

**The Role of Women in Farm Households in Vietnam**  
**-An Analysis of Women's Contribution and**  
**Decision-Making-**

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## **ABSTRACT**

### **Title: The Role of Women in Farm Households in Vietnam -An Analysis of Women's Contribution and Decision-Making-**

Women were confirmed to contribute to agricultural production and pursue multiple household livelihood strategies in developing countries. However, their role is not recognized correctly, and development strategies ignored rural women. Lack of access and control productive resources, traditional norms are noted as factors limiting women's equal participation in economic activities and making decisions.

Many researchers studied women's role in over the world. However, most studies mentioned women's role in general, very few focus on a specific household domain. In addition, previous authors approached women's roles through only their involvement or their decision-making individually. So, in-depth research of women's families' situation and the relationship between women's contributions and decision-making is required.

Our study aims to identify the role of women by analyzing their contribution and decision-making in the household. Our research has four specific objectives: firstly, we want to understand how women contribute to their families; secondly, we clarify how women make decisions in their households and its influent on household income; thirdly, we examine the relationship between women's contribution and decision-making; lastly, we try to provide some policy implications.

Regarding objectives of the study, we chose the mountainous region of Vietnam to be a study site because mountainous women had difficulty accessing social resources, education, training, and speaking out as social norms. Although the gender issue is integrated with the national strategies targeting social-economics development, women in the mountainous region still face challenges developing their internal capacities and self-determination in the family and community. Moreover, in Vietnam, there were not many researchers focus on rural women or

mountainous women. Therefore, our study seems to be more necessary and significant. Our research found results as follows:

Firstly, by analyzing cattle households' situation, we explored that cattle production is considered the main livelihood of the farmer in the mountainous region. It created a sustainable income for farmers. Especially, females are considered the primary labor of cattle production, and female labor positively impacts household cattle income.

Secondly, the women's contribution analysis revealed two views of women's involvement in the household, including their spending time on cattle production and the number of collected goods. Both approaches also indicated that women contribute to cattle production more than men. They are involved in all activities; their working hours are longer, and the amount of green grass collected is also more significant than men. It is easy to see that women have more contribution to household cattle production compared with men.

Thirdly, the outcome of women's decision-making analysis showed that although having a positive impact on household cattle income, women's decision-making power is low. They only involve in making small decisions in the household. In an important transaction, their voice is quiet. In addition, this study also identified many influences on women's decision-making, such as household size, women's age, ethnicity, household agricultural labor, and men's participation.

Fourthly, regarding to women's contribution and decision-making analysis, we understood the role of women in the household and why they positively impact household income. Further exploring the relationship between women's contributions and decision-making, we discovered that when the number of agri-labor per household is more than one person, women's decision-making power decreases as the time spent on household cattle production increases. Furthermore, as the number of agri-labor per household increases, this tendency becomes stronger. In short, having too much agri-labor in farm households negatively impacts women's role in the households.

Lastly, we try to point out some policy implications. For example, create the whole-sale cattle market to support for cattle household and improve the local labor market; improving awareness of gender-equality for minority ethnic women

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## **LIST OF ABBREVIATIONS**

BIC	Bayesian Information Criterion
BMA	Bayesian Model Average
DMI	Decision Making Index
GSO	General Statistic Office
IFAD	International Fund for Agricultural Development
FAO	Food and Agriculture Organization
OECD	Organization for Economic Co-operation and Development
TUS	Time Use Survey
UNICEF	United Nations Children's Fund
UN	United Nation
VND	Vietnam Dong

# CHAPTER I

## INTRODUCTION

### 1.1. The necessity

Women play an essential role in farmer households and rural areas. They make critical contributions to agricultural production, manage complex households, and pursue multiple livelihood strategies in developing countries. Rural women often contain elaborate homes and pursue numerous livelihood strategies. Their activities typically include producing crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water, engaging in trade and marketing, caring for family members, and maintaining their homes. These activities are not defined as "economically active employment" in national accounts but essential to rural households' well-being. (FAO, 2011). Women produce over 50 percent of the world's food (FAO, 2011) and comprise about 43 percent of the agricultural labor force globally and in developing countries (Doss, 2014). The average annual women's contribution to a household income accounts for 43.52 percent of total household income (*PK Roy, 2017*).

