.

In caring for her crops, I observed Margaret spraying pesticides. The pesticides were stored (in a barrel) and mixed behind the house. While spraying, she wore no protective clothing (such as a mask, gloves, and long sleeve shirt)

instead wore shorts, a T-shirt, and was barefoot. After spraying pesticides, she washed her hands (but did not change clothing), and went to her son who was waiting on the porch.

Living in a white cement house some distance from the main road, Joan (42 years old) lives with her husband (47 years old) and their children. Living in the house is her 16 year old son, a ten year old daughter, a nine year old daughter, and a seven year old niece. She has been married to her current husband for eight years. The 16 year old is from a previous partner and her responsibility to raise alone. She must provide the money to pay his school fees. To do this, she raises some poultry. But paying school fees, which are expensive, proves to be very difficult for her. Joan said it is common in Jamaica that men and women have separate economies, especially if they have children from different marriages. Each partner must provide for himself or herself, she said. This is something that I often noticed: couples are living together but partners have separate economies, have children from different marriages, and therefore separate responsibilities. But, she said, compared to men, women have it harder in the struggle to survive. Grandparents also play an important role in helping families out, such as child rearing.

While her husband leases one and a half acres from a relative, they also have four squares (approximately 0.5 acre) of land rent free. They grow sweet potato, sugar cane, hot pepper, cabbage, and cucumber. She is also persuading him to grow tomato. She and her husband work together, but he alone prepares the land or both hire workers. She said both decide on which crops to plant and how to spend the income from farming. The usual marketing method is to market via higglers at the farm gate. Her husband also sells cows' milk at a nearby community, Bog Walk. Both decide how to use this income. As both decide on matters of farming income, this is something typical of the community.

In talking to her husband, he agreed that he and his wife both make decisions about farming. He also has ten acres rent free from a relative, of which he cultivates five acres. Having such a large amount of land does not provide

him many benefits. The one reason why he does not farm more than half of it, is because of the market; why waste money on fertilizer and pesticides if there is no market? Higglers, he said, come around infrequently. If they do, according to Joan's husband, the higgler says, "Me don't want any of that. Too many farmers are reaping the same." So the crop ends up rotting at the farm gate. Both he and his wife would like to export crops but exporters also do not come around. He finds himself in a dilemma as his wife had surgery, and it proved to be very expensive at J$10,000 (about US$280). Meanwhile, insect problems (which he did not face five years ago) are more expensive to control.

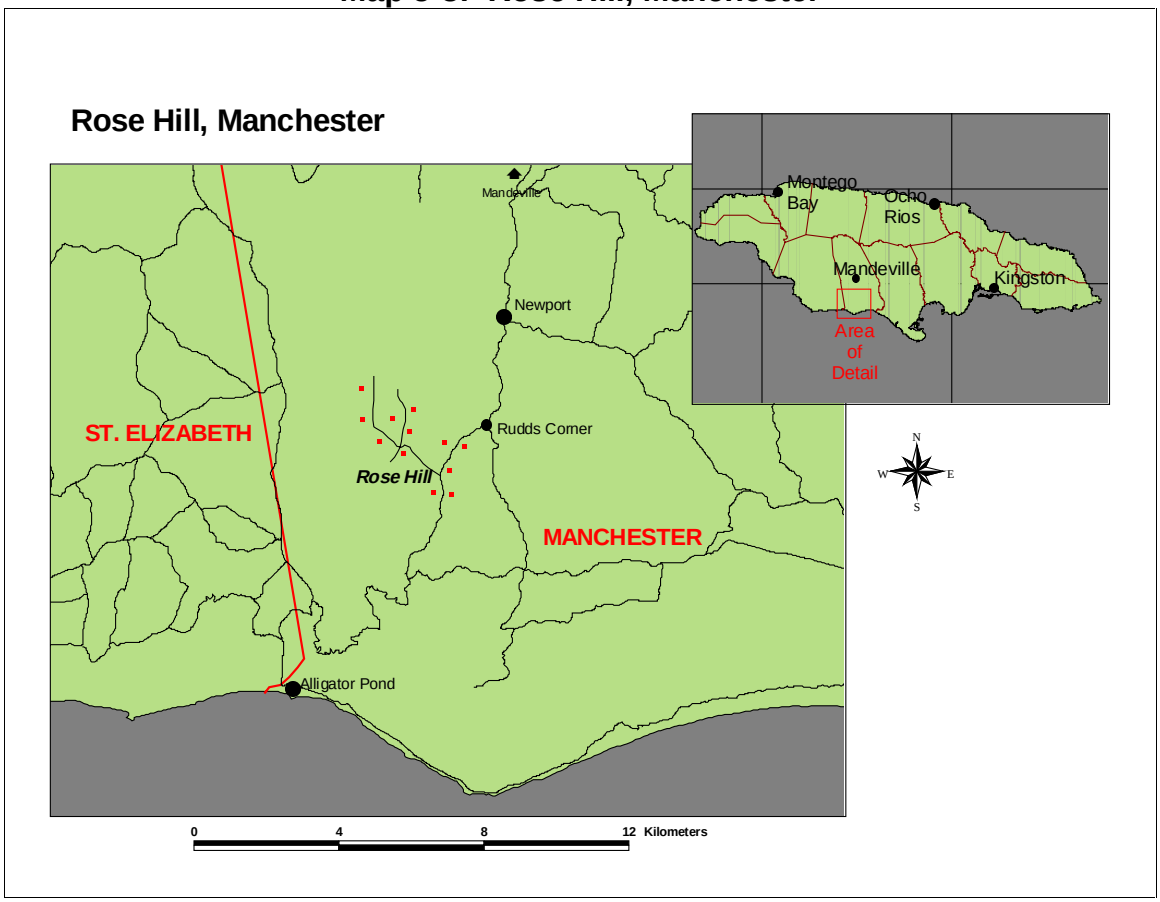
C. ROSE HILL, MANCHESTER

From the town of Mandeville, the largest city in Manchester parish, a drive for 16 kilometers south leads to the community of Rose Hill (latitude 17° 55' N, longitude 77° 31' W) (see Map 5-3). Located not far from the south-west coast of the island, Rose Hill is within an area which receives between 50 and 70 inches of rainfall per year (Statistical Institute of Jamaica, 1997). As with other parts of the island, Rose Hill receives rainfall on a basis that varies monthly and drought is also a possibility. On the way to Rose Hill, the countryside is hilly, although not nearly as steep as the land around Hazard and Donnington Castle. Elevation for the area is about 800 meters above sea level.

Soils, in general, are red limestone soils (either terra rosa or rendzina) (Edwards, 1995). Rendzinas (clay soils), have good agricultural potential, although they contain low potassium levels (Edwards, 1995). The terra rosa soils contain bauxite (aluminum ore) which is used to make aluminum. Sections of eroded lands expose a deep orange color soil, characteristic of high levels of iron oxide. Manchester parish, including the area near Rose Hill, is known for its bauxite mining operations. The bauxite mining companies, including Aluminum Partners of America (Alpart), own large tracts set aside for mining in the future yet only the companies know exactly when that will be. Many farmers have leasing arrangements with a bauxite mining company in order to raise cattle on

the grassy fields. In many cases, part of the land which is leased is put into crop production. Characteristic of the environment of Rose Hill is that little land is in permanent crops (trees and shrubs). This is due to the contracts that many have with a bauxite mining company (Alpart) in which they cannot grow permanent crops.

Map 5-3: Rose Hill, Manchester



(Source: Baseline data from IPM CRSP)

Rose Hill is a main production center for sweet potato (*Ipomoea batatas*). This root crop requires less maintenance than do callaloo or hot pepper. Many of the farmers sell their best sweet potatoes to exporters. Although they can withstand drought better than these other crops, sweet potatoes need irrigation. However, there is no network of irrigation canals in Rose Hill; instead, farmers rely on rainfall, or they water crops with buckets.

In Rose Hill, I counted 123 households in a radius of about six kilometers. Many of the homes were built along the main stretch of dirt road through the community center. Along this road, there was also an elementary school, shops (kiosks), and churches. On a nearby hilltop was Rose Hill's community center. Behind the community center and along paths through fields for cattle grazing was the community's water tank. However, because this region can go for weeks without rainfall, as was the case when I was there, the water tank is often dry. Most people in Rose Hill (75.5%) collected water in rain tanks adjacent to their homes and others (12.2%) borrowed water from neighbors with rain tanks. Five people (10.2%) said they get their water from the community water tank and one person (2.0%) had access to a public pipe.

From the approximately 123 houses total in Rose Hill, I randomly selected and interviewed 33 households. In 21 (63.6%) of the 33 households, there was a male and a female decision maker (but not necessarily husband and wife), seven (21.2%) households were headed by a single male, and five (15.1%) were headed by a single female. The average size of the household was 5.9 members. The average age was 47 and the median 43 years old. From the 33 households, a total of 49 people were interviewed (I interviewed 22 people in Rose Hill). Twenty-five of the 49 were women (51.0%) and almost all (89.7%) were farmers. Of the farmers, 21 were women (44.7%) and 23 were men (52.3%). One farmer not in the random sample was included as this person wished to be interviewed. The majority of homes (95.5%) were constructed of cement, fewer homes (4.5%) were made of wood alone, and one home (2.3%) was constructed of wood and cement. The size of homes ranged from 1 to 2 rooms (29.8%), 2 to 3 rooms (29.8%), and 4 to 5 rooms (31.9%). Most homes had electricity (83.0%) and televisions (80.4%), while many had telephones (61.7%). People cooked food by using gas and/or wood (44.7%), used gas alone (36.2%), or wood alone (19.1%). In addition, most people did not possess a vehicle (74.5%) and did not own bicycles (66.0%).

Table 5-34 portrays the occupations of women and men interviewed in Rose Hill. Although female participation was less than in Hazard/Donnington

Castle, the majority of women in Rose Hill were farmers (including higglers). Note that some men and women gave multiple responses (such as farming and carpentry).

Table 5-34: Main Occupations of Women and Men in Manchester

	N	Percent
Women		
Farming	21	84.0
Housewife	7	28.0
Domestic	3	12.0
Nursing	2	8.0
Shopkeeper	1	4.0
Teacher	1	4.0
Hairdresser	1	4.0
Total respondents	25	
Men		
Farming	23	95.8
Construction	5	20.8
Carpentry	1	4.2
Tractor Driver	1	4.2
Total respondents	24	

(N=49 people)

Land Profile

In Rose Hill, farmers and non-farmers were asked, "How much total land do you have?" Table 5-35 shows the acreage and distribution. Interestingly, many people in this community had between 2.1 and five acres or between 5.1 and ten acres (due to rented or leased land). It is unusual that one woman reported having 89 acres (mostly leased). Five people did not respond to the question. In Tables 5-35, 5-36, and 5-37, I list acreage for the individual interviewed—not for the entire household.

