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The VACB model in Hòa An Village and Xeo Trâm Hamlet: Comparison and Analysis through a Gendered Lens

Alyssa Bosold
SIT Study Abroad

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The VACB model in Hòa An Village and Xeo Trâm Hamlet: Comparison and Analysis through a Gendered Lens



Alyssa Bosold

Independent Study Project (ISP)

SIT Vietnam: Culture, Social Change, and Development

Spring 2012

Abstract

Burning fuel-wood, a method of traditional cooking practiced by half of all homes in Vietnam (Global Alliance for Clean Cook-stoves 2012) and the majority of homes in Hòa An Village and Xeo Trâm Hamlet, has significant negative consequences in terms of environmental and personal health. In Hòa An Village and Xeo Trâm Hamlet, as is true in much of Vietnam, gender roles dictate that women should be primarily responsible for household chores like cooking (World Bank 2001, Nguyen 2012, Nguyen 2012, Vo 2012). This means that women must often deal directly with the environmental dangers and safety hazards of woodstoves. As environmentally sustainable and safe cooking methods are implemented in Hòa An, Xeo Trâm and elsewhere, it is vital that women's first-hand knowledge, ideas and opinions are considered in the process. This study will use the lens of gender to examine a common method for sustainable fuel use promoted throughout Hòa An and Xeo Trâm: the VACB model. VACB is an integrated farming system that includes a garden (*vườn*), fish pond (*ao*), pigs or poultry (*chồng*), and biogas. Through a series of interviews and surveys and a case study using gender analysis in Xeo Trâm Hamlet, this study seeks to answer the following specific questions: 1.) How do men and women participate in traditional woodstove cooking? How does the VACB system affect these traditional gender roles? 2.) Does the VACB model meet the needs of both men and women? How do men and women in Hòa An Village and Xeo Trâm Hamlet perceive this model? 3.) Is the VACB model implemented in a way that considers the opinions of men and women? Gender analysis reveals that complex variables, including not only gender but education level, age, health, geographic location, and land holdings, influence perception of the VACB model and needs in terms of sustainable cooking. It also shows that people from the Xeo Trâm Hamlet, and women in particular, are marginalized from the implementation of the VACB model and systems for sustainable fuel use. Ultimately, this study demonstrates the importance of the insights provided by marginalized men and women in Xeo Trâm and concludes that dedication to gender and social equity is necessary for the success of systems for sustainable fuel use and cooking.

Keywords: Wood-fuels, VACB model, Xeo Trâm Hamlet, Hòa An Village, gender roles, implementation, gender analysis, power relations, marginality, equity, participatory approach

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List of Abbreviations

CCRD- The Center for Rural Communities Research and Development

CTU-Can Tho University

Co2- Carbon Dioxide

ES- Environmental Studies

GHG-Green House Gasses

ISP- Independent Study Project

SIT-School of International Training

USD- United States Dollar (conversion factor used in this paper is 1USD=20,000 VND)

VAC-Integrated farming system prior to the VACB model that includes *vườn* (garden), *ao* (fish pond), *chuồng* (pig or poultry)

VACB- Integrated farming system that includes *vườn* (garden), *ao* (fish pond), *chuồng* (pig or poultry), and biogas

VND- Vietnamese Dong (currency of Vietnam); (conversion factor used in this paper is 20,000 VND= 1USD)

WGS- Women, Gender and Sexuality Studies

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1. Introduction

1.1 Wood-fuels, women, and VACB: How are they related and why are they important?

In Vietnam, a country of over 86 million people (The World Bank Group 2012), half of all homes practice traditional cooking with woodstoves and fuel-wood (Global Alliance for Clean Cook-stoves 2012). The number of households using fuel-wood includes the majority of homes in Hòa An Village, an area with 3,800 houses and a total population of over 15,000 (Nguyen 2012). It also includes almost all of the 180 homes in Hòa An's Xeo Trâm Hamlet. Cooking with fuel-wood contributes to global climate change by emitting greenhouse gasses (GHGs) including carbon dioxide (Co₂), methane, and dangerous aerosols like black carbon (United Nations Foundation 2012, Luceno et al 2012). The impact of cooking with fuel-wood is significant: burning of biomass such as wood and crop residues contributes to 18% of global GHG emissions (Bond 2007, Jacobson 2001). Cutting wood for cooking also encourages climate change by causing deforestation and desertification (United Nations Foundation 2012, Luceno et al 2012). Wood fueled cook-stoves are not only hazardous to the environment, but are also harmful to people who cook near them. In Vietnam, 23,800 people die prematurely each year due to exposure to cook-stove smoke or accidents involving wood fueled cook-stoves (Global Alliance for Clean Cook-stoves 2012). In Hòa An Village and Xeo Trâm Hamlet, as is true in much of Vietnam, gender roles dictate that women should be primarily responsible for household chores like cooking (World Bank 2001, Nguyen 2012, Nguyen 2012, Vo 2012). This means that women must often deal directly with the environmental dangers and safety hazards of woodstoves. Therefore, as more environmentally sustainable and safe cooking methods are implemented in Hòa An, Xeo Trâm and elsewhere, it is vital that women's first-hand knowledge, ideas and opinions are considered in the process.

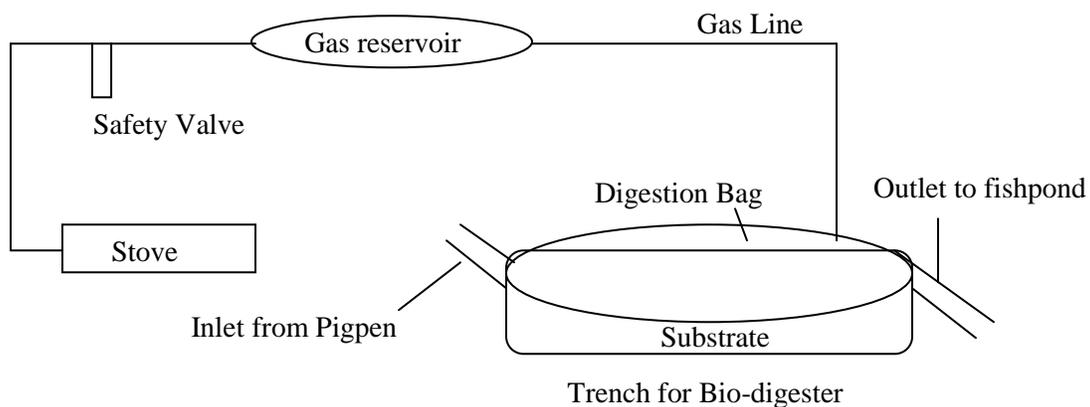
One of the ways to ensure that women's voices are heard in the implementation of sustainable cooking methods is through evaluation with gender analysis. Gender analysis recognizes that there are differences in the lives of men and women, meaning that men and women have unique priorities, needs and concerns. Gender analysis also attempts to determine how gender intersects with other variables such as socio-economic status, age, ethnicity etc. to shape peoples' needs and positions. The process of gender analysis includes understanding the different roles of men and women, examining who has access to and control over decision making and other resources, and studying how access and control are shaped by socioeconomic context (Asian Development Bank 2006). Ultimately, gender analysis seeks to promote equity between all groups of men and women. It is a method for strengthening the voices of women and others who are often marginalized. Gender analysis is a useful tool for evaluating sustainable cooking and fuel use systems because it can help researchers to determine whether men and women's views and perceptions are considered equally, and can ensure that women's important opinions and understanding of cooking are recognized.

This paper will use a gendered analysis and perspective to examine a model for sustainable cooking and fuel use that has been promoted as a replacement for fuel-wood throughout Vietnam and in Hòa An Village: the *vườn* (garden) *ao* (pond) *chuồng* (pig or poultry) and *biogas* model (VACB). This model is based on traditional "VAC" farming practices in Vietnam's Red River Delta. Traditionally, in order to deal with flooding in the Red River Delta, farmers built homes on mounds. To construct these mounds, they dug dirt from the ground, leaving a large hole. This hole was eventually turned into a fish pond (*ao*) and was integrated into existing Red River Delta farming practices, which included growing gardens (*vườn*) and raising pigs/poultry (*chuồng*) (Pham 2012). Biogas was later adapted as a way to complete this

VAC method of farming, using waste from pigs or poultry in a productive way and creating a system of cooking that is environmentally beneficial (Pham 2012).

In the VACB system manure from livestock (usually pigs) passes through an installed bio-digester. As manure moves through the bio-digester, it is transformed through anaerobic digestion (a digestion process completed without oxygen) into fertilizer for algal plants that fish consume and methane gas. In this case, methane is an environmentally benign bio-gas because it is derived from contemporary plant stock rather than fossil fuels or sequestered coal (Monani 2012). There are several different ways to design the bio-digester for the VACB model, but the design that is most common in Hòa An is the plastic bag bio-digester (Figure 1). In this model, manure is mixed with water and fed through a pipe into a digestion bag. As the digestion process occurs, methane rises to the top of the bag and into another pipe that is connected to a stove for cooking. At the same time, digested and clean organic material moves through the bottom of the bag and into the fishpond where it acts as fertilizer (Pham 2007).

Figure 1: Diagram of a Plastic Bag Bio-Digester



Adapted from Pham (2007).

1.2 Literature review

The VACB system ideally creates a diversified and sustainable income for farming families by allowing them to sell crops, fish, and pigs, while simultaneously stopping the emission of GHGs and improving the household environment (Nguyen 2012, Ni et. al 2001). It is often stated that the VACB model is especially beneficial for women. For example, according to Mr. Thanh Pham (2012) of The Center for Rural Communities Research and Development (CCRD), the VACB model reduces the time that women spend collecting fuel, cooking, and cleaning cookware dirtied by wood-smoke. It also saves them money by eliminating the cost of commercial gas or wood from the market and improves their health by managing animal waste and reducing indoor air pollution from woodstoves (Pham 2012).