However, the role of women is not recognized correctly, especially in rural areas. The growth in the agriculture and rural sectors in many developing countries undermines by gender-related constraints and unequal access to productive resources and opportunities (*World Bank, FAO and IFAD 2008; FAO 2011*). Despite women's tremendous contribution to food production and well-being for the household, development strategies ignored rural women (*Murshid and Yasmeen, 2004*). Thus, the lack of access and control over productive resources is the main factor limiting women's equal participation in economic activities, thereby hampering the human development process (*Acharya, 2003*). Women's work remains unrecognized even though their contributions to the family are vital. Women are the breadwinners and work longer hours than men (*UNDP, 1995*). In terms of asset management

and production management, women account for a meager share of men, only 25.3% (*Nhan, 2014*).

Gender inequality in various sectors and many developing countries impose costs on society regarding untapped potential in achieving agricultural output, food security, and economic growth. Therefore, strategies promoting gender equality in productivity, access to productive resources, and economic opportunities are increasingly becoming high on the development agenda (UN, 2015). It will not only lead to the empowerment of rural women and men, but it is also vital for agricultural and economic development as a whole. The leading cause of gender inequality in agriculture and rural areas is the lack of awareness and traditional understanding of gender issues, social behaviors, and the influence of patriarchy. On the other hand, rural women are generally low in education, which means that half of the labor force in the economy lacks knowledge, production skills, or constraints. Therefore, the productivity and income of society or the economy reduce.

Many studies in the world have indicated gender issues and women's role in rural households. Shive (2011), Mugniyah (2002), Rengalakshmi et al. (2002), Bari (2000), Khin Pwint Oo (2003) identify women's role through their contribution to household's production activities. These results showed that women are considered breadwinners in their families. They undertake many works even if the heavier traditional male activities like land preparation; they are the central labor in many domains of agricultural production (crop, livestock, fishery, etc.). Meanwhile, men are only responsible for "market" work (farming, herding, and other income-generating activities). Although the above studies provided a comprehensive view of women's involvement in a household, understanding their participation in a specific domain seems necessary.

Other researchers approach women's roles through their decision-making in the household. Ramesh Balayar (2021), Bjornlund. H et al. (2019), Sell, M. and Minot, N. (2018), Sonia Akter (2017) constructed a decision-making index to estimate the women's decision-making power. These researches indicated the same phenomenon that women have little involvement in big decisions of the family. While men are responsible for deciding on the sale of crops and livestock and retain the money they earn from the sale, women make

decisions about savings, food and non-food expenditures, household needs, and get money from men to pay for household expenses. On the other hand, although many influences on women's decision-making were pointed out, the linkage between women's decision-making and household income should be discovered to understand women's role in households.

It can be seen that women's contributions and decision-making were discovered by many previous researchers. However, not many people studied women's roles basing analyzing the linkage between the two above aspects. Therefore, further research about the relationship between women's contribution and women's decision-making making is needed.

On the other hand, in developing communities, gender equality may be more concerned than the rest of the world. Like a piece of the developing area, Vietnam also faces the gender gap. Especially in the mountainous regions of Vietnam with a high poverty rate and minority ethnic groups, women are disadvantaged in access to social resources, education, and speaking out as social norms (GSO Vietnam, 2019). However, a few studies focused on women's role in the mountainous region.

Regarding the above reasons, we decided to conduct a study: *The Role of Women in Farm Households in Vietnam - An Analysis of Women's Contribution and Decision-Making*.

## **1.2. Literature review**

### 1.2.1. What is the role?

#### a. Definition and features of the role

Before conducting a study about the women's role, it is necessary to understand what the role is. There are many definitions of role, but we focus on common descriptions.

According to the Cambridge dictionary, the role is the position or purpose that someone or something has in a situation, organization, society, or relationship; the role is the duty or uses that someone or something usually has or is expected to have.

