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Women and Pesticide Management in the Philippines:

An Assessment of Roles and Knowledge

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ABSTRACT

This research studied the roles and knowledge level of women in pesticide management for rice and vegetables. This research emphasizes the contributions and needs of women in pesticide management and explains why women are invisible in pesticide management. Data for this research were collected in 2004 from three municipalities in Nueva Ecija, Philippines. Primary data were collected from 240 farm women using an interview schedule. Focus group discussions with farm women leaders were conducted to improve the questionnaire and provide qualitative data. Frequency distributions, means, reliability analyses, correlation analyses, and multivariate analyses were used for data analysis.

The results of the study show that farm women were performing fourteen pesticide management activities in rice and vegetable production. Women are performing field and non-field roles on rice and vegetable pesticide management. Women's higher level of activity in non-field roles reveals that they perhaps perform productive and reproductive roles simultaneously which effectively hides their involvement on pesticide management. Factors that influence farm women's participation in field roles in rice pesticide management were marital status, having a male household member, and perceived level of control over pesticide usage. Factors that influence women's participation in non-field roles in rice pesticide management were educational attainment, farm size and perceived level of control over pesticide usage. For field roles in vegetable pesticide management, having a young child, having a male household member, and perceived level of control over pesticide usage were influential factors affecting the extent of their involvement. For non-field roles in vegetable pesticide management, perceived level of control was the only influential factor affecting their involvement.

Results also showed that farm women have a high level of knowledge of pesticide health impacts. This may be due to their role as health caretakers of the household and the presence of the IPM CRSP in the research areas. Multivariate analysis revealed that presence of a male household member and village characteristics impact women's knowledge level. The results of the study underscore the need for pesticide management extension services for farmwomen that address gender dimensions. It also emphasizes the need for pest control alternatives such as IPM.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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Chapter 1

INTRODUCTION

1.1 Women, agriculture and pest management

Women have been farmers since the beginning of history. They remain central to agricultural production systems, particularly in the developing countries, in terms of the work they do in the food chain (Shiva, 1988). In fact, some agricultural historians believe that women first domesticated crop plants and thereby initiated the art and science of farming (Samanta, 1994). While men went out hunting in search of food, women started gathering seeds from the native flora and began cultivating these for food, feed, fodder, and fuel (Sachs, Gajurel and Bianco, 1997). Yet until recently, the predominant image of the farmer was male. Agriculture programs and policies have generally ignored women's needs and concerns as farmers and as important contributors to the economy.

Over the last decades however, there has been increasing awareness of the extent and significance of women's activities in agriculture. Hundreds of studies have documented and challenged strongly held myths about the roles and contributions of women in agricultural production. These studies have established that women do work on the farm. They are very much engaged in the physical activities of farming such as planting and weeding. They are also livestock raisers. Their income, especially in poor households, makes a substantial contribution to the total household income; and more importantly, they are involved in decision-making for specific farm activities (Ancheta, 1982; Res, 1985; Illo, 1985 and 1988; FAO, 1997; Amoloza, 1997; Huvio, 1998; Sachs, 1996; Ransom, 2002).

Although gender is now a well-researched topic in agriculture, research about the relation of gender and pesticide management is less available. Crop protection specialists usually have a technical background and not uncommonly find it hard to deal with social issues, more so with gender. Gender specialists generally have a social science background and are often not involved in the technical side of programs. Not surprisingly, women's problems with regards to pesticides and its management are trivialized and rarely addressed. It does not help that compared to men, women have limited access to pesticides and information on pesticide risks (Hulshof and Sagnia, 2003). Women's limited access to pesticides can be explained by the fact that some women in rural areas are less mobile than men and often do not have the opportunity to visit local markets because of distance and time constraints (Laurense and Ali, 1999). In other cases, women farmers lack the financial resources to choose among the pesticides in the market thus, opting for the cheapest and most available but not necessarily the safest pesticide (Hulshof and Sagnia, 2003). On the other hand, women's limited access to pesticide information and/or its risks can be explained by the fact that most extension staff are male and usually target male farmers in the dissemination of the proper use of pesticides and how to recognize its health effects (Laurense and Ali, 1999; Meir, 1999; Tuyen, 1999). Additionally, other information and training activities on pesticide management address men because of the notion that farmers are males (de Garbino, Besbelli and Ruse, 2003). Such gender barriers seriously affect women's access and use of pesticides and pesticide-related information. This is unfortunate because women's exposure to pesticides probably entails even greater risks, since through them pesticide residues can affect other household members. A case in point is when human breast milk samples were found to be contaminated with pesticide residues which put newborns and infants at risk (Chikuni and Polder, 2003). Women also generally prepare the food and serve as health caretakers for the farm household. Women have consistently reported that they are responsible for taking care of family members who have fallen ill (Paolisso and Gammage, 1996). The failure to address women's concerns in pesticide usage can have a negative effect on total food production and food security, as well as on the health of women and future generations.

1.1.1. Agriculture in the Philippines and rice-vegetable systems

In the Philippines, agriculture is the backbone of the economy and the major propeller of national development. Agriculture contributed 22.1% to the gross domestic product (GDP) in 1990 and more than 70% of the population is directly or indirectly dependent on it (FAO, 1990; de la Cruz, 1999). In 1997, the combined area devoted to agriculture was 10.3 million hectares, with rice as the most widely planted crop (de la Cruz, 1999). Needless to say, within the agricultural sector and the whole economy in general, rice is one of the most important and dominant commodities. In addition to rice, vegetable production is increasingly becoming an important component of Philippine agriculture. This can be attributed to the growing awareness of the vital role of vegetables in the Filipino diet and vegetable's potential for the export market as a strategy for earning foreign exchange.

Rice remains the agricultural commodity with foremost political and economic significance in the Philippines. As a major staple, rice accounts for 35 percent of the average calorie intake of the population and as much as 60-65 percent of the calorie intake of the households in the lowest income quartile (David and Balisacan, 1995). Moreover, rice farming is the source of income and employment of 11.5 million farmers and other sectors of the society (Philrice Brochure, 1995). Due to its economic importance, rice is the central focus of government agricultural policies. Of the approximately 3.4 million hectares of Philippine rice lands, some 2.1 million hectares (61%) are irrigated, 1.2 million ha (35%) are rainfed lowland, and 0.07 million ha (2%) are upland (RiceWeb). Landownership structure is highly skewed in the country. While about 50 percent of the Filipinos are dependent on rice farming for their livelihoods, many of them do not own the lands they till. In general, share tenancy is the dominant mode of tenurial and sharing arrangement in rice farms. In terms of farm size, about 43 percent of the rice farms are below 2.0 ha in size (Penalba, 2000). Demand for rice during the next 25 years is expected to increase by 65 percent in the country due to its steady annual population growth of 2.36 percent (IRRI, 1999).

On the other hand, the importance of vegetables as part of the Filipino subsistence, be it as food or as a source of livelihood, should not be underestimated. The different vegetables in the country are important sources of minerals, vitamins, fiber, and proteins (Pabuayon, 2001). Apart from their nutritional value, vegetables contribute significantly to the farm household's income when sold locally and to the country's foreign exchange if exported. In fact, vegetable production ranks second to ornamentals in terms of income generated per unit area and time (Pabuayon, 2001). Vegetables are widely used as an intercrop or as a component of rice cropping systems. In 1997, vegetable production comprised eight percent of the total agricultural output of the country although utilizing only five percent of the total agricultural area (Lantican, 2000). Additionally, Lantican reported that vegetable production grew by an annual average of two percent in eight years from 4.5 million metric tons in 1990 to 5.1 million metric tons in 1997. As the Philippine agricultural industry is focused on meeting export commitments which the government supports, increased production of vegetable crops is expected. Currently, the country is an exporter of vegetable products including asparagus, shallots, onion, garlic and lettuce to foreign markets in Japan, Indonesia, Canada and the United States.

1.1.2. Rice-vegetable systems and pesticide usage

In the Philippines, pesticides play an important role in rice-vegetable systems. They serve as the primary, if not the sole weapon of the Filipino farmers in their war against pests and diseases. This approach to pest management in the Philippines can clearly be traced to the Green Revolution technology which was instituted through a government program in the early 1970s called “Masagana 99”. The program provided credit and advice on rice production, particularly on the use of high-yielding varieties (HYVs), fertilizers, and pesticides to ensure the goal of harvesting 99 cavans (or 4950 kilos) per hectare (Palis, 1998). However, the Green Revolution efforts led to excessive and irrational use of insecticides (Warburton et al., 1995). Though the HYVs outproduce local varieties, this level of production was attained in conditions created by immense dosages of external inputs that included pesticides. The modern technology that accompanied this agricultural revolution has taught the farmers that rice is almost synonymous with pesticides. Without pesticides, production is low; limited production leads to hunger; and hunger leads to uncertainty of life. With this logic, rice and pesticides have become interdependent in the minds of the farmers. Unfortunately, an analysis of rice production showed that more than 80% of insecticide sprays that farmers applied in a season could be considered as misuse (Heong, et al., 1994). Worse, many of the pesticides commonly sold in developing countries, including the Philippines, have been judged to be hazardous chemicals and are banned or restricted for use in developed countries (Pingali and Roger, 1995).

In the case of vegetables, farmers tend to be even more pesticide-dependent than in rice production (Heong, Lazaro and Norton, 1997). Farmers view insects and diseases are one of the main constraints to vegetable production (Lantican, 2000). Furthermore, this heavy pesticide use is due partly to the high "cosmetic" value demanded by consumers, forcing farmers to deliver damage-free produce. This market pressure to produce high-quality farm products encourages vegetable farmers to adopt extreme measures to keep their harvest free from visible pest damage. This logic, similar to the case of rice, led to widespread pesticide misuse in vegetable farming (Adalla, 1990, Adalla and Hoque, 1991; Bernardo, 1992; Medina, 1987; Tjornhom, et. al., 1996).

1.1.3. Pesticide usage and women

Knowledge about the toxic impact of pesticides on women's health is only now emerging from decades of scientific and regulatory neglect. Most studies rarely look at the different impacts of pesticides on women and men, and almost no gender-disaggregated data are available, leaving policies and strategies to be formed with no attention to women’s issues (Dinham, 2003a). Moreover, as trainers and researchers frequently assume that men are the only ones involved in pesticide usage and management, women are not considered for trainings on pesticide hazards or as in need of pesticide-related information. Thus, the exposure of women to pesticides is often grossly underestimated.

Women have a particular susceptibility to pesticides due to their physiological characteristics, lifestyle, and behavior. Farm women are at a greater risk of accumulated exposure because of long working hours from an early age and multiple exposures (at work and domestic settings), with potential exposure to pesticides through: working conditions, eating contaminated plants and produce, washing of contaminated clothing, drinking contaminated water, and intense use of a multitude of pesticides in agriculture (Rother, 2000). In a recent analysis of cancer among 146,000 California Hispanic women farmers, compared with the general Hispanic population, these women were more likely to develop certain types of leukemia by 59%, cervical cancer by 63%, uterine cancer by 68%, and stomach cancer by 70% (Mills and Kwong, 2001). Studies have also documented increased incidence of miscarriages, still births, and delayed pregnancy among women farm workers and wives of men employed in pesticide mixing and spraying in agri-food industries (Ransom, 2002). Other recorded health effects from research with women in the field include acute effects such as dizziness, muscular pain, sneezing, itching, skin burns, blisters, difficulty breathing, nausea, nail changing color and sore eyes (Ransom, 2002; Jacobs and Dinham , 2003). The transfer of farm chemicals in breast milk is also a concern – it is estimated that in Dehli, India the average infant receives 12 times the acceptable level of DDT (Ransom, 2002). Clearly then, the intensive use of pesticides pose great health risks for farm women and, through them their families.

The same story can be told about women and pesticide usage in the Philippines. Despite the fact that Filipino women have been shown to be involved in pest management, few studies have been conducted on this subject. Generally, Filipino women, being the custodian of household cash, have some control on the purchase of pesticides for their rice farm (Martin and Albright, 2003; Tanzo, et al, 2001; Hoque and Saavedra, 1988; Ancheta, 1982). Women are also involved in pest management activities including the hiring of labor for spraying, weeding, and postharvest operations such as seed saving (Hoque and Saavedra, 1988; Ancheta, 1982; Huvio, 1998; Res, 1985). Their role in pesticide-related activities multiplies when vegetables are involved. Still and all, information about women's roles in pesticide activities, their exposure to pesticides, how they cope with its effects, level of awareness about the health impacts of pesticide usage, and other related concerns are often a non-issue in many research and formal institutions in the country. Invisibility and marginalization of women's problems with pesticide management exists. Without data on women's pesticide management behavior, it would be very difficult to sensitize agricultural professionals and policymakers and to integrate women into mainstream agricultural programs and projects on pest management.

1.1.4. Women and Integrated Pest Management

In response to environmental degradation and pesticide misuse, an alternative known as Integrated Pest Management (IPM) was developed during the 1970s. IPM is an ecosystem-based strategy that provides economical, long-term solutions to pest problems through a combination of biological, cultural, mechanical/physical, and chemical controls (Flint and Gouveia, 2001). With IPM, pesticides are used only after crop/field monitoring indicates that they are needed, thus minimizing negative health impacts on humans and on the ecosystem. Therefore, IPM replaces thoughtless, routine pesticide applications with alternative and safer practices. As IPM strategies require specific knowledge, observation, decision making skills, as well as problem-solving capacity on the part of the users; farmers are thus empowered as pest management decision makers rather than merely consumers of technologies developed by far-away research institutes (van de Fliert, 1999).

The Philippines is one of four Asian countries that has encouraged IPM as an official agricultural policy (Adalla, 1998). In May 3, 1993, former Philippine President Fidel V. Ramos issued Memorandum Order No. 126 implementing "*Kasaganaan ng Sakahan at Kalikasan*" (KASAKALIKASAN), the National Integrated Pest Management Program. KASAKALIKASAN aimed at making IPM the standard approach to crop husbandry and pest management in rice, corn, and vegetable production in the country. Various methods such as the use of radio programs, audio cassettes, and educational materials like comic books, leaflets, and posters are being used in the country to bring the IPM message to rural farm communities. Intensive on-farm, hands-on training is also being carried out to equip farmers with the necessary decision-making skills that will make IPM effective.

In 1994, one year after the President initiated KASAKALIKASAN, the Integrated Pest Management Collaborative Research Support Program (IPM CRSP) identified the Philippines as one of its primary sites to develop and implement a replicable approach to

IPM. The IPM CRSP is a collaborative partnership among U.S. and developing country institutions with an emphasis on research, education, training, and information exchange. The program has a socio-economic component whose major aim is to identify and describe the social, economic, political, and institutional factors affecting pest management. IPM CRSP acknowledges that adoption of IPM will be weak unless social and economic factors are fully considered in technology development and implementation. IPM CRSP chose the Philippine Rice Research Institute (PhilRice) as their leading collaborating institution in the country.

With the country's clear support for IPM and considering that Filipino women are involved in pest/pesticide management, tying all these together can provide significant information for IPM programs. Through training women in ecologically based pest control, where they will be informed of the health hazards of pesticide use and that pesticides should be used as the last resort, a better and broader pest management ethic will be embraced by farm households and possibly by the next generation. IPM programs developed with a consideration of women farmer's situation in the Philippines is potentially a win-win situation.

1.2. Research Questions

Women's involvement in agriculture has been well documented over the past years. The body of literature on the issue of women and pest management however, is very limited in the Philippines. The current research helps to bridge that gap by providing missing information from the perspectives of women farmers and leaders. This research will assess and analyze the extent and type of women's involvement and knowledge with regards to pesticide management. By doing so, it hopes to provide pertinent information to enhance women's pesticide management roles and in the end, to improve the implementation of integrated pest management in rice-vegetable systems.

To fully understand the situation of women in pesticide management the following questions will be addressed:

1.2.1. *What are the pesticide management roles women farmers perform in rice and vegetable systems?*

Women's practices and contributions in pesticide management have rarely been studied or documented partly because of the image of pest management as a male domain. However, the few studies that have tackled this issue have shown that women are indeed involved in this area of crop protection (Jacobs and Dinham, 2003; van de Fliert and Proost, 1999, Heong and Escalada, 1997). Some results even showed that women are assuming increased responsibilities in pesticide management as the rural economy develops and male out-migration grows (Ruifa, et.al., 1997; Meenakanit, et al., 1997). These studies unpeel assumptions about women and pesticide usage and help in improving the visibility of women in pesticide management. Therefore, the current study seeks to understand the extent and type of involvement of women in pesticide management in rice-vegetables systems in the Philippines. Are women farmers in the Philippines performing the same pesticide management roles in both rice and vegetables? This kind of information will help in identifying research gaps so that appropriate interventions can be developed to improve women's pesticide management decision-making, knowledge and skills.

1.2.2. What factors influence women farmers involvement in rice and vegetable pesticide management?

An individual's socio-demographic and farm characteristics may influence her involvement in pesticide management. In addition, the level of control an individual perceives she has over pesticide usage may also impact her agricultural involvement. For this research, women's socio-demographic (age, educational attainment, marital status, member of farm organizations), household (presence of male household members and children), farm characteristics (farm size, tenure status) and perceived level of control over pesticide use will be analyzed to see how these impact their roles in pesticide management.

1.2.3. *What is the level of knowledge of women farmers on the health impacts of pesticides?*

Many farmers in different parts of the world see pesticides as the best remedy against pests and diseases (Heong and Escalada, 1997; Hulshof and Sagnia, 2003). Unfortunately, widespread pesticide misuse in rice-vegetable farming systems has often been reported (Adalla, 1990; Adalla and Hoque, 1991; Bernardo, 1992; Medina, 1987, Tjornhom et al, 1996). With regards to women farmers, their exposure to pesticides is often grossly underestimated. Trainers, researchers, and policymakers frequently assume that "men spray pesticides" and women will be less or not exposed. However, different studies have demonstrated the many ways women are exposed to pesticides (Hulshof and Sagnia, 2003; Wesseling, 2003; Reeves and Rosas, 2003; Vodouche, 2003;

Dharmaraj and Jayaprakash, 2003). With pesticide exposure in the field, responsibility for washing pesticide-contaminated work clothes, cleaning pesticide containers and sometimes using containers for storage, women are obviously both active and passive victims of pesticide use. Thus, it is important to know women's level of knowledge about the health hazards of pesticides. Are women informed of the health hazards and effects of pesticides? What do they consider as symptoms of pesticide poisoning? Do they know what to do in cases of pesticide poisoning in the household? Who do they think they should go to for treatment and when do they think they should seek treatment? The answers to these questions will be relevant in establishing if women are properly informed of the hazardous health effects of pesticides.

1.2.4. *What factors influence women farmers knowledge of the health impacts of pesticides?*

Socio-demographic and farm factors may influence female farmer's level of knowledge on the health impacts of pesticides. For this research, a number of socio-demographic variables will be related to level of knowledge of the health hazards of pesticides: age of respondent, educational attainment, marital status, presence of male household members, tenure status, presence of children in the household, farm size, membership in farm organization, extent of women's involvement in pesticide management for rice and vegetables, and perceived level of control over pesticide usage. These variables will be analyzed to see how these factors impact women's level of knowledge.

Chapter 2

LITERATURE REVIEW

The purpose of this chapter is to present and synthesize what is currently known about women and pesticide management in agricultural settings. In the first section, a survey of relevant literature will be presented concerning the assumptions which led to farm women's invisibility in the pest management agenda. As such, an examination of the institutional, normative, and attitudinal biases in society that help perpetuate and reinforce women's invisibility in pest management and in effect perpetuate the image that this area is a male domain will be conducted. This review will lay the foundation in suggesting reasons why women have not been included in most pesticide-related research and policies. Subsequently, the available literature that documents the roles of women in pesticide management and usage will be discussed in the second section. This is important as it will demonstrate that women are indeed active participants in pesticide management. In the third section, a review of the growing health impacts of pesticide usage and health issues specifically related to women will be summarized. Research findings show that women are indeed impacted by pesticides through the numerous roles they play in the farm and the household. This section then raises critical issues regarding the safety and health of women farm workers and the need for these women to be aware and informed of pesticide health impacts. The next two sections examine the various socio-demographic, levels of control, and farm factors that can impact the roles and knowledge of women in pesticide management and this leads to the last section which is the conceptual framework of the study.

2.1. Exclusion of Women in Pest Management

Over the past three decades, there has been a tremendous growth of research interest on farm women. This is reflected in a flourishing of literature which focuses primarily on women's position in the gender division of family labor and decision-making on the farm (Whatmore, 1988). In the past, the "farmer's wife" had received scant attention within a research agenda that centered on the farmer, a term which carries with it masculine connotations (Williams, 1964; Boulding, 1980). The growing body of work on farm women clearly marks a significant improvement and recognition in the position of women in the agricultural arena. However, there seems to be an oversight on farm women's involvement in the area of pest management, specifically on their roles and situations relating to pesticide activities. Women's concerns in this area are generally treated as unimportant in agricultural research and development. This has consequences that are often not only detrimental to the social and health status of the women themselves and their families but also to the success of pest management programs and projects.

There are several erroneous assumptions which led to women's invisibility in the pest management research agenda. Not surprisingly, most of these assumptions reflect the biases that also led to women's invisibility in the more general agricultural research agenda. These assumptions reveal why women's situation in the area of pesticide management are trivialized and rarely addressed and why pesticide exposure of women is significantly underestimated. One can see these biases through the exclusion of women as research respondents or the focus on pesticide usage as if it is the only pest management strategy. These biases are held among researchers, epidemiologists, safety personnel, and policymakers (London and Rother, 2003).

First, researchers have assumed that the male is the only farmer in the household who is involved in pest management activities. This assumption was formed due to several pest management biases that feed each other. One of these is that pest management is synonymous with the use of pesticides. This is very true in many countries, particularly in Asia, where pesticide application remains farmers' dominant control tactic (Heong and Escalada, 1997). And as pesticide usage commonly involves using a large and heavy knapsack sprayer which connotes hard physical labor, it is then associated with or always thought of as men's work. Women's contribution in pesticide spraying is then only seen as "helping out"; they are seen as not possessing the required strength or skills in the farm regardless of the fact that most female tasks especially in domestic reproduction are equally if not more strenuous (Eviota, 1992; Attanapola, 2004). A study in North Vietnam showed that women carried sprayers with a capacity of 15 liters while in South Vietnam, women used hand sprayers of eight-liter capacity (Paris, 1997). Thus, although women may be quite involved in pesticide application, they continue to be defined as "helping out" due to stereotyped notions of the different abilities of women and men.