Table 5-35: Total Acreage in Manchester

Acres	N	Percent
0.1 – 1.0	7	15.9
1.1 – 2.0	1	2.3
2.1 – 5.0	15	34.1
5.1 – 10.0	13	29.5
10.1 – 20.0	4	9.1
20.1 – 89.0	4	9.1
Total	44	100

(N=44 people)

After determining the total acreage, I asked for the size of the first parcel (see Table 5-36). Of the distribution of land, most people had 0.1 to one acre.

Table 5-36: Acreage of First Parcel in Manchester

Acres	N	Percent
0.1 – 1.0	27	57.4
1.1 – 2.0	6	12.8
2.1 – 5.0	12	25.5
5.1 – 10.0	2	4.3
Total	47	100

(N=47 people)

I asked the same questions about the second parcel of land (see Table 5-37). This time, only farmers responded. Many had between 2.1 and five acres.

Table 5-37: Acreage of Second Parcel in Manchester

Acres	N	Percent
0.1 – 1.0	2	6.4
1.1 – 2.0	6	19.4
2.1 – 5.0	13	41.9
5.1 – 10.0	7	22.6
10.1 – 20.0	0	0
20.1 – 80.5	3	9.7
Total	31	100

(N=31 farmers)

Next, I examined who in the household owned land (Table 5-38). I did not ask people if they had title to the land nor specifically if the land owned was family land. Therefore, some family land was included in the figures. Also, I do not display data in ranges as it keeps the original data intact, necessary to be able to compare exact numbers instead of ranges. In Rose Hill the amount of land owned by people was different from the other two communities. For example, if a person owned land, this meant it was the first parcel (the land on which the home is usually built). Ownership of second or third parcels of land was extremely rare. The exception was, of the 30 farmers who said they use a second parcel, only one farmer (a female) owned land, and she said the size was one acre. The rest of the farmers rented/leased land for crop cultivation from a bauxite company (discussed earlier in this section). For the third parcel of land, 14 farmers responded that they have access to a third parcel; however, only one farmer (the same female) owned that land (1.5 acres). The rest of the farmers, as with the second parcel, rented/leased usually from a bauxite company. Five farmers rented/leased a fourth parcel. Also surprising was that, compared to other communities, the male and female "Joint Decision Makers" did not own land together.

Table 5-38: Ownership of Land in Manchester, by Gender

Acre	Female Decision Maker	Male Decision Maker	Other female family	Other male family	Total
0.25	1	3	0	1	5
0.5	0	2	0	0	2
0.75	0	2	0	0	2
1	1	1	1	0	2
2	1	1	0	0	2
2.5	0	1	0	0	1
3	1	1	0	0	2
5	0	2	0	0	2
8.5	1	0	0	0	1
10.5	1	0	0	0	1
Total	5 (24.25 acres)	13 (21.75 acres)	1 (1 acre)	1 (0.25 acre)	20 (47.25 acres)

(N=20 people)

From Table 5-38, six women [(Female Decision Maker + Other female family)] owned a combined 24.5 acres. For men, the combined total was 14 men owning 22 acres. Of the total land, women owned 51.8% and men owned 46.5%. Most surprisingly, is that women, while fewer in number, owned more land than men.

The amount of land men and women rented/leased was examined (see Table 5-39). One woman, who leased 80.5 acres, was excluded from Table 5-39 because it is highly unusual for any farmer in Rose Hill, male or female, to have this much land and skewed the mean. Of the total land, women alone rented/leased 23.4% of land. Men alone rented/leased 73.6% of land. Based on this, men clearly rented/leased more land than women.

Table 5-39: Areas Rented or Leased Land in Manchester, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Total
0.25	0	1	1	2
1	0	1	1	2
1.5	0	1	0	1
2	1	1	0	2
2.5	0	1	0	1
3	0	1	1	2
3.5	0	1	0	1
4	0	2	0	2
4.25	0	1	0	1
5	0	1	0	1
5.5	1	0	0	1
6	2	1	0	3
6.5	1	0	0	1
7.5	0	1	0	1
8	1	0	0	1
47	0	1	0	1
Total	6 (34 acres) [80.5 excluded]	14 (106.75 acres)	3 (4.25 acres)	23 (145 acres)

(N=23 people)

Next, I looked at the amount of land accessed rent free (see Table 5-40). As can be seen, the male decision maker has control of much of rent free land (74.3%).

Table 5-40: Areas Rent Free in Manchester, by Gender

Acre	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Total
0.5	2	0	0	2
1.0	0	0	1	1
2.0	0	2	0	2
2.5	0	1	0	1
3.0	1	0	0	1
3.5	0	1	0	1
5.0	0	1	0	1
Total	3 (3.5 acres)	5 (13 acres)	1 (1 acre)	9 (17.5 acres)

(N= 9 people)

Crop Production

In an area where almost all farmers cultivated sweet potato, I determined the major crops grown, by gender (see Table 5-41). In addition, the responses of men and women were equal for sweet potato.

Table 5-41: Frequency of Crops in Manchester, by Gender

Crop	Female Decision Maker	Male Decision Maker	Total N	Percent
Sweet Potato	21	21	42	95.4
Sweet Pepper	11	12	23	52.2
Tomato	9	12	21	47.7
Carrot	7	5	12	27.3
Cabbage	5	5	10	22.7
Coffee	3	1	4	9.1
Irish Potato	1	1	2	4.5
Turnips	0	2	2	4.5
Gungu	2	0	2	4.5
Pumpkin	1	1	2	4.5
Beans	1	1	2	4.5
Hot Pepper	0	1	1	2.3
Callaloo	1	0	1	2.3
Watermelon	0	1	1	2.3
Avocado	1	0	1	2.3
Corn	1	0	1	2.3
Peas	1	0	1	2.3

(N=44 farmers)

Again, as in Hazard and Donnington Castle, what is interesting is the higher frequency of women who reported growing crops. There was also a larger diversity of crops cultivated than would be expected in an area where monocropping is practiced. I also looked at households where male and female decision makers were cultivating separate crops. If women had separate crops from their partner, I discovered that they were more likely to grow vegetable crops, such as tomato or sweet pepper. However, some women also grew their own parcels of sweet potato. Where women farmed their own crop, they made the decision about spending this income. Men predominately grew sweet potato as their main crop, for which either the female or both partners decided together.

In Table 5-42, I asked farmers for the major problems they faced when cultivating or marketing crops. Most complained about pests, with the sweet potato weevil being the number one. Drought was, even though sweet potato has lower water requirements than leafy vegetables, mentioned as the second major problem.

Table 5-42: Major Problems Reported in Manchester

Problem	N	Percent
Pests	31	72.0
Drought	16	37.2
Marketing	11	25.6
Labor	3	7.0
No money	2	4.7
No transport	1	2.3
No Problems	4	9.3

(N=43 farmers)

Production Tasks

The next set of questions deal with production tasks (see Table 5-43). Following the table, I aggregate the responses along gender lines.

Table 5-43: Crop Production Tasks in Manchester, by Gender

Task	Female Decision Maker	Male Decision Maker	Joint Decision Makers	Hire	Other male	Total N
Nursery Preparation	7	13	19	9	6	43
Land Preparation	3	10	14	21	2	43
Planting	8	13	18	8	6	43
Spraying	7	20	9	10	6	43
Weeding	8	12	18	8	7	43
Harvesting	8	12	18	9	6	43
Post Harvest	8	12	19	8	6	43
Marketing	8	18	15	0	5	43

For the questions contained in Table 5-43, all but one farmer responded. Note that as some farmers provided multiple responses, the numbers (added horizontally for each task) are greater than total N. By analyzing the responses

that were aggregated along gender lines, I found that men were participating to a greater extent in production tasks, although the participation of women was also substantial. The results for Rose Hill are very similar to those from Hazard/Donnington Castle. For the category of "Nursery Preparation," 26 women [(Female Decision Maker (7) + Joint Decision Makers (19) = 26)] and 38 men worked in total. For "Land Preparation," the responses resulted in 17 women and 26 men worked on this production task. For "Planting," there were 26 women and 37 men. Sixteen women and 35 men sprayed pesticides. For "Weeding," in total, 26 women and 37 men worked on this task. Twenty-six women and 36 men participated in "Harvesting." For "Post Harvesting," there were 27 women and 37 men. And for "Marketing," 23 women and 38 men sold the crops.

Decision Making

Farmers in Rose Hill were asked who makes decisions for the following tasks: decision making about the (major) crops, allocation of workers (including who hires workers and how much to pay), how to use the income from farming, and how the crops will be sold (see Table 5-44). The actual questions are listed in original form following the table where I have also aggregated the responses along gender lines to understand whether women or men are making the decisions regarding each task. There were some multiple responses, for example in the pesticide questions. Note that I have added the category "Joint Decision Makers" to both male and female responses.

Table 5-44: Decision Making in Manchester, by Gender

Decision	Women Say	Men Say	Total
Who decides about major crop?	N=21	N=23	N=44
Female Decision Maker	8	0	8 (18.2%)
Male Decision Maker	4	11	15 (34.1%)
Joint Decision Makers	6	12	18 (40.9%)
Other Male Family	3	0	3 (6.8%)
Who decides who does the work?	N=21	N=23	N=44
Female Decision Maker	8	0	8 (18.2%)
Male Decision Maker	4	11	15 (34.1%)
Joint Decision Makers	6	12	18 (40.9%)
Other Male Family	3	0	3 (6.8%)
Who decides about hiring?	N=21	N=23	N=44
Female Decision Maker	8	0	8 (18.2%)
Male Decision Maker	4	11	15 (34.1%)
Joint Decision Makers	6	12	18 (40.9%)
Other Male Family	3	0	3 (6.8%)
Who decides how to sell crop?	N=21	N=23	N=44
Female Decision Maker	7	0	7 (15.9%)
Male Decision Maker	4	14	18 (40.9%)
Joint Decision Makers	7	9	16 (36.4%)
Other Male Family	3	0	3 (6.8%)
Who decides how to use farming income?	N=21	N=23	N=44
Female Decision Maker	10	0	10 (23.2%)
Male Decision Maker	2	10	12 (27.9%)
Joint Decision Makers	7	13	20 (46.5%)
Other Male Family	2	0	2 (4.6%)
Who decides on pesticide use?	N=15	N=18	N=33
Female Decision Maker	7	0	7 (21.2%)
Male Decision Maker	2	13	15 (45.5%)
Joint Decision Makers	4	6	10 (30.3%)
Other Female Family	0	0	0
Other Male Family	2	0	2 (6.1%)
Who chooses the pesticide?	N=15	N=18	N=33
Female Decision Maker	7	0	7 (21.2%)
Male Decision Maker	2	13	15 (45.5%)
Joint Decision Makers	4	6	10 (30.3%)
Other Female Family	0	0	0
Other Male Family	2	0	2 (6.1%)
Who buys the pesticide?	N=15	N=18	N=33
Female Decision Maker	7	0	7 (21.2%)
Male Decision Maker	2	13	15 (45.5%)
Joint Decision Makers	4	6	10 (30.3%)
Other Female Family	0	0	0

Other Male Family	2	0	2 (6.1%)

First, in Table 5-45, note that not all farmers responded to each question. From this table, it can be seen that men are not making farming decisions alone, especially concerning farming income. The pattern of responses was comparable to those from Hazard and Donnington Castle. Along gendered lines, however, it becomes apparent that women have split their responses along the female, male, and "Joint Decision Makers" (as well as "Other Male Family"). None of the men said that the female decision maker decides alone, rather it was the male or both who decided together. In total, for the question, "Who makes the decisions about the major and other crops?," 26 women and 36 men said they did this. There were 26 women and 36 men for "Who decides who does the work with the major and/or other crops (plant, weed, harvest)?." The same number of women and men resulted from the question, "Who decides if you will hire workers, and how much to pay?." Importantly, for these first three questions (who decides about the crop, labor, and hiring), two responses were that on her crops she made the decisions and on his crops both male and female "Joint Decision Makers" made the decisions about his crops. These responses have been added into the results. Twenty-three women and 37 men said they decided how the crop will be sold. For the next question, "Who decides how to use farming income?," there were 30 women and 34 men, showing slightly more female influence in decisions concerning how to spend farming income.