The role is defined as an abstraction of the behavior. Thus, a role always belongs to a specific, more extensive behavior that involves other roles, called collaborative behavior (Guy Genilloud, 2000).

## b. Feature and elements of the role

F.Steimann (2000) listed features of role include: the role comes with its own properties and behavior; Roles depend on relationships; An object may play different roles simultaneously; An object may play the same role several times, simultaneously; An object may acquire and abandon roles dynamically; The sequence in which roles may be acquired and relinquished can be subject to restrictions; Objects of unrelated types can play the same role; Roles can play roles; A role can be transferred from one object to another; The state of an object can be role-specific; Features of an object can be role-specific; Roles restrict access; Different roles may share structure and behavior; An object and its roles share an identity; An object and its roles have different.

According to Mengesha, Astair Gebremariam (1990), the concept of role focuses on the one hand on activities and the other on expectations, which are characteristics of particular categories of people and relevant to certain contexts. Thus, the present case facilitates our special aim of looking at individual women's varied positions, particularly those of workers and mothers, and associated activities and resources and expectations about them and serves to link them with specific socioeconomic contexts and differential employment levels socio-demographic data.

## c. The role of women

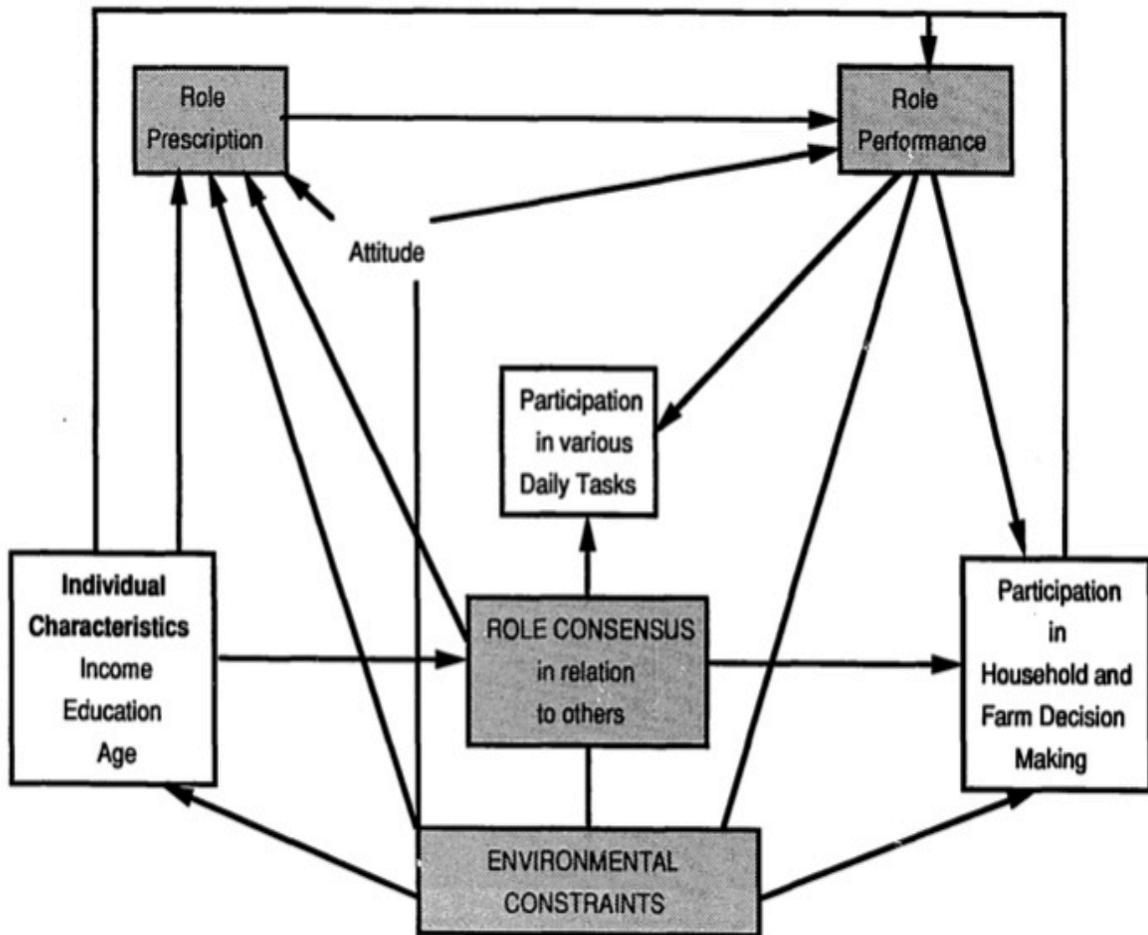
About the role of women in the household, Mengesha, Astair Gebremariam (1990) analyzed the linkage among three kinds of roles, including Role Prescription and Role Performance, and Role Consensus (Figure 2)