Pest management, specifically IPM, in reality involves the use of multiple tactics. These tactics include social/cultural, biological, chemical, and legal/regulatory activities

(Allen and Rajotte, 1990). Therefore, pesticide usage is just one of the recommended methods and is used only after crop monitoring indicates that it is needed. The popularity of pesticide usage can be traced to the Green Revolution in the 1960s and 1970s. In that era, pesticide usage was deemed as a necessary input to achieve high yields. As a result, farmers sprayed insecticides as many as 15 times per season (Heong and Escalada, 1997). Farmers were encouraged even more to use pesticides due to the availability of subsidies and loan schemes from the government (Kenmore et al, 1987; Conway and Barbier, 1990; Conway and Pretty, 1991).

One of the major repercussions of thinking that male farmers are the only ones involved in pest management is that women are largely ignored in the provision of training and extension on this subject matter. Thus, males automatically become the only target group for community programs (Meir, 1999; van de Fliert, 1999). It does not help that some of these sessions require their trainees to be literate. As the literacy rate among rural women is usually lower than that of men, this effectively excludes a great many women.

On the other hand, though some women are invited to pest management trainings, they face the difficulty of arranging their time at home and in the farm (Tuyen, 1999; Meir, 1999). In the Philippines, women comprised about only 6% of the participants in training activities conducted by the Agricultural Training Institute in 1993 (FAO, 1994). Women are unable to attend unless somebody takes care or takes over her household and farm roles. Men's participation in training courses is usually the result of a personal decision; in contrast, women's participation is somewhat dependent on a collective decision by the whole family. She will have to convince other members of the family of the usefulness of her participation in the training. This is a particularly important issue when trainings last a whole day, or worse several days, and take place outside the women's community. Unless all these factors are considered in pest management trainings, women will continue to be excluded.

Another major repercussion of thinking that pesticide application is only the responsibility of men is that quantification of pesticide exposure is gender-blind. Such stereotyped views of who applies pesticides and how individuals are exposed, eliminates women farmers from pesticide research and policy. In effect, comprehensive data on the prevalence of women's exposure to pesticides and its impact on women's health are lacking (Garcia, 2003). A case in point is on infertility concerns where research is focused on sperm counts, while there is a lack of corresponding research on the effects on the unborn fetus and on women's reproductive cycle (Dinham, 2003a). Additionally, Zahm et al. (1997) pointed out that female farmers and female members of farm families have not been evaluated as extensively as male farmers regarding cancer risks.

Researchers have also assumed that the most popular pest management method, pesticide usage, involves only one step which is spraying or applying the chemicals. And as this step is assumed to be done by males, the contributions of women to pest management are not known. But studies all over the world report that women are a major workforce on various kinds of agricultural fields and undertake activities, one of which is spraying or applying pesticides (Health and Workers Group, 1985; van de Fliert, 1999; Tenaganita and PANAP, 2002; Dharmaraj and Jayaprakash, 2003; Vodouhe, 2003; Reeves and Rosas, 2003). In a banana and pineapple plantation in the Philippines, all sprayers were women. Management explained that they preferred women as sprayers because they do not smoke and are easier to handle (Health and Workers Group, 1985). Women were even reported to do the spraying while pregnant or breastfeeding. There are also cases in Vietnam, Thailand and China where women farmers do the spraying in rice as a consequence of male migration to the cities, lack of capital to hire labor, or the unavailability of hired or family male labor (Paris, 1997). In India and China, spraying pesticides is increasingly becoming the role of women due to the development of the rural economy (Ruifa, et. al, 1997; Dharmaraj and Jayaprakash, 2003), as men move to non-agricultural jobs and leave the field work to their wives.

Furthermore, a detailed look at pesticide usage and management reveals that it is a multi-task responsibility and women are active participants in a number of these tasks. Women, besides doing the spraying or applying of the chemicals, were reported to be mixing the pesticides before application, cleaning pesticide equipment, storing pesticide and pesticide equipment, placing and monitoring pesticide traps around the field or storage areas and so on (Meenakanit, et.al., 1997; Rengam, 1999; Tisch and Poznanskaya, 1999; Reeves and Rosas, 2003; Habib, 2003). Thus, considering pesticide activities as only pesticide application makes the other contributions of women indiscernible. As Dixon (1985) argued, a failure to classify and enumerate labor adequately is one of the main reasons for the failure of official figures to represent accurately the shape of the agricultural workforce. Many studies carried out in several countries over the years indicate that the value of unrecorded activities, a high proportion of which are performed by women, may have ranged between one-third and one-half of measured GNP (Beneria, 1997). In India, the underreporting of women's work force rate in the census varies from 30 to 40% (Kelkar and Wang, 1993). In Bangladesh, statistics showed that 0.8% of women are involved in the agricultural labor force. However, a micro census undertaken by the Agricultural Sector review in 1988 revealed that 42.6% of the rural women report agriculture as their primary and another 12.1 % report it as their secondary occupation (Rothschild and Mahmud, 1990).

In line with this, the method of collecting data on pesticide management is critical in obtaining the correct information on who does what in the farm household, specifically in pesticide management. Interviews and surveys that asked women if they manage or use pesticides may normally get a negative response. But it is possible that if questions are posed more specifically (e.g. Do you mix the pesticides? Do you clean and store pesticide equipment?), women's responses may reveal that they are indeed active participants in pesticide management. Such is the case with rice production where a more detailed questioning of women's roles revealed that more than 50% of their time is devoted to rice farming (Paris, 2000). Additionally, the time allocation method used in data gathering can also be critical. One time allocation method is through recall where each household member is asked about their contribution to each task. The other approach is through direct observation, in which the time allocation of each household member is recorded by an outside observer. These two techniques were compared in a study in Burkina Faso on rural women's time use (McSweeney, 1979). Some 44% of women's work was unaccounted for using recall.

Researchers have also assumed that whatever pest management roles women perform are just an extension of their household tasks. As household tasks are generally unpaid and not considered as part of agriculture, the pest management contributions of women are then unrecorded and unrecognized in most statistics and research. In the case of pesticide usage, some of the activities are probably performed by women as part of their domestic chores such as cleaning pesticide equipment or storing pesticides and pesticide equipment. In effect, these pesticide management activities would seem part and parcel of women's everyday domestic responsibilities. These activities are then internalized as an essential part of women's obligations as wife and mother. This perception is not only shared by the household and outsiders (interviewers, researchers, economists) but also by the women as well.

Moreover, the concept of labor or work adds to the invisibility of women's contributions to pest management. Labor tends to be narrowly defined in terms of work associated with the paid commodity production process or an activity which generates cash income (Reimer, 1986; Waring, 1991; Beneria, 1997; Illo, 1999). This concept of labor ignores a whole realm of conventionally defined "women's work" in the subsistence and reproduction process as it only counts activities in the commercial production (Whatmore, 1991). As some of the pest management activities of the women are guised as household tasks, this labor is then unpaid which discounts the work being performed by women. The pesticide management work of women is left out of the analysis due to the limiting notion of work/labor. This limited conception of labor puts value on the farm work of males but marginalizes women farmers.

2.2. Roles of Women in Pesticide Management

Despite the fact that certain assumptions exist that lead to the invisibility of women in pesticide management, a few studies have started to emerge that document women's roles in pesticide management (Meenakanit, et.al., 1997; Rengam, 1999; Tisch and Poznanskaya, 1999; Reeves and Rosas, 2003; Habib, 2003). However, these studies do not quite focus in detail or expound what women do in pesticide management. As it is, they only point out a couple of pesticide management roles and not much is said about these roles. The various roles pointed in these studies were noted down and the following list was produced:

1. Monitors fields after spraying,
2. Treats the seeds with pesticides,
3. Sprays/Applies pesticide (pre- and postharvest),
4. Mixes pesticides,
5. Handpicks pests after pesticide application,
6. Makes decision (how much to buy, where to buy, etc),
7. Buys pesticide,
8. Carries/Transport pesticides to the field and back to the storage area,
9. Cleans/Recycles pesticide equipment and containers,
10. Disposes pesticide containers,
11. Washes pesticide-soaked clothes,
12. Stores pesticides and pesticide equipment,
13. Place pesticide traps around crop storage areas, and
14. Disposes unused or expired pesticides

An analytical review of the literature reveals that pesticide roles performed by women can be classified into two categories. One is a ***field role*** wherein the women directly handle or have first-hand exposure with pesticides on the field such as spraying, applying manually or mixing the chemicals. Generally, field roles are (1) commonly associated with the male farmer and (2) are usually the only recognized pesticide farm activity in most statistics and research. With these two biases working together, it explains why most pesticide health impact research is not gender-differentiated but focused only on males. However, recent research has found that women do perform this major role (Arumugam, 1992; Dharmajal, 1997; Moses, 2003; Dharmaraj and Jayaprakash, 2003; Vodouhe, 2003). There are documented cases in the Philippines, Vietnam, Thailand, China, Chile and India where women are regularly exposed to pesticides because of their active participation in these field roles (Health and Workers Group, 1985; Paris, 1997; Dharmajal, 1997; Ruifa, et. al, 1997; Dharmaraj and Jayaprakash, 2003). Some of these women even perform these field roles while pregnant or breastfeeding (Health and Workers group, 1985; Moses, 2003; Dinham, 2003). Additionally, if the spraying equipment is not available or too heavy, women will use watering cans or will not hesitate to apply the pesticides manually using their bare hands or leaves as brushes (Dharmajal, 1997; Hulshof and Sagnia, 2003).

The second type of role consists of pesticide activities performed by women as part of their household duties such as cleaning pesticide containers, washing pesticide-soaked clothes, or buying pesticides. Some rural women even rely on washing pesticide-soaked clothes like overalls to generate income (London, et. al., 2002). These activities may also put women in contact with the chemicals. Direct pesticide exposure is possible when they have first hand contact with the pesticides especially when cleaning containers and equipment. A bigger probability is indirect exposure through pesticide drift or residues such as when they are washing pesticide-soaked clothes. In addition, these roles are generally accomplished outside the farm. Due to these characteristics, this ***non-field role*** is generally unrecorded and unacknowledged by government workers, researchers, and even by the women themselves as a pesticide management activity. Regrettably also, the kind of pesticide exposure from these non-field roles is not recognized by women as problematic (London, et. al., 2002). Because women accomplish these pesticide activities in various ways which fit into their domestic chores, the degree of women's involvement in pesticide activities is not visible. On top of this, non-field roles are generally unpaid which may be a major reason why they are not considered as work or reflected in economic statistics as productive.

In the performance of their multiple roles, women are exposed to various levels of pesticides. Furthermore, it is crucial to recognize both types of pesticide management roles to assess the extent and kind of exposure women have from pesticides. It is also important to recognize that chemical spraying or application is not the only pesticide activity in the farm. One should be careful to look for the non-field roles so that documentation of who does what in pesticide management is properly noted.

2.3. Health Hazards of Pesticide Management on Women Farmers

The proper use of pesticides avoids or lessens health impacts on humans. In this section, three issues related to health hazards of pesticide management will be reviewed. The first issue concerns protection and safety practices farmers observe in handling pesticides. The precautions against exposure that farmers practice are discussed. The second is a review of the health impacts and symptoms of pesticide exposure and poisoning focusing on health impacts on women. Lastly, a summary of the treatments or first-aid actions farmers practice when faced with pesticide poisoning is presented.

2.3.1. Precautionary Measures against Exposure/Poisoning

Studies about how farmers protect themselves from pesticide exposure are few. The studies available focus primarily on pesticide practices such as the amount of pesticides applied, the timing or frequency of application or the type of pesticides used (Heong, et al., 1994; Warburton, et al., 1995; Heong, et al., 1997). In almost all of the studies, farmers' precautions against exposure are generally summed up in one short descriptive paragraph. Not surprisingly, studies on what farm women do to protect themselves and their household against pesticide exposure are more difficult to find. This oversight is unfortunate because women play the predominant role in taking care of the household's health in addition to their involvement in pesticide management. Dewar (1996) reported that women were most concerned with farm health and the need for screening particularly from pesticide exposure. In the succeeding paragraphs, a summary of existing protection or safety practices is presented, with most research having male farmer respondents. Though most farmers recognize that pesticides could have some negative effect on their health, this does not necessarily translate into safe handling practices. Overall, the potential for exposure and contamination in handling pesticides is very high. Indeed, farmers' precautionary measures against exposure have been overlooked in pesticide management issues (Rola and Pingali, 1993).

Studies show that most male farmers were aware that wearing protective clothing and equipment while applying and managing pesticides are important (Sakala, 1987; Sivayoganathan, et al., 1995; Vaughan, 1995; Rapusas et al, 1997; Hwang, et al, 2000; Ajayi, 2000; Nicol, 2003). However, knowing the importance of using protective equipment is not enough to convince farmers to use them. For example, the Agricultural Health Study (a project funded by the US National Cancer Institute and conducted with 28,921 farmers who were registered applicators in North Carolina and Iowa) found that less than half of the study population wore eye protection, breathing protection, or protective clothing when applying pesticides (Alavanja, et. al., 1999). Studies in West Africa and Sri Lanka which found men using these protective equipment observed that the materials they use are substandard (Sivayoganathan, et al., 1995; Ajayi, 2000) or uncomfortable to use (Hussain, 1999). For male farmers who do not use any protective clothing, Ajayi (2000) and Dinham (2003b) cited economic (high cost and lack of money), non-availability, lack of information, and heat as reasons. For women farmers, most of them did not use any protective clothing at all and they cited the same reasons given by the male farmers from the Ajayi and Dinham's studies (Rengam, 1999; Garcia, 2003). In addition, London and Rother's (2003) study of women farmers on fruit farms reported that hand protection tends to interfere with dexterity thus; they opt not to wear any gloves. For those who do use protective clothing, many of these women farmers thought that protective clothing meant a handkerchief over their face or a facemask (Rengam, 1999; Hwang, et al, 2000).

In line with the use of protective clothing, it has been revealed that such clothing has been found to retain residues (Coffman, Obendorf and Derksen, 1999). As a result, those who wash these clothes are potentially exposed to pesticides while laundering (Gladen, et. al., 1998; Grieshop and Stiles, 1994). Only two studies have explicitly researched farm laundry practices, and both found the majority of farms used the family washing machine to wash clothing worn during applications, although most kept the laundry separate (Gladen, et. al., 1998; Curwin, et. al., 2002).

In terms of reading labels before using the pesticides, women and men farmer's practices are almost the same. In a study of male Lao farmers, more than 90% of the respondents did not read labels carefully (Rapusas et. al., 1997). This was the same practice in a study of Indian women (Sawhney, 1995), in which most women farmers reported they did not read the information about pesticides given on the labels or packets of pesticides purchased. The study added that these women were purchasing the pesticides from their landlords thus, they were not concerned with instructions.

With regards to avoiding eating or smoking while spraying, farmers have differing practices. Lao farmers cited that eating or smoking should be avoided while spraying (Rapusas, et al, 1997). For vegetables farmers, it was noted that it is not unusual for farmers to eat, drink or smoke while applying pesticides, or on a break, without washing hands (Sodavy, et al., 2000; Dinham, 2003b). And in a study in Sri Lanka, women farmers were found to be chewing betel as they spray (Rengam, 1999).

One study showed that pesticide applicators appear to recognize the consequences of spraying against the wind, and they take precautionary measures to observe the direction of the wind before they start spraying (Ajayi, 2000). But what they use as indicators to determine wind direction is usually informal (plant leaves, flag/cloth, smoke, sprayer vapor, etc).

One particular practice specific to women farmers was caring for their children while working in the fields. Even during spraying operations, the children were in the vicinity; their mothers were carrying them while applying pesticides or women farmers were breastfeeding their children in the fields (Rengam, 1999). The same study found that children were asked by their mothers to carry the pesticides and store them in their homes.

After pesticide application, farmers often take a bath (Rapusas, et al, 1997; Ajayi, 2000). In addition, after pesticide application, spray tanks were commonly washed in the nearest river or stream – which is also used for bathing, for watering, and for bathing animals (Rengam, 1999).

Farmers disposed of pesticide containers and equipment in various ways. Unfortunately, most of the practices do not conform strictly to recommendations. Most of the households leave the pesticide containers in the field, or thrown in the bushes, in irrigation canals, near streams, around the house, or in unused wells (Normiyah and Chang, 1997; Rengam, 1999; Ajayi, 2000; Sodavy, et al., 2000; Dinham, 2003). These practices can be dangerous such as when children in Sri Lanka were seen playing with used containers (Rengam, 1999). For some farm households, pesticide containers are reused by the households or by other persons, especially when sold (Dharmajal, 1997; Rengam, 1999; Ajayi, 2000). In a Pakistan study, containers were reused by the household for spices, oil, food and medicine (Rengam, 1999) which gives pesticide residues an easy entrance into the body. In India, ice cream vendors buy these containers to transport ice cream, milk, and other ingredients (Dharmajal, 1997; Dharmaraj and Jayaprakash, 2003). Some women farmers in rural India, though aware that the containers may contain poison, still reuse the containers because of the perception that the poison could be removed by soaking or rinsing (London and Rother, 2003). On the other hand, cotton farmers discard their faulty spraying equipment by selling them to scrap merchants who have no facilities for removing pesticide residues (Hussain, 1999). Other farmers burn or bury the containers in the soil (Normiyah and Chang, 1997; Ajayi, 2000).

Male and female farmers use similar storage practices. Unfortunately, most of them have never linked pesticide exposure to their storage practices (Nicol, 2003). The most popular storage place is in the house or rooms within the household, with little or no special storage for pesticides (Sawhney, 1995; Normiyah and Chang, 1997; Rengam, 1999; Ajayi, 2000; Sodavy, et al., 2000). Many farmers admitted negligence or carelessness in that they kept and placed the chemicals near food or where children could easily reach them. It is possible that farmers attach a greater premium on the possible financial risks of losing their chemicals (e.g. to thieves) than the possible health risks to their family resulting from the possible accidental poisoning from these chemicals.

2.3.2. Health Impacts and Symptoms of Pesticide Poisoning

With the different roles women play in pesticide usage and management, they are routinely exposed to pesticides and health risks. Unfortunately, relatively few studies have analyzed the extent and health impact of pesticide exposure by gender because of the gender biases that exist in this major farm activity. The failure to address this area is troubling because women have a particular susceptibility to pesticides due to their physiological characteristics, lifestyle, and behavior. Farm women are at a great risk of accumulated exposure because of long working hours from an early age and multiple exposures at work and domestic settings (Rother, 2000).

Women's physiological difference from men has a major impact on the way women are affected by pesticides. The skin is the body's largest organ and 90 percent of pesticide exposure occurs through the skin. Women have thinner skin than men and they may absorb more pesticides under similar levels of exposure (Tenaganita and PANAP, 2002). This predisposes women to higher absorption of chemicals into the body. In addition, persistent pesticides have a tendency to accumulate in fatty tissue and can stay in the body for many years. In view of the fact that women have proportionately more body fat than men, accompanied by regular hormonal changes through the reproductive cycle, they potentially store more pesticides in their bodies (Tenaganita and PANAP, 2002; Reeves and Rosas, 2003).

Studies have also shown the link between a variety of reproductive health impacts on women from pesticide exposure. Women farm workers are often exposed to organochlorine and organophosphate pesticides which have been linked to elevated risks of reproductive problems (Sever, et.al., 1997). As a consequence, increased incidence of miscarriages, stillbirths, and delayed pregnancies among women agricultural workers and wives of men employed in pesticide mixing and spraying have been noted (Ransom, 2002). There is also evidence of increased risk of birth defects from parental exposure to pesticides (Tenaganita and PANAP, 2002). One California study found that limb reduction defects among offspring of agricultural workers occurred three to fourteen times more frequently than among the general US population (Schwartz, et al, 1986). A follow-up study showed 1.6 times greater risk for limb reduction defect when parents were involved in agriculture (Schwartz and LoGerfo, 1988). The risk was greater when mothers lived in countries with high agricultural productivity and high pesticide use. A study of grape workers in India reported that exposure to pesticides resulted in almost six times the spontaneous abortion rate of non-exposed couples, as well as significantly greater chromosomal damage (Rita, et.al., 1987). In addition, specific herbicides, such as 2,4-d, and 2,4,5-T, have been found to disrupt estrogen cycles in women (Schetler, 2002). Other pesticides such as aldrin, dieldrin, chlordane, and toxaphene can also disrupt reproduction hormonal cycles (Ransom, 2002).

Studies on cancer of women with pesticide exposure are slowly increasing as well. In Colombia, Mexico, and Sweden, exposure to insecticides was detected as a risk factor for female breast cancer (Olaya, et.al., 1998; Romieu, et.al., 2000; Hardell, 2003). Some studies show that women experience increased risks for cancer of lymphatic and blood tissues due to pesticides (Zahm, et. al., 1993; Kristensen, et.al., 1996; Zhong, 1996; Folsom, et.al., 1996; Khuder, 1997). A few observations are also available on increased incidence of cancers of the bladder (Kristensen, et.al., 1996), ovary (Donna, et.al., 1984, 1989), thyroid (Inskip, et.al., 1996), and cervix uteri (Stubbs, et.al., 1984; Wesseling, et.al., 1996) due to pesticide usage.

Topical injuries are also common among women affected by pesticides. High rates of dermal and eye injuries are widespread among women as they are by and large responsible for the cleaning or washing of materials and equipment used or worn for pesticide application and these women lack protective clothing when they do the application themselves. These types of health impacts have been documented in fruit, cotton, and ornamental plantation female workers in Latin America, the Philippines, California, and Malaysia (Health and Workers Group, 1985; Tenaganita and PANAP, 2002; Habib, 2003; Wesseling, 2003; Reeves and Rosas, 2003).

There are also pesticide-related illnesses which are mild and moderate that have been reported by women farm workers. Some reported symptoms are headaches, dizziness, tiredness, nausea, vomiting, and coughs (Pesticide Post, 1994; Habib, 1996; Vodouhe, 2003; Reeves and Rosas, 2003). These illnesses are non-specific and may be confused with common ailments or flu-like illnesses and as such, under-reporting of these illnesses as pesticide-related is common. Other cases go unreported for lack of access to health care, since many farm women work in areas chronically short of physicians and hospitals (McCraken and Conway, 1987; Slesinger, 1992). But even when services are available, the physicians are often not trained to recognize symptoms of pesticide poisonings, fail to consider possible occupational exposure, or are not familiar with the tests to be conducted (Moses, 1992; Dinham, 2003a; Reeves and Rosas, 2003).

These studies illustrate the extent of pesticide health risks women face and the urgency for action and change. Although some studies may require more confirmation, the need for further study should not hamper urgent mitigation. The next generation is likely to be at risk if exposed in the womb, as is the generation after that. Greater focus of research on exposed women is seriously needed. The strategy to collect information on exposure circumstances, awareness of pesticide health impacts, and pesticide management/usage practices of women is the first step in getting more precise information about the linkage between women and pesticides.