I also wanted to know who in the household decides, chooses, and buys pesticides (see Table 5-45). Surprisingly, even fewer male decision makers than in Grove Farm/Lloyds Pen and Hazard/Donnington Castle made this decision.

There were clearly cases of separate spheres of influence in Rose Hill. Many times I found that if one person (male or female) worked off-farm, he or she alone usually decided how to spend this income. In those same households, if the other partner farms, this person (who also does all the farm work) usually decided alone how to spent the farming income. In three cases, both the male and female grew sweet potato separately from the other and decided alone how

to spend the earnings from the crop. In general, if both grew the crops together, both decided how to spend the income. If he alone grew a crop, more often both decided how to spend the income together. If the female decision maker alone grew a crop, she usually decided how to spend the income. As previously mentioned, vegetable crops such as tomato and sweet pepper were usually the crops that the female decision maker preferred to grow.

After determining decision making, I looked at marketing methods (see Table 5-45). Most sold it to an exporter or a higgler at the farm gate. Note that multiple responses are accounted for and one farmer did not respond to the question.

Table 5-45: Marketing Method in Manchester

Marketing Method	N	Percent
To exporter	36	83.7
To higgler	35	81.4
To public market	6	14.0

(N = 43 farmers)

Farmers were also asked which type of marketing they would prefer (see Table 5-46). Here, of 20 males, 90% preferred selling to an exporter. Women were split between selling to an exporter or to a higgler. It is clear that farmers (except one) in Rose Hill, just as in Grove Farm/Lloyds Pen and Hazard/Donnington Castle, did not prefer to market via higglers. Again, as in the other two communities, selling to higglers was one of the most frequently used marketing methods. Note that five farmers did not respond to the question.

Table 5-46: Preferred Marketing Method in Manchester, by Gender

Preferred Marketing Method	Female Decision Maker	Male Decision Maker	Total
Sell to exporter	9	18	27 (69.2%)
Sell yourself	9	2	11 (28.2%)
Sell to higgler	1	0	1 (2.6%)
Total	19	20	39 (100%)

(N= 39 farmers)

Pest Identification and Management

Two pests were shown to farmers. First, the sweet potato weevil (*Cylas formicarius*) in its adult stage is known to eat the leaves of sweet potatoes. The real damage to sweet potatoes, however, is when the adult weevil bores inside the base of the plant and lays eggs which become the larvae. The larvae bore through the inside of the sweet potato, causing the major crop damage. The photograph used was a cross section of a sweet potato in which the inside of the potato had been eaten—the cause—weevil larvae. Another pest of sweet potato, the soil grub (*Typhorous* spp.), was shown to farmers in both adult and larval stages. As part of pest identification, I was looking for indication of whether farmers could match the adult to larvae forms of pests and match the photographs depicting specific sweet potato damage to the individual pest. One additional photograph of a ladybug (*Hippodamia convergens*) was also shown to farmers.

A total of 17 (39.5%) of 43 farmers surveyed in Rose Hill participated in the pest identification section of the survey. Of the 17 farmers, four (23.5%) were women, and 13 men (76.5%). Each farmer surveyed was shown four photographs of sweet potato pests or sweet potato damage and one photograph of the ladybug (see Table 5-47).

The first insect shown to farmers was a photograph of an adult sweet potato weevil. Surprisingly, all farmers identified the adult sweet potato weevil in its adult stage. For the question, what type of damage the weevil does, eight farmers (47.1%), including three women, said that the adult eats inside of the

potato (which is not true, rather the immature weevil—the larvae—does this). However, six farmers (35.3%) said that the weevil bores inside of the potato (stem, or potato itself) and lays eggs (the most destructive stage of the weevil). This answer shows considerable knowledge of the pest's lifecycle. Farmers' responses included: that it eats the leaf and inside of the potato, damages the outside of the potato only, and eats the leaf and outside of the potato. These answers are also correct. From 12 farmers who responded, 11 (91.7%), including three women, said that the adult sweet potato weevil was their most destructive pest.

The next insect, this time a photograph of the sweet potato weevil in its larval stage (the larvae were in a cross-section of a sweet potato) was shown to farmers (see Table 5-47). Here, fewer farmers (although still the majority) identified the larvae of the sweet potato weevil. For a description of the damage the pest causes, nine farmers (60.0%), including two women, said that it eats inside of the potato. Two farmers (13.3%) said it bores inside the potato and lays eggs. Three farmers (including one woman) have seen the damage but did not know the cause. One male farmer had never seen this damage before and one woman did not respond.

For the next pest, the adult soil grub, the majority was not able to identify it. Fewer farmers (N=13) answered the question about damage. Seven farmers (53.8%), including two women, said that it only eats the leaves of the sweet potato, one female farmer (7.7%) said that it only eats the outside of the sweet potato and another male (7.7%) had seen the adult grub but did not know the damage it causes. One female farmer (7.7%) did not know and three farmers (23.1%) had never seen it before.

The next insect, the larval stage of the soil grub, was shown to 17 farmers; and the majority did not identify it. For damage the larvae grub causes, of 16 farmers, nine (56.3%), including all four women, said that the grub larvae eats the inside of the sweet potato (it actually bores "channels'" lines on the exterior of the sweet potato). Six farmers (37.5%) said it eats the bottom (exterior) of the

potato, which is true. One farmer (6.3%) said they while they have seen the grub larvae, they did not know the damage it causes.

The last insect that farmers were asked to identify was the ladybug, a beneficial insect. Almost all farmers, except one male, could not identify it. Note that 16 responded to the last question.

Table 5-47: Insect Identification in Manchester, by Gender

	Recognized	Not Recognized	Total
Adult Weevil (N=17 farmers)			
Women	4	0	4 (23.5%)
Men	13	0	13 (76.5%)
Total	17 (100%)	0	17 (100%)
Larvae Weevil (N=17 farmers)			
Women	2	2	4 (23.5%)
Men	10	3	13 (76.5%)
Total	12 (70.6%)	5 (29.4%)	17 (100%)
Adult Grub (N=17 farmers)			
Women	2	2	4 (23.5%)
Men	3	10	13 (76.5%)
Total	5 (29.4%)	12 (70.6%)	17 (100%)
Larvae Grub (N=17 farmers)			
Women	1	3	4 (23.5%)
Men	4	9	13 (76.5%)
Total	5 (29.4%)	12 (70.6%)	17 (100%)
Ladybug (N=16 farmers)			
Women	0	3	3 (18.8%)
Men	1	12	13 (81.2%)
Total	1 (6.3%)	15 (93.8%)	16 (100%)

After determining how many insects farmers could identify, I asked for the pest management strategies they implemented (see Table 5-48). While generally not used it in their own farm fields, the majority have heard about sex pheromone traps for weevil control. Other farmers did nothing as they believe there is no control possible. One woman said she sprayed pesticides.

In the case of weevil larvae, farmers were not making the connection that sex pheromone traps were a pest management strategy (see Table 5-48). Somehow, fewer farmers connected the two stages of the insect, as the larvae was seen as a separate species from the adult. But it is apparent that farmers did not know how to control the adult or larvae sweet potato weevil. One farmer mentioned the use of rainfall (or perhaps any means of keeping the soil moist). Flooding infested fields for one to four weeks can reduce weevils to very low levels, according to the Asian Vegetable Research and Development Center (AVRDC, 1983). The possible control of the weevil by using irrigation is not of great importance to researchers compared to other measures such as improving the genetic resistance of sweet potato varieties (with little achieved thus far) or developing pseudoresistance (deeper formation of storage roots to inhibit the weevil from access to the root) or short-season varieties (which give less time to the weevil to attack the root) (CGIAR, 1998). In the context of Rose Hill, as infrastructure is not likely ever to be built, irrigation on a large-scale is not a feasible means of control. Moreover, the hilly landscape makes flooding large tracts prohibitive. But there may be some merit to the control measure (keeping the soil moist). In reviewing Patterson's (1996) thesis, keeping the soil moist as a method to control weevils was also mentioned by some farmers in Denbigh Kraal, Clarendon. Where large-scale irrigation is not possible (such as in Rose Hill), the soil may be keep moist by applying water manually.

For the management of the adult soil grub, fewer female farmers responded as this pest is not as well known as the weevil (see Table 5-48). Of the sample, most (excluding women) sprayed pesticides. One farmer heard of the sex pheromone (and confused the weevil with the adult soil grub).

In summary, pesticides were not being used in great amounts for control of sweet potato pests (see Table 5-48). Instead, farmers, knowing pesticides do not work "do nothing." In the table below, not all farmers responded to each question.

Table 5-48: Pest Management in Manchester, by Gender

	Women	Men	Percent
Adult Weevil (N=16 farmers)			
Heard of Pheromone	2	9	11 (68.8%)
Pesticides	1	0	1 (6.3%)
Do nothing	0	4	4 (25.1%)
Total	3	13	16 (100%)
Larvae Weevil (N=11 farmers)			
Do not know	0	4	4 (36.4%)
Do nothing	0	2	2 (18.2%)
Rainfall controls	0	1	1 (9.1%)
Heard of Pheromone	1	1	2 (18.2%)
Never seen	0	1	1 (9.1%)
Burn infested potato	0	1	1 (9.1%)
Total	1	10	11 (100%)
Adult Grub (N=10 farmers)			
Pesticides	0	4	4 (40.0%)
Never seen	0	3	3 (30%)
Do nothing	1	1	2 (20%)
Heard of Pheromone	0	1	1 (10.0%)
Total	1	9	10 (100%)
Larvae Grub (N=12 farmers)			
Do nothing	1	7	8 (66.7%)
Pesticides do not work	0	1	1 (8.3%)
Spray Pesticides	0	1	1 (8.3%)
Add Fertilizer	0	1	1 (8.3%)
Do not know	0	1	1 (8.3%)
Total	1	11	12 (100%)

The next question deals with the source of pest knowledge for farmers (see Table 5-49). It appears that most farmers were self-taught, with men also reporting learning from other farmers and extension agents.