While these and additional benefits for women have been confirmed by other sources (Phat 2012, Zhu 2006, Nguyen 2012, Lun and Phuoc 2012), there is almost no research that uses an explicitly gender-based perspective or the method of gender analysis to examine the VACB model in Vietnam, in the Hòa An Village, or in the Xeo Trâm Hamlet. What related scholarly research I could find often mentioned the importance of social equity in strategies for rural development like the VACB model. However, this research only looked at gender issues briefly or failed to address them entirely. For example, Peters (2001) talked about upland rural development in Vietnam, focusing on the importance of socially equitable implementation, but did not specifically discuss gender equity. A report by the Center for Agricultural Research and Ecological Studies of Hanoi Agricultural University only mentioned gender in one sentence, explaining that gender issues influence whether agro-forestry models are feasible (Mai et al. 2005). In an evaluation of small-scale anaerobic digesters in Vietnam that included the bio-

digester of the VACB model, Nguyen (2011) explained one gender related barrier to implementation:

The biogas support projects do not involve all members of the family and this causes disagreement on the construction of a biogas plant. Most biogas support projects introduce biogas information through either representative organizations such as the Women's Union or the Farmer's Association, etc. Then only one member in the family know[s] the advantages of biogas while the other members [do] not.

Unfortunately, further discussion of this gendered challenge was lacking. Nguyen and Evers (2011) also talked about biogas systems, focusing specifically on the implementation of the VACB model in the Mekong Delta and how farmers are involved in this process. While their study showed that including farmers as knowledge brokers can contribute to the success of the VACB model, they mainly talked about male farmers as knowledge brokers. Their study did mention that, of the farm families they interviewed, only one farmer's wife was involved in transferring knowledge of the VACB model to the community. However, they failed to explain the significance of this observation and did not discuss the issue of women's marginality any further.

Overall, it seems that any considerable discussion of the VACB model in terms of gender focuses only on how the VACB system can benefit women. Current scholarly research and discourse on the VACB model fail to truly analyze how VACB affects men and women differently, how it influences traditional gender roles, and whether its design, implementation, and use encourage gender equity and the leveling of power relations. A more detailed analysis that provides insights into the gendered power relations behind the VACB model is instrumental in ensuring the success of this system and of sustainable cooking and fuel use in Xeo Trâm, Hòa An and Vietnam as a whole. Because women are responsible for food preparation and understand the process of cooking and fuel-use first hand, their perspective and feedback is

extremely valuable in the design and implementation of sustainable cooking systems. They experience the benefits and the disadvantages associated with cooking, they know what systems work best in what situations, and they can appreciate the money, labor, and time that will go into each cooking system. Their knowledge and opinions are highly important and can provide suggestions for creating or improving sustainable cooking methods so that they are beneficial, affordable, and practical for particular communities. However, if women are marginalized and their voices overlooked in a system of inequality, their valuable contributions to efforts to promote clean cooking, mitigate climate change, and create sustainable livelihoods may never be realized.

1.3 Objectives

By using a gendered perspective to examine the VACB model in Hòa An Village and Xeo Trâm Hamlet, my study seeks to evaluate the inclusiveness of sustainable cooking efforts in these areas. It will hopefully serve as a starting point for a system of sustainable cooking that considers all voices in its design, is tailored to the needs of all people, and can be adapted and maintained by families throughout the Hamlet and Village. Conducted as a series of interviews with people in Hòa An and a case-study using gender analysis in Xeo Trâm Hamlet, my research is focused on the gendered impacts of the VACB model as compared to woodstove cooking and examines the gendered dynamics of the VACB model's design, implementation, and use. My research is guided by the following specific questions:

- 1.) How do men and women participate in traditional woodstove cooking? How does the VACB system affect these traditional gender roles?
- 2.) Does the VACB model meet the needs of both men and women? How do men and women in Hòa An Village and Xeo Trâm Hamlet perceive this model?
- 3.) Is the VACB model implemented in a way that considers the opinions of men and women?

Ultimately, after answering these questions, I hope to draw what conclusions I can about the VACB model's effects on gender equity in Hòa An Village and in Xeo Trâm Hamlet. I will attempt to evaluate whether the VACB model currently promotes gender equity and will make suggestions from a gendered perspective to improve this system for sustainable cooking in Hòa An and Xeo Trâm.

2. Methodology: Structure and Limitations

The concept of gender equity is inherently connected to power relations between men and women. In order for men and women to be represented equally and for both of their needs and priorities to be met, there must be shared and equal power between them. Unfortunately, as Mason (2005) explains, "...power relations are notoriously difficult to measure". Because power relations are often enforced by institutionalized and socially accepted norms, it is challenging to gauge their effects and notice how they influence daily interactions. There is much debate about the proper research methodology for studying gendered differences in power relations (Mason 2005). Many scholars suggest that interviews and observations are best because they allow direct contact with women and men and give the researcher time to see how gender influences "freedom of movement" and the process of decision-making (Mason 2005). However, others argue that a sample survey is a more effective measure of gender equity and empowerment because, while it may not produce detailed results and understanding, it will provide a larger sample size and a more accurate picture of power and equity as a whole (Mason 2005).

Mason (2005) explains that the best way to overcome this obstacle is to use an approach that involves a diverse set of methods. With this in mind, I tried to design a mixed methodological structure for my research that would provide the kind of detailed information gathered through observation and interview, while still reaching a large enough sample size to draw some conclusions about the VACB model as it relates to gender equity. Also keeping in

mind the one month duration of the ISP period, I organized my research to allow sufficient time for both data collection and interpretation. I conducted my research in three stages that included interviews, survey distribution, observation and analysis.

2.1 Stage One: Expert interviews

The first stage of my research (conducted from April 16-April 20) was reserved for interviews (each lasting about 1 hour and 30 minutes) with officials and experts on the VACB model. During this time, I spoke with experts such as Mr. Tran Phat at the College of Rural Development in Hòa An. This interview with Mr. Phat helped me to develop an understanding of the VACB model in Hòa An, including its implementation, its disadvantages, and its positive impacts. Prior to this interview, I also spoke with Mr. Thanh Pham, Director of CCRD in Hanoi, who helped me to understand the general history and impacts of the VACB model. Both of these interviews were conducted in English and did not require a translator (Appendix 1).

In addition to interviews with experts on the VACB model, I also spoke with a primary school teacher in Hòa An and representatives from the Women's Unions of Hòa An Village and Xeo Trâm Hamlet. These interviews helped me to understand the socioeconomic context of Hòa An and Xeo Trâm and the gender roles within these areas. Interviews also provided more insight into how the VACB model has been implemented and the role of women and the Women's Union in this process (Appendix 2). Interviews with Women's Union representatives and the primary school teacher were conducted in Vietnamese and translated into English with the help of Mr. Nay, a staff member at the College of Rural Development in Hòa An.

Along with conducting interviews, I also used the first stage of my research as a time to gather secondary sources related to the VACB model and gender analysis. I read books and information about gender analysis previously collected from the World Bank's Vietnam

Development Information Center in Hanoi, and found new information about the VACB model both online and in books from Can Tho University (CTU).

2.2 Stage Two: Case study using Gender Analysis

The second stage of my research (conducted from April 23-April 28) used gender analysis to examine the VACB system as compared to traditional woodstove cooking. While I had initially planned to use gender analysis to study VACB and woodstove cooking within the entire Village of Hòa An, I quickly realized that I did not have the capacity or resources to accomplish this goal within the one month time period allotted for my ISP. Instead of using gender analysis to examine all of Hòa An, which has a population of over 15,000, I chose to draw conclusions from a case study in the Xeo Trâm Hamlet, which has only 180 households. I carried out my case study with the assistance of Mr. Phat and Ms. Thanh, the leader of the Xeo Trâm Hamlet Women's Union. Together, they selected interview and survey respondents throughout the Hamlet for me to visit. Each morning during this phase of my research, my interpreter and I met Ms. Thanh at her home near the entrance of the Xeo Trâm Hamlet and prepared for a full day of surveys and interviews. Before each survey or interview, I explained my research and its purpose, asked participants if they were willing to contribute, and gained permission to publish their answers in my study (Appendix 3).

Initially, I had created a very structured plan for carrying out my interviews and surveys. I had intended to first conduct four in-depth interviews: two with families who used the VACB model and two with families who used woodstoves. I wanted to organize these interviews as focus sessions (with just myself, my interpreter and the interviewee) to avoid biased responses resulting from the presence of others. For similar reasons, I had also hoped to talk separately with the husband and wife in each household. Next, I planned to distribute surveys to twenty

houses throughout the Hamlet, speaking to the person responsible for cooking in each home and asking him/her specific questions with quantifiable answers. After only a few minutes in the field, I realized the difficulty of sticking to my plan. In the end, I made some adjustments to my research process that I believe both helped and hindered data collection.

I did begin gathering data with in-depth interviews. These were conducted over the course of two days (Appendix 4). However, while I had originally hoped that these interviews would be held in focus sessions, I soon discovered that in a small Hamlet like Xeo Trâm conducting focus interviews is extremely difficult. In all of my interviews, Ms. Thanh was present and often added her opinions to the conversation, correcting some responses and explaining different concepts. While I know that I could not have conducted my interviews without her, was very grateful for her guidance and support, and felt that her presence made interviewees more comfortable around me, I could not help but wonder how she may have influenced my interviewees' responses and how they may have answered differently if she had not been there. For example, in one case, after a female respondent mentioned that she did most of the housework, Ms. Thanh added, "her husband helps when he is free." While the wife concurred with Ms. Thanh, I wondered about the sincerity of her agreement.