2.3.3. Treatment Practices for Pesticide Poisoning

With all the health hazards women encounter with pesticide exposure, a review or analysis of their treatment practices would logically seem to follow. Unfortunately, no study has been found that fully documented or focused on this phenomenon. A possible reason for this is the relatively recent concern with the issue of women and pesticide exposure. Another reason is that pesticide poisoning is underreported because many farmers do not receive care or treatment and in many cases, the association between illness and exposure is not recognized by the farmer themselves or even by the primary care physicians. In any case, the very few studies that have documented women's treatment practices cited specific incidents shared informally by the farmers with the researchers.

Women in Pakistan who were informally interviewed found the question on how they treat symptoms of pesticide poisoning ridiculous (Habib, 2003). The women reported that it is not possible to acquire medicine for small ailments. Other women in this study used local remedies such as applying mustard or butter oil for cases of skin burning. One respondent reported that she took medicines but after three or four days the health problems returned. In another study in Pakistan, farmers ate yoghurt and pickles (Hussain, 1999). In the case of Cambodia where 210 vegetable farmers (30% of which are women) were interviewed, the farmers consumed sugar cane, lemon juice, honey, tamarind, medicinal/herbal tea and “coining” which is applied to “release the intoxication/illness” (Sodavy, et al., 2000). In Ajayi’s study (2000), if the farmer thinks he/she has been exposed to pesticides, he/she may drink lemon juice and or massage the body with shea butter oil. It would seem then that farmers think that pesticide poisoning can be self-treated by drinking some local remedies or applying some oil/concoction to the skin.

A few studies suggest that women do not do anything in cases of pesticide poisoning for several reasons. In the case of Habib’s study (p. 3, 2003), one of the farm women remarked that “unless we are unable to move, we do not think of going to a doctor or taking medicine”. In India, the women were found to have no recourse for action and were used to tolerating any discomfort in order to appease hunger each day. The study also added that medical facilities were beyond people’s reach, in relation to both distance and money, and that no landowners provide first aid near the field. Therefore, it would seem that even though women would like to treat cases of pesticide poisoning, their lack of resources or opportunities prevented them from doing so.

For acute pesticide poisoning, one study reported that crab and tamarind juices, salt solution, and excreta of pigs serve as first aid to the farmers, mostly being used to induce vomiting (Dharmaraj and Jayaprakash, 2003). In the case of Cambodia, the farmers reported that they had called for the doctor to cure them at home or they went to the hospital (Sodavy, et al., 2000). Additionally, Korean rural farmers, both male and female, reported that they sought medical treatment because of their pesticide-related illnesses (Sohn and Choi, 2001). The majority of these farmers were required to be admitted to a hospital at least overnight.

2.4. Factors that Affect Women's Involvement in Pesticide Management

Individual, household, and farm characteristics of women farmers may potentially effect the extent of their involvement in pesticide management. The perceived level of control women have on pesticide usage may also impact their involvement. For this research, the following variables will be analyzed to see how they influence women's involvement in pesticide management: age and educational attainment of the women, marital status, presence of male household members, presence of children, farm size, tenure status, membership in farm organizations and perceived level of control over pesticide usage.

Age is an important socioeconomic characteristic which may reflect changing attitudes and roles. Mohai and Twight (1987) suggested that people may become more cautious and conservative due to the biological, psychological and social changes they experienced as they grow older. Older women are often seen as traditional people who have always had a lower position in agricultural production (Wang, 1996; Zhou, 1996).

In contrast, younger women were found to make many production decisions and are able to produce rice by relying on their own knowledge and strength (Ruifa, et al, 1997). In a study of farm wives in seven states in the US, it was found that younger wives are more likely to carry on multiple roles (Draughn, et.al., 1998). The same is true in a study in North Dakota where younger farm wives were likely to take more active roles in farm labor (Pankow, et. al, 1991). Furthermore, in a study of women's role performance in animal husbandry, age had a significant negative correlation with role performance (dr. Bora, 2000). Considering this scenario, it is hypothesized that the older a woman is, the lesser roles she would perform in the farm.

Married women, especially those from rural and agricultural areas, are traditionally thought to be responsible for most of the household chores and childcare responsibilities. The husband was expected to be the one primarily working in the farm to provide the basic necessities for his household (McCoy, et al., 2002). If ever the married women are asked to help in the farm, this would be very minimal and is done to save on labor costs. This kind of set-up reduces or completely cuts women's farm involvement. On the other hand, women who are single, widowed or separated, especially those who are land owners, tend to be more involved in farm production as they have full control of all the farm activities (Pearson, 1979; Sachs, 1983; Ezumah and Domenico, 1995; McCoy, et. al., 2002). Taking these various factors into consideration, marital status may be a predictor of women's involvement in the farm. For this research, it is expected that married women have lesser involvement in pesticide management.

Education refers to the number of formal years of schooling the individual has attended. It is a factor that may influence the responsibilities or roles that a person is assigned to. It is possible that the more educated a person is, the more roles she will perform because she will be able to handle these duties with the knowledge she possesses. This was found true in a study of farm women in the US where more educated wives were more likely to carry out multiple roles to a greater degree (Draughn, et.al., 1988). Bearing this is mind, it is predicted that the more educated a woman is, the more involved she will be in farm work.

In recent years, women in farming communities from Africa, Thailand, China, and the Philippines have assumed increasing responsibilities or participation on farm work as men abandon agriculture to seek better-paying jobs in urban areas (Eviota, 1992; Ezumah and Di Domenico, 1995; Meenakanit, Escalada and Heong, 1997; Ruifa, et al., 1997). As men found more steady jobs in nonagricultural industries or waged employment, crop production became the responsibility of women in the farm households. Therefore, it is expected that the presence of male members in the farm household decreases the involvement of women in the farm.

In rural or agricultural areas and developing countries, taking care of the children is usually the entire responsibility of the women (Eviota, 1992; Meir, 1999; McCoy, et. al., 2002; Attanapola, 2004). In such a scenario, women or farm wives are expected to devote the majority of their time to child care while the husband goes to work or farms. This is confirmed by studies in rural Honduras, in Catalonia, Spain, in North Dakota, and in a national survey of US farms where it was found that households with children had decreased women's involvement in the farm (Jones and Rosenfeld, 1981; Ramon and Canoves, 1988; Pankow, et. al, 1991; Paolisso and Gammage, 1996). In the Honduras study, for women with pre-school sons and daughters, childcare responsibilities forced women to reduce their work in corn production and school-aged children's agricultural labor was substituted for women's labor. In effect, having young children in a household lessens the opportunity for adult women to engage in other activities or work. This is a similar reason why women's participation in agriculture training is low - women are unable to attend unless somebody will look after her children (Meir, 1999).

One of the most important observations in the comparisons of land owning and landless farm workers in the Philippines is that there is more participation of women in the landed households (Polestico, 2003). In the landless families, the women were found to have smaller roles in farming. A reason given by the study is that agricultural labor is generally paid and the ones who would access or are given opportunities to earn this income are mostly men. Given this finding, tenure status would be expected to be a good predictor of women's involvement in pesticide management.

The extent of involvement in pesticide management may also be affected by farm size. Filipino women from households which have large landholdings were found to withdraw from farm work to engage in other paid work such as managing retail stores or trading; while others withdrew from productive work altogether (Eviota, 1992). In these households, men were the main workers in the fields thus giving women fewer chances to make decisions or to participate (Ruifa, et al, 1997). It is also possible that women from larger landholdings represent wealthier households who have the resources to hire labor for farm work thus, freeing women to do other activities. In smallholding households, women extensively served as family labor in order to reduce the total cost of hired labor. Women concentrated their labor on the farm and consequently became largely unpaid family workers. This was found to be true in various studies conducted with farm women as respondents. In rural Honduras, women's involvement in the farm increases when they have smaller farm sizes (Paolisso and Gammage, 1996). A similar result was obtained in a study conducted in several states in the US wherein wives from smaller farms were more likely to participate in several roles than women from large farms (Draughn, et.al., 1988; McCoy, et. al., 2002). Additionally, a study of rural women in Turkey revealed that female household members from small landholdings worked long hours in the field or often worked as wage laborers for larger farms when they have finished their own fields (Morvaridi, 1992). With this in mind, it is hypothesized that the smaller the farm size, the more roles women perform in pesticide management.

Being a member of a farm organization may relate to a person's extent of participation in the farm. Farmers who have major agricultural roles are the ones who may want to become members of farm organizations compared to those who have minor roles only or none at all. It has been noted also that with the increasing recognition of women's contributions to Philippine agriculture, women members in farmer's associations have increased from 16% in the early 1980s to 26% in the early 1990s (FAO Fact Sheet, 1994). It is also possible that members of farm organizations have more access to farm information and training which equips them with the necessary skills to perform more farm roles. Hence, membership in farm organizations may very well predict women's extent of involvement in pesticide management. It is expected then, that women who are members of farm organizations are more involved in pesticide management.

The level of control women perceived they have may influence their involvement in farm production activities. The more control a person has over an activity, the more likely she will be involved in this activity. Sawer (1973) and Rosenfeld (1985) found that when farm wives have more control on farm decision-making, the more active she is on farm work. Additionally, Buttel and Gillespie (1984) expounded that generally men have more farm roles (than women) as they have more control because of the power and authority traditionally assigned to them by society. It is expected then that more control a woman perceived she has over pesticide usage, the more likely she will be involved in pesticide management activities.

2.5. Factors that Affect Women's Knowledge of Pesticide Health Impacts

Socio-demographic characteristics of the women, farm characteristics, and the extent of involvement of women farmers in pesticide management may be key factors in explaining differences in women's knowledge of pesticide health hazards. The following variables will be reviewed to see how they may influence women's level of knowledge of pesticide health hazards: age, marital status, educational attainment, number of male household members, tenure status, farm size, number of children, and membership in farm organizations. In addition, the extent of involvement of women in the farm will be reviewed to see how it impacts their level of knowledge.

One study found that young people show greater sensitivity to the negative impact of pesticides on human health (Traxler, 1995). The age factor was supported by Dunlap and Beus' (1992) study which found that younger adults tend to show more concern over pesticide usage than older adults. In addition, a study of adult farm workers in New York found that older farmers, after many years in farming, felt that new efforts to protect their health were unnecessary (Hwang, et al., 2000). If this is the case, it is possible then that younger women will have more knowledge of the health hazards of pesticide usage.

Married women may not be very active on the farm possibly due to household and childcare responsibilities. Thus, married women may perceive themselves to be at lower risk of pesticide exposure which may make them less likely to seek information or be interested with pesticide health impact issues (Meeker, et al., 2002; Ontario Farm Family Health Study, 2003). In addition, farm trainings or seminars usually invite the male head in a farm household rather than the wife. These situations limit women from learning farm related information and issues. It is then hypothesized that married women have lesser knowledge of pesticide health impacts.

Education is an important factor that may have bearing on one's level of knowledge. Formal education allows individuals to have a closer contact with scientific and technological issues (Traxler, 1995). A telephone study of Idaho residents by Dunlap and Beus (1992) found that respondents with higher levels of education were found to be more concerned about pesticide usage than their counterparts. Level of education was also found to be positively associated with awareness of protective measures for Sri Lankan male farmers (Sivayoganathan, et al., 1995). In studies of women farmers from developing countries, most of them were not able to read which decreased their ability to heed the safety warnings offered on pesticide labels (Rengam, 1999; Garcia, 2003). Likewise, Chikuni and Polder (2003) reported that level of education can explain gender differences in knowledge of potential toxicity of DDT in countries like Zimbabwe. Thus, education may be a good predictor in determining women's knowledge of pesticide health hazards. It is expected then that the more education a woman has achieved, the more knowledgeable she is of pesticide health impacts.

It has been established in the past sections that pest and pesticide management extension services are geared toward male farmers due to cultural perceptions of agriculture as men's work. A study even reported that sons were given more opportunities to learn about farming than daughters because sons were considered the future farmers (Zeuli and Levins, 1995). In addition, there are also cases where men do not like or refuse permission for their wives to participate in agricultural courses (Bradshaw, 1999). For these reasons, having a male household member may mean that less (or none at all) pesticide-related information reaches women farmers.

It is possible that women from landed households will have more interest in acquiring knowledge about farm related issues as they would want more returns from their hard-earned land. It may also follow that as women from landed households have more roles, these women would be more attuned or exposed to farm related issues. In a study of adult New York farmers, owners/operators were more aware than farm workers of the need for personal protective equipment when using chemicals (Hwang, et al., 2000). Thus, tenure status may be a possible predictor of women's level of knowledge with regards to the health hazards of pesticide exposure. It is hypothesized then that women from land-owning households are more knowledgeable of pesticide health impacts.

As increasing farm land holdings has been found to decrease women's farm contributions (Draughn, et.al., 1988; McCoy, et. al., 2002), it is possible then that women's level of knowledge regarding farm issues will also decline. Bigger landholding means fewer roles for women and eventually less enthusiasm to acquire more farm knowledge.

A recent US study found that having children resulted in an increased concern about pesticides (Govindasamy, Italia, and Adelaja, 1998). This was also the case in two nationwide studies where households with more children were more concerned about food safety (Diaz-Knauf et al., 1999; Bruhn et. al., 1992). It is possible then that farm women who have young children will strive to be informed of the health impacts of pesticide to protect their children.

Farm organizations provide forums where farmers may share their resources and discuss farm issues/concerns (McPherson and Smith-Lovin, 1982). Farm organizations may even be contacted by institutions or companies to showcase the latest farm technologies or to present experiment or laboratory results. Therefore, being a member of farm organizations may actually inform women of the health issues regarding pesticide management.

Women who have more farm roles may be more active in pursuing farm knowledge which includes pesticide management. More knowledge may mean more skills and capabilities to efficiently or effectively carry out one's pesticide management roles. In addition, being more involved (or performing more roles) in pesticide management will greatly inform women of the different activities and issues regarding this farm activity. In Sawer's study (1973) of married farm couples in Canada, she found out that farm wives who were more active on the farm were likely to seek information about farm matters. These farm wives felt that such roles should be accompanied by responsibility for gathering information relevant to their roles. In this sense, informationseeking behavior becomes purposive. Thus, the extent of women's involvement may very well predict her level of knowledge on farm issues. It is expected then that women who have more pesticide management roles are likely to be more knowledgeable of pesticide health impacts.

2.6. Conceptual Framework

This section develops a conceptual model aimed at explaining the involvement of farm women in pesticide management and their knowledge of the health hazards associated with pesticide use (see Figure 1, p 45). Based upon the review of literature, the following hypotheses (in order of the research questions posed) state the expected relationships with the dependent variables:

1. What are the roles of women farm workers in pesticide management for rice and vegetable systems?

Hypothesis 1.a. Women are more likely to perform field roles in vegetable pesticide management than in rice pesticide management..

Hypothesis 1.b. Women are more likely to perform non-field roles in vegetable pesticide management than in rice pesticide management. .

2. What factors influence farm women's involvement in rice and vegetable pesticide management?

Hypothesis 2.a. Higher education, land-owning households, perceived level of control, and membership in farm organization are associated with increased involvement of women in pesticide management activities.

Hypothesis 2.b. Younger age, being married, having male household members, having children, and large farm size lower women's involvement in pesticide management activities.

3. What is the level of knowledge of farm women on the health hazards of pesticides?

Hypothesis 3. Women farmers have low levels of knowledge of the health hazards of pesticides.

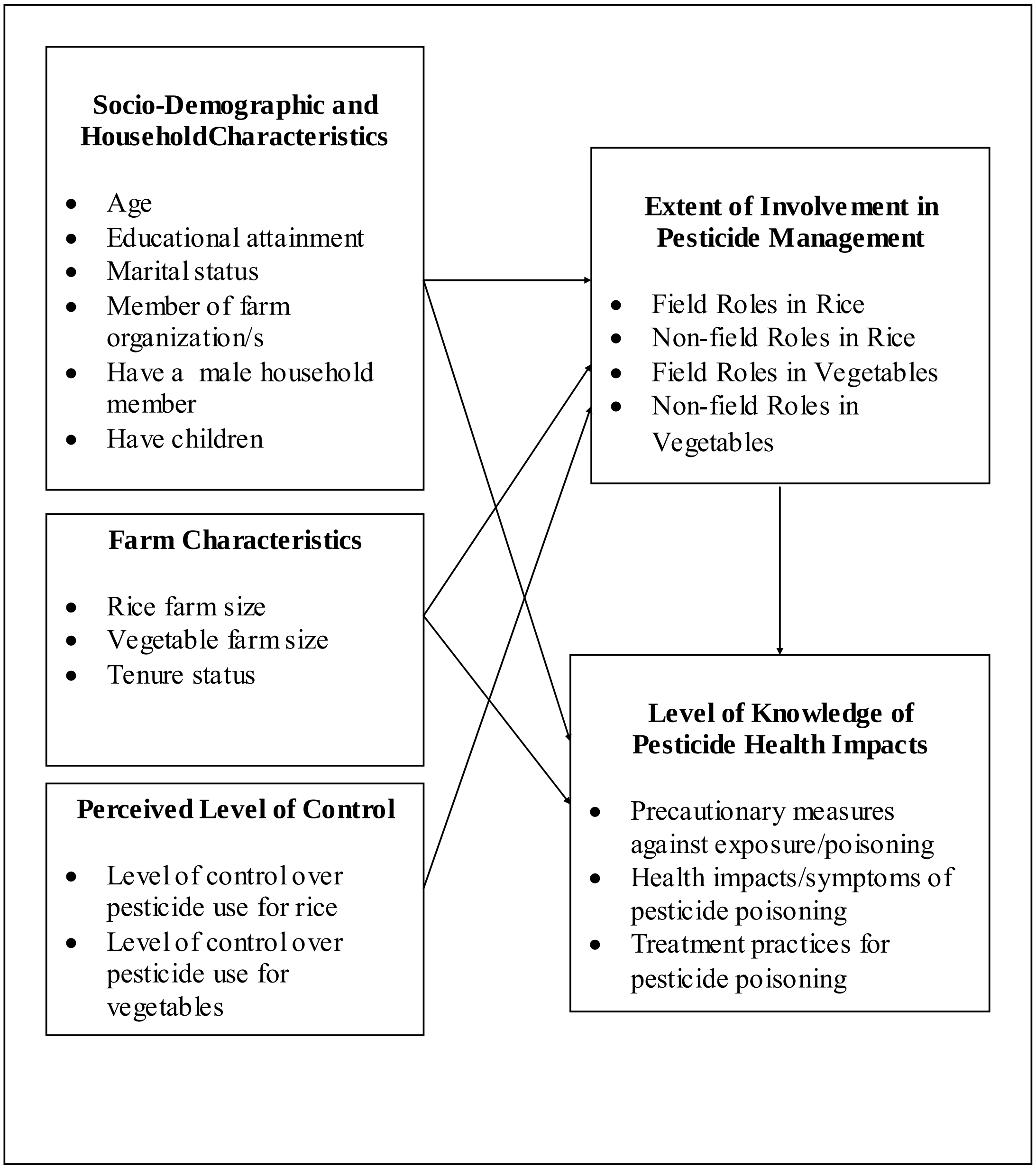
4. What factors influence women farm workers knowledge of the health impact of pesticides?

Hypothesis 4.a. Higher education, having children, membership in farm organization, land-owning households, and perceived higher level of control are associated with an increase in women's level of knowledge on the health hazards of pesticides.

Hypothesis 4.b. Younger age, being married, having male household members, and bigger farm size decrease women's level of knowledge on the health hazards of pesticides.

Hypothesis 4.c. Involvement in pesticide management tasks is associated with increased knowledge and this relationship is stronger for those involved in field roles than for those in non-field roles.

Figure 1. Conceptual Model of Women Farmer's Roles in and Knowledge of Pesticide Management



Chapter 3

METHODOLOGY

This research mainly relied on primary data collected in three municipalities in the Philippines using a structured questionnaire administered to female farmers. Focus group discussions were also conducted with women leaders to improve the questionnaire and to partly substantiate the quantitative data. The survey questions focused on women's extent of involvement and level of knowledge with regards to pesticide management. The survey instrument administered to the female farmers was developed specifically for this research project.

The following sections describe in detail the research setting, data sources, sample selection, data collection, and data analysis. Human subjects approval for the entire project was obtained from the Office for Research Protections, The Pennsylvania State University (approval number IRB# 18674).

3.1. Research Setting

The survey was conducted in three municipalities from the province of Nueva Ecija, Philippines namely, San Jose, Bongabon, and Sto. Domingo (see Figure 2). These are all Integrated Pest Management Collaborative Research System program (IPM CRSP) sites. Nueva Ecija is located 150 kilometers north of Metro Manila in the Central Luzon region. Agriculture is the main industry of the people because of its naturally rich soil. In fact, the province is a primary rice producing area and also a major source of onions for the country. Other lowland crops such as corn, vegetables, spices, and sugarcane are also

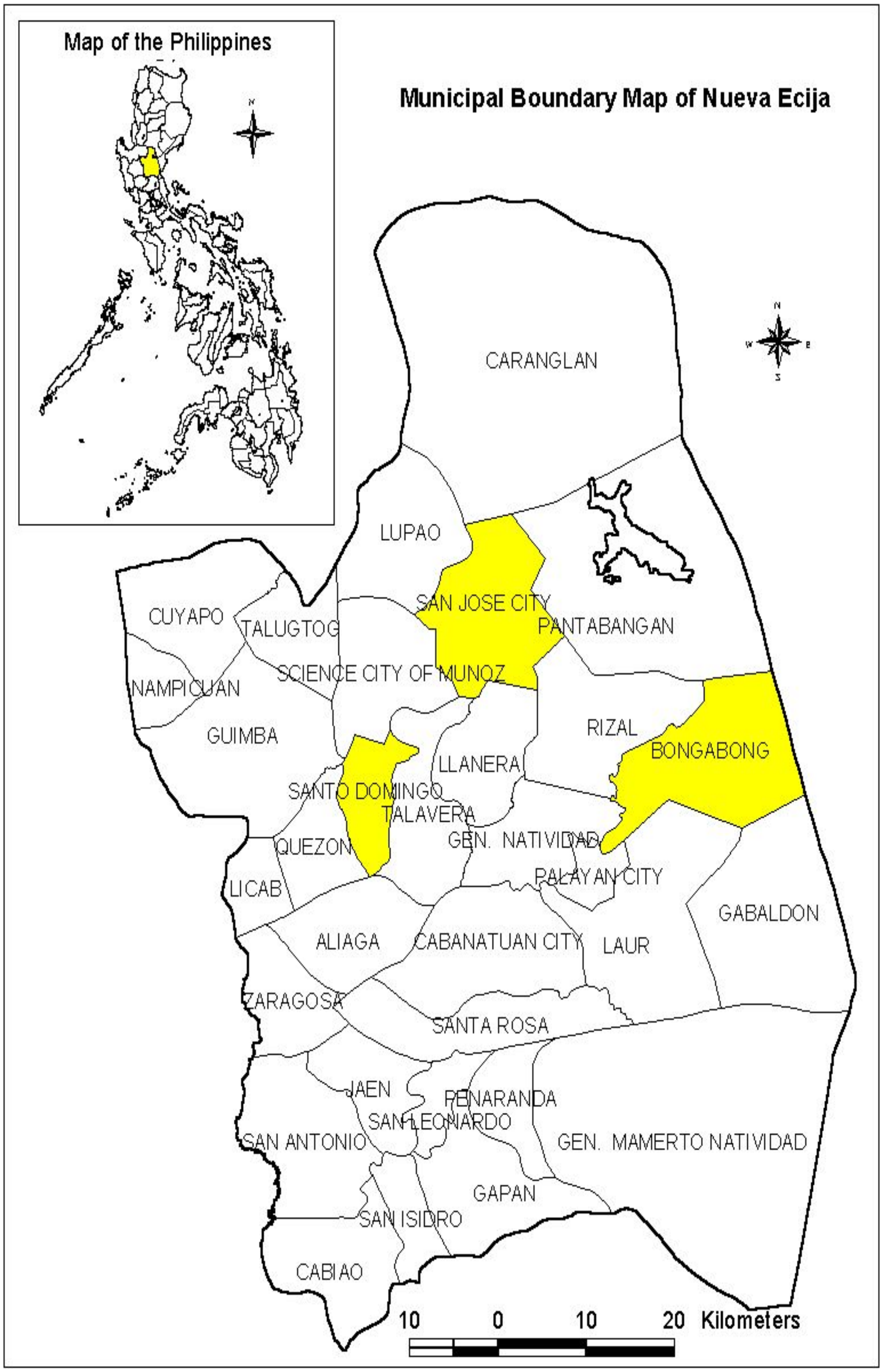


Figure 2. The research municipalities in Nueva Ecija province (inset map shows location of Nueva Ecija in the Philippines)

produced in great quantities in the province. Agriculture has played a vital role in molding the culture of the people. The typical Nueva Ecijano family is tightly knit and is the basic working unit on the farm.