Table 5-49: Source of Pest Management Information in Manchester, by Gender

Source	Women	Men	Total
Self-taught	2	7	9 (56.2%)
Other farmers	1	3	4 (25.0%)
Extension agents	0	3	3 (18.8%)
Total	3	13	16 (100%)

(N=16 farmers)

Case Studies

Elise, a farmer and a single mother of 37 years, is well-known in the community. She has a six, 18, and 19 year old daughter, and a four year old son. Born in Rose Hill, and now living in a small cement house, she also lived for a short time in Kingston.

She cultivates her own crops, mainly sweet potato, tomato, sweet pepper, and cabbage. She alone makes the decisions on the crops she grows and she does all of the work on her crops. However, she also farms with her father. She and her father do all of the farming activities together (except for land preparation, for which they hire), including marketing of the crops. Jointly they decide on matters of farming and income spending. He leases 50 acres from a bauxite company of which four acres are for crops. He rents another six acres from his mother and sister. One acre of this is used mainly for tomatoes. Both father and daughter sell their sweet potato to exporters. Her involvement in production, marketing, and decision making reflects the greater female participation in Rose Hill.

She is knowledgeable about sweet potato farming especially, including pests of sweet potato. Elise seems to appreciate the farming lifestyle as she can compare it to the other line of work she tried in Kingston. While they can make a profit in good years, they face tremendous risk in farming, especially when farming one crop on a large scale. In fact, last year they lost J$100,000 (approximately US$2,800) in sweet potato cultivation. They said that prices suddenly drop during marketing (farmers from other parishes flood the market), pests (namely the sweet potato weevil) have always been a problem, and the

high costs of labor restrict successful farming. Furthermore, she said, you cannot see the progress of sweet potato until you harvest it. Unharvested sweet potato allows the weevil to persist in the ground. Elise said that nobody, including the Rural Agricultural Development Authority (RADA), helps the small farmer.

A housewife and farmer, April is 68 years old. Like Elise, she is also well-known in the community and is a central figure. She is very kind, allowing people to stay at her home for extended periods of time. Living in her home is her husband (age 73), a sister (64), two sons (ages 24 and 28), a child (five), and a nephew (19). Also living in the house part-time are: a son (37), and two men (54 and 57). April's husband works as a mason in Mandeville.

She owns 10.5 acres with her siblings. One of her sons does most of the farming, growing sweet potato, sweet pepper, and coffee. He sells sweet potato to exporters. While she sells her crops (sweet potato, Irish potato, and sweet pepper) to higglers, she decides about the money. She prefers to sells at a market, but cannot find time for this endeavor as she is busy caring of children left in her care. The reason for this is that she can see how things are run, otherwise she may be cheated. Exporters, for example, may not pay her. Some exporters (also applies to higglers) first take the crop, sell it at the market, and return a portion of the profits. She also said that her money and the money her husband earns are separate and both decide separately how to spend it. As an older woman, she is not as active in labor-intensive tasks nonetheless exemplifies the female role in deciding about spending farming income. She also reflects the wish of many women to market crops themselves.

CHAPTER 6: DISCUSSION OF RESULTS – IMPLICATIONS FOR ADOPTION OF IPM

In the gathering of quantitative and qualitative data from the three Jamaican communities, the thesis has attempted to explore men and women's roles in the crop production, marketing, and decision making. Furthermore, it has examined how these roles transfer into pest identification and management. This chapter presents a discussion of the survey results. This includes a comparison of findings from the communities in order to determine the extent women work in crop production, marketing, decision making, and pest management. Further, this chapter relates the findings to the literature on agriculture in the Caribbean.

To begin, a basic comparison of how many people participated in farming was made. In Lloyds Pen and Grove Farm 72.7% of people farmed, 100% in Hazard and Donnington Castle, and 89.7% in Rose Hill. A simple explanation for the variations in the number would be the close proximity of Lloyds Pen/Grove Farm to Kingston and, to a lesser extent, Rose Hill to Mandeville. These urban centers may present a more lucrative substitute to farming. Another explanation for variations includes the fewer number of women who owned and rented/leased land in all three communities.

The comparison was extended to the number of females and males participating in farming. In Grove Farm and Lloyds Pen, of all the occupations that women engaged in, over half (55.0%) of women farmed. For men in Grove Farm and Lloyds Pen, 87.5% farmed. Compared to the other two communities, people who live in Grove Farm and Lloyds Pen had the most diverse forms of employment, ranging from factory work, mechanics, to hairdressing. In Hazard and Donnington Castle, both 100% of women and men farmed. In Rose Hill, of all women interviewed, 84% farmed and for men, 95.8% farmed.

The figures suggest that women's participation was less in Grove Farm and Lloyds Pen. Why are women involved to a lesser extent in Grove Farm and Lloyds Pen? The proximity of Grove Farm and Lloyds Pen to Kingston is one possible reason. It appears that women are able to look for other income

generating opportunities, for example higglering. Farther from urban centers, Hazard and Donnington Castle and, to a lesser extent, Rose Hill there are fewer employment opportunities other than farming for women and men.

In comparing my findings to the literature, Innerarity (1996) estimated that 23% of the total employed in Jamaica's agricultural labor force were women. However, the data I gathered included both wage earning and informal agricultural work and is significantly higher than 23%. For an estimation about women's participation throughout the Caribbean, Chase (1988) estimated that women made up 30 to 40% of the agricultural labor force. I assume that these percentages were derived from both formal and informal participation of women. My findings from Grove Farm and Lloyds Pen are similar to this estimate.

LAND OWNERSHIP

Also to be considered in determining women's participation in farming is land ownership (see Table 6-1). Of the three communities, the one with the widest discrepancy between the amount of land that women and men owned is Hazard/Donnington Castle followed by Grove Farm/Lloyds Pen. In Rose Hill, the percentages were more equal between the genders. A possible explanation for the nearly equal land ownership is that women in Rose Hill view farming as an acceptable vocation. As an overall conclusion about land ownership, women are often constrained in access to land through inheritance and also seem to face major constraints to acquiring land through other means (purchasing or renting, for example).

Table 6-1: Comparison of Land Ownership in Three Communities, by Gender

Community	Women	Men
Grove Farm/Lloyds Pen	22.6%	60.4%
Hazard/Donnington Castle	9.0	81.2
Rose Hill	46.5	51.8

In Tables 6-1 and 6-2, note that I do not include "Joint Decision Makers" (both partners) as I compare gendered ownership and amount rented/leased,

including family land. Because men own more land, or in the case of Hazard and Donnington Castle, virtually all land, they have the advantage of having collateral with which they can borrow money from banks or other institutions if they decide to expand crop production or purchase agrochemicals. With such an advantage, land owning men will continue to benefit economically over landless women. If extension agents frequent the communities, they will work with land owners rather than with farmers with less secure forms of tenure.

Rented or Leased Land

In addition to how much land men and women own, I also asked for the amount of land men and women rented/leased. In Grove Farm and Lloyds Pen, women did not rent/lease land alone (see Table 6-2).

Table 6-2: Comparison of Rented/Leased Land in Three Communities, by Gender

Community	Women	Men
Grove Farm/Lloyds Pen	0	61.5%
Hazard/Donnington Castle	1.8%	86.5%
Rose Hill	23.4%	73.6%

The results of this question show the wide discrepancy between the amount of land that men and women rented/leased in each community. Men rented/leased the greatest amount, when compared to that of women in Grove Farm and Lloyds Pen, closely followed by Hazard and Donnington Castle. Rose Hill had the greatest amount of land that was rented/leased by women. For IPM, the difference in the amounts that men and women rented/leased can have several implications. For example, as in the case of land ownership, men are able to generate more income from the land they rent. Men are able to grow a greater variety of crops simultaneously and, if pest problems arise, can rely on one of the other crops for insurance. In short, men are able to produce crops on a larger scale than women farmers.

As a final measurement I aggregated all land that women and men owned, and rented/leased in the three communities (see Table 6-3). From the total 116

respondents (Men = 77; Women = 28; “Joint Decision Makers” = 11) and from a total 446.3 acres, men had 319.2 acres (71.5%), and women 86.35 acres (19.3%). Both the male and female “Joint Decision Makers” (in the same households) owned 40.75 acres or 9.2%.

Table 6-3: Comparison of Total Land Owned, Rented or Leased in Three Communities, by Gender

All Communities	Percent
Men	71.5
Women	19.3
Joint Decision Makers	9.2

In a general sense, the findings of my research are similar to what others have reported. Momsen (1981; 1988) and Chase (1988) argue that men own, rent, or lease more land than women in the Caribbean. In a study of Jamaican agriculture, Rao (1990) found that female holders had “only 11.7% of acreage” (1990: 174), a figure lower than my estimates from the three communities combined.

PRODUCTION TASKS

This section compares the gendered participation in crop production tasks (see Table 6-4). Not shown in Table 6-4 is that in Grove Farm and Lloyds Pen, for the category post harvesting, the ratio increased to twice as many men as women participating. In Hazard and Donnington Castle and Rose Hill, the ratio remains the same (1.5 times to 1.7 times as many men as women, respectively). For marketing, in each community, the difference of men compared to women is more than one and a half times.

In general, the data show that of the three communities, Grove Farm and Lloyds Pen had the least amount of female participation (compared to male participation) in production tasks. Rose Hill had the most female participation (compared to male participation), although the results from Hazard and Donnington Castle made it a close second to Rose Hill.

Table 6-4: Comparison of Participation in Production Tasks in Three Communities, by Gender

Nursery Prep, Land Prep, Planting, Spraying, Harvesting	Women	Men
Grove Farm/Lloyds Pen	1	>4x
Hazard/Donnington Castle	1	1.7x
Rose Hill	1	1.5x
Marketing		
Grove Farm/Lloyds Pen	1	1.6x
Hazard/Donnington Castle	1	1.7x
Rose Hill	1	1.7x

In post harvesting and marketing, women began to play a greater role than in the other production tasks. However, it appears that men are also involved in post harvesting and marketing, more so than women. In conclusion, Hypothesis 1 ("Women who farm are involved in all aspects of crop production to an extent equal to that of male farmers") is not valid. Many agricultural researchers in Jamaica mentioned to me that women just "help out" in crop production. The data show otherwise, especially in Hazard/Donnington Castle and Rose Hill. I think that women's participation in agriculture in the three communities is influenced by women's lack of ownership and rented/leased land. I would argue that in the community where women owned and rented/leased the most land, Rose Hill, also had the highest female participation in agricultural production. In relating my findings to the literature, women do not provide the bulk of labor in food production activities, as argued by Momsen (1984), Chase (1988) and Barrow (1993) in reference to the Caribbean region. Nor did I find that farming in Jamaica has become "feminized," due in part to male migration (Momsen, 1987: 347). However, I agree with the statement that women farmers are burdened with children, housework, and farming chores (Momsen, 1981: 49) and this must be included into analysis of the gendered division of labor.