In addition to Ms. Thanh, there were also several other members of the Hamlet who would poke their heads into house doors to gossip about neighbors, or take a seat next to the interviewee in order to listen to what was being said. In some cases, a question posed to the interviewee would turn into a conversation among all of the other people listening to the interview. Although husbands and wives were generally interviewed separately, spouses often walked in and out of each others' interviews or were close by in another area of the house. All of this made it very difficult to know what answers truly belonged to the interviewee and what

answers were influenced by the presence or voices of others. Even my own presence as a Westerner conducting research related to gender and fuel use may have influenced responses, as interviewees may have changed their answers to comply with what they thought I wanted to hear.

In addition to an altered structure of in-depth interviews, I also had to make some adjustments to the number of in-depth interviews I conducted. While I did conduct two interviews with families using woodstoves and one with a family using biogas, my fourth interview turned out to be a follow-up conversation with Ms Thanh. She has a VACB system and had told me about it in our previous interviews and interactions. However, because there are only three VACB systems in the Hamlet and the other family with the model was not available for an interview, I instead talked more with Ms Thanh. Rather than a formal interview, we spoke informally, chatting about life and the VACB system over some freshly cut sugarcane. Although it would have been valuable to interview another family, I thought that my conversation with Ms. Thanh was just as important. Each time I spoke with her, I understood more about her opinions of the VACB model, the changes in her daily life as a result of the VACB system, and about cooking and lifestyle in the Xeo Trâm Hamlet as a whole.

Along with these modifications in the interview process, my methods of survey collection also ended up differing from my original plan. I had intended to conduct twenty surveys by walking around the Hamlet, stopping for about ten or fifteen minutes at each household to read questions aloud and circle respondents' answers. However, once I sat down at a home and started reading survey questions, respondents began giving me more detailed and elaborate answers than I had expected. Of course, I was interested in their ideas and could not help but ask questions that were not originally in my survey. In the end, while I did collect data and circle answers on pre-

constructed survey sheet (Appendix 5), I also gathered other information. Twenty surveys became twenty mini-interviews, lasting anywhere from fifteen minutes to one or two hours. Twenty women (one from each household) responded to the survey, as they were primarily responsible for cooking. However, in four of the twenty houses, husbands also gave their input because they helped significantly with collecting wood in these homes. Again, while I had not originally planned to conduct my research in this way, I think that it was a very beneficial change. It allowed me to gain a common set of data that I could use to compare households, but also helped me to understand the unique circumstances and problems that were faced by each person, both male and female, whom I interviewed. Throughout the process of data collection, I also made and recorded my own observations that eventually contributed to my analysis and understanding of cooking and fuel use in the Xeo Trâm Hamlet and Hòa An Village.

2.3 Stage Three: Data analysis

The final stage of my research (May 1-May 10) was dedicated to analyzing results and drawing conclusions from collected data. I recognize that with only a few weeks in the field, my understanding of the gender dynamics and other complex factors that affect fuel use and the process of adopting sustainable fuel in Hòa An Village and Xeo Trâm Hamlet is still very limited. It is also worth noting that while I tried my best to remain neutral and objective in my analysis, my results and conclusions are influenced by my interests and background. As a Women Gender and Sexuality Studies (WGS) minor and Environmental Studies (ES) major, I have taken classes in United States on the relationship between gender and environmental issues and my ideas have been shaped by the theories and concepts presented in class. My passion for ES and WGS and my prior knowledge have most likely shaped my interpretation of data and have affected the results and conclusions I have drawn from my research. Language barriers

provided another challenge to the process of data analysis. While all of my interpreters were excellent and very helpful, I am concerned that some of the thoughts expressed by the people of Hòa An and Xeo Trâm may have been lost in translation. Ultimately, despite limitations and personal bias, I feel that my data and observations from the field reveal important insights.

3. Results

Through analysis and interpretation of data collected in the field, I have discovered a very multifaceted and complex picture of fuel use in Xeo Trâm Hamlet and in Hòa An Village. I have found that gender intersects with variables such as age, health, land holdings, social status, and economic conditions to influence participation in cooking and fuel use, perception of the VACB model, and implementation of the VACB system. Results are reported below and are organized into categories based on my initial research questions. Findings are mainly derived from the case study in Xeo Trâm Hamlet, but are supplemented by interviews with teachers and Women's Union representatives in Hòa An Village.

3.1 How do men and women participate in traditional woodstove cooking? How does the VACB system affect these traditional gender roles?

In the Xeo Trâm Hamlet, and in most of Hòa An Village, there are clearly defined gender roles (Nguyen 2012, Nguyen 2012, Vo 2012). Men in the area are generally responsible for working in rice fields or doing odd jobs for others when it is not harvest season. Some women also work shifts in the fields or find employment to supplement the family's income. In addition, women are primarily responsible for housework and usually do all or most of the cooking. In only two of the twenty households surveyed, where wives were sick or busy taking care of grandchildren, husbands helped to do both household chores and cooking. Overall, while some women reported that they do the same amount of work as their husbands and one woman thought

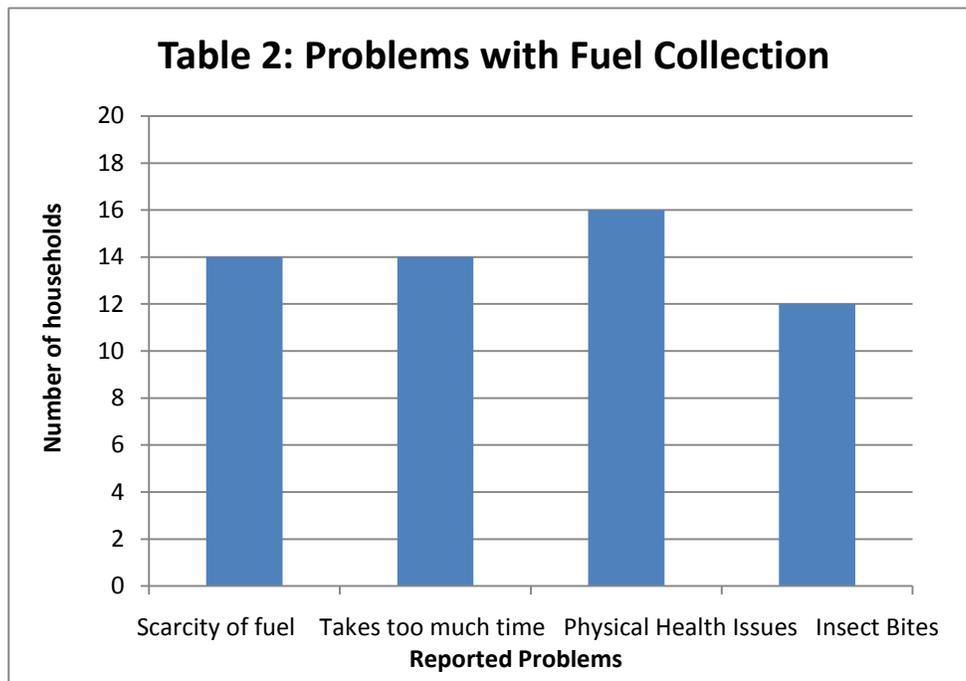
that her husband actually worked harder than she did, several of the women interviewed believed that cooking and housework gave them more responsibilities than their husbands.

Hòa An is an extremely poor village, with an average income of 80,000-100,000 VND (4-5 USD) per day (Nguyen 2012) and Xeo Trâm is one of its poorest Hamlets (Nguyen 2012). Many families interviewed reported that they live hand to mouth and struggle to earn money on a daily basis. Because the Village and Hamlet are so poor, people living there tend to use the least costly cook-fuel possible: wood. In all twenty families surveyed, collected wood was the main source of fuel for cooking. While some families did purchase wood on occasion, the vast majority of families interviewed collected wood because they could not afford to buy it. At a price of 100,000VND (5 USD), one meter of wood often costs more than their daily or sometimes weekly income. Gathering wood is a lengthy process that takes anywhere from two hours to a whole day. Because scarcity of wood is a problem in Xeo Trâm, collection often involves travel to distant areas where wood is more accessible. In Xeo Trâm Hamlet, most households collect wood two to three times per month. However, people may also collect wood on a daily, weekly or monthly basis depending on the availability of wood, their free time and their physical health. In all surveyed homes but one, wood collection was considered a part of women’s household chores and cooking duties, and in the majority of homes, women collected wood by themselves (Table 1).

Table 1: Responsibility for Wood Collection in the Household

<i>Who Collects the Wood?</i>	<i>Number of Households</i>
Woman collects wood with husband	3
Woman collects wood with families or children	4
Man collects wood alone	1
Woman collects wood alone	12

Overall, it seems that collecting wood is a burden for women and is one of their more significant responsibilities. Collecting wood also creates several hardships for women including headaches from heat, backaches, and bites from ants, leeches and bees (Table 2). Fourteen out of twenty women surveyed explained that collecting wood takes too much time and nineteen out of twenty women were not satisfied with collected wood as a primary cook-fuel.



Unfortunately, for many women in Xeo Trâm Hamlet, few substitutes for wood cooking are available and affordable. For example, only three out of 180 families in the Hamlet were able to implement the VACB system as an alternative to wood cooking. Many families and women surveyed reported that they could not afford the costs of the biogas system and the pigs needed for the VACB model to operate.