Nueva Ecija has been the target of several pesticide studies in the past. A farmer survey (Lazaro, et. al, 1995) and IPM CRSP participatory appraisal activities (Norton, et.al, 1999) with rice-vegetable farmers in Nueva Ecija found that heavy pesticide use on vegetables as well as apparent pesticide misuse are common in the province. Rola and Pingali (1993) conducted a study in the province and found that frequent application of highly toxic chemicals has resulted in health damage from chemical exposure which affected the farmer applicator and exposed the whole household to an increased risk of chemical poisoning. Several baseline surveys were also conducted in the area as part of the research for IPM CRSP and results showed that pest control practices in rice and vegetables were found to be very similar, with farmers relying mostly on pesticides to manage insects and diseases (Heong, et al, 1997; Tanzo, et al, 2001).

These studies suggest that pesticide usage is a norm in the province, involving heavy use and/or misuse of pesticides. Therefore, having Nueva Ecija as a research site should provide a rich source of information and insights regarding pesticide management. In addition, as the survey focused on the three IPM CRSP sites, this study enriches the program's socio-economic research component. Furthermore, it contributes to the broader inter-disciplinary research being conducted at Nueva Ecija by PhilRice, which is the main collaborating institute of IPM CRSP in the country.

The following section describes in brief the three survey municipalities:

3.1.1. San Jose Municipality

San Jose is one of the three major cities in Nueva Ecija province. This city serves as one of the principal trading and commercial centers of the province. It has a total land area of 18,725 hectares with a population of 108,254 (NSO, 2000). More than 50% of the total land area is agricultural (9,628 ha), with 6,644 ha (69%) irrigated and 2,982 ha (31%) rainfed. Rice is the main crop in the area. Other field crops grown are maize, root crops, legumes (mungbean, peanut, cowpea, and pole string beans), vegetables (cabbage, pechay, mustard, lettuce, bittergourd, eggplant, squash, tomato, patola), and spices (onion, garlic, sweet, green, and hot peppers). Rice is usually planted in June, July, or August, and vegetables in October, November, or December. Sometimes, two vegetable crops are grown in the dry season, with the second crop starting in January, February, or March. Intercropping is quite common, particularly for those farmers who grow more than one vegetable crop per season. About 62% of the farmers in San Jose are managing farms of 1-3 hectares. More than two-thirds of the farmlands are rented or leased and only 22% are fully owned. In 1990, San Jose had a farmer population of 4,800 in 38 villages called “barangays” (Nueva Ecija Brochure).

3.1.2. Bongabon Municipality

Bongabon is one of the largest onion producers of the province. It produces about 60 percent of the country's total onion harvest. It has a total population of 49,255 (NSO, 2000) with a land area of 28,352.90 hectares. More than half of the population (65%) lives in the rural area with farming as a major source of income. The total rice area in the municipality is 5,635.90 ha while total vegetable area is 2,609.50 ha. Other crops commonly planted in the area are hot and green pepper, corn, soybeans, eggplant, tomato, and a variety of root crops.

3.1.3. Sto.Domingo Municipality

Sto. Domingo has a total land area of 9,569 hectares or about 1.8% of Nueva Ecija's total land area. It is estimated that of the municipality 's total area, roughly 90.8% or some 8688.18 hectares are devoted to agriculture while only 9.20% or a mere 880.18 hectares is utilized for other purposes such as residential, commercial, institutional, industrial and open spaces, etc. The town of Sto. Domingo has a total household population of 40, 992 (National Census of Population, 1995). The town's economy largely depends on agriculture. The primary crop planted in the municipality is rice, while secondary crops are onion, tomato, white/green corn, bittergourd, hot and green peppers, squash, and watermelon. Though the hectarage planted for onion is quite large, the average production however is lower than the provincial average. The farmers are heavily dependent on the use of inorganic fertilizers, which apart from being expensive, are destructive to the environment.

3.2. Data Sources

The main source of data for this research was collected from female farmers using an interview schedule. A Focus Group Discussion (FGD) was also conducted with two sets of female farm leaders. The FGD was primarily done to improve the questionnaire and secondly, to partly substantiate the quantitative data from the female farmers.

3.2.1. Focus Group Discussion with Female Farm Leaders

3.2.1.1. Sample selection

For female farm leaders, purposive sampling was used. Local government officers in the survey areas were consulted in coming up with a list of active farm women leaders in the chosen municipalities. To make the focus groups as homogeneous as possible, it was decided that for each municipality the female farm leaders were grouped into two. The first group consisted of *female farm technicians* and the other group consisted of *female farmer leaders*. The female farm technicians were local government extension/agricultural officers. The female farmer leaders were women engaged in farming and were recognized farm leaders in their areas. At least 5 - 10 leaders were in each group.

3.2.1.2. Data Collection

A focus group discussion (FGD) with the female farm leaders was conducted in each municipality. The FGD collected information from female farm leaders specifically concerning the following areas: (a) the roles women farmers play in pesticide management; (b) their perceptions on the health impacts of pesticides; and (c) their treatment practices regarding pesticide poisoning. The researcher acted as facilitator of the FGD and was assisted by a PhilRice research staff member. The latter recorded the discussions and helped set-up the discussion area. The use of some Participatory Rural Appraisal (PRA) tools such as the card and grouping techniques were employed to make the discussion more lively and assured more participation from the leaders (Bartle, 2005).

To learn what activities female farmers participate in pesticide management, the leaders were engaged in a general discussion. They were asked the specific question: “What do female farmers do in pesticide management?”. Answers were written by the facilitator on a manila paper. Once the leaders felt they had given all the answers, the facilitator then recited to the group other possible roles women were observed to perform in pesticide management (this was based on the questionnaire to be administered to the female farmers and the review of literature for this study). The group reacted by agreeing or disagreeing to these roles. They were then asked to analyze why they did not mention these other roles. After which, the farmers were asked if they want to add any other role to the list. This activity was important in validating the list of roles in the questionnaire.

To get information about their perceptions on the health impacts of pesticides and their treatment practices, each female leader was given some paper and a pen. They were asked to write down what they believed were the possible health impacts of pesticide exposure. Their answers were collected and then taped on a manila paper. Once all the answers were put up on the manila paper, the facilitator then asked if they had anything to add or delete. Then, these responses were grouped by the facilitator as to whether they are short or long-term pesticide health impacts (see Appendix B for a sample of this FGD output). The same process was followed in asking the leaders what they felt should be the treatment to take when pesticide poisoning happens.

3.2.1.3. Data Analysis/Usage

The FGD was conducted to primarily help refine the survey questionnaire, particularly the area on roles of female farmers in pesticide management. In addition, it was used to substantiate the data from the farmers.

Based on the FGD, the list of roles female farmers perform in pesticide management was validated. Initially, the female leaders mentioned field roles only particularly, monitoring and handpicking pests after pesticide application. When the facilitator asked if they see farmers performing the various non-field roles, they unanimously agreed that farmers are doing these activities also. The farmer leaders also added that spraying and mixing pesticides were being done by the female farmers and they cited situations when these are being done. Therefore, the 14 pesticide management roles identified for this research were applicable for the research areas and there was no need to eliminate any of the roles in the questionnaire. The specific instances where the pesticide management roles were performed were cited or quoted in Chapter 4.

The rest of the qualitative data collected from the female leaders were used in substantiating the survey data from the female farmers. The farm leaders shared what they know and practiced regarding protecting themselves from pesticide exposure. They also cited instances on how they treated themselves when pesticide poisoning occurred. In the descriptive analysis, these data from the FGD were used to expound and further interpret the women's knowledge of pesticide health impacts.

3.2.2. Survey with Female Farmers

3.2.2.1. Sample selection

A multistage sampling technique was used to select the female farmer respondents. First, the three municipalities (and the barangays within each municipality) where IPM CRSP experimental sites are located were purposively selected. The San Jose site covered three barangays where IPM CRSP experiments had been established before and where experiments were on-going. These barangays were Palestina, Abar 1st, and Sto. Tomas. The Bongabon site covered the sole barangay experimental site of the project which was Lusok. In addition, Vega was included as it is the barangay where the majority of the National Onion Grower's Cooperative Marketing Association (NOGROCOMA) members were located. NOGROCOMA is the leading onion cooperative in Bongabon which the IPM CRSP has started collaborating with around 1996. The Sto. Domingo site had only the barangay of San Francisco as an IPM CRSP site.

A master list of rice-vegetables farmers was obtained from the local government in each municipality. This masterlist served as the population of the survey from which random sampling was done. A number was assigned to each farmer on the list and through the drawing of ballots, the respondents were then selected. If the farmer selected on the list was male and married, his wife served as the respondent. If the male farmer was single or widowed, the oldest female household member served as the respondent. Generally, this was the mother or sister of the male farmer. If the selected farmer was female then, she automatically became a target respondent. Forty respondents were targeted for each of the six barangays, giving a total of 240 female farmers for this study.

Though the local municipal officers indicated that the masterlist was the most recent one, upon searching for the selected farmers, a number of difficulties with the master list were found. Some of the farmers were already dead, a few have left farming, others had moved, while some had sold or rented out their land. If this was the case, another farmer from the master list was selected until the target number had been reached.

There were also cases when the selected farmer could not be reached. This usually happened when the farmer's house was not accessible due to poor or unsafe road conditions. In about five to seven cases, the farmer was out of the house/farm and despite returning 2-3 times to catch her, the enumerators were not able to do so. If this was the case, another farmer was pulled out from the masterlist.

One kilo of foundation rice seeds were given to all respondents (survey and FGD). This was a traditional way of thanking the local or farm people and at the same time a good way to help them improve their harvest.

3.2.2.2. Data collection

Data for the female farmers were collected using a multi-topic questionnaire. The questionnaire was translated into the local dialect, Tagalog, with the help of the communication staff of PhilRice and improved through the pre-testing. A copy of the final questionnaire is included in Appendix A. The survey instrument mainly used structured questions. and was administered face-to-face to the female farmers. The questionnaire covered a range of questions pertaining to the respondents:

1. Basic socioeconomic and farm information;
2. Pesticide management practices;
3. Pesticide-management activities that farm women perform;
4. Knowledge of protection and safety practices related to pesticide management;
5. Knowledge of health impacts or symptoms of pesticide poisoning/exposure;
6. Knowledge of treatment practices for pesticide poisoning;
7. Constraints they face in pesticide management; and
8. Perceived level of control regarding pesticide management.

The section which dealt with the respondent's level of knowledge was partly taken from the "Pesticide Knowledge Test (PKT)" developed by McCauley, et. al (2002). The PKT involved a 20 true-false items (aligned to the EPA-prepared training materials for farmworkers) designed to test only the basic pesticide knowledge of migrant farmworkers (see Appendix B for a copy of the PKT). McCauley's team purposely limited the number of test items to 20 and kept them simple as their target population could read neither English nor Spanish.

For this research, the PKT was expanded and divided into three parts so that the items will cover more issues that are important to proper pesticide management. The need to add more items to the PKT was also deemed necessary to avoid the problem encountered by McCauley's team where they attributed the small differences in scores among the respondents to the short length of the questionnaire. The additional items were culled from different pesticide safety brochures found in the web and were validated by an entomologist and committee member, Dr. Edwin Rajotte. In addition, instead of a true-false type of response, a five point Likert scale was used. Likert scaling is deemed more appropriate as it will capture the respondents' knowledge confidence regarding the items. In addition, if the respondents are not that sure of their stand on one item, she can choose an undecided response.

The questionnaire was pre-tested using a group of farmers in Abar 2nd, Nueva Ecija. This municipality is also a top rice-vegetable producing area in the province but not an IPM CRSP site. Questions and attitudinal statements that were vague or confusing to the farmers were improved or changed. This occurred primarily in questions regarding their perceptions about the use and health impacts of pesticides and on the perceived level of control questions regarding pesticide management. Some English or more common/local terms (as compared to its Tagalog equivalent) were also inserted in some questions to guide the enumerators and farmers. The enumerators read the Tagalog question first and if the farmer seemed confused, the enumerator then used the English or local term. The five point Likert type of response was a bit confusing to the farmers. Thus, each question bearing this type of response was printed in a separate sheet and below it was the response the farmer can choose (see Figure 3). A number was also assigned to each response to make it more obvious which responses had greater weight. Additionally, a ruler-arrow was drawn in these sheets showing the weight of each response. These sheets were then handed to each farmer when they were interviewed. Normally, the farmer just pointed to the response she felt represented her answer.

Q#15. How important are the following sources of information about pesticide management?

1: Not important
2: Somewhat important
3: Undecided
4: Important
5: Very important

1 (not important) — 2 — 3 (undecided) — 4 — 5 (very important)

Figure 3. An example of a response sheet used during the survey.

3.2.2.3. Training of Enumerators

Nine enumerators were employed as data collectors for this study. These enumerators were selected from a pool of trained enumerators at PhilRice, Nueva Ecija. Thus, they were already trained to interview farmers and had previously worked in different PhilRice survey projects. The researcher discussed with the enumerators the scope of the study to help the enumerators understand what needed to be done, why, and how it should be done. During the meeting, each enumerator was given a copy of the questionnaire and the researcher explained/discussed each question. The discussion proved to be very helpful as the enumerators suggested ways of improving the questions or how the questions should be asked based on their experience and based on the purpose of the study. Additionally, the researcher was able to make clear to the enumerators what each question meant and its relevance to the study. After the necessary revisions in the questionnaire, the enumerators were then sent to the field to pre-test the questionnaire.

3.2.2.4 Data Analysis

3.2.2.4.1. Measurement of variables

There were several dependent variables and independent variables employed in this study. For the dependent variables, three served to assess the extent of involvement of women farmers in pesticide management for rice (i.e. overall involvement for rice, non-field rice roles, and field rice roles), another three served for vegetables (i.e. overall involvement for vegetables, non-field vegetable roles, and field vegetable roles), and one assessed the respondent's level of knowledge with regards to pesticide health hazards.

For the independent variables, three categories were used: socio-demographic and household characteristics of the respondents; farm factors, and perceived level of control of the respondent.

Dependent Variables

1.Field and Non-field Roles for Rice and Vegetables

Women's involvement in pesticide management was measured by assessing the different roles farm women performed in pesticide management for rice and vegetables. There were 14 roles identified and these was divided into two types namely, field and non-field roles. For each of the 14 roles, the respondent was asked to indicate if she performs the role regularly, occasionally, or never. A score of "3" was given to each role if the respondent was performing the role regularly, a "2" if the role is being done occasionally, and "1" if the respondent has never performed the role. Separate composite scores were calculated for rice/field, rice/non-field, vegetable/field, and vegetable/non-field roles by adding the scores on their respective seven roles and dividing by 7. Possible scores ranged from 1 to 3, with a higher score indicating higher involvement of the women in pesticide management work.

Field roles were defined as the tasks in pesticide management in which a person directly handles or has first-hand exposure to pesticides. These tasks included the following seven activities: applying pesticides using a knapsack sprayer, applying pesticides manually using the hands or a brush, treating seeds with pesticides, mixing pesticides before application, placing pesticide traps around crop storage areas, monitoring the field after pesticide application, and handpicking pests in the field after pesticide application. On the other hand, *non-field roles* are pesticide activities that were generally accomplished outside the farm and may put a person in direct or indirect contact with the chemicals. These included the following seven activities: carrying or transporting pesticides, buying pesticides, cleaning or recycling pesticide equipment or containers, washing pesticide-soaked clothes, storing pesticide or pesticide equipment/containers, disposing pesticide containers or equipment, and disposing unused or expired pesticides. Reliability analysis was performed for the field and non-field roles for both crops to check for the internal consistency of the items in each scale. Field roles for rice had a *Cronbach's Alpha* of 0.813 while non-field roles had 0.616. Field roles for vegetables had a *Cronbach's Alpha* of 0.748 while non-field roles had 0.606.

2. Knowledge of Pesticide Health Hazards

Knowledge of pesticide health hazards refers to the respondent's awareness of the (1) precautionary measures against exposure, (2) symptoms of pesticide poisoning and health effects of pesticide use, and (3) treatment practices for pesticide poisoning.

Precautionary measures against exposure refer to the activities farm women carry out to protect themselves or their household members from pesticide exposure or poisoning. Health impacts or symptoms of pesticide poisoning refer to the illnesses or diseases a person is afflicted with that are due to pesticide exposure/poisoning. Treatment practices refer to the immediate or basic treatments done by farm women for cases of pesticide poisoning/exposure.

Initially, this dependent variable was to be measured using the three indicators: level of knowledge of (1) protection or safety practices, (2) health impacts or symptoms of pesticide poisoning or exposure, and (3) treatment practices for pesticide poisoning/exposure. For each indicator, a list of knowledge statements was developed that the respondent was asked to express agreement or disagreement using a five-point scale: (5) strongly agree; (4) agree; (3) undecided; (2) disagree; (1) strongly disagree. In total, there were 41 knowledge statements with perception of protection or safety practices having 18 statements, perception of impacts or symptoms of pesticide poisoning having 16 statements, and perception of treatment practices having 7 statements. Descriptive analysis of the farm women's responses to these 41 items were included in Chapter 4. However, when reliability tests were performed for this scale to test for the internal consistency of the items, it produced a low *Cronbach's Alpha.* After dropping the treatment practices indicator, five items from the precautionary or safety practices, and another five from the health impacts or symptoms, a low but acceptable Cronbach's Alpha was achieved (0.614). Using the remaining 24 statements, a composite score was created by adding up the scores on the individual statements and dividing the sum by 24. The possible score ranged from 1 to 5, with a higher score indicating higher level of knowledge about pesticide health hazards. The composite score was used in the correlation/regression analysis that addressed Hypothesis 4.

Independent Variables

For the independent variables to predict women's involvement in pesticide management, six socio-demographic and household characteristics (age, marital status, educational attainment, member of a farm organization, having a male household member, having a child); five farm factors (farm size rice, farm size for vegetables, tenure status, and municipality differences); and two perceived level of control factors (perceived level of control for rice and vegetables) were used. For assessing women's knowledge of pesticide health hazards, the same independent variables were utilized, but in addition, four more variables were included in the socio-demographic and household characteristics (extent of involvement in rice/field, rice/non-field, vegetable/field and vegetable non/field roles).

<u>1. Socio-demographic and Household Characteristics</u>

1.a. Age

Age was measured by a direct question asking for respondents' actual age in years.

1.b. Marital Status

Marital status was measured by asking respondents': what is their marital status? The three response categories were: (1) single; (2) married; (3) widow. For the statistical analysis, this variable was recoded binomially where in “0” stands for single or widow and “1” stands for married.

1.c. Education

Formal educational attainment was measured by asking respondents’: what is the highest grade that you finished in school? Three response categories were used; (1) elementary graduate or less; (2) some high school and high school graduate; (3) some college and more.

1.d. Member of farm organization

Membership in farm organization was measured by asking a direct question: Are you a member of a farm organization? Response was coded as: (0) no and (1) yes.

1.e. Have a child/children under 5 years old

This refers to the presence of children in the respondent’s household. The item asked women to indicate number of children in the household. The response choices were to indicate successively the number in each of this category: “under 5 years of age”; “age 5 to 18”; and “over age 18”. The variable was coded into two categories: (1) if there are children under 5 years of age, and (0) if there are no children at all in the household or if they were over 5 years of age.

1.f. Have a male household member age ≥12 years

This refers to the presence of male members in the respondent's household who are old enough to help in the farm. The item asked the respondent to indicate the number of male members in their household. The response choices were to indicate successively the number in each of this category: "under 12 years of age"; "age 12 - 19"; "age 20 – 50"; and "over age 51". For the statistical analysis, this variable was recoded binomially where in "1" stands for having a male member in the household age 12 years and above and "0" stands for not having a male household member age 12 years and above.

2. Farm Characteristics

2.a. Farm size for rice

Farm size for rice refers to the number of hectares the respondent planted for rice. It was measured by asking a direct question: what is your farm size for rice?

2.b. Farm size for vegetables

Farm size for vegetables refers to the number of hectares the respondent planted for her vegetable crops. It was measured by asking a direct question: What is your farm size for vegetables?

2.c. Tenure Status

Tenure status was measured by asking respondents: what is your tenure status? There were five response categories: (1) land owner; (2) leasee; (3) hired laborer; (4) maintainer; (5) mortgaged; (6) other. Land owner is defined as one who has a title of the land she (or her husband) is farming. Leasee is one who rents or takes on lease the land the farm operator operates. The rent may consist of a fixed amount of money or produce, a share of produce, or it may be based on some other terms or tenancy agreements. A hired laborer is one who does not own land and farms where she is needed. A maintainer is a unique arrangement in Nueva Ecija where the owner hires a permanent laborer to take charge of his/her field. The owner supplies all the farm inputs while the permanent laborer manages all the farm activities. Mortgaged is when the farmer is using land that is only loaned to her by another farmer. This variable was recoded as: “1” owner and “0” non-owner/renter.