Firstly, women's roles in a rural setting to which we are referring pertain to prescribed roles. It implies that in a traditional agrarian society, such as the village, women's roles are performed according to society's demands or normative prescriptions of each community. The idea that individual behavior could be constructed as role performance implies that role links individual behavior and social structure. In the case at hand, role performance can be considered women's domestic work performance, field labor, market transactions, etc., on the one hand, and participation in decision making on the other.

Secondly, in intra-household participation, individuals are involved in overt activities

or goal-oriented behavior known as role performance. In the case at hand, role performance can be considered women's domestic work performance, field labor, market transactions, etc., on the one hand, and participation in decision making on the other.

Thirdly, Role consensus may be the outcome of negotiation based on costs and benefits the decision to act may bring.



**Figure 1: Conceptual model of intra-household participation and rural women's role**

Sources: Mengesha, Astair Gebremariam, 1990

According to the above theories of role, in our study, two components' roles will be explained by two elements: their participation in household tasks or their contribution to the household's economy and their power to make decisions in a family.

### 1.2.2. Women's contribution

Many researchers tried to find evidence about women's contribution in a lot of household life domains. However, especially in developing countries, most studies<sup>15-28</sup> focused on rural women's involvement in agricultural production activities<sup>1,2</sup> and daily life<sup>3,4</sup> of farmer households. Besides, women's contribution to the labor force<sup>5</sup> and household economy<sup>6</sup> are also indicated in detail.

Throughout the previous study's findings in the 20<sup>th</sup> century, women's contribution was evaluated by the working hours and the percentage of people joining agricultural employment and household tasks (Pal<sup>7</sup>, 2001; Kathiriya<sup>8</sup>, 2013; Acharya and Sharma<sup>9</sup> (1999); ADB<sup>10</sup>, 2000). Most studies revealed that women undertake more farm works than men. While men are responsible for the market or machine operation, women take on unpaid work and household tasks. Besides household chores (Ida Rosada<sup>11</sup>, 2016; Jieru<sup>12</sup>, 1999), women sometimes also undertake activities accountable to a man, such as land preparation. However, the imbalance in job opportunities and wages between men and women was quite clear. Generally, all of the above studies show a comprehensive view of women's contribution to families. However, understanding their participation in a specific domain seems necessary.

According to studies in the 21<sup>st</sup> century, the women's contribution issue is discovered deep in economics. Researchers concentrated on estimated the participation of women in household income (PK Roy<sup>13</sup>, 2017; Shiv Narayan<sup>14</sup>, 2011). It is easy to see that women and female farmers contribute to household performances compared to men. In some cases, women are the breadwinners of their families. However, their contribution seems to be unrecognized. Although women have longer working time than men, their household work remains un-paid; meanwhile, men's contribution is estimated by their wage. Therefore, women in rural areas have little say in households. This issue was widespread in rural areas or remote regions in developing countries. Although women's economic contribution seems

to be calculated due to the time use survey method, the accuracy is being argued.

In short, previous studies analyzed women's contribution in many domains of a rural household, including farming (crop, fish, and livestock production) and household's daily life (chores, child care). Although the above studies provided a comprehensive view of women's involvement in a family, understanding their participation in a specific domain seems necessary. On the other hand, the time use survey method has been used to calculate women's economic contribution. However, the accuracy of this method is being argued. Therefore, applying more calculation methods is essential to improve the precision of analysis.