Because the VACB model is not widely implemented throughout the Hamlet, it made it difficult to assess the system’s impact on gender roles or women’s responsibilities. However, from interviews with women in the Village of Hòa An and with two of the households that

implemented the VACB in Xeo Trâm, it seems that the system does not necessarily encourage gender equity in household chores and responsibilities. As Nguyen Thi Thanh leader of the Hòa An Village Women's Union (2012) explained, when compared to woodstove cooking, the VACB system does not change the amount of responsibility that women have. In the VACB model, it is women who generally care for pigs, gardens, and poultry. Although they do not have to collect wood, they still have to do a significant amount of work around the house and are still primarily in charge of cooking. In an interview with primary school teacher Vo Thi Kim Lien (2012), she explained that her brother implemented the VACB system in his home but his wife usually manages the entire system on her own. In households of the Xeo Trâm Hamlet that had implemented the VACB system, it also seemed that gender roles remained the same pre and post VACB. As Tran Lun (2012), the wife in a Xeo Trâm household with the VACB model explained, she was responsible for most of the household chores and received some help from her husband. This relationship between her and her husband remained the same regardless of their method of cooking.

However, despite the fact that the model did not encourage change toward equity in household roles, it did provide important benefits for the families and the women who used it. All interviewees asked about the VACB model mentioned that the system is beneficial because it saves money. As Vo Thi Kim Lien (2012) explained, the system is good because families do not need to pay the costs of fuel or fertilizer, and can use the fish and gardens to provide food for their families. In Xeo Trâm Hamlet, all three VACB models were installed by students from School of International Training (SIT) at no cost to the households. Ms. Thanh (2012), Tran Lun and her husband Dinh Phuoc (2012) reported that they were happy to save money on the system itself and to be spared from the occasional cost of buying wood. Tran Lun (2012) also explained

that the system makes cooking faster, and Ms. Thanh (2012) appreciated that, unlike cooking with wood, she does not have to constantly watch the food that she cooks with biogas. Ms. Thanh also values the system because it makes her household environment cleaner, taking care of pig waste and eliminating smoke in her home.

3.2 Does the VACB model meet the needs of both men and women? How do men and women in Hòa An perceive this model?

While those who have the VACB system in the Xeo Trâm Hamlet and Hòa An Village seem to be satisfied with its affects, I discovered through surveys and interviews in Xeo Trâm that the VACB method is not ideal for all men and women. Perception of the VACB model and its ability to meet the needs of men and women in Xeo Trâm Hamlet is influenced by several variables including economic conditions, geographic location, health, and age. These variables often cut across gendered lines to influence men and women in similar ways, or intersect with gender to create differing perspectives on the VACB model.

One of the main challenges to installing the VACB model in the Xeo Trâm Hamlet, and one of the most significant factors influencing men and women's perception of the model in similar ways, is economic status. The plastic bag bio-digester model that is usually installed in Hòa An costs an average of around 6,000,000 VND (300 USD) (Nguyen 2012). While microloans are helpful for women in Hòa An and Xeo Trâm, allowing them to purchase some of the pigs or poultry necessary for the VACB model, there are no loans available in Xeo Trâm specifically for installing bio-digesters (Tran 2012). As previously mentioned, the three bio-digesters in the area were financed and installed by SIT students. In the two households without the VACB model that were selected for in-depth interviews, both men and women viewed lack of funds for the bio-digester as an obstacle to implementing the VACB system. While these two

families had enough pigs to operate the biogas aspect of the VACB model, they could not afford the costs of buying and installing a bio-digester and did not know how to find financial support.

Not only is the bio-digester expensive to install, but the price of raising enough pigs to operate the VACB system is extremely high. In order for the VACB system to work, a household needs to raise at least two female pigs every year (Tran 2012). While the two homes described above did have the right amount of pigs for the system, others struggled with this aspect of the VACB model. Even Ms. Thanh, who installed her biogas system in 2011, did not always have enough pigs to produce biogas for cooking. In the beginning, she could only use the biogas system occasionally and still relied mainly on collected wood. Only recently, after her daughter moved her own pigs to Ms. Thanh's home, could the biogas system function properly.

Furthermore, of the twenty households surveyed, none raised enough pigs to operate the biogas aspect of the VACB system. Ten out of the twenty homes raised only some pigs, often just one or two male pigs or a few piglets. Among these ten pig-raising respondents, half explained that if they had more money or capital, they would like to buy more pigs and potentially install a biogas system.

However, many respondents also noted that raising pigs is a risky business and is not always profitable. As two survey respondents explained, the market price for pigs fluctuates. In both of their cases, when their pigs were ready for sale, the market price was extremely low. They ended up losing money on their pigs and were disappointed with their investment in this form of livestock. In another survey, one woman and her husband explained that the cost of pig feed is very high. They raised one pig and fed it with sludge that they found in their yard. They told me that if they bought feed for the pig, they would lose money. Because they struggled to

raise just one pig, they were reluctant to take out any loans for purchasing additional pigs and were uncertain about their ability to maintain a VACB system.

In addition to economic constraints, other factors that influence men and women's perception of the VACB model in similar ways are land holdings and geographic conditions. For example, one family surveyed reported that they only have a small amount of land and do not have enough room for a garden, pond and pigsty. Many of the homes in the Xeo Trâm Hamlet face similar spatial restrictions that limit their ability to install the VACB model. As Ms. Thanh (2012) explained, the average household in Xeo Trâm has only about 1,500 square meters (approximately 0.3 acres) of land. Another geographical barrier to the VACB model is acidic surface soil and water in Hòa An and Xeo Trâm. For biogas production to work, water must be mixed with pig dung to initiate the creation of methane. However, when water is too acidic, as it often is in Hòa An Village, it can kill the bacteria that cause methane production to occur. Before depositing water into a bio-digester in Hòa An, its pH value must be tested and calcium must be added accordingly. As Mr. Tran Phat (2012) explained, the acidic properties of the soil and water in Hòa An create a persistent and significant obstacle to successful operation of the VACB system and can discourage men and women from implementing it.

Along with factors like financial status, land and geography that influence perception of the VACB model across gendered lines, variables like age and health intersect with gender to influence respondents' perceptions of the VACB model and their interest in adapting the system. As is true with wood collection, it is mainly women who are responsible for tending to the pigs in a household. To illustrate, among the ten survey respondents who raised pigs, seven women informed me that they take care of pigs primarily on their own with minimal or no assistance from their husbands. Because women are largely responsible for the care of pigs, if they are ill or

elderly, it often prevents them from raising pigs and makes them disinterested in the VACB model. For example, one woman explained that she raised pigs in the past but, because she recently became sick, no one could take care of pigs anymore. Another woman was not interested in pigs because she was ill and felt that pigs cost too much money compared to the time and effort she would have to invest in caring for them. In another case, a woman's husband was suffering from a severe illness. She spent most of her time taking care of him and could not spend any time on additional activities. Even wood gathering was difficult and she could only do it for a few hours or minutes a day. She did not have time to care for pigs or manage a VACB system.

Another woman surveyed was sixty-five years old and felt that she did not have the strength necessary to take care of pigs. She said, "I am too old to do that". A woman of fifty-nine noted that she might be interested in raising pigs if she had the money, but she also explained that it would take a lot of work and she would need people to help her. She mentioned that she does not have running water and one of the most difficult tasks for her is carrying water from the river to her home in the dry season. As she ages, her arms are becoming weaker and water collection is becoming more challenging. If she raised pigs, she would need to bring water from the river to clean the pigpen on a regular basis. With no husband and just a small amount of help from her son in terms of housework and wood collection, it seems that the VACB model might be a difficult system for her to maintain.

Many of the women who were not interested in the VACB model or were concerned about their ability to maintain it instead expressed interest in commercial gas. In fact, eighteen out of twenty survey respondents specifically mentioned that they would like to purchase and use a commercial gas stove. However, all of these respondents also explained that the cost of the

stove and the gas is too high for them to afford. According to respondents, it costs anywhere from 500,000-800,000 VND (25-40 USD) to purchase a gas stove and 400,000-500,000 VND (20-25 USD) for a tank of fuel. Three respondents actually owned gas stoves but rarely used them because they felt that the fuel ran out quickly and was too expensive to replace on a regular basis. Others worried that gas stoves were unsafe and could potentially cause explosions. One woman explained that gas stoves break easily. Her stove had worked for five or six months but broke soon after and was too costly to repair. Ultimately, while some women believe that gas stoves are easier to maintain than the pigs necessary for the VACB system, they also recognize that gas stoves come with their own set of disadvantages. In addition to the negative aspects of gas described above, it should also be noted that gas cooking does not have the environmental, economic, and health benefits of the VACB model such as reduced Co₂ and GHG emissions, a sustainable and diversified system of agriculture, and the elimination of unsanitary waste.

While the VACB model may not be an ideal system for all men and women in Xeo Trâm and Hòa An, it does have positive impacts on livelihoods that cannot be overlooked. Those families interviewed who have installed the system in the Xeo Trâm Hamlet for example, have all reported that their lives have been made easier since the system has been installed and that they are happy with the way the system is working. The reported challenges to installing the VACB model and the differing perceptions of this system should not be viewed as efforts to undermine this system's significance and viability in Hòa An and Xeo Trâm. Instead, these critiques should be seen as potential entry points for improving the VACB model or providing alternative solutions to supplement the VACB system so that all men and women may have access to practical, affordable and sustainable fuel.