2.d. Municipality differences

To ascertain whether there were differences among the three municipalities chosen as the study sites, two dummy variables were incorporated with Bongabon used as the reference category.

<u>3. Perceived level of Control</u>

3.a. Level of Control for Rice

This refers to the amount of control the respondent perceived she has on the quantity of pesticides to be used on their rice crop. The respondents were asked: How much control do you think you have on the amount of pesticides to be used in your rice farm? The four response categories were coded from 1 to 4 as follows: (1) no control; (2) small amount of control; (3) moderate amount of control; and (4) great deal of control.

3.b. Level of Control for Vegetables

This refers to the amount of control the respondent perceived she has on the quantity of pesticides to be used on their vegetable crop. The respondents were asked: How much control do you think you have on the amount of pesticides to be used in your vegetable farm? The four response categories were again coded from 1 to 4: (1) no control; (2) small amount of control; (3) moderate amount of control; and (4) great deal of control.

3.2.2.4.2. Statistical Analysis

The relationship between the independent variables and dependent variables was initially examined using bivariate analysis. This level of analysis serves as an indicator for whether the strength and direction of the relationships are consistent with the conceptual framework/review of literature. A multivariate analysis followed, using ordinary least squares (OLS) regression to determine the partial associations between each of the independent and dependent variables while controlling for each of the other independent variables. The multiple correlation coefficient and its square, the coefficient of multiple determination, are used to assess the predictive power of the collective set of independent variables to the dependent variable. The standardized regression coefficient, labeled Beta assessed the relative importance of the predictor variables in accounting for the variance observed in the dependent variable. For this study, a .05 level of significance was the criterion used in testing the hypotheses.

3.2.2.4.3. Descriptive Analysis

Frequency, ranking, and means were used in describing the data on the socio-demographic, household, and farm characteristics, pesticide management practices, extent of involvement in pesticide management, and level of knowledge of the respondents.

3.2.2.4.4. Data encoding

Data encoding was done in the Philippines using Microsoft Access. Afterwhich, the data was transformed into SPSS. Variable names were assigned to each question and responses were coded numerically. For open-ended questions, the responses were collapsed and grouped into broad categories.

CHAPTER 4

DESCRIPTIVE STATISTICS

This chapter presents a description of the women farmers' socio-demographic, household, and farm-related characteristics, roles in pesticide management, level of knowledge of the health impacts of pesticide usage, and pesticide management practices. The first section presents the socio-demographic and household characteristics of the respondents by municipality level. Farm-related data touch on farm size and land ownership characteristics for rice and vegetables by municipality level. The third section deals with the varying activities women perform in pesticide management, both field and non-field roles. The fourth section talks about the respondents' level of knowledge on safety/precautionary measures on the use and management of pesticides, health impacts or symptoms and treatment measures of pesticide poisoning are described and evaluated to determine their overall level of knowledge of the health impacts of pesticide usage. Lastly, the respondents' pesticide management practices and their perceived level of control over pesticide usage are presented to further characterized them.

4.1. Socio-demographic and Household Characteristics of the Respondents

On the basis of responses from 240 women farmers, Table 4.1 presents the socio-demographic characteristics of the respondents across the three municipalities. The age of the respondents ranged from 23 to 83 years, with a mean of 49 years. The largest percentage of the respondents (26 percent) was in the age range of 40-49 years. The San Jose respondents were the youngest having a mean age of 46 years while the Bongabon

Table 4.1. Socio-Demographic and Household Characteristics of the Respondents by Municipality (N=240)

Variables		**San Jose (%)**	**Bongabon (%)**	**Sto. Domingo (%)**	**TOTAL**
Age	20 to 29 years	8	2	7	6
	30 to 39 years	28	10	22	21
	40 to 49 years	23	33	25	26
	50 to 59 years	21	24	23	22
	60 + years	20	31	23	24
	TOTAL	100	100	100	100
	Average	46	53	49	49
Marital Status	Single	2	1	2	2
	Married	92	93	88	91
	Widow	7	6	10	7
	TOTAL	100	100	100	100
Educational Attainment					
	no schooling	2	2	0	1
	some elementary	16	23	18	18
	elementary grad	23	38	30	29
	some high school	19	11	15	16
	high school grad	22	9	23	18
	some college/voc	10	10	7	10
	college grad	6	7	8	7
	some or post grad	2	0	0	1
	TOTAL	100	100	100	100
Member of Farm Organization	No	90	71	93	84
	Yes	10	29	7	16
	TOTAL	100	100	100	100
Households with Male Members					
	Under 12 yrs	45	21	45	37
	Age 12 to 19 yrs	27	25	17	25
	Age 20 to 50 yrs	63	64	65	64
	Over age 51 yrs	33	44	35	37
Households with Children					
	Under 5 yrs	44	30	32	37
	Age 5 to 18 yrs	48	32	47	43
	Over age 18 yrs	17	25	15	20

respondents were the oldest with a mean age of 53 years. About a quarter of the respondents (24 percent) were in their sixties. Regardless of the municipality they come from, the majority of the respondents were married (91 percent). Only two percent of the respondents were single.

Data on the level of education attained by the respondents indicates that the overwhelming majority of the respondents (99 percent) had attained some level of formal schooling. The San Jose respondents had higher educational attainment as most of them had reached or graduated from high school (41 percent) and they had the highest percentage of respondents reaching college or graduate schooling (18 percent). For the Bongabon and Sto. Domingo respondents, most of them had only reached or graduated from elementary school and none had reached graduate school. Though the level of education data seems quite high, this data is comparable to provincial data which reported that 20 percent of the farmers attended a few years or more of college (RBFHS, 1996-1997).

In terms of membership in farm organizations, the Bongabon respondents were most active among the villages as almost 30 percent were members. This could be explained by the fact that a strong farm onion cooperative namely, NOGROCOMA, exists in the village. The San Jose (90 percent) and Sto. Domingo (93 percent) respondents were generally non-members of farm organizations.

Most of the households (64 percent), regardless of the municipality, had male household members aged 20 to 50 years. Sto. Domingo and San Jose had the highest percentage of households with male members under 12 years of age (45 percent each).

On the other hand, Bongabon had the highest percentage of households with male members over the age of 51 years (44 percent). With regards to the presence of children in the household, all the municipalities had the highest percentage of children belonging to age group of 5 to 18 years old.

4.2. Farm Characteristics by Municipality

The farm-related characteristics of the respondents by municipality are shown in Table 4.2. Details on the tenure status of the lands cultivated by the respondents show that most of the Bongabon (75 percent) and Sto. Domingo (60 percent) respondents were land owners. San Jose respondents were generally non-landowners (53 percent).

Rice farm sizes ranged from as small as 0.10 hectare to as large as 10 hectares, with an overall average size of 1.47 hectares. The majority of the San Jose (56 percent) and Sto. Domingo farms (70 percent) were less than one hectare. Bongabon farms were generally bigger as more than half (54 percent) ranged from one to bigger than four hectares, with an average of 1.63 hectares. Vegetable areas ranged from 0.02 to 6.0 hectares. The average farm area for vegetables (one hectare) was smaller than the average area in rice. Not surprisingly, the majority of the households in the three villages were farming vegetables areas that were less than one hectare. In terms of average vegetable farm size, Bongabon had the largest with 1.3 hectares and San Jose had the smallest with 0.8 hectare.

Table 4.2. Farm-related Characteristics of the Respondents by Municipality (N=240)

Variables		San Jose (%)	Bongabon (%)	Sto. Domingo (%)	TOTAL
Tenure Status	Owner	47	75	60	58
	Leasehold	43	25	20	33
	Hired laborer	4	0	5	3
	Maintainer	5	0	15	5
	Mortgage	1	0	0	1
	TOTAL	100	100	100	100
Rice Hectarage	< 1 ha	56	46	70	55
	1.00 to 1.99 ha	17	20	13	17
	2.00 to 2.99 ha	15	20	10	16
	3.01 to 3.99 ha	8	5	5	7
	> 4.00 ha	4	9	2	4
	TOTAL	100	100	100	100
	Average	1.47	1.63	1.13	1.47
Vegetable Hectarage	< 1 ha	83	64	78	76
	1.00 to 1.99 ha	7	15	10	10
	2.00 to 2.99 ha	7	11	10	9
	3.01 to 3.99 ha	2	6	0	3
	> 4.00 ha	1	4	2	2
	TOTAL	100	100	100	100
	Average	0.8	1.3	0.9	1.0

4.3. Involvement in Pesticide Management for Rice and Vegetables

4.3.1. Field Roles in Pesticide Management for Rice and Vegetables

For the field roles in pesticide management in rice, data shows that about a quarter of the women are regularly or occasionally performing five of the field activities in pesticide management (see Table 4.3). These activities are applying pesticides using a knapsack sprayer or manually by their hands/brush, treating seeds, mixing pesticides, and putting pesticides or placing traps around the field after pesticide application. For pesticide management in vegetables, the women's participation increases to almost 30 per cent for these five activities. During the FGD, it was reported that mixing the pesticides

Table 4.3. Field Roles of Women-farmers in Rice and Vegetable Pesticide Management (N = 240)

Pesticide Management Activity	Rice (%)			Vegetable (%)		
	Never	Occasionally	Regularly	Never	Occasionally	Regularly
Treating seeds with pesticides	77	17	6	65	25	10
Mixing pesticides before application	75	17	8	70	19	11
Applying pesticides using a knapsack sprayer	74	14	12	67	16	17
Applying pesticides using hands/brush	74	19	7	66	23	11
Putting pesticides or placing traps around the field after pesticide application	73	20	7	77	17	6
Handpicking pests in the field after pesticide application	55	28	17	52	26	22
Monitoring the field after pesticide application	25	44	31	18	42	40

is most often done by the women for vegetable crops. Furthermore, when applying pesticides by hand/brush, some women add soap to the pesticides in the belief that the pests will stick more to the pesticides. Monitoring the field after pesticide application proved to be an activity that is often performed by the women with about three-fourths of them reporting doing so in rice and 82 percent in vegetables. Handpicking pests, such as snails or bugs, after pesticide application is being done by almost half of the women respondents in rice and vegetables. Monitoring the field and handpicking pests were also the primary activities mentioned by the female farm leaders during the FGD. The farm women leaders also said that handpicking pests is a family activity. Once a week, all household members go to the field together so that the handpicking will be accomplished as quickly as possible. The pests that they had handpicked are then buried, burned, or pesticide is poured on them to totally destroy them. It is worthwhile to note that the two field activities the women are most active in, monitoring and handpicking pests, are major IPM processes. Though only a quarter of the women reported applying pesticides using a knapsack sprayer, still this disproves the notion that women never do this activity. As one of the female farmer-leaders interviewed shared: "Yes, the knapsack sprayer is heavy. But carrying it is nothing different from carrying my baby who is almost as heavy". Others said that they just half-filled the knapsack sprayer in order to accomplish the work. Some women added that they never hesitated using the knapsack sprayer especially if the male household members are not available to do so. This usually happens when the male farmer is busy with another activity/work or when the female farmer is a widow. A few of the farm women leaders shared that they do the spraying when the pests are really abundant or when the farm area is just small. According to these female farm leaders, applying pesticides using a knapsack sprayer is just another activity that needs to be performed if they want to harvest crops and earn each cropping season so as to feed the family. Women's participation in these field activities of pesticide management proves that they are directly involved in this activity and suggests the kind and extent of exposure they have from pesticides.

4.3.2. Non-field Roles in Pesticide Management for Rice and Vegetables

Limited research exists on non-field roles in pesticide management. This gap exists due to several biases, which were discussed extensively in the literature review, that exist in women and pesticide management research. However, a detailed look at pesticide management will reveal that there are seven non-field roles being done by women farmers. Recognizing these non-field roles is important as these activities provide insights on the extent and type of exposure women have from pesticides.

Looking at Table 4.4, buying pesticides and washing pesticide-soaked clothes are activities that at least half of the women carry out regularly on their rice and vegetable farms. These two activities reflect the overlapping or multi-tasking roles of women in the household and in the farm. In addition, these activities may expose women to pesticides. Based on the focus group discussion with women farm leaders in the area, buying pesticides is done by the woman at the same time that she visits the market to buy other household needs. They do this to save them time and effort. The farm leaders also reported that women are the preferred purchaser of pesticides as she gets better prices because she haggles for a lower price. Visits to some local agricultural stores showed that some of these pesticides were not covered or sealed properly thus leaks are not an impossibility. The only safety prevention from pesticide exposure being done is to put the containers in plastic bags. Thus, buying pesticides can be considered an activity in which women can be exposed to pesticides. On the other hand, the focus groups added that washing pesticide-soaked clothes is done by women as they wash the other dirty clothes of the household. According to these women, it is not uncommon to find their husbands' long sleeves and shirts drenched with pesticides after spraying in the field. Asked if they used gloves in washing these clothes, none reported doing so but others qualified that they sometimes soaked the clothes first in water and detergent. These two non-field activities are often not calculated in most pesticide-exposure data.

Table 4.4. Non-field Roles of Women-farmers in Rice and Vegetable Pesticide Management (N = 240)

Pesticide Management Activity	Rice (%)			Vegetable (%)		
	Never	Occasionally	Regularly	Never	Occasionally	Regularly
Washing pesticide-soaked clothes	14	20	66	13	20	66
Buying pesticides	17	33	50	15	32	53
Carrying/transporting pesticides to the field	48	34	18	43	36	21
Storing pesticide or pesticide equipment or containers	48	27	25	48	26	26
Disposing pesticide containers or equipment	58	25	17	58	25	17
Disposing unused or expired pesticides	81	11	8	80	12	8
Cleaning or recycling pesticide equipment or Containers	86	9	5	86	9	5

Cleaning or recycling pesticide containers and disposing unused or expired pesticides were activities that most of the women never did for both rice and vegetable production. Similar results were found in the focus groups with the women leaders reporting that recycling these containers was very dangerous. Then again, disposing of unused or expired pesticides may not be common in these areas probably because these farmers never buy pesticides in bulk. In addition, it has been found that farmers use excess pesticides for their other crops or for the following planting season to save money (Heong, Escalada, and Lazaro, 1994).

Storing and disposing of pesticide or pesticide equipment/containers were being done occasionally or regularly by 40 to 50 percent of the women farmers. Based on the FGD with women leaders, they usually store pesticides inside the house as this may be stolen if placed outside. In addition, pesticide containers are usually dumped in trash cans near the house. Again, storing and disposing pesticides or its containers are activities reflective of the overlapping roles of women in the household and the farm. More importantly, these activities are possible sources of indirect pesticide exposure happening to women especially if most of these pesticide equipment and containers have leaks or traces of pesticides on them.

4.4. Knowledge of Pesticide Health Impacts

Women's level of knowledge regarding pesticide health impacts were assessed based on their responses to a series of statements using an improved Pesticide Knowledge Test (PKT). This improved PKT was derived from the one developed by McCauley and her team (2002) and from various pesticide safety brochures. The 41 statements in the PKT measured knowledge in three general areas: (1) precautionary measures against exposure/poisoning, (2) health impacts/symptoms of pesticide poisoning, and (3) treatment practices for pesticide poisoning. For their response, the women were asked to choose from a five-point scale: strongly disagree, somewhat disagree, undecided, somewhat agree, and strongly agree.

4.4.1. Knowledge of Precautionary Measures against Exposure/Poisoning

Respondents had a high level of knowledge of the precautionary measures regarding pesticide exposure/poisoning (Table 4.5). At least 90 percent of the respondents strongly agreed to half of these 18 statements and about 12 items had a mean score of 4.39 and above. Moreover, very few of the respondents had an

Table 4.5. Women's Knowledge of Precautionary Measures against Exposure or Poisoning (N =240)

Pesticide Statement	Response **(%)**					
	Strongly Agree (5)	**Some what Agree (4)**	**Unde-cided (3)**	**Some what Disagree (2)**	**Strongly Disagree (1)**	**MEAN**
Pesticides should be stored out of reach of children and animals.	98	2	-	-	-	**4.98**
Pesticides are dangerous for people and animals.	95	4	0.4	-	-	**4.95**
It is important to read instructions/warning labels on pesticide containers.	94	5	-	-	-*	**4.93**
It is important to shower and change clothes after handling pesticides.	95	5	-	**-***	**-***	**4.92**
When working in the field, the pesticides can stick to your clothes and shoes.	90	8	**-***	1	**-***	**4.87**
Protective clothing (gloves, boots, long sleeves, etc) should be worn when mixing or applying pesticides.	90	8	-*	-*	1	**4.86**
It is not okay to store water in containers that have been used for storing pesticides.	94	2	**-***	3	1	**4.85**
It is not good to apply pesticides on a windy day.	92	5	2	1	1	**4.85**
It is not okay to bring young children to the field after pesticide application.	93	3	1	1	2	**4.82**
It is important to read the signs and announcements at the border of the field or orchard before entering.	66	27	5	1	1	**4.55**
Eating, drinking, or smoking in the field increases the possibility of pesticides entering the body.	77	11	3	4	5	**4.53**
Spilled pesticides can contaminate as well.	64	23	5	4	4	**4.39**
Pesticides that are not in the original container may have been adulterated.	50	23	11	10	6	**3.99**
Empty pesticide containers can not be kept for reuse.	60	8	2	19	12	**3.85**
Leaking pesticide containers or equipment should be repaired or replaced.	49	21	2	4	25	**3.65**
You cannot eat fruit directly from the tree or plant after it rains because the rain does not rinses off the pesticide residues.	47	19	2	19	13	**3.67**
Soap and water do not remove pesticides from hands.	2	**-***	-	15	83	**1.23**
Concerning safety to humans, pesticides are not the same.	1	1	1	10	87	**1.21**

* value is <1 but not 0

“undecided” stand on any of the items. This high level of knowledge was unexpected, albeit very welcome, since the majority (70 percent) of these women had not attended any training or seminar about the proper use of pesticides.

Of the 18 statements, only two received a very low mean score connoting their disagreement with these items. These statements were: “soap and water do not remove pesticides from hands” (mean 1.23) and “concerning safety to humans, pesticides are not the same” (mean 1.21). It is interesting to note that during the focus interview, most of the women leaders also believed that washing with soap and water after contact with pesticides is a good way to protect themselves. Indeed, washing with soap and water immediately after spraying will remove pesticides but only on the surface. The human body begins to absorb many pesticides on contact, so washing alone will not remove all pesticides. This misconception should be a cause for concern as the women are usually the main health caretakers of their households. Believing that soap and water are enough to remove pesticides from the hands, women may then be encouraged or even support their husbands in thinking that using gloves is not necessary when applying pesticides. This misconception can also be connected to the statement “you cannot eat fruit directly from the tree or plant after it rains because the rain does not rinse off the pesticide residues” which received a mean score of 3.67. For this statement, almost one-third (32 percent) of the respondents somewhat and strongly disagreed with the idea. This affirms that the respondents do believe that water can remove pesticides or its residues from contact. Believing that pesticides are the same when it comes to human safety is again another misconception. Some pesticides can be extremely toxic, others are very safe (Flint and Gouveia, 2001). Women may not be aware of the different health impacts of pesticide because: (1) pesticides are not properly labeled, (2) they never bothered reading the pesticides labels at all or, (3) they are not able to recognize or were not taught which pesticides are safe and unsafe. Nonetheless, not knowing which ones are toxic and will need extra care in using, may prove to be very dangerous to these women and their households.

During the FGD, the farm women leaders shared other precautionary measures against exposure/poisoning that they practice or know. They reported there is a need to put an extra shirt on their back when using the knapsack sprayer to guard them against pesticide leaks. In order to protect their skin during pesticide application, they believe that they should wear long sleeves and only the eyes should be exposed. In addition, they avoid spraying pesticides in the afternoon because they believe that the winds are strongest at that time and therefore pesticides drifts is common. Furthermore, pesticide application in the afternoon should be avoided as it will be too hot which makes wearing the protective clothing uncomfortable.

4.4.2. Knowledge of Pesticide Health Impacts and Symptoms of Poisoning

There were 16 statements that measured the respondents' level of knowledge about pesticide health impacts and symptoms of poisoning. Unlike their knowledge of protection and safety practices, the respondents' knowledge of pesticide health impacts and symptoms was not as high and as stable. Even though the majority of the respondents strongly agreed with half of these 16 statements, the frequency ranged varied widely and only from 52 to 85 percent (Table 4.6). In addition, only half of the 16 statements received a mean score higher than 4.00. There were also five statements which received an undecided response that ranged from 10 to 33 percent. Moreover, there were six statements that have considerably high percentages (35 to 86 percent) for somewhat and strongly disagree responses connoting a misconception of the issue.

Table 4.6. Women's Knowledge of Pesticide Health Impacts and Symptoms of Pesticide Poisoning (N =240)

Pesticide Statement	Response (%)					
	Strongly Agree (5)	Some what Agree (4)	Unde-cided (3)	Some what Disagree (2)	Strongly Disagree (1)	MEAN
Pesticide drift or residue is harmful.	85	11	1	3	0.4	**4.78**
Vomiting, diarrhea, salivation, and cramps are signs of pesticide poisoning.	81	13	4	1	1	**4.72**
Mild and moderate illnesses such as headaches and dizziness can happen after contact with pesticides.	80	15	1	4	1	**4.69**
Pesticides pose many health risks to pregnant women and children.	80	10	3	2	5	**4.57**
Some people can get sick from pesticides faster than others even though they work in the same place.	68	25	1	3	3	**4.53**
Contact with pesticide causes eye injuries.	68	21	7	3	1	**4.53**
Pesticides can enter the body through the skin.	64	24	3	5	4	**4.37**
Contact with pesticides may cause blister or skin rash.	52	21	10	9	8	**4.02**
Even if pesticide has been sprayed onto a plant it is still harmful to humans.	46	23	7	15	9	**3.81**
Pesticide exposure can cause cancer.	40	26	26	5	4	**3.93**
Pesticides can be transmitted to family members in the laundry.	36	23	6	15	20	**3.39**
Being more exposed to pesticides does not affect my immunity to it.	35	7	8	15	35	**2.90**
Pesticides are more dangerous for women than men.	13	10	21	17	38	**2.43**
Under similar levels of exposure, women absorb more pesticide than men.	8	16	33	28	16	**2.73**
It is not easy to identify a sickness triggered by pesticides.	3	6	10	20	60	**1.71**
Pesticide poisonings have delayed but not immediate health effects.	1	6	7	20	66	**1.56**

The respondents are knowledgeable of the short-term or immediate health impacts of pesticide poisoning. This was apparent with the high mean scores the following statements received: (1) vomiting, diarrhea, salivation, and cramps are signs of pesticide poisoning (mean 4.72); (2) mild and moderate illnesses such as headaches and dizziness can happen after contact with pesticides and (mean 4.69); (3) contact with pesticides causes eye injuries (mean 4.53); and (4) contact with pesticides can cause blister or skin rash (mean 4.02). In line with this, they strongly disagreed (60 per cent) with the statement: "it is not easy to identify a sickness triggered by pesticides". These women perceive pesticide health impacts as illnesses that are immediately experienced or have physical manifestations that can be seen. This assumption is all the more reinforced/strengthened when more than a quarter of the respondents (26 per cent) gave an "undecided" response to the statement "pesticide exposure can cause cancer" and the majority disagreed with the statement "pesticide poisonings have delayed but not immediate effects" (mean 1.56). During the focus group interview with female farmer leaders, when asked what are the possible health impacts of pesticide usage, most of the women focused on short term effects (i.e., headaches, vomiting, dizziness, etc) with only one or two mentioning the long term ones (i.e., cancer and tuberculosis). When the female farm technicians from different government offices were asked the same question during the focus group, they focused on the serious or long term health impacts (i.e. cancer, death, lung problems, tuberculosis, dead nails, etc) rather than on immediate health impacts. A probable explanation for this is that the respondents and the women farmer-leaders may have experienced the short term health impacts on a regular basis or witnessed them happening often with their co-farmers and easily associate pesticide poisoning with this kind of health impacts.