The next question answered was, "What are the differences in the methods of marketing of crops in the three communities?" Furthermore, are there gendered preferences in how to market crops? Selling crops to higglers was, overall, the main marketing method in the three communities. Only in Rose

Hill did more farmers mention selling to exporters over higglers, however marginally compared to higglers (83.7% versus 81.4%). In all three communities, neither men nor women preferred to sell to higglers. In Grove Farm/Lloyds Pen and Hazard/Donnington Castle, about 60% of women preferred to sell the crop themselves and 43.3% of women in Rose Hill. In both Grove Farm/Lloyds Pen and Hazard/Donnington Castle, about 40% of men preferred to sell to an exporter compared to almost 70% in Rose Hill. One-third of women in Grove Farm/Lloyds Pen, 15.8% in Hazard/Donnington Castle, and 47.3% in Rose Hill preferred to export.

In conclusion, women preferred to market crops themselves if they had a choice. The exception was Rose Hill, where slightly more women would like to export. In all three communities, most men preferred to sell crops to an exporter. As a possible reason for women wanting to market crops themselves, many said that they can better see the whole marketing process and thereby maintain some control over how much they will accept. In this way, they are less likely to be cheated. On occasion, the complaint about being cheated also extended over to exporters. They were sometimes said to buy a crop on credit from a farmer and never returned to pay the bill.

Marketing as a problem has been mentioned in various amount of detail in the literature. For example, Patterson (1996) in reference to Clarendon, cited “insecure markets as a serious constraint to farming" (1996: 100). Farmers there planted crops and became dismayed when the price they received for the crop did not match their expectations. Patterson also reported that in many cases, farmers left the crop unharvested as the labor costs would exceed profits from sale. She further concluded that in an island the size of Jamaica, the market could be easily flooded with one type of vegetable and, as a result, the price of the particular vegetable plummets. Based on her analysis, I think that shifting blame to higglers by categorizing them as cheaters is counterproductive in the effort to better the standard of living of farmers. There are other forces, such as the influx of cheaper imports, that affect the price. While the marketing system of higglering is not without faults, it allows for diversification of crops produced and

thereby diminishes risk to farmers (Mintz, 1984). In retrospect, I think that another benefit of women selling the crop themselves would be that they could sell greater quantities than by marketing via higglers. Higglers, according to Mintz (1984) usually purchase small amounts such as "several hands of bananas, a handful of ackees, a few breadfruits, half a dozen eggs…" (1984: 221).

Both Mintz (1984) and Rao (1990) expound upon the dependence of the small farmer on the higgler, and vice versa. Rao (1990) explains, "the efficiency of the higgler network is tied to the level of prosperity of the farmers whom they serve and the availability of roads, transport services and other infrastructure" (1990: 168). In addition to this dependence, Rao (1990) also argues that there is no "viable alternative to the services provided by the higgler which often includes credit and assistance in harvesting the crops" (1990: 168).

DECISION MAKING

From the data, I determined in which of the three communities women participated to the greatest extent in decision making concerning farming. For the question, "Who makes decisions about major crops?" In Grove Farm and Lloyds Pen, the ratio was three men to one woman. In the other two communities (Rose Hill and Hazard/Donnington Castle), the ratio was 1.4 to 1.5 as many men to women making the decisions about the major crops. For the question about who decides on labor allocation, in Grove Farm and Lloyds Pen the ratio decreased to 5.8 times as many men to one woman. The ratios for Hazard/Donnington Castle and Rose Hill remained the same. Approximately the same ratios were observed for the question "Who decides about hiring of workers and how much to pay?," and "Who decides how the crop will be sold?" However, for the question, "Who decides how to use the income derived from farming?," the ratios for the communities were more even. In Grove Farm and Lloyds Pen, for example, there were 1.2 men to one woman. In Hazard and Donnington Castle, there was one, and in Rose Hill, there was 1.1. These results show that decision making of farming income is something that that men and women participated in almost equally.

Table 6-5: Comparison of Participation in Decision Making in Three Communities, by Gender

Decides about major crops?	Women	Men
Grove Farm/Lloyds Pen	1	3.1x
Hazard/Donnington Castle	1	1.4x
Rose Hill	1	1.5x
Decides about who does work?		
Grove Farm/Lloyds Pen	1	5.8x
Hazard/Donnington Castle	1	1.4x
Rose Hill	1	1.5x
Decides about how to spend farming income?		
Grove Farm/Lloyds Pen	1	1.2x
Hazard/Donnington Castle	1	1.0x
Rose Hill	1	1.1x
Decides on the pesticide?		
Grove Farm/Lloyds Pen	1	9x
Hazard/Donnington Castle	1	1.7x
Rose Hill	1	1.6x

The most striking aspect of the decision making questions was that virtually every time (and in every community) men did not mention the female decision maker alone. Instead, men said they made the decisions or that both made them together. This suggests that women participated in decision making to a greater extent yet do not receive credit for this. The second striking aspect was a progression in the participation of the female decision maker. For example, in Grove Farm and Lloyds Pen, almost no women made decisions alone. In Hazard and Donnington Castle, more female decision makers were mentioned, until Rose Hill, where the greatest number female decision makers participated alone. The third striking aspect is that in Grove Farm/Lloyds Pen and Hazard/Donnington Castle, only one woman mentioned a male decision maker alone making decisions about how to spend income. In Rose Hill, two women said this.

However, the virtual equality did not extend into decision making about the purchase of pesticides in Grove Farm and Lloyds Pen. There, the male decision

maker was found to be nine times more than the female decision maker in deciding that pesticides should be used.

In summary, the least amount of female participation in decision making about farming aspects was seen in Grove Farm and Lloyds Pen. Both Hazard/Donnington Castle and Rose Hill are even in the amount of women participating. Why do men control these decision making processes? It could be because men own and rent more land. If the crops are grown on land that men own, then men would likely have the control over decisions. Another reason may be how men perceive themselves. In Lloyds Pen, a male farmer told me that farming is a male dominated business. Women, according to him, are not really farmers—they just "help out." Men said that women carry out tasks which do not require as much responsibility, strength, or knowledge about farming. Weeding was given as an example of this. However, another woman said she would like to farm but her husband would not permit it.

Hypothesis 2, "Main decisions about crops (such as callaloo, hot pepper and sweet potato) would most likely be made by both male and female decision makers together (Joint Decision Makers)," was proven to be true except for Grove Farm and Lloyds Pen. There, male farmers were clearly shown to be in charge of decisions about crops and the purchase of pesticides. In the other two communities, there was a significant number of women who participated in decision making about crops. However, in each community, male and female decision makers decided together how the income from farming should be spent, but did not extend in the same way to the purchase of pesticides.

As previously mentioned, I would link women's limited land ownership or rented/leased land as these variables influence female participation in decision making. Rose Hill is the community where women own, rent/lease the greatest percentage of land, and I argue that female participation in decision making is greatest there as well. In relating my findings to the literature, one estimate of female participation in decision making in farming was made by Henshall (1981). She found that women are main decision makers in more than one-third of small-scale farms in the Caribbean. In a general sense, I think that my findings are

quite similar. For example, women in Grove Farm and Lloyds Pen made 25% of main decisions, yet increased in women participating, about 40%, in Hazard and Donnington Castle and in Rose Hill.

And lastly, in Table 6-6, I was interested in describing the characteristics of women who were either participants or non-participants in decision making in households with a male partner. In other words, are there special characteristics of the women who make decisions in agriculture versus women who do not make decisions in agriculture, where both partners are present? I base the following data (see Table 6-6) on the question, "Who makes the decisions about the major crop?" In Grove Farm and Lloyds Pen, I interviewed ten female decision makers who lived with male decision makers—making them households where "Joint Decision Makers" reside. In Hazard and Donnington Castle, I interviewed 18 women and in Rose Hill, 17 women.

Surprisingly, I found that, by examining Table 6-6, that there were no great differences in women's age, education, or the education of the male partner between women who were participants in decision making versus women who were non-participants in decision making. This observation pertains to all three communities.

Table 6-6: Descriptors of Female Decision Makers*

Grove Farm/Lloyds Pen (N=10 Women Total)	**Participants in Decisions** (N=4 Women)	**Non-Participants in Decision** (N=6 Women)
Average Age of Women	42 years	46 years
Education of Female Decision Maker		
None	1	0
Primary/All-Age	2	4
Secondary/High School	0	2
College (including nursing & teaching)	0	0
Non-response	1	0
Total N	4 Women	6 Women
Education of Male Partner		
None	1	0
Primary/All-Age	2	3
Secondary/High School	0	1
College (including nursing & teaching)	0	0
Non-response	1	2
Total N	4 Men	6 Men
Hazard/Donnington Castle (N=18 Women Total)	(N=14 Women)	(N=4 Women)
Average Age of Women	46 years	43 years
Education of Female Decision Maker		
None	0	0
Primary/All-Age	8	3
Secondary/High School	3	1
College (including nursing & teaching)	1	0
Non-response	2	0
Total N	14 Women	4 Women
Education of Male Partner		
None	0	0
Primary/All-Age	8	2
Secondary/High School	3	1
College (including nursing & teaching)	0	0
Non-response	3	1
Total N	14 Men	4 Men
Rose Hill (N=17 Women Total)	(N=12 Women)	(N=5 Women)
Average Age of Women	42 years	45 years
Education of Female Decision Maker		
None	0	0
Primary/All-Age	8	3
Secondary/High School	0	1
College (including nursing & teaching)	4	1
Non-response	0	0
Total N	12 Women	5 Women

Table 6-6 continued

Education of Male Partner		
None	0	0
Primary/All-Age	7	2
Secondary/High School	1	1
College (including nursing & teaching)	1	0
Non-response	3	2
Total N	12 Men	5 Men

*In Households with both a Female and a Male Decision Maker (Joint Decision Makers)

PEST IDENTIFICATION AND MANAGEMENT

At the onset of research, I had hoped be able to test a hypothesis: "Do women and men have unique kinds of knowledge relating to pest management?" However, the sample size was too small to make a comparison of any major significance. Therefore, I do not suggest that the data presented in this discussion on pest identification would be true over a larger sample. Instead, I provide an idea of pest identification among small-scale farmers.