3.3 Is the VACB model implemented in a way that considers the opinions of men and women?

Critiques of the VACB system, especially from both men and women at the Hamlet level, are important and can add to the success of the model in a particular area. Unfortunately, after studying the implementation of the VACB model in the Xeo Trâm Hamlet, it seems that marginality of Hamlet members and Hamlet women in particular, is inherent in the current implementation process. However, it should be noted that creating a participatory and inclusive process of implementation is difficult. There are significant challenges that must be overcome before gender and social equity can become a central part of the VACB's implementation. The following section seeks to describe both the disparity that exists in the implementation of the VACB model and the challenges to overcoming this inequality.

On one level, all members of the Xeo Trâm Hamlet seem to face marginality in the decision-making process. According to an interview with Ms. Thanh, leader of the Xeo Trâm Women's Union, organizations at the Hamlet level have a "weak voice" when it comes to decision-making. Speaking in terms of the VACB system, she explained that she has no real say in deciding who gets funding to install bio-digesters and the VACB model. Overall, I sensed uncertainty from Ms. Thanh about the process of installing and financing biogas and the VACB system. While she explained that University Students installed her biogas system for free, she also said that it is the Village People's Committee that decides where biogas systems are installed and how they are funded. At the same time, Mr. Tran Phat (2012) informed me that there are no specific government programs or loans to install the biogas aspect of the VACB system in the Xeo Trâm Hamlet.

This conflicting information left me with a feeling of confusion that I believe was shared not only by Ms. Thanh, but by many members of the Hamlet. For example, during one of my in-

depth interviews, a woman explained that she had heard of the VACB system but had no idea how to get financial support for this model and did not understand what was necessary to install or operate it. Another woman I spoke with during my in-depth interviews had heard of the VACB model and wanted to install a biogas system. However, she believed that she could not find any funding for the VACB model and biogas because governance at the Village level thought she was too rich to receive any money. Furthermore, while eleven out of twenty survey respondents had at least briefly heard about the VACB model, several of these respondents also argued that they did not know how to install the model or how to get any funding for it.

The same kind of confusion existed when it came to evaluation of the VACB system. To illustrate, Ms. Thanh explained in our interview that she thought there needed to be more feedback from local people about the VACB model. However, she did not know where to voice her concerns and critiques. She felt that if she spoke about her opinions of the VACB model in larger Village organizations, her input would be weak and overlooked. Overall, in terms of the VACB model, it seemed that the voices of leaders and citizens in the small and poor Hamlet of Xeo Trâm were somewhat lost in a larger system of governance and institutions. The people of the Hamlet were therefore left feeling uncertain about their options for implementing and evaluating the VACB system.

Women of Xeo Trâm Hamlet face an additional level of gendered marginality that further restricts their understanding of the VACB model and their role in its implementation. This marginality based on gender was clearly demonstrated in one of my in-depth interviews. During an interview with the wife of one family, she explained that she did not know how she could get the VACB model but had heard about it and thought it would be beneficial. On the other hand, the husband in the household told me that he had been in contact with people at Hòa An's

College of Rural Development and that they had promised to install the bio-digester for the VACB model within the year. While he explained that he had discussed the model with his wife and that they both agreed that it would be a good thing, he seemed to be more knowledgeable about the actual implementation of the system. As he described it, his wife relied on him to contact the College of Rural Development and to learn about the VACB model from others because she generally had to stay home to take care of household chores and duties. This situation seemed to reflect one of Ms. Thanh's statements that while the husband and wife in a family generally make decisions about the VACB by consensus, the husband's voice tends to be stronger. Another wife explained it this way: "My husband and I make decisions together. If I decide something by myself, he will hit me". Although she said this with a playful laugh, her statement seemed to reflect a true inequality in power within the home. While women's opinions are considered, they do not seem to hold the same level of influence as the views of men.

In addition to some marginality in the process of implementing the VACB model within a household, women are also marginalized from the institutional frameworks that are responsible for designing and installing the VACB system. For example, while the Women's Union in the Xeo Trâm Hamlet is supposed to be involved in the implementation of the VACB model, it seems that its role is limited. As several female survey respondents reported, they had heard about the VACB model at Hamlet Women's Union meetings, but were told only that the model is good. The Women's Union did not have any information about how to fund the model, how to install the model, or what women could do to become a part of the implementation process.

Furthermore, almost all farmers who are technicians for the VACB model and understand the way it operates are men (Tran 2012, Pham 2012). In the Xeo Trâm Hamlet, women expressed interest in potentially learning more about the technical aspects of the VACB model

and helping others to implement the system. During my interviews and surveys I asked six women whether they would like to study the technical elements of the VACB model. These women either had the VACB model in their home or knew about the system and were raising pigs. All six women responded that they want to study how the system works so that they can install or repair their own systems and help others to use the VACB model. Despite their demonstrated interest, no formal training is available specifically for women to learn about VACB technology and implementation.

While my interviews and survey showed me that women would like to be more involved in VACB implementation, design, technology and installation, my fieldwork also helped me to understand some of the reasons why they have been marginalized from these processes. Some of the largest barriers to women's inclusion are time and educational capacity. As described previously, gender roles in Hòa An and Xeo Trâm assign many responsibilities to women. They must take care of the home and often must work in the fields as well. Because women are so busy and their labor is often what keeps their families alive from day to day, it is very hard for them to take time out of their daily activities to learn more about the VACB model. As one woman explained, she would be interested in learning more about the VACB model, implementing it and helping others to install it, only if it did not take up too much of her time. If there were short classes about the system and if it were something she could learn easily, she would be more likely to participate. Unfortunately, the VACB system is very complex and truly understanding the technical elements of the model seems to require time and dedication.

Another barrier preventing women and other members of the Xeo Trâm Hamlet from becoming more involved in implementing and designing the VACB model is their degree of education. As Ms. Thanh (2012) explained, the level of education among people of the Xeo

Trâm Hamlet and is very low. Because the area is so poor, many current adults could not afford to attend school in the past or had to drop out after primary or secondary school to help their parents earn a living. Today, there are still many children, especially during secondary school, who stop attending classes to help their parents with farming or work (Vo 2012). Poverty and resulting low education levels would make it challenging to teach both men and women in Xeo Trâm the more complicated and technical elements of the VACB system and the process of creating biogas.

In a personal communication with Mr. Nguyen Nay (2102), who has a background in social sciences and an interest in development in Hòa An, he explained that lack of education among Hamlet members means including them in implementation and design of models like the VACB will involve time and commitment. Hamlet members must be trained to understand systems like the VACB and someone must be willing to take time to work directly with them. Mr. Nay (2012) also noted that a truly participatory system that incorporates the voices, opinions, and feedback of all men and women is difficult to implement. He described that many government officials at the Village level and above do not understand the participatory approach. Those that do often feel that their salary is too low to dedicate the time and effort needed to structure a participatory system and to hear the opinions of all people (Nguyen 2012). However, while participatory decision-making and equitable implementation of the VACB system do seem difficult to achieve, they are not impossible goals. Through continued evaluation of the VACB model using the lens of gender analysis and social equity, critiques can be made that will forge a path to a more inclusive, practical and successful system of sustainable fuel.

4. Discussion and Suggestions

My research in Hòa An Village and gendered analysis of the VACB model in the Xeo Trâm Hamlet has begun to illuminate some of these important critiques of the VACB system. It has also pointed the way towards possible methods for enhancing the VACB model and the overall process of sustainable fuel use. As results were mainly specific to Xeo Trâm Hamlet, suggested methods of improvement are also mainly targeted towards this Hamlet. I have focused on Xeo Trâm Hamlet because I spent the most time here and gained the deepest understanding of issues specific to this area. Ultimately, I recognize that my time in the field was limited and that working to improve the VACB model and sustainable fuel will require much more detailed research and analysis. However, the observations and suggestions I have outlined in the pages that follow can provide inspiration or foundation for future exploration, research, and solutions.

During my time in the field, I began to understand the many integrated and complex factors that shape current cooking and fuel-use practices in Xeo Trâm and that will influence progress towards more sustainable methods of cooking in the future. From my observations, it seems that the most significant factor acting as a barrier to implementing sustainable solutions like the VACB system in Xeo Trâm is economic status. Current economic conditions provide minimal funding for biogas and contribute to low incomes that restrict families from purchasing the pigs necessary for the VACB system to function. Economic barriers to the VACB system cut across gendered lines and must be addressed if the VACB model is to be successfully adopted by men and women and implemented on a large scale throughout the Hamlet.

4.1 Financing biogas through participatory microcredit programs

First, it is important to provide families with a way to finance bio-digesters and biogas systems. While no loans are currently available to fund biogas systems in Xeo Trâm Hamlet, Mr.

Pham (2012) of CCRD suggested that funds from the Vietnamese government’s Clean Water and Sanitation Program could be allocated to install VACB systems and biogas. Further research on this Clean Water and Sanitation Program revealed that it has an intended goal of installing 1,000,000 biogas systems throughout Vietnam. The program also expresses goals of establishing a pro-poor approach and mainstreaming gender in its operations (Australian Agency for International Development et al 2011). Because of its described goals, this program seems that it could be a potential source of funds in the future. However, as it is currently implemented, the program distributes money to Provincial level governments across Vietnam. As of now, it seems that the program’s focus may be too broad for a significant amount of its funds to reach the small Xeo Trâm Hamlet.

A more effective and immediate approach to funding biogas systems in Xeo Trâm Hamlet might be to reform existing microloan programs or to create a new microloan project specifically designed to fund bio-digesters. Currently, there are three programs that offer microloans to the people of Xeo Trâm Hamlet only for purchasing pigs, poultry, or other livestock (Tran 2012). These programs are listed below as they were described by the leader of the Hòa An Village Women’s Union, Nguyen Thi Thanh (2012) and by Mr. Tran Phat (2012).