Most of the women respondents believed that pesticides do not affect women's health more than men. This is indicated with their disagreement on two statements: under similar level of exposures, women absorb more pesticide than men (44 percent) and pesticides are more dangerous for women than men (55 percent). The only issue the women-respondents recognized as a gender-related health impact was their agreement (90 percent, mean 4.57) on the statement that "pesticides pose many health risks to pregnant women and children". However, a review of literature shows that women do have a particular susceptibility to pesticides due to their physiological characteristics, lifestyle, and behavior. Women in general have thinner skin and more fatty tissue than men thus they may absorb more pesticides under similar levels of exposure (Tenaganita and PANAP, 2002; Reeves and Rosas, 2003). High rates of dermal and eye injuries are also more widespread among women because they are largely responsible for cleaning or washing of materials and equipment used or worn for pesticide application (Health and Workers Group, 1985; Tenaganita and PANAP, 2002; Habib, 2003; Wesseling, 2003; Reeves and Rosas, 2003).

4.4.3. Knowledge of Treatment Practices for Pesticide Poisoning

Women's knowledge of treatment procedures for pesticide poisoning is relatively high (Table 4.7). Of the seven statements presented to the respondents, five received a mean score higher than 4.00. These women are conscious of what to do when they see or experience pesticide poisoning. The women being well-informed about treatment procedures probably has to do with their role as health caretakers of their households. In addition, most of the treatment procedures presented in this section are related to immediate or direct pesticide health impacts. The latter, based on the last discussion, is something which the women have been found to be very aware of. It is likely then, that these women also know the treatment measures associated with these short term health impacts of pesticide poisoning.

Table 4.7. Women's Knowledge of Treatment Practices for Pesticide Poisoning (N = 240)

Pesticide Statement	Response (%)					
	Strongly Agree (5)	Some what Agree (4)	Unde-cided (3)	Some what Disagree (2)	Strongly Disagree (1)	MEAN
It is important to transport patients to the nearest doctor, hospital or clinic.	97	3	-	-	-	**4.97**
If you get pesticides on you, it is important to immediately remove any contaminated clothing & rinse skin w/ water.	93	7	-	-	-	**4.93**
If pesticides come in contact with the eyes, eye flushing should be done.	83	13	3	0.4	1	**4.75**
Victims who inhaled pesticides should be removed from pesticide area to fresh air immediately.	69	22	3	3	3	**4.51**
Drink medicine when pesticide poisoning occurs.	57	20	8	7	8	**4.12**
When a person had swallowed pesticides, it is important to drink at least some water or milk.	43	25	18	5	10	**3.86**
When poisoning has occurred, the doctor needs the pesticide label.	35	13	7	18	27	**3.13**

An almost equal number of people agreed (43 percent) and disagreed (45 percent) that pesticide labels should be brought to a doctor when poisoning occurs. The women do not know or are not sure if the pesticide label will be able to help them and the doctor while they are being treated. In reality, the pesticide label is an excellent source of information on how they will be treated. Knowing what kind of pesticide affected them will help medical practitioners and even the farmers know how to best treat the poisoning. Pesticide labels contain the ingredients of a particular pesticide which will help determine toxicity levels and also first aid instructions which will help in treating the victim (see Appendix D. Sample of and Information Found on a Pesticide Label).

During the focus group interview, the female farm leaders and female farm technicians also focused on first-aid treatments for pesticide poisoning. Similar replies were given by both groups such as taking a shower immediately, drinking medicine, resting for a while, drinking or taking in something sweet like sugar or soda. The only difference among the answers given was that some of the female farm technicians also suggested getting a sputum test or x-ray. Visits made to different hospitals and local clinics to determine what kind of treatment is given for pesticide related illnesses were not fruitful. Local clinics reported that they never treated pesticide related illnesses as these are generally done in major hospitals. Visits to two major hospitals in the areas proved to be frustrating as the personnel needed were always out/on-leave and people were hesitant to share any information. One hospital reported that all their records were just written on index cards (not yet inputted in a computer) and not very well organized therefore it will not be easy to look for pesticide-recorded illnesses.

4.5. Pesticide Management Practices of the Respondents

The most common criteria in the selection of pesticides were read to the respondents and they were asked to rate the importance of each criterion. Table 4.8 presents the respective distribution of responses and means for each criterion.

Table 4.8. Respondent's Criteria in the Selection of Pesticide used in their Rice-Vegetable Farm (N = 240)

Criteria in the selection of pesticide	Response (%)					
	Not Important (1)	Somewhat Important (2)	Undecided (3)	Important (4)	Very Important (5)	MEAN
Effectiveness of pesticide in controlling pests	0	1.3	0	30.8	67.9	**4.65**
Pesticide is safe to use	3.3	4.2	4.2	40.0	48.3	**4.26**
Pesticide can be used for both rice and vegetable	4.2	5.4	1.7	56.3	32.5	**4.08**
Brand name of pesticides	2.9	11.7	2.5	57.9	25.0	**3.90**
Availability of pesticide	1.3	16.3	4.2	54.6	23.8	**3.83**
Price of pesticide	8.3	8.3	2.5	57.1	23.8	**3.80**
Pesticide is recommended by government worker	8.8	20.4	2.1	60.0	8.8	**3.40**
Pesticide is recommended by co-farmers	9.6	25.0	3.8	55.0	6.7	**3.24**
Pesticide is recommended by pesticide sales agent	13.8	21.7	3.3	52.5	8.8	**3.21**
TV or radio ads about pesticide	21.3	22.5	2.9	49.2	4.2	**2.93**

There were two criteria in the selection of pesticides that were considered very important by the respondents and received the highest mean scores. These were "effectiveness of pesticide in controlling pests" (4.65) and "pesticide is safe to use" (4.26). The criterion "TV or radio ads about pesticide" was considered least important by the respondents (mean 2.93).

The data clearly shows that the women farmers are using various and multiple criteria in the selection of pesticides. There were 10 criteria presented to the respondents and all of these were considered important or very important by the majority of the women. The effectiveness of pesticide in controlling pests was the paramount criteria for these women and was more important than whether the pesticide is safe to use or even the price of the pesticide. Additionally, if a pesticide is recommended by another person, whether this is a government worker, co-farmer or pesticide sales agent, this is a reason to consider selecting a particular pesticide. This may mean that personally discussing with farmers about pesticides is crucial in the farmer's decision-making in this area. This could be the rationale for why pesticide companies send their staff to visit farmer areas regularly. It was not surprising that the women considered the criterion "pesticide can be used for both crops" as important and ranked it third (mean 4.08) as studies have shown that farmers prefer wide-spectrum toxicity for their pesticides (Rola and Pingali, 1993; Warburton, Palis and Pingali, 1995). The unpopularity of television or radio pesticide ads for these women, despite the fact that almost all households have these appliances in the Philippines and despite the many television/radio advertisements of various pesticides, should be noted especially by technology promotion or extension groups. A similar finding can be observed with cotton farmers in Pakistan who were also not influenced greatly by television ads for pesticides despite innumerable ads during the cotton season (Hussain, 1999). The study reported that in most cases, the choice of pesticide and its quantity is determined by the broader, aggressive marketing strategies of the multinationals.

The respondents were also asked how often they buy pesticides from different sources (Table 4.9). The retail store (mean 2.67) was the most regular source of pesticides for the women. Many farmers in the area do not buy pesticides in bulk or wholesale because they do not have the financial capability to do so. In addition, the majority of these women are farming small areas only and therefore will not need large amounts of pesticides per cropping season. Cooperative or farm organizations (mean 1.40) are not very popular for the respondents as a regular source of pesticides. This could be explained by the fact that the majority of the respondents are non-members of farm organizations.

Table 4.9. Respondent's Source of Pesticides (N = 240)

Source of pesticides	Response (%)			
	Never (1)	Sometimes (2)	Always (3)	MEAN
Retailer	4.2	25.0	70.8	**2.67**
Wholesaler	50.8	38.3	10.8	**1.60**
Pesticide agent	56.3	38.8	5.0	**1.49**
Cooperative or farmers organization	64.2	31.7	4.2	**1.40**

When asked how often they use the different kinds of pesticides, the respondents reported that they used insecticides (mean 2.53) and herbicides (mean 2.49) most often in their rice-vegetable farm (Table 4.10). Rodenticides (1.75) were the least popular for the respondents. These results actually reflect the national figures in which 55 percent of the pesticides sold in the Philippines are insecticides, followed by herbicides (Rola and Pingali, 1992). Similar findings can be found in other studies conducted in Nueva Ecija where rice farmers, although generally male, reported that insecticide and herbicides were the most commonly applied chemicals in Nueva Ecija (Rola and Pingali, 1993, Bhuiyan and Castañeda, 1995; Cagauan, 1995; Warburton, Palis and Pingali, 1995). These studies further added that rice farmers use more organochlorines (OC) and organophosphates, the latter being preferred more because they are cheaper, widely available, and known for wide-spectrum toxicity (Rola and Pingali, 1993; Warburton, Palis and Pingali, 1995). Unfortunately, based on World Health Organization (WHO) standards, OC and OP are hazardous chemicals. In addition, some of the OPs popular in the Philippines have been banned or severely restricted in the United States (Warburton, Palis and Pingali, 1995). With regards to the other pesticides, molluscicide has become popular in the Philippines as it controls golden snail in rice. Fungicides are more commonly used in vegetables than in rice.

Table 4.10. Pesticides Used by the Respondents (N = 240)

Pesticide Used	Response (%)			
	Never (1)	Sometimes (2)	Regularly (3)	MEAN
Insecticide	0.8	45.4	53.8	**2.53**
Herbicide	1.3	48.3	50.4	**2.49**
Molluscicide	26.7	54.6	18.8	**1.92**
Fungicide	32.5	54.6	12.9	**1.80**
Rodenticide	34.2	57.1	8.8	**1.75**

The respondents were also asked what criteria they considered important in deciding the amount of pesticides to apply on their crops. Looking at Table 4.11, the respondents generally considered the directions on pesticide labels (mean 4.38) and husband or father’s recommendation (mean 4.18) as important criteria on this aspect. Recommendations by a co-farmer (mean 3.30) and pesticide sales agent (3.01) were the least popular. As pesticide labels are most relied upon by the farmers, much effort should be placed on making the labels clear and understandable to these farmers. Using the local dialect in writing the directions on these labels would be a good starting point.

Table 4.11. Criteria Used by the Respondents in Deciding Amount of Pesticide to Use (N =240)

Criteria in deciding amount of pesticide to use	Response (%)					
	Not Important (1)	Somewhat Important (2)	Undecided (3)	Important (4)	Very Important (5)	MEAN
Directions on pesticide label	2.1	2.5	2.1	42.5	50.8	**4.38**
Husband or father's recommendation	2.9	3.8	1.7	55.8	35.8	**4.18**
Co-farmers recommendation or experience	6.7	28.3	0.8	56.7	7.5	**3.30**
Recommendation of pesticide sales agent	14.2	27.5	6.3	47.1	5.0	**3.01**

The respondents were asked to consider a list of possible sources of pesticide information and which among these sources are most important (Table 4.12). Pesticide labels (mean 4.33) and the husband/father (mean 4.25) were considered as the most important sources of pesticide information by the respondents. Magazines/newspapers (mean 2.67) and radio/television (3.00) were the least important sources of information for the women. These results are consistent with the earlier findings of this research that pesticide labels are very much depended on by the farmers for information. And again, radio and television, together with magazines and newspapers, proved to be unpopular for these women farmers. It is possible that magazines and newspapers are not very much relied upon as the leading ones are written in English and most often are not available in the villages' stores. One has to ride one or two public transportation vehicles in order to buy the leading newspapers/magazines.

Table 4.12. Respondent's Source of Pesticide Information (N = 240)

	Response (%)					
Source of pesticide information	**Not Important (1)**	**Somewhat Important (2)**	**Undecided (3)**	**Important (4)**	**Very Important (5)**	**MEAN**
Pesticide labels	0.4	4.2	0.4	51.7	43.3	**4.33**
Husband/Father	2.1	4.6	0.8	50.8	41.7	**4.25**
Government/Extension worker	8.8	14.2	2.5	54.6	20.0	**3.63**
Co-farmer	4.6	25.4	0.8	58.8	10.4	**3.45**
Pesticide sales agent	11.3	24.2	5.0	51.7	7.9	**3.21**
Radio/TV	14.6	30.8	2.5	44.2	7.9	**3.00**
Magazine, newspapers	25.0	29.6	3.3	37.9	4.2	**2.67**

The respondents were asked a question regarding their perceived level of control over pesticide usage. For their answers, the women were asked to choose from a four-point response scale: no control, small amount of control, moderate amount of control, and great deal of control.

Looking at Table 4.13, more than one-third of the respondents perceived that they have no control over the amount of pesticides to be used for rice (35 percent) and vegetables (33 percent). Only very few women (16 to 18 percent) felt they have a great deal of control on this aspect.

Table. 4.13. Perceived Level of Control over Pesticide Usage and Health Impacts

Item	Response (%)				Total (%)
	No Control	Small Amount of Control	Moderate Amount of Control	Great Amount of Control	
Perceived Level of Control over the Amount of Pesticide Used					
Rice	35.0	27.0	22.0	16.0	100
Vegetables	33.0	28.0	21.0	18.0	100

CHAPTER 5

WOMEN'S INVOLVEMENT IN PESTICIDE MANAGEMENT

This chapter describes statistical results for the potential explanatory variables for women's involvement in pesticide management. The first section of this chapter presents statistical differences between women's extent of involvement in field and non-field pesticide management roles for rice and vegetables. In the second section, I present results of the bivariate analysis between the explanatory variables and dependent variables. Lastly, results of the regression analysis explaining variation in women's involvement in pesticide management are presented.

5.1. Involvement in Pesticide Management in Field and Non-field Roles for Rice and Vegetables

A comparison of means is presented to see the statistical difference between the involvement of women in rice and vegetables with regards to pesticide management. The paired sample t-test procedure was used to determine the difference.

Looking at the data presented in Table 5.2, there is a statistically significant difference between women's involvement in field roles on rice and vegetables pesticide management (p=.000). Women's involvement in field roles for vegetables had a mean score of 1.57 and only 1.48 for rice. Looking at the non-field activities on rice and vegetables, we can also conclude that there is a significant difference between women's involvements in pesticide management for these two crops (p=.003). Women's involvement in non-field pesticide management activities for rice (1.79) had a slightly higher mean score than that for vegetables (1.77). This shows that there is a distinction on how women are involved in pesticide management. In terms of field roles, women are more active in vegetable pesticide management. But in terms of non-field roles, women are somewhat more active in rice pesticide management. Note however that levels of participation in field and non-field roles are not very high.

Table 5.1. Statistical Significance Results for the Difference between Involvement of Women in Pesticide Management for Rice and Vegetables

Variable	Rice	Vegetables	t	P
	Mean Score			
Field roles	1.48	1.57	-5.353	.000
Non-field roles	1.79	1.77	3.008	.003

5.2. Bivariate Analysis Results of Women's Involvement in Pesticide Management

Bivariate analyses were used to examine the relationship between the women's extent of involvement in pesticide management and selected characteristics of the women respondents, the respondents' household, the farm, the village, and women's perceived level of control over pesticide usage. Pearson correlation coefficients of the relationship between women's involvement in pesticide management, both field and non-field for rice and vegetables, and the selected variables are presented in Table 5.2.

Table 5.2. Correlation Coefficients of Selected Variables for Women's Involvement in Pesticide Management for Rice and Vegetables (N=240)

VARIABLES	WOMEN'S INVOLVEMENT IN			
	Rice		Vegetables	
	Field	Non-Field	Field	Non-Field
I. Socio-demographic and Household Characteristics of the Respondents				
Age	.118	.056	.062	.065
Marital status	-.234**	-.099	-.165*	-.132*
Educational attainment	-.125	-.162*	-.164*	-.159*
Member of farm organization	.029	-.065	.009	-.058
Have a child under 5 years old	-.103	-.093	-.147*	-.078
Have a male household member age ≥12 years	-.175**	.052	-.154*	.020
II. Characteristics of the Respondent's Farm				
Rice farm size (hectares)	-.076	-.190**		
Vegetable farm size (hectares)			-.172**	-.109
Tenure status (renter vs. owner)	.026	.026	.003	.010
San Jose (reference Bongabon)	.089	-.002	.066	.023
Sto. Domingo (reference Bongabon)	-.045	-.002	.038	-.027
III. Respondent's Perceived Level of Control				
Level of control on the amount of pesticides to be used for rice	.207**	.282**		
Level of control on the amount of pesticides to be used for vegetables			.232**	.311**

*p <0.05 ** p<0.01

For field roles in rice, marital status, having a male household member age greater than or equal to 12 years old, and perceived level of control over pesticide usage have a statistically significant association with women's involvement in pesticide management. Women who are married and have a male household member age 12 years and older have lower field roles in rice pesticide management. On the other hand, women who perceived they have higher level of control over pesticide usage are likely to have more field roles in rice pesticide management.

With regards to non-field roles in rice, educational attainment, farm size and perceived level of control over pesticide usage were statistically significant. Women who have educational attainment and bigger farm sizes are likely to have lesser non-field roles in rice. However, women who perceived that they have higher level of control over pesticide usage are likely to have more non-field roles.

In terms of field roles in pesticide management in vegetables, six variables were significant. Marital status, educational attainment, having a child under five years old, having a male household member who is 12 years or older, and farm size have a negative and statistically significant association with women's involvement in pesticide management. Perceived level of control over pesticide usage has a positive and statistically significant association.

For women's involvement in non-field pesticide management in vegetables, marital status and educational attainment have negative and statistically significantly associations with involvement. Again, perceived level of control over pesticide usage came out as positive and statistically significant.

Except for the results with the educational attainment of the respondents, all the significant relationships in the bivariate analyses were in line with the expectations presented in the conceptual framework. Higher educational attainment was expected to lead to more roles for women but instead the opposite was found with lower educational attainment of the women leading to more roles in pesticide management, particularly in field roles in vegetables and rice and non-field roles in vegetables. As with regards to the variables which were found significant, it is possible that women who are single or widows will have more roles in pesticide management as they will have more control of the operations in the farm including pesticide management. Additionally, in the Philippines, as well as in other countries, it has been found that women are much more involved in smaller farms, especially vegetables areas, as it reduces labor costs (Ruifa, et al, 1997). The data supports this particularly with non-field roles in rice and field roles in vegetables. The absence of very young children in the household increases women's pesticide management roles perhaps because they will have more time to engage in farm activities rather than childcare. In the Philippines, taking care of young children has generally been the responsibility of women. Lastly, the perceived level of control women have on the amount of pesticides to be used on their crop is positively associated with level of involvement.

5.3. Multivariate Analysis Results of Extent of Involvement in Pesticide Management

This section provides multivariate analytical results from OLS regression models. These models test the hypotheses stated in Chapter 2 on women's extent of involvement in pesticide management and how it is associated with various socio-demographic and farm characteristic variables.

5.3.1. Determinants of the Extent of Involvement in Pesticide Management for Rice

The dependent variables FIELD and NON-FIELD RICE ROLES measure women's extent of involvement in pesticide management activities on rice. A higher score on the scale for this variable suggests that a woman has more roles or is more involved in pesticide management activities for this crop.

The multivariate analytical results on the extent of involvement for rice are presented in Table 5.3. Among the 11 variables used, only three variables were statistically significant for field and non field-roles in pesticide management for rice. In addition, when compared to the bivariate analysis, except for the perceived level of control on field roles in rice, all the variables retained their significance in the multivariate analysis. For field roles*, Marital status, Having a male household member 12 years or older,* and *Perceived level of control over pesticide usage* were statistically significant. The first two had a negative and statistically significant influence in women's involvement in field roles for rice. This means that married women are more likely to have lesser involvement in field roles than single or widowed women. Married women are likely to have lesser field roles as they perhaps to tend concentrate more on their domestic responsibilities and let the husband do most of the farm work – which includes pesticide management. Having a male household member age 12 years and older is also likely to decrease women's involvement in field roles. The presence of a male household member who is old enough to help in the farm affects negatively women's involvement in pesticide management. On the other hand, the variable *Perceived level of control over pesticide usage* was found to be positively and statistically significant with women's involvement in field roles. Women who perceived that they have a great deal of control on the amount of pesticides to be use in the farm is likely to be more involved in field roles in rice pesticide management.

With regards to non-field roles in rice pesticide management, the variables *Educational attainment, Rice farm size,* and *Perceived level of control* were found to be statistically significant. *Educational attainment* has a negative and statistically significant influence on non-field roles in rice. Therefore, women with higher education have lesser involvement for this type of role in pesticide management. This is the opposite of what was predicted in the conceptual framework. A probable explanation for this is that in the Philippines women who have attained a high degree of education are usually encouraged to find work outside the farm because non-farm work is often seen as more financially stable and provides more security compared to working on the farm. Women who have not finished schooling are usually the ones working on the farm. *Rice farm size* is also negative and statistically significant in explaining women's involvement in non-field roles. Women having smaller farmlands are likely to be more involved in non-field roles to save on labor costs for the household. The variable *Perceived level of control over pesticide usage* was found to be positively and statistically significant with women's involvement in non-field roles.