To determine if there is gendered knowledge in the ability to identify pests and beneficial insects, I compared the answers of men and women. In Grove Farm and Lloyds Pen, the 25% (one out of four) of women who identified the flea beetle is comparable to the result of men, at 28.5% (two out of seven). For the adult army worm, as almost all farmers identified this pest, the differences between men and women were slight. For women, 75.0% identified it (three out of four), and 85.7% of men (six out of seven). There was no difference between men's and women's ability to identify the larval stage of the same pest, the army worm. For the leafhopper, the ability to identify was similar between both as no females and only one male identified it. As only two farmers, both male, were able to identify the ladybug, knowledge of beneficial insects was low.

For IPM, by not being able to identify the flea beetle, know its breeding patterns, and how it damages the crop, farmers are missing a crucial aspect of pest management. Furthermore, even with IPM the insect will less likely be controlled. I found that farmers used the same pest control tactics such as pesticide formulations for different insects. For example, in Grove Farm and

Lloyds Pen, Lannate (sometimes mixed with a fungicide and another chemical) was sprayed every four to eight days to control the “worm” and other pests. Many farmers called different insects, good or bad, the same name (for example, “bugs”).

In Grove Farm and Lloyds Pen, farmers were aware of the larval “worm” stage of the beet army worm. However, judging from the lower percentage of identification for the adult stage of the beet army worm—the “moth”—this points out that not all farmers made the connection that they were dealing with the same pest. For IPM, this could mean that when farmers see the “moth,” they would be less likely to control it at the time they observe it. The misidentification would allow the “moth” to spread throughout the callaloo and lay eggs. The low percentage of identification of the leafhopper means that damage will continue if farmers do not know which insect is causing the specific damage. As the ladybug (natural predator) was identified by few farmers, it would also be killed by pesticides.

In Hazard and Donnington Castle, as few farmers could identify mite damage, control efforts are hindered. None of the seven women who responded correctly identified it. Of the nine men, three identified it. The same applies to the hot pepper leaf damaged by virus, as no farmers could identify the pest. For aphid identification, again most did not identify it. None of the six women identified it and of the ten men, three did identify it. And lastly, the natural predator of aphids, the ladybug, was not identified by nearly all farmers. Of the six women, one identified it. None of the men identified it. Along gender lines, women were not able to identify any pests in Hazard and Donnington Castle. While neither men nor women identified virus damaged hot pepper, about a third of men identified mite damage and aphids.

Drawing from the results, firstly, pest identification percentages were low. In contrast to the pests of callaloo, the pests of hot pepper are completely different. Hot pepper pests (aphids and mites) are extremely small or invisible (viruses, which are transmitted by aphids) to the eye; therefore, farmers rarely see the pests that cause the damage. Overall, while pest identification

percentages were low, I conclude that men have better ability than women to identify pests of hot pepper.

What does this mean for IPM? As in Grove Farm and Lloyd Pen, if farmers do not know which pests are harming hot peppers, then they will most likely continue spraying pesticides until the pest problem goes away. However, in the cases of virus (aphid transmitted) and mite damaged hot peppers, spraying pesticides does not control their spread. By the time aphids are observed in the hot pepper field, viruses are already transmitted. If IPM is to work, farmers should be taught by extension agents about the kinds of hot pepper pests they are facing, the type of damage each pest causes, and appropriate control tactics. It should also be stressed that ladybug beetles are important in natural control of aphid populations and not be killed by pesticides.

In Rose Hill, while all farmers correctly identified the adult sweet potato weevil, fewer (70.6%) identified the larvae weevil. A distinction is that larvae burrow through the sweet potato and cause the most damage. Most importantly, the lower percentage for the larvae weevil indicates that farmers did not connect the adult with the larvae weevil. For the weevil larvae, of the four women who responded, two correctly identified it and of the 13 men, ten correctly identified it.

A similar identification pattern was observed for the soil grub. For the adult soil grub, most farmers identified it (70.6%). For women, two of four women and of the 13 men, three correctly identified it. In this case, women were more likely to identify the pests. As with the weevil, fewer farmers identified the larvae grub, indicating that farmers did not make the connection between adult and larvae stages. And, as with the sweet potato larvae, soil grub larvae cause most of the damage. Of the four women, one identified the larvae grub. Of the 13 men, only four identified it. Lastly, for the ladybug, only one male farmer identified it.

To determine which of the three communities has the “most” local knowledge of pests is difficult. One reason is that I was asking not for the identification of the same pests in each community, nor are the same crops grown in each area. For example, while relatively new to the export market (as a

non-traditional agricultural export), sweet potato has been grown on the island for some 300 years, whereas “Scotch Bonnet” hot pepper and callaloo have not been cultivated nearly as long. Therefore, an across the board comparison is not possible. If I were to base it on identification alone, Hazard/Donnington Castle would have the least amount of local knowledge. While the high percentages of misdiagnosis from Hazard/Donnington Castle is interesting, it masks some of the reasons for misdiagnosis. Consider the pests farmers were asked to identify: viruses, aphids and mites. These are either invisible to the eye or very difficult to see. Local knowledge of pests more likely includes those pests that are larger (for example, beet army worm or sweet potato weevil).

With the types of pests that farmers had to identify kept in mind and considering the small sample size, I attempt to designate which community has the greatest difference between men and women in the ability to identify pests and the beneficial insect. In conclusion, in Grove Farm/Lloyds Pen the ability of men and women to identify pests was roughly the same although men were able to identify the beneficial insect. In Hazard/Donnington Castle, as women were not able to recognize any pests (but did identify ladybug beetle), men identified pests around 30% better than women. In Rose Hill, one of the differences between identification ability of men and women was that men were found to have a much higher percentage for identifying weevil larvae. To determine the reason for this, I refer to Table 5-31. Of the small sample, possibly men have been farming a longer time (more responded that they are self taught about insects), more males reported learning from other farmers, and more males have received extension. Although women had a higher percentage for identifying the adult grub, for the larvae men had a slightly higher percentage. With this in consideration, I conclude that men in Rose Hill have slightly more pest knowledge.

Now, I briefly revisit one obstacle to IPM that was discussed in the literature, that of increased amounts of labor demanded for some IPM control methods. While I found that complaints about labor (such as the high cost or lack of availability) did not rank nearly as high as that of pests, marketing, or

water in Grove Farm/Lloyds Pen (13.8%) and Rose Hill (7.0%), labor was reported to be more of a problem in Hazard/Donnington Castle (20.9%). Therefore, if IPM demands a labor-intensive approach, this would probably prove to find the least acceptance in Hazard/Donnington Castle. In other words, less labor demanded in order to control pests would probably need to be developed for Hazard/Donnington Castle. As mentioned in the literature, less labor-intensive approaches are especially in the interest of women farmers (Malena, 1994; FAO, 1997).

FARMERS' VIEWS ON PEST PROBLEMS AND EXTENSION AGENTS

In Grove Farm and Lloyds Pen, one farmer told me that when he began farming, few pesticides were used. This has changed in recent years, and he explained that, like pests breeding ever more resistance to pesticides, "some pesticides have to breed up." Callaloo farming has become too expensive for him because of the high price of pesticides needed for this crop. This farmer was skeptical that anything could be done to control pests.

Many people I spoke with in Grove Farm and Lloyds Pen, more so than the other communities, were wary of an "outsider" such as myself coming in and asking questions. Many, especially in Lloyds Pen, also showed distrust of anyone associated with the government, even if the person was Jamaican. Although I explained that I was associated with a non-governmental organization (CARDI), I was not immune from suspicion. It was believed, in general, that I would take information (even though I wrote down no names) and misuse it against people. Most farmers did not believe that extension agents would prove to be of benefit to them.

In Hazard and Donnington Castle, one farmer showed me a bucket of tiny, disfigured hot peppers. He said, "Wiped out by Jherri curl." He was very confused about "Jherri curl," thinking that mite and viruses were the same ("Jherri curl") and sprayed "Blue-blue" (Kocide, a fungicide) on the crop. He has also seen many "flies" (aphids) on the bottom side of hot pepper leaves. When he saw leaves turning yellow (possibly a sign of virus damage), he concluded that

they plant needed more fertilizer. In short, based on his limited resources he had no way of knowing what was afflicting his crops. Was I there to answer these questions? No, I was not, I said. I continued, this information will be of use to CARDI and RADA, and in turn maybe they will be able to help you. "Oh, yes, he said, I have seen them drive by very fast, but they don't stop here."

In Rose Hill, one farmer lamented that an "expert" from the government came to his farm, found "ticky ticky" (weevil) in the sweet potato field, yet never returned to bring anything to control nor give advice on control measures. One older farmer said that people (like me) keep coming around, spraying the sweet potato, taking crop samples, but in all of the visits no one has helped him out financially. Several other farmers showed me piles of discarded sweet potatoes which, in their view, were damaged by the sweet potato weevil. One of the more extreme views on pest control and governmental extension agencies came from a male farmer. He complained that small-scale farmers can do nothing to control the sweet potato weevil. "Big farmers, they have something (pheromone traps) and have the money to buy it. Big farmers and the government get together and set pricing strategies to keep the small farmers out of competition. And RADA, that's just a waste of time. They don't do anything, nothing at all. They should be non-existent." However extreme this viewpoint may be about RADA, regarding pest control, many farmers I talked to were convinced that "something" (sex pheromone traps) could control the sweet potato weevil, yet somehow they either had never attempted to get the traps or felt that they could not afford them.

However, in Rose Hill, while farmers would benefit from extension that teaches them about insects, in general they knew about sweet potato weevils. Further, they have heard about and wanted to try the sex pheromone traps. The question is, here is almost a "perfect" IPM product which can be constructed with locally found materials (except pheromone—chemically derived—is made in the United States), and does not cost much. According to Janet Lawrence of CARDI, for J$500 (about US$14), five pheromones, enough for one season, can be purchased. I have seen how the sex pheromone traps kill hundreds of adult male sweet potato weevils. The problem, it appears, is one of distribution.

Unlike other farm products, the sex pheromone cannot be found at local farm stores. Instead, CARDI has arranged with RADA that RADA distributes the sex pheromone to farmers. According to some farmers in Rose Hill, RADA is virtually a non-entity. Sex pheromones traps for the sweet potato weevil should be sold at farm stores (with instructions) and at field days where extension agents explain how to properly construct them.

CHAPTER 7: CONCLUSION

In conclusion, I turn the direction of the thesis to revisit one of the survey foci: major constraints in farming. In doing so, I designed this chapter to emphasize, through in-depth descriptions, the major farming problems in the three communities. Briefly, I set out to complete three main goals in this chapter: 1) summarize the findings of the research; 2) encompass discussions with qualitative remarks; and 3) relate the findings to the adoption of IPM. I begin with the first community, Grove Farm and Lloyds Pen.