Table 3: Microcredit Programs in Xeo Trâm Hamlet

Loan Sponsor	Amount Loaned
Women’s Union of Hau Giang Province	5 million VND (250USD)
Can Tho University(CTU)-Michigan State University (MSU)	3-4 million VND (150-200 USD)
Oxfam	1 million VND (50 USD)

I believe that for those people in the Hamlet who do have enough pigs to operate the VACB system, loans should be available specifically for bio-digester purchase and installation. These loans should be accessible regardless of income and families should not be denied a loan

for biogas because they are considered too wealthy. Perhaps rather than financial status, loans for bio-digesters should be available based on demonstrated ability to operate and maintain a VACB system. Ultimately, more research is necessary to assess the feasibility of this solution, to determine which of the microloan programs listed in the table above could potentially create a set of funds for bio-digesters, and to decide whether it would be productive to form a new microfinance program in the Xeo Trâm Hamlet.

If a current microfinance program is expanded or a new program created, it is important that the women and men of the Xeo Trâm Hamlet be given a voice in determining how and where funds from the program are allocated. Women's Union Leaders in particular, and relevant officials throughout the Hamlet, should be given the opportunity to play an active role in deciding how funds are distributed. Perhaps if funding originates from the Provincial or Village level, a certain number of loans could be set aside for each Hamlet and Hamlet leaders and members could decide who among them will receive available loans. To reduce confusion about how to fund the VACB model, up-to-date information about funding programs and the qualifications for receiving funding should be provided to the leader of the Hamlet Women's Union and other governmental organizations within the Hamlet. Again, more time in the field is necessary to understand how loans are currently distributed and to suggest additional methods for reforming the allocation process so that it includes the marginalized voices of people, especially women, from the Xeo Trâm Hamlet.

4.2 Strategies for overcoming additional financial and social barriers

An equitable approach to money lending that offers funds for biogas based on demonstrated ability to maintain the VACB model is one way to improve sustainable fuel use in Xeo Trâm Hamlet. However, it would only be useful for those families who can afford to buy

pigs. As previously mentioned, another financial barrier to the VACB model in Xeo Trâm is the fact that many families in the Hamlet cannot afford to raise the amount of pigs necessary for a biogas system. For those who are committed to raising pigs, but cannot afford two female pigs each year, it would be valuable to have a different method for producing biogas that could be used to supplement pig manure. Researchers in Can Tho recognize this problem and are already exploring supplemental sources of biogas, including human waste (Tran 2012). Continued research on this integrated method of biogas production could eventually provide the people of Xeo Trâm Hamlet with greater access to the benefits of the VACB model and sustainable cooking through biogas.

Unfortunately, an integrated system will not be beneficial for those people who cannot establish the VACB model due to lack of land, or for women in particular who are prevented from implementing VACB because of factors like age and health. For these men and women, it seems that it may be beneficial to explore a system for sustainable fuel-use outside of the VACB model. The system proposed should be one that meets the needs of elderly or ill women by requiring less work than the VACB model but providing similar environmental and health benefits. If the system is to succeed, it must also be much less costly than commercial gas and affordable for families to maintain. One potential system for sustainable cooking that seems to meet these criteria is the creation and distribution of alcohol fuels and stoves. Alcohol fuels like ethanol and methanol burn clean, meaning they emit relatively low levels of Co₂ and do not produce harmful smoke or aerosols (Project Gaia, Inc. 2011). Ethanol is a form of biogas made from renewable resources including sugar-based sources (molasses, sugarcane, etc) starches (cassava, potatoes, etc) and cellulose-based materials (plant residues, grasses, etc) (Project Gaia, Inc. 2011). Methanol is made primarily from carbonaceous materials (materials high in carbon

such as grasses and agricultural waste) and from waste gasses produced by natural gas flares (Project Gaia, Inc. 2011).

Alcohol fuels have proven to be economically viable and affordable for low-income families in other contexts. For example, a study in Madagascar showed that, at a cost of about 0.20 USD per liter, ethanol is, "...significantly cheaper than LPG and kerosene and only marginally costlier than cooking with wood fuel on an open fire" (Project Gaia et al 2010). Another, more general study on the viability of methanol in developing countries explained that methanol could be introduced to a market at a cost of less than 0.35 USD per liter (Stokes and Crocco 2005). This is significantly less expensive than the cost of a tank of gas and even a meter of wood in the Hòa An Village. However, more research is necessary to determine how long one liter of ethanol or methanol would last as compared to one tank of gas or one meter of wood, and costs of each cooking method should be compared with these values in mind. Furthermore, while alcohol fuels are inexpensive, the initial cost of a safe, reliable, long lasting and clean alcohol-burning stove is projected around 50 USD (1 million VND) (Project Gaia et al 2010). In the Xeo Trâm Hamlet, this cost is equivalent to the price of one pig and may be a significant barrier to implementation if families are not able to receive some form of loan for the purchase of the stove. Perhaps if loans are established for biogas systems, they could also offer funding for alcohol stoves.

Again, a great deal of additional research is necessary before this method of sustainable fuel can be introduced in Hòa An Village or Xeo Trâm Hamlet. In addition to more research on the costs of alcohol fuels and stoves, it is also necessary to examine the capacity for production of ethanol fuels in the area and the potential market for these fuels. Ethanol and methanol are still relatively new forms of fuel and are just beginning to be explored in Vietnam. In 2010, the

Vietnamese government established, "... a legal framework to encourage the production and use of bio-fuel, [and to] design a roadmap for using bio-fuels in Vietnam, learning bio-fuel technologies, training human resources for this industry, [etc]..." (Viet Nam Net Bridge 2010). In 2009, a plant for producing bio-fuel from catfish fat began to operate in Can Tho and now exports its fuel to Singapore (Viet Nam Net Bridge 2010). Although they are new, these policies and industries are promising beginnings to bio-fuel production in Vietnam. Even more encouraging are CTU's experiments with water hyacinth as a potential form of biogas (Can Tho University 2009). The invasive water hyacinth can be found crowding the waterways that run through Hòa An Village and would be extremely useful if converted into a low-cost ethanol fuel that could be widely distributed and successfully used for cooking. Overall however, alcohol fuels like ethanol and methanol will not be easy to introduce in Xeo Trâm and much more research and development seems necessary before these fuels can become a viable solution.

4.3 Creating equitable implementation

Ultimately, when experimenting with new forms of sustainable fuel and applying the existing VACB system, it is vital to consider the opinions of people at the Hamlet level, especially the women who are responsible for cooking. If new and existing systems for sustainable fuel-use do not meet the needs of the people who use and maintain them, or are not understood by those who could benefit from them, they will not be adopted. In Xeo Trâm Hamlet, I noticed gendered differences in understanding of the VACB model and exclusion of women from the process of implementing the VACB system. If they continue, these gendered inequalities could inhibit the adoption and success of the VACB model and other proposed systems of sustainable fuel in the area.

One way to overcome inequality and ensure that women are included in the process of designing and implementing sustainable fuel, is by employing them as technicians who install VACB systems, and allowing them to act as “knowledge brokers” (Nguyen and Evers, 2011) who provide their communities with information about sustainable fuel use and the operation of sustainable fuel systems. Currently, the majority of VACB technicians in general (Pham 2012), and all of the technicians in Hòa An Village (Tran 2012) are men. However, as survey results and interviews demonstrated, women are interested in taking a more active role in installing the VACB model and understanding the technical elements of this sustainable system. Because women are the ones often responsible for maintaining the VACB model and other systems that relate to cooking, it is important that they understand how these systems function and have the opportunity to add their ideas to the design process. Women’s integration and voice in formal systems of implementation could have spillover effects into informal structures. Specifically, giving women a more significant role as formal knowledge brokers and VACB technicians might eventually strengthen their voices in household decisions related to sustainable cooking and the VACB model.

Although there are real barriers, including availability and education level, that limit women’s participation in implementation of the VACB model, these obstacles are not insurmountable. First, the possibility of training to become a technician for sustainable fuel systems like the VACB model should be presented to women, perhaps at Women’s Union meetings, to gauge interest and availability. Next, those people responsible for training technicians (in Hòa An trainers are CTU staff) should make every effort to format their classes so that interested women can attend and are not excluded from participation. Nguyen Thi Thanh (2012) of the Hòa An Village Woman’s Union explained that programs are already in place to

encourage capacity building and technology sharing between the mainly male Farmer's Association and the Women's Union in Hòa An. Perhaps these existing programs could be expanded to include technology sharing related to sustainable fuel and the VACB model. Members of the Farmer's Association who currently act as technicians for the VACB model could help CTU employees to train interested members of the Women's Union. Finally, classes could be designed in a way that is short but productive and information could be presented so that it is easy for participants to understand. Low education levels may be an initial challenge, but it seems that interested women and men, who want to become part of a system that will better their lives, will be quick to learn and enthusiastic about the knowledge that they gain. Overall, while developing equal participation in systems of sustainable fuel use takes time and effort, it is an absolutely necessary step in ensuring the success of proposed programs. Implementation that encourages social and gender equity will understand the needs of men and women, will ensure that sustainable fuel-use systems meet these needs, and will ultimately create a system that is beneficial to many people and more likely to be adopted on a widespread basis.

5. Conclusion

After speaking with the women and men of Xeo Trâm Hamlet and compiling their thoughts and ideas into a set of results, conclusions, and suggestions, one woman's words still ring clearly in my mind. She asked me, "What is your research going to do to help us?" As I attempted to respond to her question, I searched for an answer that was simple and direct. However, what I ultimately realized is that my research cannot provide a simple solution or an easy way to create working systems of sustainable fuel use in Xeo Trâm. Instead, its purpose is to deconstruct simple solutions, to reveal complexity and critique, and to propose questions and

suggestions that can become the basis of improvement for existing systems of sustainable cooking.