The value of the adjusted R^2 for field roles (.120) and non field roles (.111) are very similar. This indicates that 11-12 percent of the variance in each type of role for rice pesticide management is explained by the independent variables.

Table 5.3. Unstandardized and Standardized OLS Regression Estimates Predicting the Effects of Socio-Demographic, Household, Farm, and Level of Control Characteristics on Women's Involvement in FIELD and NON-FIELD ROLES for Rice Pesticide Management (N=240)

Independent Variables	Field Roles		Non-Field Roles	
	B[a]	Beta[b]	B	Beta
I. Socio-demographic and Household Characteristics of the Respondent				
Age	.002	.061	-.001	-.049
Marital status	-.299	-.186**	-.109	-.080
Educational attainment	-.022	-.077	-.038	-.155*
Member of farm organizations	.018	.014	-.092	-.087
Have a child under 5 years old	-.076	-.081	-.054	-.067
Have a male household member age ≥12 years	-.229	-.179**	.049	.044
II. Characteristics of the Respondent's Farm and Village				
Rice farm size (hectares)	-.030	-.081	-.058	-.183**
Tenure status (renter vs. owner)	.072	.078	.056	.071
San Jose (reference Bongabon)	.120	.133[c]	.012	.016
Sto. Domingo (reference Bongabon)	-.029	-.023	-.030	-.029
III. Respondent's Perceived Level of Control				
Perceived level of control on the amount of pesticides to be used for rice	.079	.190**	.095	.267***
R^2	.161		.156	
R^2 adjusted	.120***		.111***	

[a] Unstandardized [b] Standardized

[c] p<0.10 *p<0.05 ** p<0.01 ***p<0.001

5.3.2. Determinants of the Extent of Involvement in Pesticide Management for Vegetables

The dependent variables FIELD and NON-FIELD VEGETABLE ROLES measure women's extent of involvement in pesticide management activities on vegetables. A higher score on the scale for this variable suggests that a woman has more roles or is more involved in pesticide management activities for this crop.

Table 5.4. presents the results of the multivariate analysis for women's extent of involvement in pesticide management for vegetables. For field roles, three variables were found significant. The variables *Having a child under 5 years old* and *Having a male household member age 12 years or older* were negative and statistically significant. This suggests that the absence of your children and old male household members at home may allow the women to engage in field roles in pesticide management for vegetables. The variable *Perceived level of control over pesticide usage for vegetables* has a positive and statistically significant influence on women's involvement in field roles. Having more control over the amount of pesticide used probably gives women the authority to be included in major pesticide management activities.

On the other hand, only one variable was found to significant for non-field pesticide management roles in vegetables. The variable *Perceived level of control over pesticide usage for vegetables* has a positive and statistically significant influence on women's involvement in field roles.

Looking at the value of the adjusted R^2 for field roles (.115), this indicates that 12 percent of the variance in field roles for vegetable pesticide management is explained by the independent variables. The adjusted R^2 for non-field roles (.099) indicates that 10 percent of the variance in non-field roles for vegetable pesticide management is explained by the independent variables.

Table 5.4. Unstandardized and Standardized OLS Regression Estimates Predicting the Effects of Socio-Demographic, Household, Farm, and Level of Control Characteristics on Women's Involvement in FIELD and NON FIELD ROLES for Vegetable Pesticide Management (N=240)

Independent Variables	Field Roles		Non-Field Roles	
	B	Beta	B	Beta
I. Socio-demographic and Household Characteristics of the Respondent				
Age	.000	-.015	-.001	.002
Marital status	-.188	.100	-.147	-.107
Educational attainment	-.037	-.131	-.032	-.129
Member of farm organizations	.026	.021	-.077	-.072
Have a child under 5 years old	-.121	-.132*	-.041	-.051
Have a male household member age ≥12 years	-.161	-.128*	.029	.026
II. Characteristics of the Respondent's Farm				
Vegetable farm size (hectares)	-.055	-.111	-.030	-.069
Tenure status (renter vs. owner)	.069	.076	.044	.055
San Jose (reference Bongabon)	.111	.126	.012	.015
Sto. Domingo (reference Bongabon)	.075	.063	-.050	-.048
III. Respondent's Perceived Level of Control				
Level of control on the amount of pesticides to be used for vegetable	.080	.198**	.104	.292***
R2	.156		.141	
R2 adjusted	.115***		.099***	

[a] Unstandardized [b] Standardized

*p<0.05 ** p<0.01 ***p<0.001

CHAPTER 6

WOMEN'S LEVEL OF KNOWLEDGE OF PESTICIDE HEALTH IMPACTS

This chapter describes statistical results for the potential explanatory variables for women's level of knowledge of pesticide health impacts which were outlined in the conceptual framework. The first section of this chapter presents results of the bivariate analysis between the explanatory variables and women's level of knowledge. The last section expounds on the results of the regression analysis which explains variation in women's level of knowledge of pesticide health impacts. Note that in this analysis, only 24 statements were used (out of the 41 that was developed) to reach an acceptable Cronbach's alpha. The 21 statements did not include statements from the knowledge of treatment for pesticide poisoning.

6.1. Bivariate Analysis Results of Women's Level of Knowledge of Pesticide Health Impacts

Bivariate analysis results are presented for women's level of knowledge of pesticide health impacts. Pearson correlation coefficients of the relationships between the respondent's level of knowledge and the respondent's socio-demographic, household, farm and village characteristics are presented in Table 6.1.

Table 6.1. Correlation Coefficients of Selected Variables for Women's Level of Knowledge of Pesticide Health Impacts (N=240)

INDEPENDENT VARIABLES	Women's Level of Knowledge of Pesticide Health Impacts
I. Socio-demographic and Household Characteristics of the Respondents	
Age	.138*
Marital status of respondent	-.021
Educational attainment of respondent	.060
Member of farm organizations	-.084
Have a child under 5 years old	-.023
Have a male household member age ≥ 12 years	.152*
Extent of involvement in pesticide management for rice, Field Roles	-.048
Extent of involvement in pesticide management for rice, Non-field Roles	-.038
Extent of involvement in pesticide management for Vegetables, Field Roles	.052
Extent of involvement in pesticide management for rice, Non-field Roles	-.061
II. Characteristics of the Respondent's Farm and Village	
Rice farm size (hectares)	.035
Vegetable farm size (hectares)	.068
Tenure status (renter vs. owner)	.058
San Jose (reference Bongabon)	-.175**
Sto. Domingo (reference Bongabon)	.065
III. Respondent's Perceived Level of Control	
Perceived level of control over pesticide management in rice	.030
Perceived level of control over pesticide management in vegetables	.009

*p <0.05 ** p<0.01

Among the respondent's socio-demographic characteristics, only *Age* and *Having a male household member age 12 years or older* have a positive and statistically significant association with women's level of knowledge of pesticide health impacts. As the respondent gets older, the more likely she will be knowledgeable of pesticide health impacts. This was the opposite of what was predicted in the conceptual framework. The literature shows that younger people were more concerned about pesticide related information and thus have the tendency to seek more knowledge about the subject. With regards to the variable *Have a male household member age 12 years and above*, this suggests that the presence of a male household member who is old enough to work in the farm will likely increase women's level of knowledge of pesticide health impacts. Again, this was the opposite of what was predicted in the conceptual framework. A possible explanation for this is that there is a transfer of knowledge from the men to the women. Even though the men are the ones usually invited to pesticide-related trainings/seminars or the only ones approached by pesticide agents, they perhaps share the information they learned with the women in their household. Therefore, the presence of an adult male suggests that pesticide-related knowledge may be shared or transferred to the women. The variable *San Jose was* found to be negative and statistically significant. This suggests that women farmers from the municipality of San Jose, when compared to Bongabon women, have lesser knowledge of pesticide health impacts. This might be because Bongabon has a strong farmer organization (NOGROCOMA) which has good linkages with government and private sectors involved in agriculture. This perhaps gives women in Bongabon the advantage of being well-informed of pesticide health impacts.

5.4. Multivariate Analysis Results of Women's Level of Knowledge of Pesticide Health Impacts

This section provides multivariate analytical results from OLS regression models. These models test the hypotheses stated in Chapter 2 on women's level of knowledge of pesticide health impacts and how it is associated with various socio-demographic, household, farm characteristics of the respondents. The dependent variable measures women's level of knowledge of pesticide health impacts. The scale for this measure ranged from 1 to 5, with a higher score indicating that a woman has a higher level of knowledge.

Table 6.2. presents results of the multivariate analysis of women's level of knowledge. Only two variables were significant in this analysis. Thus when compared to the bivariate analysis, three variables (marital status in field and non field roles, educational attainment in field and non-field roles and vegetable farm size in field roles) had lost their significance in the multivariate analysis. The variable *Having a male household member age 12 years or older* has a positive and statistically significant correlation with women's level of knowledge. This suggests that having a male member who is old enough to work in the farm is likely to increase women's level of knowledge of pesticide health impacts. This is the opposite of what was predicted in the conceptual framework. The literature and the FGD with women leaders report that men are usually the ones invited to pesticide trainings and seminars. It is possible that men share or transfer the knowledge they received to the women in their households. Therefore, having a male member in a household, the more likely is knowledge shared to women and this

increases women's knowledge about pesticide health impacts. The variable *San Jose was* found to be negative and statistically significant. This suggests that women farmers from the municipality of San Jose, when compared to Bongabon women, have lesser knowledge of pesticide health impacts. As explained earlier, this might be because Bongabon has a strong farmer organization (NOGROCOMA) which collaborates with government and private sectors involved in agriculture, including IPM CRSP. Perhaps this gives farm women in Bongabon the advantage of being well-informed of pesticide health impacts.

Looking at the value of the adjusted R^2 (.048), this indicates that barely five percent of the variance in women's level of knowledge of pesticide health impacts in the sample is explained by the independent variables. This suggests that the variance in this data is not explained much by the given independent variables.

Table 6.2. Unstandardized and Standardized OLS Regression Estimates Predicting the Effects of Socio-Demographic, Household, Farm, and Level of Control Characteristics on Women's Level of Knowledge of Pesticide Health Impacts (N=240)

INDEPENDENT VARIABLES	B[a]	Beta[b]
I. Socio-demographic and Household Characteristics of the Respondents		
Age	.003	.148
Marital status of respondent	.005	.004
Educational attainment of respondent	.026	.138
Member of farm organizations	-.101	-.124
Have a child under 5 years old	.028	.046
Have a male household member age ≥ 12 years	.113	.134*
Extent of involvement in pesticide management for rice, Field Roles	.040	.061
Extent of involvement in pesticide management for rice, Non-field Roles	.100	.130
Extent of involvement in pesticide management for Vegetables, Field Roles	.083	.124
Extent of involvement in pesticide management for rice, Non-field Roles	-.202	-.265
II. Characteristics of the Respondent's Farm and Village		
Rice farm size (hectares)	.005	.020
Vegetable farm size (hectares)	-.008	-.025
Tenure status (renter vs. owner)	-.010	-.017
San Jose (reference Bongabon)	-.131	-.220**
Sto. Tomas (reference Bongabon)	-.032	-.041
III. Respondent's Perceived Level of Control		
Perceived level of control over pesticide management in rice	.038	.138
Perceived level of control over pesticide management in vegetables	-.034	-.124
R^2	.116	
R^2 adjusted	.048	

[a] Unstandardized [b]Standardized
*p<0.05 ** p<0.01

CHAPTER 7

CONCLUSION

The objective of this study was to examine the roles and level of knowledge of women farmers on pesticide management. Initially, the factors believed to contribute to the invisibility of women in pesticide management research were presented. After that, the various activities women perform relating to pesticide management were presented and classified. A review of literature formed the basis for the development of a conceptual framework that lays out the factors influencing women's roles and knowledge on pesticide management. The research answers the following research questions:

1. What are the different pesticide management roles women farmers perform in rice and vegetable systems?
2. What factors influence women farmers' involvement in rice and vegetable pesticide management?
3. What is the level of knowledge of women farmers on the health impacts of pesticides?
4. What factors influence women farmers' knowledge of the health impacts of pesticides?

To address these research questions, field research was conducted to collect primary data from 240 farmwomen from three municipalities in Nueva Ecija, Philippines. A questionnaire was developed and administered face to face to women farmers. A focus group discussion was also conducted with female farmer leaders and female farm technicians to improve the questionnaire and to provide qualitative data. Frequency distributions, means, reliability analyses, correlation analyses, and multivariate analyses were the methods used for the data analysis.

7.1. WHAT HAS BEEN LEARNED FROM THIS STUDY?

i. Women and their Roles in Pesticide Management

The results of this research project show that farm women are involved in pesticide management for rice and vegetables. Unlike what most literature reports, women are active players in pesticide management. Though levels of involvement may be low, there were farm women who carry out a range of tasks from the major task of spraying pesticides to the simple task of disposing unused or expired pesticides. It is worthwhile to note that women were found to be most active in handpicking pests and monitoring the field after pesticide application. These are major IPM processes and therefore underscore the possible role women can be tapped to play in this pest management strategy. The majority of women wash pesticide soaked clothes and buy pesticides, activities which are likely to be done together with their household tasks. This clearly illustrates the multiple responsibilities of farm women and which when done simultaneously with their household tasks may hide the extent of their involvement. Because research on farm women is traditionally focused on their role as a wife or mother, their farm contributions can become invisible. More importantly, this highlights the point that reproductive (or household) and productive (or farm) work are intricately intertwined. Farm women perform productive and reproductive work simultaneously or a particular task might include elements of both production and reproduction. The process of combining these various tasks is not a conscious activity but a habitual experience arising from daily practice (Whatmore, 1991). Involvement in pesticide management often integrates the arenas of farm and the family, wherein labor within the family arenas can appropriately be construed as farm activities (Colman, 1981).

The results also show that women were performing slightly more field roles on pesticide management on vegetables than on rice, and performance in non-field roles on rice and vegetables are not very different. This finding not only illustrates how women participate in each crop but it also at the same time demonstrates the many ways in which they are exposed to pesticides, directly and indirectly. Exposure to pesticides perhaps begins when women purchase chemicals that are not properly sealed or are leaking. Direct exposure probably occurs when they treat seeds, spray or manually apply the pesticides especially if they do not wear any Personal Protective Equipment (PPE). Indirect exposure is perhaps most common when they wash pesticide-soaked clothes. Lack of recognition of non-field roles is tantamount for undercounting indirect sources of pesticide exposure for women. Also, this research was careful to measure women's participation in 14 pesticide management activities rather than subsuming them under pesticide application or spraying. Both cases, the lack of recognition of non-field roles and subsuming the different roles under pesticide application/spraying, are problematic as results showed that women are active in non-field roles and were doing the various 14 pesticide management activities. In order to fully comprehend women's encounter with pesticides, and the impact of these chemicals, it is necessary to look at both types of pesticide management roles.

In addition, as non-field roles are more actively performed by women and non-field roles are largely unpaid and accomplished outside the field this then explains why women are unrecognized in pesticide management work. Farm work tends to be defined as labor done outside the home and for remuneration (Reed, et al., 1999). Women performing non-field farm work generally do not receive wages for this type of work. This also explains why no tangible record of their work contribution appears on official documents, such as tax records (Rosenfeld, 1985). The situation "worsens" as non-field roles are mostly carried out where one resides (i.e., washing of pesticide-soaked clothes). Differentiation of home and work site may not exist when involvement in pesticide management is being tackled and where non-field roles are involved. Therefore, the limiting notion of farm work contributes to the invisibility of farmwomen in pesticide management.

Some of the factors which influence female participation in rice and vegetable pesticide management are consistent with previous research (i.e., women's marital status, level of control, farm size, having a young child) while other results represent more fresh additions to the literature (i.e., educational attainment, having a male household member). It is worth noting that various factors differentially affect field and non-field pesticide management roles for both crops wherein what is significant to one, may not be true for the others. Only the variable *Perceived level of control* proved to be consistently significant and positive regardless of the kind of role and type of crop. Note however that the variance explained by the independent variables used in this study to explain level of involvement in pesticide management was a bit low. Therefore, there is a need to look more into this area.

The gender role expectations that prevail in the Philippines resemble that in most developing countries. Filipino women's primary role remains in the domestic sphere as wives and mothers and such a position assumes a lower status than that of the "breadwinner and household head" position of men (the father or the husband). Thus, it was not surprising to find that married women will have lesser field roles in pesticide management in rice as compared to single or widowed women as the gender norm systems expect married women to be focused on the welfare of their households. This perhaps is reflective only in rice farming (and not in vegetable farming in the regression analysis) as it has always been considered the major occupation of the Filipino farm households.

The result for the level of educational attainment was the opposite of what was predicted based on the literature reviewed. Higher education, which was assumed to equip a person with more skills and information to carry out more roles, was not necessarily true for non-field roles in rice pesticide management. Rather, women's education may provide them with the requisite skills and may increase their incentive to seek work outside the home and the farm. It is worthwhile to note that about 17 percent of the sample had attended college, graduated from college, or attended graduate school and barely two per cent had no schooling. Filipino farmwomen with lower education may be the ones more involved in pesticide management as they have nowhere else to work. It is also possible that women who have lower educational level takes on non-field work in rice as these kind of tasks demands lower levels of qualification, work that the male farmer deserted or does not want to do. Women's low level of education leaves them with no alternative other than an occupation in farming; thus it is possible that women's non-field work in rice pesticide management may not be the result of her free choice, but of social and economic necessity (Sociologia Sela, 1979).

The results with farm size, specifically on non-field rice roles, confirm what is found in the literature that farmwomen from smaller landholdings are more active in pesticide management. Landholding size is one of the major bases for rural class differentiation in the country. The interplay of the forces associated with gender norms and the household's economic status may determine the extent and direction of women's productive and economic roles. Farm size is a function of economic status in the Philippines and effects how much women are needed in the farm. Smaller landholdings represent less wealthy households who skimp on resources as much as possible. This perhaps is particular for non-field roles in rice pesticide management as farm households with larger rice landholdings tend to hire labor rather than depend on the family.

The prevailing gender norm system in the country is quite traditional with the women's work domain circumscribed by home production which significantly includes childcare activities. While childbearing is biologically determined, the role of childrearing is socially determined. The gender role expectation of taking care of the children limits women's involvement in productive activities, which includes the farm. In addition, the age structure of children set the boundaries by which women's time allocation may vary. The presence of young children places a demand on women's time that competes with their availability to perform farm tasks. As a result, women belonging to farm households with children, especially young ones, are less involved in farm activities like pesticide management so as to devote their time for childcare. This phenomenon possibly is more applicable to field roles in vegetable pesticide management as women are really more active in vegetable production than in rice. They are even sole managers of vegetable production particularly if this involves small or home gardens only.

The presence of male household members who are old enough to help in the farm was significant for field roles in rice and vegetable pesticide management. This reflects the farm household labor situation in the Philippines where male members are the ones preferred, or probably expected, by the household to assist in pesticide management rather than the female adult members. Thus, a farm household having a male household member who is old enough to work in the farm will lessen the chance of women working in pesticide management.

Farmwomen's perceived level of control on amount of pesticide use is also a factor that impacts their involvement on pesticide management. This shows that farmwomen who feel that they have a say on the household's pesticide usage will have more roles in pesticide management. This situation is probably more true in households where women decide on the farm budget, in effect the amount of pesticide to be bought and eventually used, as it affects household finances. Though this variable proved to have the strongest correlation with women's involvement, it should be noted that the direction of the causal relationship may be the opposite. It is possible that when farm women are more involve in pesticide management, they will perceive that they have more level of control over pesticide usage. Furthermore, this variable may be linked to the risk literature wherein women's perceived level of control may have to do with whether they see pesticide management as a risky or risk-free technology. These areas should be looked at in future research.

This explicit determination of the involvement of women in pesticide management proved productive for three reasons. First, it expounded on why the invisibility of farm women exists on pesticide management. Second, it reveals the many possible ways farm women may be exposed to pesticides. Lastly, it also help explained the impact of gender roles and expectations in Philippine society to women's pesticide management roles.

ii. Women and their Knowledge of Pesticide Health Impacts

Contrary to what was expected, farmwomen in the Philippines showed a high level of knowledge of pesticide health impacts. They were knowledgeable of 1) protection/safety practices on pesticide management, 2) health impacts/symptoms of pesticide poisoning, and 3) treatment practices for pesticide poisoning. This was surprising because, according to the FGD, the majority of them have not been invited and had not attended pesticide management trainings and seminars. A factor to consider in explaining this phenomenon is the gender role ascription of Filipino women as health caretakers of the household. This role may compel farm women to learn about the health impacts of pesticide exposure to better take care of the household. Another possible reason for the women's knowledge of pesticide health impacts is that they all live in IPM CRSP sites. The IPM CRSP had established experiment sites in various farm households and conducted several extension activities (Field Day with Farmers, Farmer's Field School, trainings, and seminars) in the three research sites. Some of these IPM CRSP trainees and farm collaborators are women. Perhaps the knowledge from the IPM CRSP activities in these areas had seeped to the other farm women in these areas.

Multivariate analysis was performed and only one factor was found to further explain this phenomenon. A factor, which did not conform to the research expectations, was the positive impact of the presence of male adult household members. Results showed that the having a male household member is likely to increase the knowledge level of farmwomen on pesticide health impacts. As the farm women leaders had reported, the male household members are the ones invited and who attended pesticide management trainings and seminars. It is possible then that the information learned by the men through these trainings and seminars are shared with the women in their households. Thus, a trickle down of information may be happening from the trainings to the men and then to the farm women. It should be noted that the variance explained by the independent variables was very low for this research. Therefore, there is a need to look more deeply at what is explaining the variance in women's knowledge of pesticide health impacts.

Bearing all this in mind, greater knowledge of pesticide health impacts is indeed a complex phenomenon, influenced by a variety of factors. Unfortunately, many aspects of safe pesticide management work against awareness/knowledge being translated to action. Many factors may intervene to create a discrepancy between what farmers know and what they do. These may include time pressures wherein women have to balance farm work and household chores and in turn does not permit the practice of safe pesticide management practices. Women may need to carry out a pesticide management activity immediately due to crop or economic demands such as lower price for banned pesticides or ones that are not properly labeled or sealed. There is also the issue of relying on PPE which has been found in the literature to be uncomfortable, inconvenient, expensive, and sometimes inaccessible to women farmers. There is enough evidence to show that PPE from the temperate countries cannot be easily adapted to tropical conditions (Chester et al., 1993) or for women's physical characteristics (Jacobs and Dinham, 2003). It is also possible that farmwomen will underestimate pesticide health risks because the work is so familiar with them, because they need to feel competent and in control, and because they are focused on the present (producing a harvest to be able to feed the family or pay debts), rather than future possibilities (getting sick). The absence of any external imposition of safety regulations is also a possible issue. In the Philippines, although pesticide labeling laws and other regulations designed to protect farm workers safety do exist, they often are not enforced (Antle and Pingali, 1995). Some of these factors were confirmed by the female farm technicians during the FGD.