### 1.2.3. Women decision-making

In many decision-making domains, the topic of women's decision-making was mentioned in many previous studies. In these studies, the decision-making power between spouses in many fields of agricultural production and household's daily life was described clearly. Most women decide household tasks, raising livestock, cultivating and harvesting crops, while men make decisions related to land using and the market (Sell<sup>29</sup>, M. et al. 2018; Sonia Akter<sup>30</sup>, 2017 ). Within households, the decision-making power between women and men is imbalanced. In the case of a decision on the use of income, men have a more significant role than women. Besides, when making an important decision, women still depend on their husbands (Mengesha<sup>31</sup>, 1990; Bjornlund<sup>32</sup>. H et al. 2019; Daniel Sumner<sup>33</sup>, 2017; Bulte<sup>34</sup>, 2016; Ramesh Balayar<sup>35</sup>, 2021). Although women's decision-making in agricultural production and farmer households was discovered comprehensively, their's decisions in a specific domain such as livestock have not been explored a lot.

On the other hand, previous research used an indicator (decision-making index) to calculate women's decision-making power. This indicator was created in many ways, but they have the same characteristic that the level of involvement of women in each decision is a central part of the calculation (C. Leigh Anderson<sup>36</sup>, 2017; Colfer<sup>37</sup>, C. et al. 2015). Thus, although the decision-making index is an important indicator to estimate women's decision-making power, its accuracy is still argued.

#### 1.2.4. The influences on women's role

Influences on women's role are identified by analyzing factors that affect women's contribution to households and decision-making power. Some main determinants of women's role were noted through previous studies, including household characteristics, individual characteristics, and social features. In the case of household characteristics, household income (Kavita Baliyan<sup>38</sup>, 2014) is mentioned as an essential factor. The more household income, the lower women's role. Besides, the household's size and household head were also indicated as determinants. If the house-head was male, decisions were significantly more likely to be male-dominated. On the other hand, where the household has more children, the role of women was improved (Bjornlund<sup>39</sup>, H. et al. 2019). Relate to individual characteristics, women's educational level and age were found to be significant factors (Itishree Pattnaika<sup>40</sup>, 2020; C. Leigh Anderson<sup>41</sup> et al. 2017)). Especially, traditional norms and cultural differences across ethnic groups also were considered typical social factors. ( Sell<sup>42</sup>, 2018; Sarah Yasmin<sup>43</sup> et al. 2015)

It is easy to see that previous studies explored a lot of determinants of women's role. However, most of the authors still used traditional methods to identify factors. They referred to a lot of literature to choose factors and then used regression models (Henrik Wiig<sup>44</sup>, 2013) to estimate impacts. It is argued about the precision and efficiency of traditional methods.