I have discovered through gender analysis that a complicated set of factors, including not only gender but education level, age, health, geographic location, and land holdings, influence perception of models for sustainable fuel use in Hòa An and Xeo Trâm. These factors interact to create unique sets of needs and priorities among different people that must be met if systems for sustainable fuel are to be easily adopted and successfully created. Unfortunately, another set of factors interact to marginalize groups of people from decision-making related to sustainable fuel use. In the case of the Xeo Trâm Hamlet, the small size of the population and the low education level of its inhabitants often cause their opinions to be overlooked in larger systems of governance and reform related to sustainable fuel and the VACB model. Ironically, for the women of Xeo Trâm Hamlet, gender roles giving them large responsibility for household chores and food preparation, often further limit their availability to participate in design and implementation of the VACB model and other systems for sustainable cooking intended to help them.

Listening to the women (and men) who are responsible for cooking in Xeo Trâm has shown that their critiques and ideas can provide important insights. While their thoughts often add complexity to the system of sustainable fuel use, it is from this complexity that ideas for improvement can originate. However, if the critiques of men and especially women remain marginalized from the current system of sustainable fuel use, methods for sustainable cooking may remain simple solutions that do not meet the multifaceted needs of people. In other words, without including all men and women in implementation and striving to meet diverse sets of needs, systems of sustainable fuel will face significant barriers to adaptation and success.

While the process of encouraging equity in systems of sustainable fuel use may be a long and difficult road, it will ultimately produce the kind of complex solutions necessary to meet all peoples' needs and improve all lives. If there is to be significant reduction in the number of woodstoves used in Vietnam, in the quantity of GHGs released by these stoves, and in the amount of health problems resulting from use of wood fuel, we must listen to the men and women in particular who understand these stoves and include their thoughts in sustainable solutions. By refusing simple answers and encouraging a complex but equitable method of developing and implementing sustainable fuel in Xeo Trâm Hamlet and Hòa An Village, I hope that my research will promote progress toward a system that provides environmentally beneficial, affordable, and accessible fuel for all of the wonderful and deserving people living in these areas.

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7. Appendices

Appendix 1: Guide for Expert Interview Series

Interview Guide for Mr. Phat and Mr. Pham Van Thanh (For Mr. Phat, questions were specific to Hòa An Village)

- Can you tell me about the history of the VACB model and its implementation?
- How do you think the VACB model affects men and women?
- Do you feel that the VACB is affordable?
- Do you think that the VACB model encourages gender equity and how?
- How are women and men involved in designing and implementing the VACB model?
- Who makes decisions regarding the VACB model?
- What do you see as the positive and negative impacts of the VACB model?

Appendix 2: Guides for Interviews with Hòa An Officials/Teachers

Interview Guide for Leader of Hòa An Village Women's Union (Nguyen Thi Thanh):

- How many people live in Hòa An Village?
- How many women and men live in the Village of Hòa An?
- What is the average age of people living in Hòa An Village?
- What is the average income of families in Hòa An and what are the occupations of men and women?
- What is the average level of education among families in Hòa An?
- What are the gender roles like in Hòa An? What kind of work are men expected to do and what kind of work are women expected to do?
- What kinds of social networks or support groups do women in Hòa An have? How do they communicate?
- How would you describe Hòa An in terms of gender equality? Are men and women equal in Hòa An?
- What does the women's Union do in Hòa An? What is the mission of the women's union?
- How does the Women's Union help to implement/set up the VACB model?
- What can you tell me about how the VACB model affects women in Hòa An and their roles around the house?
- Do you think that many women know about the VACB model? Do you think they like it?

Interview Guide for VACB owner and leader of the Women's Union in Xeo Trâm Hamlet (Nguyen Thi Thanh):

- When was the VACB system introduced in your Hamlet?
- What kind of cooking do most of the people in your Hamlet do? What kind of fuel do they use?
- How many homes are there in your Hamlet?
- How many people live here in total?
- How many are men or women?
- What are their average ages?
- What is the marital status of most people in your hamlet (married/single/widowed/etc)?
- What is the occupation of men and women in your hamlet?
- What is the average income of the people in your hamlet?
- What is the average education level?
- How many homes in your Hamlet have the VACB system?
- What would you say about gender roles in your hamlet? What do men usually do and what do women usually do?
- What do you do as the head of the Women's Union in Xeo Trâm?
- Has the Women's Union helped people to use the VACB model?
- When did you get your VACB system? How did you get it?
- How do you feel that the VACB system has changed your life?
- Are you satisfied with it, or do you have some problems with it?
- How long have you had your VACB system?

- Would you be interested in being a technician and teaching people the technical aspects of the VACB model? Do you think that others would be interested in this?
- Do you think that women have a say in how the VACB model is designed and implemented in the village?

Interview Guide for Primary School Teacher in Hòa An Village (Vo Thi Kim Lien):

- What grades do you teach?
- How long have you been teaching in Hòa An?
- How long have you been living in Hòa An?
- What would you say are the typical gender roles for men and women in Hòa An?
- Do you see these roles changing at all among the younger generations?
- How many girls versus boys do you see in your classes?
- Do you think that students in Hòa An are interested in studying the environment and things like the VACB model?
- Do you think that in the future, girl students specifically would be interested in learning technical aspects of the VACB model and in teaching others how to use the VACB model?
- Do you ever notice that students are absent from school? What are the main reasons for that?
- How do you fuel the primary school/Do cooking there?
- In your home, what kind of fuel do you use?
- What can you tell me about the VACB model?

Appendix 3: General Introduction for Interview Subjects

My name is Alyssa Bosold and I am a student from the United States. I have been studying in Vietnam since February. I am doing research in Hòa An as a part of an Independent Study Project for my study-abroad program/SIT. My research will look at the fuels used for cooking in Hòa An. It will compare cooking with woodstoves to the newer VACB model used in some homes in the village. The study will be used to see how men and women benefit differently from these models. The results of my study will show how the VACB model is beneficial or harmful for different groups of people, and may lead to suggestions for improving VACB.

Do I have your permission to include your name in my study?

The study will be reported to SIT students, advisors, the College of Rural Development and the Project Gaia NGO in Gettysburg that deals with sustainable fuel use. The study will also be the basis of a Senior Thesis at Gettysburg College.

If you do not feel comfortable using your name, I will not include it in my results.

If you have any questions during our interview or would like to stop the interview at any time, just let me know.

Appendix 4: Guide for In-Depth Interviews in Xeo Trâm Hamlet

Families with Woodstoves: (Women)

- What are the things that you do on a typical day? What is your daily routine?
- How do you make decisions in your home (about what to farm, how to use money, etc.)? Do you decide, does your husband decide, do you decide together?
- Are you the one that does most of the cooking in the house?
- How much time do you spend cooking each day?
- How much time do you spend gathering fuel?
- What kind of fuel do you use?
- Where do you go to get your fuel? How far away is that? Do you collect fuel on your own land or someone else's land?
- Do you have any problems collecting your fuel?
- What kind of a stove and pots do you use?
- Are you satisfied with your method of cooking food?
- Have you heard of the VACB model?

-What do you think of it? Would it be helpful? Is there anything that is preventing you from implementing it?

Families with woodstoves: (Men)

-What are the things that you do on a typical day? What is your daily routine?

-How do you make decisions in your home (about what to farm, how to use money, etc.)? Do you decide, does your wife decide, do you decide together?

-Do you help with the cooking or gathering fuel in your household?

-if so, see above questions for women

-Have you heard of the VACB model?

-What do you think of it? Would it be helpful? Is there anything that is preventing you from implementing it?

Families with VACB Model: (Women)

-What are the things that you do on a typical day? What is your daily routine?

-How do you make decisions in your home (about what to farm, how to use money, etc.)? Do you decide, does your husband decide, do you decide together?

-Are you the one that does most of the cooking in the house?

-How much time do you spend cooking each day?

-what kind of stove and pots do you use?

-How did you cook before you used the VACB model?

-How has the VACB model changed the things that you do in your daily routine?

-Do you think it has made more or less work for you, or is it about the same? Would you like a system that creates less work?

-What do you think are the positive and negative things about the VACB model?

-what do you like most about the VACB model? What do you like least?

-Do you feel more equal to your spouse because of the VACB model? Has your relationship with your spouse changed as a result of the VACB model?

-When did you get your VACB model and how did you pay for it?

-Did you help to decide when to purchase it, where to install it, etc.?

-How well has the VACB system worked for the time you have had it?

-Are you satisfied with the VACB system and would you recommend it to others?

-Are you a member of the Women's Union or any other local government organization?

-Does this organization relate to the VACB model at all?

-Are you interested in being a technician for the VACB model and teaching people how to use the system? Do you think that other women would be interested in this?

For VACB Model: (Men)

-What are the things that you do on a typical day? What is your daily routine?

-How do you make decisions in your home (about what to farm, how to use money, etc.)? Do you decide, does your wife decide, do you decide together?

-Do you do any cooking in the house?

-How much time do you spend cooking each day?

-what kind of stove and pots do you use?

-How did you cook before you used the VACB model?

-How has the VACB model changed the things you do in your daily routine?

-Do you think it has made more or less work for you, or is it about the same? Would you like a system that creates less work?

-What do you think are the positive and negative things about the VACB model?

-what do you like most about the VACB model? What do you like least?

-Do you feel you and your spouse are more equal because of the VACB model? Has your relationship with your spouse changed as a result of the VACB model?

-When did you get your VACB model and how did you pay for it?

-Did you help to decide when to purchase it, where to install it, etc.?