Grove Farm and Lloyds Pen

In Grove Farm and Lloyds Pen, the lack of water is one of the main reasons why farmers do not cultivate callaloo or limit the amount planted. Most (72%) small-scale farmers I talked to are more concerned with their limited access to irrigation water and lack of rainfall than with pests. The problem, it seems, is that a few farmers are receiving water (or can afford to pay for it). From the majority of farmers, I sensed a feeling of marginalization. One older farmer I spoke to said that the larger-scale farmers take the water. Small-scale farmers "just perish," he said. "We just take what we can get." When I began the interview, though I explained the organization I represented, he was less than excited to speak with me. He said, "I don't believe we will be better off, [and we will] not receive water. I appreciate your coming here but really several people have come around and taken good information. I never done seen it. That's how we look at it."

Another farmer with 25 years of experience said that the government has done little to address the water problem. He said that there is a reservoir in the parish which has water for the dry season, but as their local politician is no longer in office, he says that the politician lost control of the water. Further, a problem is the high cost of water for many farmers. One long-time resident told me that the increased cost of water caused many people to give up farming. Patterson (1996) found that if farmers in Clarendon have to purchase water for irrigation,

high costs may prohibit many farmers from participating in farming. It is not suggested that improved access will solve all problems as not all of those who have irrigation water are using it wisely. On different occasions, I witnessed sprinkler systems being used in callaloo fields during mid-day, when the sun evaporates a major percentage of the moisture before it lands on the crop. I also witnessed large amounts of water used to flood farm fields or diverted into holding ponds. Both of these methods of watering crops are very inefficient and result in much of the water being evaporated. Instead, as a long-term solution to the water problem better water management practices should be advocated. These practices include keeping more moisture in the ground by not plowing the entire field before planting, use of green manure, organic or plastic mulches, terracing along the contours, and drip irrigation systems. All of these recommended practices should fall under the banner of IPM.

For one in four farmers in Grove Farm and Lloyds Pen, even with proximity to urban areas, marketing remains an elusive solution to their problems and was discussed in relation to the literature in the previous chapter. I was told by one farmer, "Farmers are not encouraged, agriculture is dismal. The bottom line is that farmers are frustrated. Farmers are not being protected; there is often no market. In Jamaica, you just take your chances as a farmer." He told me how he was encouraged by the "government" to plant mango and coconut and even was told which species to plant. He invested much time and money. This year, he said, there is no market for these crops. Another farmer, interested in exporting, explained: "With export, he said, you hardly lose the crop [you have security that you will be able to sell the crop]." In the past, he explained, he had been contacted by exporters. Not being satisfied with their offers, however, he drew away from them, saying "they were just trying to keep him down." Instead, he and his wife market their crops on the roadside. Another male farmer told me that the only markets for his crops are local ones. "Export does not come into question," he said.

Still another male farmer, interested in exporting, said that the people exporting crops are the ones making money. "Foreign exchange," he said,

"farmers don't get any of that. It's a two-way street and if you don't have a contact [in the United States], you can't get paid. Until farmers have a contact [and some sense of security of price], farmers are between a rock and a hard place. Farmers farm, just do it blind. The farmers business future is not bright. Young people see this and don't want to go into farming."

While marketing remains a major problem, farmers face increased competition from imported food, a topic mentioned in the literature (see Gumbs, 1981; Rao, 1990; Spence, 1996). One former farmer, dismayed at the government's unfavorable treatment of the small-scale agricultural sector, told me that he does not believe that Jamaica's future should be in agriculture. Says he, "It's such hard work, so much time. Industrialize the country, that's the only way to go. We're such a small country, we can't even grow enough to feed ourselves, and we're only 2.5 million people. It doesn't make sense for small farmers to grow food because the food they grow isn't high quality. Imported food sells over ours. The government won't cut out imports and allow people to produce food, feed our people. The free market needs to be controlled, if not, farmers suffer, importation kills farming."

Hazard and Donnington Castle

In contrast to the previous community, farmers in Hazard and Donnington Castle received greater amounts of rainfall. In addition, most farmers had access to a water source (pipe, for example) for which they did not have to pay. Still, drought was seen as a problem by 19% of farmers.

In Hazard and Donnington Castle marketing was mentioned by 50% of farmers as a problem. In these communities, the main reason for not growing hot pepper or limiting the amount planted was that farmers could not sell their produce. The higglers who come to this remote area must take into account time needed to navigate the poorly maintained roads. One woman explained that marketing was not always a problem for farmers in the area. In Guys Hill, the Agricultural Marketing Corporation (AMC) existed until the 1980s. The AMC had overseas contacts to export crops. The whole area around Hazard and

Donnington Castle was planted with banana trees. Due to Jamaica's debt problem, and the AMC not making a profit, the AMC was shut down when the government changed hands (the Jamaica Labour Party lost in 1972 to the People's National Party).

Another farmer, a male, recalled that marketing used to be easier under this system. The reason for the problems in the farming sector now, he explained, was the government causing most of the mess. He said, "When they [government] talk about farmers, they mean farmers with 800 or 2,000 acres and exporting bananas. But not us, we don't see any of the government people, get no government subsidy. And the same crops we grow, the government imports!" In almost the same way, farmers in Hazard and Donnington Castle feel as marginalized as the farmers in Grove Farm/Lloyds Pen, except their main problem is marketing.

Rose Hill

Though the percentage of farmers reporting water shortages was lower in Rose Hill (38%), this is partially due to the lower water requirements of sweet potato than other crops, for example, callaloo. However, farmers in Rose Hill who grow vegetables other than sweet potato complained about water shortages. A characteristic of Rose Hill different from the other communities is the number of people (75%) who have rain tanks (for collecting rainfall) or can use the community rain tank or borrow from neighbors. About four to five years ago, rainfall became less. Many farmers told me that drought meant more sweet potato weevils and other insects.

As many farmers in Rose Hill sell sweet potatoes for export, the complaints about marketing were fewer (25%). Some farmers said they received too low a price for sweet potatoes and other farmers said that the export market is not good. I was told that sometimes there is a surplus of sweet potatoes (especially if another parish has an exceptional production season), causing the price to drop. At these times, it is cheaper for farmers to leave the crop,

unharvested. Incidentally, leaving sweet potatoes in the ground allows the weevils (and soil grubs) to reach infestation levels.

Looking at Rose Hill, the community seems to be, compared to the other two, the one with fewest obstacles (water and markets) to IPM.

THE ROLE OF GENDER IN IPM

After this in-depth look, it becomes clear that there are other constraints to crop adoption, perhaps even overriding my focus on gender. As discussed, these include marketing of crops and/or lack of irrigation water or rainfall. Such constraints may also be more important than controlling pests, for water is needed to begin crop growth and marketing marks the end of the production cycle. Small-scale farmers, lacking institutional support (such as crop insurance, banks) are naturally risk-averse and will not invest time and money if they do not believe they will have water or find a market. Where such constraints to crop adoption exist, I believe that these constraints will also carry over to impede the adoption of IPM as well. As briefly mentioned in the previous chapter, the use of water to help control the sweet potato weevil is one use of water in IPM. Or, why would a farmer invest additional time and effort as part of IPM (scouting for pests, for example) if marketing is a problem?

With these constraints in consideration, one obvious question is, how is my research in gender roles of relevance to the promotion of IPM? I am not suggesting that research into gender is not important. Indeed, I think my research uncovered valuable information which can be summarized in three main points: First, as its name suggests, the Caribbean Agriculture and Development Institute (CARDI) is a development institute. For IPM to become truly an instrument of development, it is clear that by including women (who own and rent less land), CARDI could target the most resource-poor in the communities. But women knew the futility of talking to me and only tolerated my questions, because they knew that no extension agent would follow up with responses to their problems.

The second point is that women and men have approximately the same input, except in Grove Farm/Lloyds Pen, in decision making about crops and

farming income. However, this does not extend to include the purchase of pesticides. The approximately same input in decision making about crops and farming income is important for several reasons. Women and men would both be interested in ways of saving money (by reducing the purchase of pesticides) if they both knew about an alternative, such as IPM. Instead of only talking to the male decision maker, and by actively including women, both male and female "Joint Decision Makers" could negotiate such matters together. To resource-poor farmers an alternative to pesticides would be welcome as the income saved could be used for the payment of, for example, school fees.

The third point is that women are able to identify pests, the damage caused by pests, as well as beneficial insects, although not with the same ability as men. However, this means that women are approachable to discuss the types of pests found on crops, could comment on the extent of damage caused, and therefore could promote IPM. In conclusion, women have the potential to be involved in the entomological aspects of extension. However, while conducting research on gender roles, I came to the realization that just increasing the number of times an extension agent visits each community would not be enough to promote IPM in any significant way; neither would merely including women in IPM extension.

How do the findings from my research relate to the theoretical foundations of IPM? To review, IPM promotes a variety of cultural, genetic, biological, and, as a last resort, chemical means of pest control with lesser adverse impact to the neighboring environment. IPM is, in theory, location-specific and takes advantage of locally available, low-input technology. In practice, my research has shown that IPM as practiced by CARDI in Jamaica has not considered the location-specific factors (such as marketing infrastructure and water availability), nor has it considered the most basic socio-economic background of farmers and the political-economic environment in which they exist into the planning of IPM. Moreover, CARDI has not put the locally-available materials to full use (for example, the reliance on pesticides on callaloo in Grove Farm/Lloyds Pen, albeit at a lower rate, increasing the amount of chemical fertilizers on hot peppers in

Hazard/Donnington Castle and imported sex pheromones on sweet potatoes in Rose Hill). Granted, CARDI is not only an organization that carries out limited extension work, this is only one aspect of their work which places greater focus on entomological research at the Kingston site.

A NEW APPROACH TO IPM EXTENSION

IPM researchers and extension agents are continuously challenged to create a comprehensive pest management "package" which not only competes with but offers better and perhaps even faster results than pesticides. In contrast to pesticides, IPM is still not an "off the shelf" product. While many IPM techniques require some education on behalf of the farmer or increased labor, pesticides, in contrast, are relatively easy to purchase and apply. Moreover, through years of development in laboratories, the pesticide is engineered to do most the work for the farmer.

Instead of an IPM "package," IPM researchers, grappling with the pests of callaloo in St. Catherine, have developed a complicated sequential sampling plan. (A distinction must be made. This plan calls for a *reduction* in pesticides, not an alternative to pesticides). Another stop-gap measure is being used in St. Mary where mesh screens are placed over hot pepper seedlings. However, once seedlings are transplanted to fields and mesh screens removed, and farmers revert to spraying pesticides to control mites and viruses. Where CARDI does have an "off the shelf" product, namely the sex pheromone trap, it languishes on shelves somewhere in the offices of RADA, I was told, instead of being made available to farmers. However, as IPM strives to utilize locally available materials, the sex pheromone, chemically synthesized in laboratories outside Jamaica, could further cause dependence on imported solutions as in the case of pesticides.

CARDI, researching IPM since 1994, is not yet producing results that can truly offer alternatives to the reliance on pesticides. Considering the small size of the CARDI staff and resources it has available, the three-crop, three-community approach is perhaps ill-conceived. CARDI might instead pool its resources,

focus on one community/crop, and work on developing and then transferring IPM. After success in that community, extension agents could move to the next community and set of pest problems.