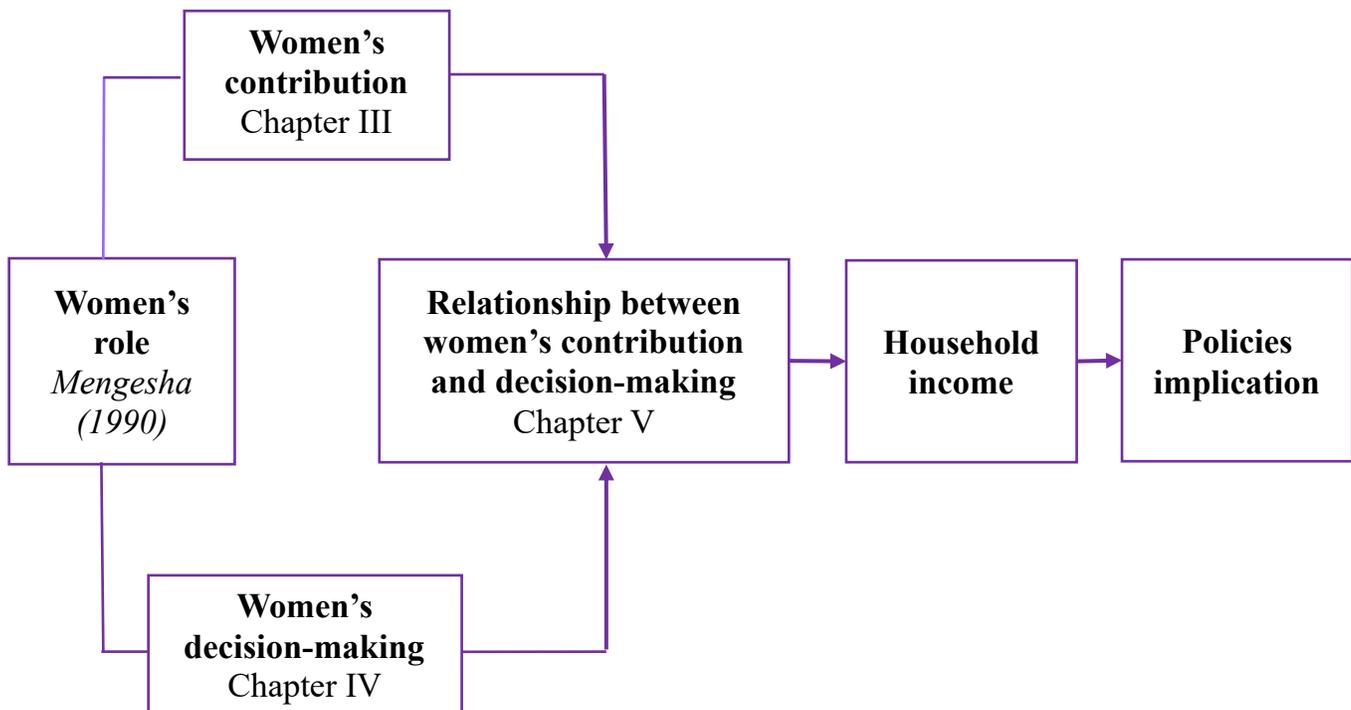
### 1.3. Objective

Our research consist of objectives: Understanding the contribution of women to household income; Defining the decision making of women in farmer household, its influences, and the impact of women's decision-making to household income; Estimating the relationship between women's contribution and their decision-making; Suggesting some policy implications to improve the women's role as well as toward improving household income.

### 1.4. Methodologies

### 1.4.1. Research framework

Figure 2 shows how we evaluate the role of women in households. According to the definition of the role and conceptual framework developed by Mengesha (1990), we analyzed women's roles corresponding to two domains women's contribution and women's decision-making.



**Figure 2: The research framework**

First of all, we identify the contribution of women on household livestock rearing through their income from collected goods and their working time in livestock production, which converted after that to money based on the market wage rate. The outcome will reveal clear how much women contribute to cattle production of the household.

On the other side, our study also analyzes how women make decisions in some domains of livestock production and its impact on household income.

In the next step, we check the impact of women's contribution on women's decision-making. It is a new idea of this study. Nevertheless, the results confirm the women's role in the household.

Lastly, some policy implication is provided through identifying positive and negative influences on women's role

#### 1.4.2. Sampling method

Among the developing countries, Vietnam also faces a gender gap. Within farm household, man always has more power than women. Based on the General Statistic Office data in 2011, the majority of household heads are male. The proportion between male and female households leader is 69.92% and 30.08%, respectively. Although women play an essential role in agricultural production such as harvesting, picking, drying, shopping, cooking, raising children, they do not have many opportunities to make household economic decisions. Only 21.27% of women can decide family activities, while 78.73% of men often determine these problems. It is easy to see that the gender inequality problem needs attention.

The Northern Mountainous region (or The Northern midland and mountainous) is the mountain area and sell-mountain in Northern Vietnam. It is the largest region, accounting for about 28.6% of Vietnam's total area. This region is characterized by complex topography, a high poverty rate, and a sparsely populated population with many minority ethnic groups. Therefore, there is a limitation on the market and labor, especially skilled labor. Women in the mountainous region are more likely than men to carry out agricultural activities like animal husbandry- more than 50% do so – while also tending to work longer than men. Women play a vital role in managing critical natural resources linked to biodiversity and food and water security (UN, 2017). Women in the mountainous region are direct labor in farming and collecting activities in households. They have not got their husbands' support as women in terrain areas (Hien 2005). Specifically, minority ethnic women face a greater risk of being marginalized and in poverty than men in the same community and women from majority ethnic groups. According to GSO Vietnam 2019, among minority ethnic communities, women and girls are often the most disadvantaged in access to social resources, education,