7.2. METHODOLOGICAL IMPLICATIONS

The recognition of pesticide management as a multi-task activity made the work contributions of women evident in this crop production activity. Rather than just asking women farmers if they apply pesticides, 14 pesticide management activities were identified and women were asked if they performed these activities or not. The more detailed questions better represented how women shape their work on pesticide management. Therefore, measurement of women's work is greatly improved by breaking down pesticide management work into separate tasks. This implies the need for posing questions as specific as possible to get the correct information on who does what in the farm. In addition, asking about very specific activities recognizes the overlapping responsibilities of women in the farm and in the household.

The original Pesticide Knowledge Test (PKT) was improved to cover more aspects about proper pesticide management. However, the improved PKT needs to be enhanced or further developed so that its reliability will increase. The improved PKT is a relatively new instrument therefore, the results of the reliability assessment is applicable only to this sample. It is also possible that the PKT may be too "easy" or too general for this group of farm women, considering their high level of educational attainment. Hence, there is a need to test this PKT to other groups or to make the statements more challenging to see if the results will be the same. It is also important to note that these statements evaluate only the knowledge level of women farmers, which may or may not translate into desired farm safety behaviors. Furthermore, studies are needed to examine the correlation of knowledge scores with actual work practices/behavior.

The research used a combination of quantitative and qualitative methodologies. The former made possible the performance of statistical analyses which was important in explaining the relationship of the variables used. The inclusion of a qualitative approach, a Focus Group Discussion (FGD) with female farm leaders, helped the research in two ways. First and foremost, the FGD helped improve the questionnaire administered to the farm women. By asking farm leaders what they had observed female farmers contribute in pesticide management, the 14 pesticide management activities identified for the research were verified. Second, the FGD partly substantiated the quantitative data from the farm women. The farm women leaders shared what they had observed happening in the field during pesticide management activities and cited examples of pesticide exposure or poisoning. This information made clearer the structured answers regarding roles and knowledge obtained from the questionnaire administered to the women farmers. It also brought the apparent difference in viewpoints of the farm women leaders and farm women such as on the short- and long-term health impacts of pesticide exposure. The combination of quantitative and qualitative approaches therefore contributed to the success of the study. This underscores the productiveness of combining or mixing approaches to collect more comprehensive and valid data on women and pesticide management.

The absence of a list of women farmers in the area reflected what is common in most agriculture areas: the lack of recognition that women are farmers. The researcher had to depend on the masterlist of farmers from the local agriculture office which was biased on male farmers. Women were considered/listed as farmers only when they are unmarried or widowed farm operators. There is an urgent need to build a strong database reflecting gender-specific roles and contributions, not only in pesticide management but also on agriculture as a whole so that it can be used to enhance understanding of women's contributions to farming.

It is also important to see how the results will hold in non-IPM CRSP research areas. This will inform us if the farm women in these villages will have the same or different roles in pesticide management and whether their knowledge of health impacts will be higher or lower.

7.3. POLICY IMPLICATIONS

If there is a strong conviction that farmwomen have a direct bearing on the welfare and health of the household, then improving women's lot is, indeed worthwhile.

The involvement of farm women in pesticide management underscores the need for women to participate in farm safety education, particularly in pesticide management related trainings and seminars. Traditionally, information and training activities regarding pesticide management have set male farmers as target groups. Pesticide educators should design courses and other educational tools in consideration of the special needs of farmwomen. Pesticide labels, the most common source of pesticide information and which is the one farmwomen rely most on how much pesticide to use, should be written as clearly as possible – verbally (using the local dialect) or through the use of pictograms. The challenge of developing language and culture appropriate pesticide materials needs to be addressed. Labels can inform the farmwomen how to discriminate among chemicals and help provide them information on appropriate use, disposal and its health hazards. Regulation via verbal labels is effective only in high literate societies – of which the research area is one. Pictograms are an alternative for less literate societies; however, since these may not be universally understood, especially in the developing countries, more education and mass communication are needed (Antle and Pingali, 1995). Furthermore, there is also a need to educate the farm women and their households on the dangers of using pesticides that has a wide-spectrum of toxicity. This practice has been shown to be ineffective in managing pests and diseases and is not recommended by the IPM. Additionally, according to the FGD, farmwomen are not usually invited to extension meetings or training sessions that deal with pesticide use, precautionary measures, or health risks. There are times that farmwomen do not feel that such invitations, when addressed to the village or a group of farmers in general, concern them. If extension messages do reach them, no special attention is paid to the gender dimension, e.g., susceptibility of women due to thinner skin and more stored fat, risks for unborn babies or nursing children, washing pesticide-soaked clothes as a source of exposure. Furthermore, such trainings do not fit with farmwomen's busy schedules. Further education about pesticide health impacts needs to 1) recognize the involvement of women in pesticide-related farm work and 2) be designed in a manner that is inclusive and appropriate to these gender issues. Public health funding should also support such initiatives.

More than the need for pesticide management information that are informed by the understanding of gender roles is the need for pest control alternatives. Such alternatives should be gender-sensitive and at the same time health and environment friendly. An example of a health and environment friendly technology is IPM. This technology contributes to livelihoods, food security and income, through reducing health hazards and developing sustainable approaches to managing crop pests, combining the use of biological, cultural, physical, and chemical tactics to minimize health and environmental hazards (Martin and Albright, 2003). IPM would minimize, if not totally eradicate the dependency on pesticides in the longer term. The Philippines is in an advantageous position because, unlike other developing countries, they have a functional IPM extension program for rice. In addition, the IPM CRSP had started to establish IPM for vegetables in the country. However, the IPM technology still has to improve its position on being gender-friendly. As it is, the major educational strategy they use, Farmer Field Schools (FFS), does not auger well with farmwomen's time. FFS are season long trainings which make it difficult for women to attend or complete the training due to the demands of their household roles. Moreover, if the selection of participants is based on data from local agricultural offices (which as explained earlier were biased on male farmers) or farm organizations (which are male farmer dominated) then this discriminates against women. It would also be wise to have an IPM training session discussing gender related pest management issues (i.e., gender health impacts of pesticide use) so that men and women alike will be aware of how pesticide exposure affect them differently. Another subject that should be discussed in these information dissemination activities are the long and short term health impacts of pesticide. Lastly, individual, household and farm factors that affect women's involvement should also be considered in the overall planning.

More gender sensitive research is needed to properly address the study of women's pesticide management roles, pesticide exposures, and related adverse outcomes. Different groups of highly exposed women (e.g. landed, single, no children) can provide valuable information. Epidemiological research should focus on individual pesticides or known combinations of pesticides, and exposure assessment methods should be refined.

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APPENDIX A.

SURVEY QUESTIONNAIRE for FEMALE FARMERS

Farm Women's Roles in Pesticide Management and Knowledge of Pesticide Health Impacts

Respondent # ________________________ Date of Interview ______________
Interviewer ________________________ Municipality ________________
Barangay ________________

I. Socio-economic Profile

1. What is your age (years) ? ___________

2. What is the highest grade that you finished in school (please encircle)?

   (1) no schooling (2) some elementary (3) elementary graduate
   (4) some high school (5) high school graduate (6) some college/vocational
   (7) college graduate (8) some or postgraduate

3. How many male household members are there in your household?
   _____ under 12 years of age _____ age 12 – 19
   _____ age 20 – 50 _____ over age 51

4. How many children are there in your household?
   _____ under 5 years of age _____ age 5 to 18 years
   _____ over age 18 years

5. Marital Status (please encircle):

   (1) Single (2) Married (3) Widow

6. Are you a member of any farm organization (please encircle)?

   (0) No (1) Yes

7. Tenure Status (please encircle):

   (1) Owner (2) Leasee (3) Hired Laborer
   (4) Others (specify) _______________

8. Farm size: _____ Rice _____ Vegetables

9. No. of years in farming ___________

II. Roles in Pesticide Management

10. Have you done any of the following pesticide management activities? (place a check on the given answer)

Pest Management Activity	Rice			Vegetables		
	Nev	Occ	Reg	Nev	Occ	Reg
10.a. Applied pesticides using a knapsack sprayer?						
10.b. Applied pesticides manually using your hands or a brush?						
10.c. Treated seeds with pesticides?						
10.d. Mixed pesticides before application?						
10.e. Put pesticides or place pesticide traps around the field or crop storage areas?						
10.f. Monitored the field after pesticide application?						
10.g. Handpicked pests in the field after pesticide application?						
10.h. Carried/transported pesticides to the field?						
10.i. Bought pesticides?						
10.j. Cleaned or recycled pesticide equipment or containers?						
10.k. Washed pesticide-soaked clothes?						
10.l. Stored pesticide or pesticide equipment/containers?						
10.m. Disposed pesticide containers or equipment?						
10.n. Disposed unused or expired pesticides?						
10.o. Others, pls specify ___________________________						

III. Pesticide usage and practices

11. How important are the following when you select a particular pesticide?

Criteria in the selection of pesticide	Very Important	Important	Undecided	Somewhat Important	Not Important
Price of pesticide					
Availability of pesticide					
Pesticide can be used for both rice and vegetable					
Brand name of pesticides					
TV or radio ads about pesticide					
Pesticide is recommended by government worker					
Effectiveness of pesticide in controlling pests					
Pesticide is recommended by co-farmers					
Pesticide is safe to use					
Pesticide is recommended by pesticide sales agent					
Others, please specify					

12. How often do you buy pesticides from the following sources?

Source of Pesticides	Always	Sometimes	Never
Wholesaler			
Cooperative or Farmers organization			
Retailer			
Pesticide agent			
Others, please specify			

13. How often do you use the following kinds of pesticides?

Pesticide Used	Regularly	Sometimes	Never
Insecticide			
Herbicide			
Molluscicide			
Fungicide			
Rodenticide			
Others, please specify			

14. How important are the following in helping you decide how much pesticide to use?

Criteria in deciding amount of pesticide to use	Very Important	Important	Undecided	Somewhat Important	Not Important
Husband's recommendation					
Direction in pesticide label					
Recommendation of Pesticide sales agent					
Co-farmers recommendation/experience					
Others, please specify					

15. How important are the following sources of information about pesticide management?

Source of pesticide information	Very Important	Important	Undecided	Somewhat Important	Not Important
Government/Extension worker					
Magazine, newspapers					
Husband					
Pesticide labels					
Pesticide sales agent					
Radio/Tv					
Co-farmer					
Others, please specify					

16. Have you attended any training or seminar about the proper use of pesticides?

_____ Yes _____ No

16.a. If yes, who sponsored or gave the training/seminar?

____

16.b. If no, why have you not attended any training/seminar?

____

17. What problems have you encountered regarding pesticide management?

____

____

____

IV. Perception of Pesticide Health Impacts

19. Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box *(Note: 5: strongly agree; 4: somewhat agree; 3: undecided; 2: somewhat disagree; 1: strongly disagree)*

		5	4	3	2	1
1	It is okay to store water in containers that have been used for storing pesticides.					
2.	It is good to apply pesticides on a windy day.					
3.	It is important to read the signs and announcements at the border of the field or orchard before entering.					
4.	Protective clothing (gloves, boots, long sleeves, etc) should be worn when mixing or applying pesticides.					
5.	Soap and water remove pesticides from hands.					
6.	You can eat fruit directly from the tree or plant after it rains because the rain rinses off the pesticide residues.					
7	Empty pesticide containers can be kept for reuse.					
8.	Leaking pesticide containers or equipment should be repaired or replaced.					
9.	Eating, drinking, or smoking in the field increases the possibility of pesticides entering the body.					
10.	When working in the field, the pesticides can stick to your clothes and shoes.					
11.	It is important to shower and change clothes after handling pesticides.					
12.	It is important to read instructions/warning labels on pesticide containers.					
13.	Pesticides should be stored out of reach of children and animals.					
14.	Pesticides are dangerous for people and animals.					
15.	It is okay to bring young children to the field after pesticide application.					
16.	Pesticides that are not in the original container may have been adulterated.					
17.	Spilled pesticides can contaminate as well.					
18.	Concerning safety to humans, all pesticides are pretty much the same.					

		5	4	3	2	1
19.	Some people can get sick from pesticides faster than others even though they work in the same place.					
20.	Contact with pesticides may cause blister or skin rash.					
21.	Pesticide poisonings have immediate but not delayed health effects.					
22.	It is easy to identify a sickness triggered by pesticides.					
23.	Pesticides pose few health risks to pregnant women and children.					
24.	Pesticides can enter the body through the skin.					
25.	Vomiting, diarrhea, salivation, and cramps are signs of pesticide poisoning.					
26.	Pesticide drift or residue is harmful.					
27.	Mild and moderate illnesses such as headaches and dizziness can happen after contact with pesticides.					
28.	Pesticide exposure can cause cancer.					
29.	Under similar levels of exposure, women absorb more pesticide than men.					
30.	Contact with pesticide causes eye injuries.					
31.	Being more exposed to pesticides does not affect my immunity to it.					
32.	Pesticides can be transmitted to family members in the laundry.					
33.	Once a pesticide is sprayed onto a plant it is no longer harmful to humans.					
34.	Pesticides are more dangerous for men than women.					

		5	4	3	2	1
35.	If you get pesticides on you, it is important to immediately remove any contaminated clothing and rinse skin with water.					
36.	Drink medicine when pesticide poisoning occurs.					
37.	It is important to transport patients to the nearest doctor, hospital or clinic.					
38.	If pesticides come in contact with the eyes, eye flushing should be done.					
39.	When poisoning has occurred, the doctor does not need the pesticide label.					
40.	When a person had swallowed pesticides, it is important to drink at least some water or milk.					
41.	Victims who inhaled pesticides should be removed from pesticide area to fresh air immediately.					

V. Perception of control on pesticide management

42. How much control do you believe you have over the amount of pesticides that you and your family members are exposed to? (please check response)

	No control	Small amount of control	Moderate amount of control	Great deal of control
Myself				
On children (or future children)				
Other family members				

43. How much control do you believe you have over protecting yourself and your family from pesticide exposure? (please check response)

	No control	Small amount of control	Moderate amount of control	Great deal of control
Myself				
On children (or future children)				
Other family members				

44. How much control do you believe you have over avoiding any possible harmful health effects of pesticide on you and your family? (please check response)

	No control	Small amount of control	Moderate amount of control	Great deal of control
Myself				
On children (or future children)				
Other family members				

45. How much control do you believe you have over the health consequences of pesticide use on you and your family? (please check response)

	No control	Small amount of control	Moderate amount of control	Great deal of control
Myself				
On children (or future children)				
Other family members				

46. How concerned would you be over the health consequences of pesticide use on you and your family? (please check response)

	Not concerned at all	Not sure	Somewhat concerned	Very concerned
Myself				
On children (or future children)				
Other family members				

47. How probable is it that you and your family members will experience some health problems due to pesticides? (please check response)

	No chance	Somewhat likely	Very likely	Definitely likely
Myself				
On children (or future children)				
Other family members				

48. How severe do you believe will the health consequences of pesticide use be on you and your family? (please check response)

	Not at all severe	Not sure	Somewhat severe	Very severe
Myself				
On children (or future children)				
Other family members				

APPENDIX B.

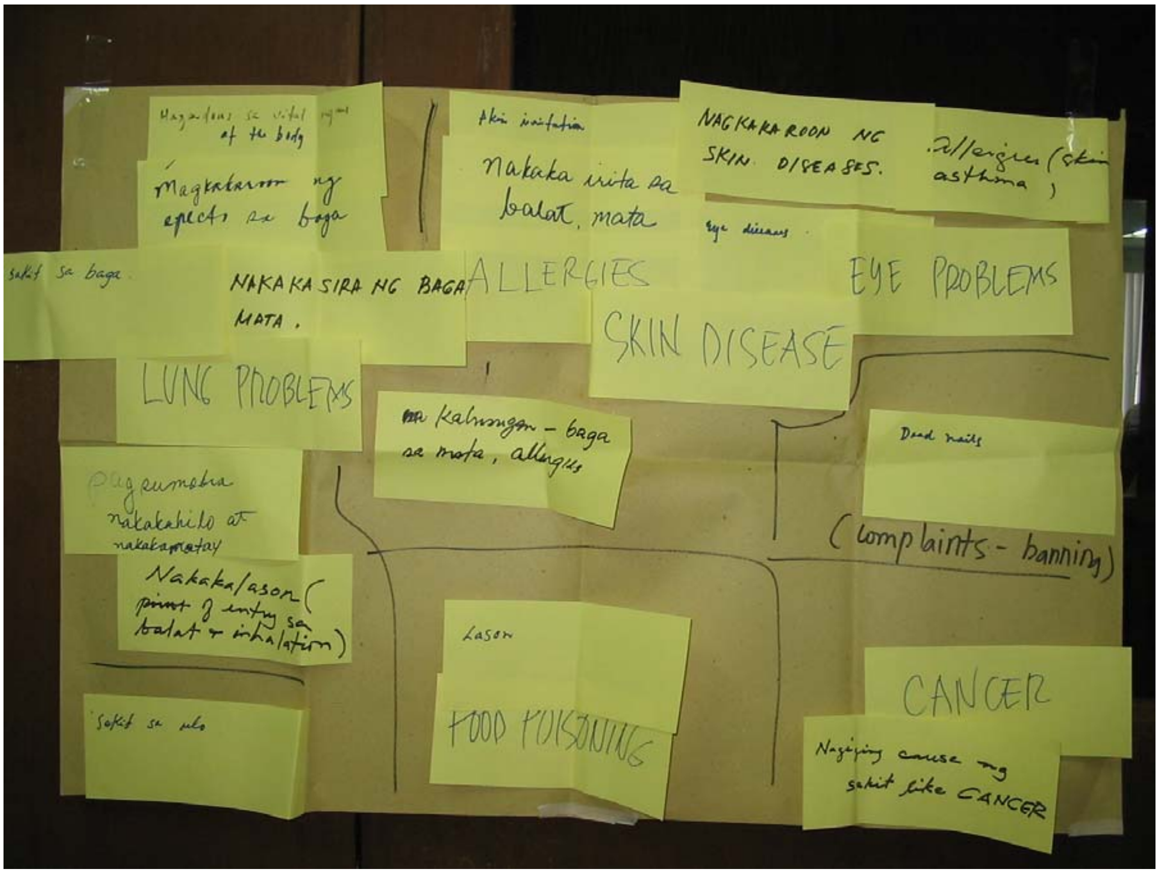
ORIGINAL PESTICIDE KNOWLEDGE TEST

(McCauley, L.A., D. Sticker, C. Bryan, M.R. Lasarev, and J.A. Scherer, 2002)

ITEM	Response	
	True	False
Pesticides are used to kill weeds and insects.		
Pesticides are dangerous to people and animals.		
Some people can get sick from pesticides faster than others even though they work in the same place.		
It is okay to store water in containers that have been used for storing pesticides.		
Sometimes contact with pesticides causes a blister or skin rash.		
With time, pesticides degrade in the environment.		
Pesticide poisonings may have immediate but not delayed effects.		
It is good to apply pesticides on a windy day.		
It is important to read the signs and announcements at the border of the field or orchard before entering.		
It is very easy to identify a sickness triggered by pesticides.		
Eating, drinking, or smoking in the field increases the possibility of pesticides entering the body.		
Pesticides pose few health risks to pregnant women and children.		
Protective clothing should always be worn when mixing or applying pesticides.		
When working in the field, the pesticides can stick to your clothes and shoes.		
Pesticides can enter the body through the skin.		
Soap and water remove pesticides from hands.		
You can eat fruit directly from the tree or plant after it rains because the rain rinses off the pesticide residues.		
If pesticides get on you, immediately remove any contaminated clothing and rinse your skin with water.		
Emergency phone numbers don't have to be posted in common meeting areas.		
It is better to work in shorts, short sleeves, and sandals when it is sunny.		

APPENDIX C.

SAMPLE OUTPUT of the FOCUS GROUP DISCUSSION



Health Impacts of Pesticide Exposure/Poisoning according to Female Farmers

APPENDIX D.

SAMPLE and INFORMATION FOUND on a PESTICIDE LABEL

Sample Pesticide Label[1]

(1) Precautionary Statements

Wear chemical-resistant gloves and long-sleeved clothing when applying this product.

Environmental Hazards

Toxic to bass, but not toxic to blue-gills. Do not contaminate water.

For sale to and application only by certified applicators or persons under their direct supervision.

RELIABLE

	Active ingredient	Sacrm Phall (SePh)	20%
(2)	Common Name	Sechall	
	Inert ingredient	Water	80%
			100%

HERBICIDE

KEEP OUT OF REACH OF CHILDREN

(3) DANGER—POISON

(5) Directions for Use

For Corn: Apply at a rate of 1lb. material per acre. Do not apply to soybeans. May be used as a general purpose weed control around grain bins, farm buildings, and fence rows. Will control annual grasses and annual broadleaves. Use at a rate of 5lbs. material per acre for general weed control. Apply with water only in at least 20 gallons per acre.

Storage and Disposal

Store in secure place where product will not freeze. Dispose of excess material in an approved waste-disposal facility.

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

General Use Pesticide

(4) Statement of Practical Treatment

If swallowed, do not induce vomiting.

SEE A DOCTOR

If inhaled, get to fresh air.

If on skin, wash with soap and water.

If in eyes, flush with water.

Call 562-8731 in the event of an emergency.

Mfg. by: Buckeye Chemical Works
Columbus, Ohio

Est. No. 292-OH1
EPA Reg. No. 292-1
Net Contents 2lbs.

Physical or Chemical Hazards

Can cause corrosion to iron tanks.

VITA

Irene R. Tanzo

EDUCATION

2000-2005	Ph.D. Candidate, Rural Sociology, The Pennsylvania State University, USA
1990-1994	MA Sociology, University of the Philippines at Los Baños, Philippines
1985-1989	AB Sociology, University of the Philippines at Los Baños, Philippines

PROFESSIONAL EXPERIENCE

2000-2004	Graduate Research Assistant, The Pennsylvania State University, USA
1989- 2005	Senior Science Research Specialist, SocioEconomics Division, Philippine Rice Research Institute, Philippines
1998-1999	Division Head, SocioEconomics Division, Philippine Rice Research Institute, Philippines

AWARDS

2005	1st Place, Social Science Division, 12th Annual Gamma Sigma Delta Research Competition
2004	Awarded Global Travel Award for fieldwork in the Philippines
2000	Awarded an IPM CRSP graduate assistantship

ORGANIZATIONAL MEMBERSHP

2005	Member, Gamma Sigma Delta Honor Society
2000-2005	Member, Rural Sociological Society
2000-2005	Member and Officer, International Christian Fellowship