Pertaining to marketing and water shortages, I am not suggesting that CARDI be responsible for building aqueducts, freeways, infrastructure, or buy all of the produce from farmers. This is beyond the scope of CARDI. CARDI could, however, use its influence to bring these issues into changing government, non-governmental organizations (NGOs), and foreign donor policy towards small-scale farming in Jamaica. Without solving (or at least addressing) the marketing and water problem, there will either be no purpose for farmers to invest time and/or money. Patterson (1996) also found that market insecurity and water shortages were important constraints to farming and affected the choice of pest management farmers were able to implement. She further argued that the concerns about marketing, water, and labor constraints "may supersede farmers' concerns for pest problems" (1996: 113).

Another problem is that an increasing amount of crops (often the same ones grown in Jamaica) are being imported from the United States and other countries. Grown on large-scale farms, the imported products undercut the prices of locally-grown crops. Jamaican small-scale farmers cannot grow crops inexpensively enough (and maintain high enough quality) to compete in their domestic market. Furthermore, while the United States has a facility which screens Jamaican crops for pests and pesticide residues, amounting to millions of dollars lost annually for the Jamaican economy; the Jamaican market (and consumer) does not have such protection. To counter the flooding of Jamaican markets, the import of the same crops grown in Jamaica could be restricted in order to support the small-scale farming sector.

Furthermore, an in-depth study of the farm-to-supermarket linkages needs to be carried out for callaloo, hot pepper, and sweet potato. At the present, however, consumers are not familiar with IPM. In an effort to create demand in the United States for IPM produced crops (as has been done for organic crops), exporters/marketers could be supported in marketing IPM. If farmers in Jamaica

know that there is an “IPM” export market and, through CARDI, know the guidelines of IPM, acceptance of IPM could be furthered.

In summary, if goals of IPM include raising the standard of living for women and also curbing pest problems and pesticide use, I suggest that the holistic spirit of IPM could, instead of adopting a singular focus on pests, become the catalyst for an overall integrated and holistic approach to rural farm development. As the name Integrated Pest Management implies, *all* factors, biological, physical, social, and political are to be used in concert to control pests and reduce pesticide use. The path CARDI extension agents are presently following may solve pest problems but farms remain underdeveloped. As with IPM, conventional pesticides become a waste of income if there is no market for crops or no water for applying pesticides.

Thus, before IPM can become widespread, a favorable environment must be created. After its creation, if farmers have a market combined with sufficient water for crops, production will increase. Under these conditions, if farmers knew that IPM could produce crops more economically and with less pest damage, there would be fewer problems convincing farmers to adopt IPM.

In conclusion, I believe that IPM is a worthwhile endeavor and based on sound philosophy. IPM can, in theory, lead to fewer pesticide poisonings and allow farmers to save valuable farming income (by foregoing the purchase of pesticides), not to mention less pest damage. However, IPM would not be a wise investment of donor funds if the benefits only go to a select few farmers, for example, larger-scale or only male farmers. In this sense, IPM can prove to have negative impacts on the smaller-scale or female farmers. Rather, the holistic philosophy of IPM should be used as the catalyst that broadens the scope of the *overall* development of the farm for both women and men. As IPM broadens its scope, it will naturally seek out better cooperation and use more effectively the resources provided by governmental and non-governmental institutions as well as those of foreign donors.

APPENDIX

IPM CRSP Socioeconomic Household Survey

Caribbean Agricultural Research & Development Institute /
Virginia Polytechnic Institute and State University

Household #_____
2. Community_____
3. Sex_____
4. Age_____
5. Training received_____

Agricultural	On-the-job	Supplier
School	Employer	None

Primary occupation_____
Secondary_____
No. of years farming in this area_____
Elsewhere_____
Distance from home to farm_____

8. **Household composition** *(Female Household-Head)*

Relation to Respondent	**Sex**	**Age**	**Education**	**Principal Occupation**	**Secondary Occupation**	**If away part-time: current residence? for how long?**
1. **Self**						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Housing Material *(Observe)*_____
(a) No. of Animals (+kind)_____
(b) How do you get water (ask about quantity & quality)_____
(c) Where do you do your cooking_____
(d) Electricity_____
(e) Telephone_____
(f) Vehicle_____
(g) Bicycle_____
(h) TV_____

10. **Land Profile**

Parcel	Size (acres)	Tenure	Who holds it	Amount cultivated currently/ last cycle
#1 (house)				
#2				
#3				
#4				
#5				

Total Acreage_____

What are some of the problems you have on the farm or in the community

Crop	Problem	Problem over time

Household Decision Making and Marketing

12. **What crops does the household currently grow and who performs what tasks?**

Crop	Nurs Prep	Land Prep	Plant	Fert & Spray	Weed	Reap	Post Harv	Market
Major								
Other								

13. Who makes decisions about the target and other crops? (self/partner/both)
14. Who decides who does the work with the target crop and/or other crops?
15. Who decides if you will hire workers and how much to pay?

16.

Crop	**Who sells it** *(deals with buyer or takes to market)*	**Who decides how to use the income**
Major:		
Other:		
Animals/animal products:		
Non-farm sources of income:	**Who earns or receives it**	

17. Where do you market your crops?

Market	**Target/Other Crops**	**Who sells/To where**
H.m. to public market		
H.m. to roadside		
H.m. from a vehicle		
H.m. to restaurant, hotel, supermarket, institution		
H.m. to public at farmgate		
To higgler at farmgate		
To exporter at farmgate		
To factory at farmgate		
Take to higgler		
Take to exporter		
House-to-house		

H.m. = Household member

18. Who decides how the crop will be sold?
19. If you had a choice, which method of marketing would you prefer? Why?
20. Do you do business directly with exporters? Yes No
If not, why?
21. Have you ever tried to sell to exporters? Yes No
22. Do you know of any special requirements that have to be met before you can export?

Pesticides and Decision Making

23. Do you use pesticides on the target/other crops? Which ones?

Crop	Pesticides Used
1.	
2.	
3.	
4.	
5.	
6.	

24. If you use chemicals, do you think it will...
increase decrease not change
...the quality of your crop?

25. If you use chemicals, do you think it will...
increase decrease not change
... the amount of crops you sell?

26. If you use chemicals, do you think it will...
increase decrease not change
...the price you will get for your crops?

27. If you control pests, would it change where you sell? Yes No
If yes, how?

28. How do you decide when to spray?

29. How do you decide which chemical to use?

30. How do you decide how much to use?

31. Are pesticides always available (Where)? Yes No

32. Where do you get your information about when, what, and how much to spray?

Farm supply store
Relative
Extension officer
Trial and Error
Employer
Agric.school
Read label
Other farmers
Radio/TV
Field day (by whom_____)
Other_____

33. Which source of information have you found most useful and why?

34. How much pesticides are bought per week_____

Since you began farming, have you seen any change in the amount of chemicals you use?

35. Who in the household decides that you should use pesticide (self/partner/both)?
Who chooses the pesticide?
Who buys the pesticide?

Photos	ID	Name	Good/Bad	Type of damage	Rank	Control Methods	Predator	Season
Callaloo: 1. Flea Beetle								
2. Beet AW Adult								
3. Leafhopper								
4. Mites								
5. Beet AW Larva								
Damage: 6. Leafhopper								
7. Worm								
8. Mite								
Sweet Potato: 9. Adult SPW								
10. Adult Grub								
11. Grub Larvae								
Damage: 12. Grub								
13. SPW								
HP Damage: 14. Mite leaf								
15. Virus leaf								
16. Aphids								
17. Mite fruit								
Beneficials: 18. Ladybird								
19. Wasp								

49. Where/From whom did you learn about the insect/disease and damage?

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Specialization: International Research and Development
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University of Idaho, Moscow, ID
B. A. International Studies and German, May 1997
Emphasis: Global Resources and Development

University of Minnesota, Minneapolis, MN
Minnesota Studies in International Development, Aug. 1996 – Dec. 1996

RESEARCH INTERESTS

Crop Production, Tropical Agriculture, and Integrated Pest Management

WORK EXPERIENCE

- Office of International Research and Development (OIRD), Virginia Tech, Blacksburg, VA

Graduate Research Assistant Aug. 1997 – May 1999
Assistant to Dr. Sarah Hamilton, Program Director, Women in International Development in research concerning gendered production roles in agriculture and Integrated Pest Management (IPM). As part of the Integrated Pest Management Collaborative Research Support Program (IPM CRSP), that works together with the Caribbean Agricultural Research and Development Institute (CARDI), conducted field research in Jamaica.

- Department of Geography, Virginia Tech, Blacksburg, VA

Graduate Teaching Assistant Aug. 1997 – May 1999
Provided instructor and student assistance in the courses Environment, Population and Development, Introduction to Human Geography, and World Regions.

- College of Forestry, University of Idaho, Moscow, ID

Research Assistant Jan. 1997 – May 1997
Indexed and stored information encompassing the taxonomy, use and distribution of pan-tropical plants and trees to CD-ROM.

- Department of Geography, University of Idaho, Moscow, ID

Research Team Member Spring 1996
Data collected through pedestrian traffic counts and analysis using Excel, in support of the proposed University Commons.

- Forestry Research Nursery, University of Idaho, Moscow, ID

Tree Nursery Assistant Aug. 1996 – Dec. 1996
Collected data for germination tests and planted seedlings for an experimental windbreak in demonstration field. Responsible for pruning and packaging of seedlings grown for sale to the US Forest Service and the general public.

- Kenya Forestry Research Institute (KEFRI), Kitui, Kenya

Agroforestry Intern Jan. 1996 – June 1996
Conducted extension work with farmers in the semi-arid Eastern Province by introducing and promoting agroforestry and other sustainable farming practices.

- Half Moon Coffee and Tea, Idaho Falls, Idaho

Business Owner Aug. 1989 – Aug. 1993
Founded a coffee and sandwich shop. Located and renovated a vacant building, developed and marketed a line of products, managed employees, and was responsible for accounting and customer relations.

OTHER WORK EXPERIENCE

Greenstar Organic Farm, Blacksburg, VA
Volunteer March 1998 – Present
Nursery upkeep including direct seeding and seedling transplantation of various vegetable crops produced by organic farming and permaculture. Other duties including weeding, thinning, and building compost.

COMPUTER SKILLS

WordPerfect, MS Word, MS Excel, SPSS, IDRISI

LANGUAGES

German (fluent), Spanish (good), Swahili (good), French (fair)

ACTIVITIES

Secretary, International Club at Virginia Tech
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TRAVEL

Western Europe, Scandinavia, Kenya, Uganda, Tanzania, Malawi, Mozambique, Zimbabwe, Canada, Mexico, Jamaica, Cuba, Columbia, Panama, Costa Rica

HOBBIES
Traveling, reading, gardening, bird watching, skiing