-How well has the VACB system worked for the time you have had it?

-Are you satisfied with the VACB system and would you recommend it to others?

-Are you a member of any organizations (local governance, other groups)?

-Does this organization relate to the VACB model at all?

-Are you interested in being a technician for the VACB model and teaching people how to use this? Do you think others, especially women, would be interested in this?

Appendix 5: Survey in Vietnamese and English

The VACB model in Hòa An Village and Xeo Trâm Hamlet: Comparison and Analysis Through a Gendered Lens

Hello and thank you for completing my survey. My name is Alyssa Bosold and I am a student from the United States. I have been studying in Vietnam since February. I am doing research in Hòa An as a part of an Independent Study Project for my study-abroad program/SIT. My research will look at the fuels used for cooking in Hòa An. It will compare cooking with woodstoves to the newer VACB model used in some homes in the village. The study will be used to see how men and women benefit differently from these models. The results of my study will show how the VACB model is beneficial or harmful for different groups of people, and may lead to suggestions for improving VACB. Your participation in my survey will help me to complete my study. The results of this study will be shared with fellow SIT students, professors and students at Gettysburg College, The College of Rural Development in Hòa An, and the Project Gaia Organization (an NGO in Gettysburg that deals with environmentally friendly cooking). I will also use responses from these surveys in a Senior Thesis at my college in the United States. Thank you for your participation. If you have any questions during the survey, feel free to ask. You may also stop taking the survey at any point in time if you do not feel comfortable answering the questions.

Xin chào và xin cảm ơn rất nhiều vì đã hoàn thành bản khảo sát này giúp em. Em tên là Alyssa Bosold và em là sinh viên Mỹ. Em đã đến và học tại Việt Nam từ tháng hai năm nay. Em đang làm một nghiên cứu ở Hòa An theo yêu cầu của chương trình học SIT. Em sẽ nghiên cứu về các loại nhiên liệu được dùng để nấu ăn tại Hòa An. Bài nghiên cứu sẽ so sánh việc nấu ăn bằng củi thông thường với mô hình VACB đã được dùng tại một số gia đình ở Hòa An. Em sẽ tìm hiểu những lợi ích khác nhau giữa đàn ông và phụ nữ khi sử dụng mô hình này. Kết quả bài nghiên cứu của em sẽ cho thấy những mặt lợi và hại của mô hình VACB với những nhóm đối tượng khác nhau và có thể từ đó sẽ đưa ra được những gợi ý để cải thiện mô hình VACB. Sự tham gia trả lời của mọi người sẽ giúp em hoàn thành bài nghiên cứu của mình. Em sẽ có thể chia sẻ kết quả nghiên cứu của mình với các bạn khác trong đoàn SIT, các giáo sư và sinh viên tại trường Đại học Gettysburg, Khoa Phát triển Nông thôn của trường Đại học Cần Thơ tại Hòa An, và đặc biệt là Tổ chức Dự Án Gaia (một tổ chức phi chính phủ ở Gettysburg chuyên về việc nấu ăn tốt cho môi trường). Và em cũng sẽ sử dụng câu trả lời của mọi người trong Luận văn tốt nghiệp của mình tại trường đại học. Cảm ơn mọi người một lần nữa vì đã giúp em. Nếu có thắc mắc gì trong khi thực hiện bảng khảo sát, mọi người cứ thoải mái đặt câu hỏi. Mọi người cũng có thể không tiếp tục tham gia trả lời bất cứ lúc nào nếu mọi người cảm thấy không thoải mái.

Background Information

Thông tin bản thân

Age/Tuổi:

Sex (circle one)/Giới tính (Khoanh tròn): Female /Nữ Male/Nam

Fuel Gathering/VACB Model

Thu thập nhiên liệu/Mô hình VACB

Do you ever gather fuel (like wood, dung, leaves, etc.)? (Circle one):

Bạn có bao giờ đi thu nhặt nhiên liệu để đốt (như củi, phân, lá cây...) không?

Yes /Có

No/Không

If yes, please answer questions 1-8 below /Nếu có xin vui lòng trả lời câu hỏi từ 1 đến 8:

1. **What fuel do you gather?** e.g. wood, bark, leaves, twigs, Roots, Dung, Sawdust. Please write below/ **Nhiên liệu để đốt nào bạn thu nhặt?** ví dụ: củi, vỏ cây, lá cây, cành cây, rễ cây, phân, mùn cưa. Vui lòng ghi vào chỗ trống phía dưới:

2. **If yes, How Often Do you gather it? (Circle one)** Nếu có, bạn có thường xuyên đi thu nhặt nhiên liệu đốt không? (Khoanh tròn):

Daily/Hàng ngày Weekly/Hàng tuần Monthly/ Hàng tháng Yearly/Hàng năm

3. **How Far do you travel to gather it? (kilometers)/Bạn phải đi bao xa để thu nhặt nhiên liệu đốt? (bằng Kilomet):**

4. **How long does it take to collect this fuel? (minutes)/ Bạn phải mất bao lâu để thu nhặt nhiên liệu đốt? (bằng phút):**

5. **Who collects the fuel? (Circle one)/Ai là người đi thu nhặt nhiên liệu đốt? (Khoanh tròn):**

I collect the fuel /Tôi đi thu nhặt

My spouse collects the fuel/Vợ hay chồng của tôi

My Mother/Father collects the fuel/Bố mẹ của tôi

My Children the fuel/Con của tôi

Other (please specify)/Khác (xin vui lòng ghi rõ) _____

6. **Do you have any problems with fuel collection? (Please circle all of the situations below that you consider to be problematic)/ Bạn có gặp bất kì khó khăn nào khi đi thu nhặt nhiên liệu đốt không? (Xin vui lòng khoanh tròn vào tất cả những ô mà bạn gặp rắc rối):**

I do not have any problems with fuel collection/Tôi không có bất kì khó khăn nào khi thu nhặt

Scarcity of fuel/ Sự khan hiếm

Takes too much time/Tốn quá nhiều thời gian

Danger from Animals/Gặp các con vật nguy hiểm

Physical Problems (neck, back, leg aches)/Những vấn đề như đau cổ, đau lưng, đau chân

Other (please specify) Khác (xin vui lòng nêu rõ) _____

7. Are you satisfied with your stove and the fuel you use to cook food? (Circle one)/ Bạn có hài lòng với bếp của nhà mình và loại nhiên liệu mà bạn dùng để nấu ăn không? (Khoanh tròn):

Yes I am satisfied with my stove and fuel /Vâng, tôi hoàn toàn hài lòng

I am somewhat satisfied/Tôi hài lòng đôi chút

No I am not satisfied/Không, tôi không hài lòng

8. If you are not satisfied, what would you like to change about your stove or fuel/Nếu bạn không hài lòng thì bạn muốn thay đổi gì về bếp nhà mình hay nhiên liệu mình sử dụng:

Have you ever heard of the VACB model? (circle one)/Bạn có bao giờ nghe đến mô hình VACB chưa (Khoanh tròn):

Yes/Rồi

no/chưa

If you have heard of the VACB model, do you think that it is helpful for families? (Circle one)/Nếu bạn đã từng nghe đến mô hình VACB rồi thì bạn có nghĩ rằng nó sẽ có ích cho gia đình mình không? (Khoanh tròn):

Yes/Có

No/Không

I have not heard of the model/Tôi chưa nghe về VACB

Why do you think it is helpful? Please explain. Tại sao bạn lại nghĩ mô hình này có ích? Hãy giải thích.

If you use the VACB model, has it reduced the amount of work you have to do? (circle one)/Nếu bạn đang sử dụng mô hình VACB, mô hình VACB có giúp bạn đỡ việc không? (Khoanh tròn):

Yes, With the VACB model I have fewer chores to do/Đúng vậy, với mô hình VACB tôi làm ít hơn trước

No, I have to do more to take care of the pigs, pond, and garden/Không, tôi phải làm nhiều hơn để chăm sóc chuồng heo, ao cá, và vườn cây.

It is about the same as before/Cũng vẫn như trước đây.

Who is in charge of maintaining the VACB model (taking care of the pigs, garden, pond)? (Circle one) Ai là người trông nom và chăm sóc mô hình VACB (chuồng heo, vườn tược, ao cá) (Khoanh tròn):

I do most of the work involved in the VACB model (feeding the pigs, gardening, maintaining the pond)/ Tôi là người làm phần lớn các công việc (cho heo ăn, chăm sóc vườn tược, ao cá)

My spouse does most of the work involved in the VACB model (feeding the pigs, gardening, maintaining the pond)/ Vợ hoặc chồng tôi là người làm phần lớn các công việc (cho heo ăn, chăm sóc vườn tược, ao cá)

My spouse and I split the work involved in the VACB model/Tôi và vợ/chồng của tôi cùng nhau làm

My children and I do most of the work involved in the VACB system/Tôi và con của tôi làm phần lớn mọi việc

The whole family participates in maintaining the VACB system/Cả gia đình tôi cùng làm

How did you pay for the VACB model? (circle one)/Bạn đã chi trả cho mô hình VACB thế nào (Khoanh tròn):

Government funding/ Chính phủ trợ giúp

Money from the College of Rural Development/Tiền giúp đỡ từ Khoa phát triển Nông thôn

Microloan/ Từ việc vay vốn

I paid for it on my own/Tôi chi trả bằng tiền của mình

Are you satisfied with the VACB model? / Bạn có hài lòng với mô hình VACB không?:

Yes/Vâng

Somewhat/Cũng có

No/Không

Please explain your answer/Xin vui lòng giải thích câu trả lời của bạn:

Cảm ơn thời gian của mọi người! Thank you for your time!