training, and speak out as social norms. According to Vietnam Women's Union in 2019, many women in the mountainous region still cannot access development strategies, which means they are still lagging in development priorities. 26.56% of women are unable to read or write; 7.2% of female employees receive professional and technical training; about 26% of women own land and property in their name (the Kinh women are 56%). Moreover, the poorest population groups are concentrated in rural and remote areas, where many ethnic minorities live. Their livelihood depends on land and agricultural production. The ethnic minority women in remote areas lack equal access to land and capital resources. Therefore, they have minimal opportunity to decide issues that affect their lives, such as careers.

Although the gender issue is integrated with the national strategies targeting social-economics development, women still face challenges developing their internal capacities and self-determination in the family and community. Therefore, we chose this region as a study site.

Among 15 provinces, Bac Giang is the most populous. Its topography and climate are representing the Northern mountainous region's features. Therefore, we choose the northern mountainous area of Bac Giang province as a representative research area.

In the study site, we select a representative district- Tan Yen to survey. These districts are the main cattle production areas of Bac Giang. We chose 17 villages in 4 communes of Tan Yen for collecting data. Cattle households are selected purposively as survey samples.

#### 1.4.3. Collecting data

##### a. Secondary data

Based on the research framework, secondary data is collected to reveal conceptual and practical problems related to research. For example, statistical yearbooks, reports of provinces, districts, communes, and information on the General statistical office (GSO) Vietnam website are valuable sources for our study. On the other hand, we also approach additional international information to enrich our research, such as books, academic journals, project reports, etc.

##### b. Primary data

- Due to using questionnaires, we interview face to face with cattle farmers and the local governor to collect the necessary information. We conducted the first survey in 2016. Eighty leaders of cattle households were interviewed to understand the situation of cattle production in the study site. In the first of 2020, we randomly chose 240 families for collecting data. The outputs of this survey concentrate on analyzing the women's role in the cattle household.

- The questionnaire for farmer consist multiple-choice, and open question with have three parts

- Part 1: General information about household's production
- Part 2: The contribution of women to the household economy
- Part 3: Information related to deciding for household

-The question for the local governor is an open question to collect general information about agricultural production in each region, policies that relate to development, gender equality, and local innovation.

- The time use survey method (TUS)

TUS method is used to collect data about the time women pay on household production activities in general, particularly cattle production. Time-use data provide deep insights into women's daily life, the nature of their work, their leisure time, their say in decision-making at the household level, and the risks associated with collection fodder (Pandey, 1999). Time use survey increases our understanding of the limitations of standard national accounts and includes activities such as unpaid housework and care of children, the elderly, and the disabled—all of which are not covered in surveys of the labor force) (Shiv, 2011).

#### 1.4.4. Data analysis method

- a. Descriptive statistic: To describe the characteristics of vegetable production household: percentage, frequency, mean, maximum, minimum
- b. Comparative statistic: Compare indicators between each representative province to reveal the development trend of the area.
- c. Cost and revenue analysis: calculate the cost and revenue as well as income of cattle farmer

- d. Output method: This method is used to count the amount of product that men or women collected, such as grass or residual crop for cattle production. After that, we convert the value of grass or residual crop into money.
- e. Decision-making index (DMI): Through the level of women's participation in deciding household production activities (paid and unpaid work) and the use of income from household production activities, we will construct a decision-making index (DMI).
- f. Bayesian Model Average (BMA) method: This is a technique of multivariate selection to select optimal linear regression models. In the BMA method, each model's parameters are measured based on the probability that those models are correct.
- g. Linear regression analysis: The linear regression model is used to identify the impact of selected variables on women's roles. Data will be analyzed by using SPSS statistics.

## **1.5. Study site**

### 1.5.1. Physical, economics and social characteristics of Bac Giang province

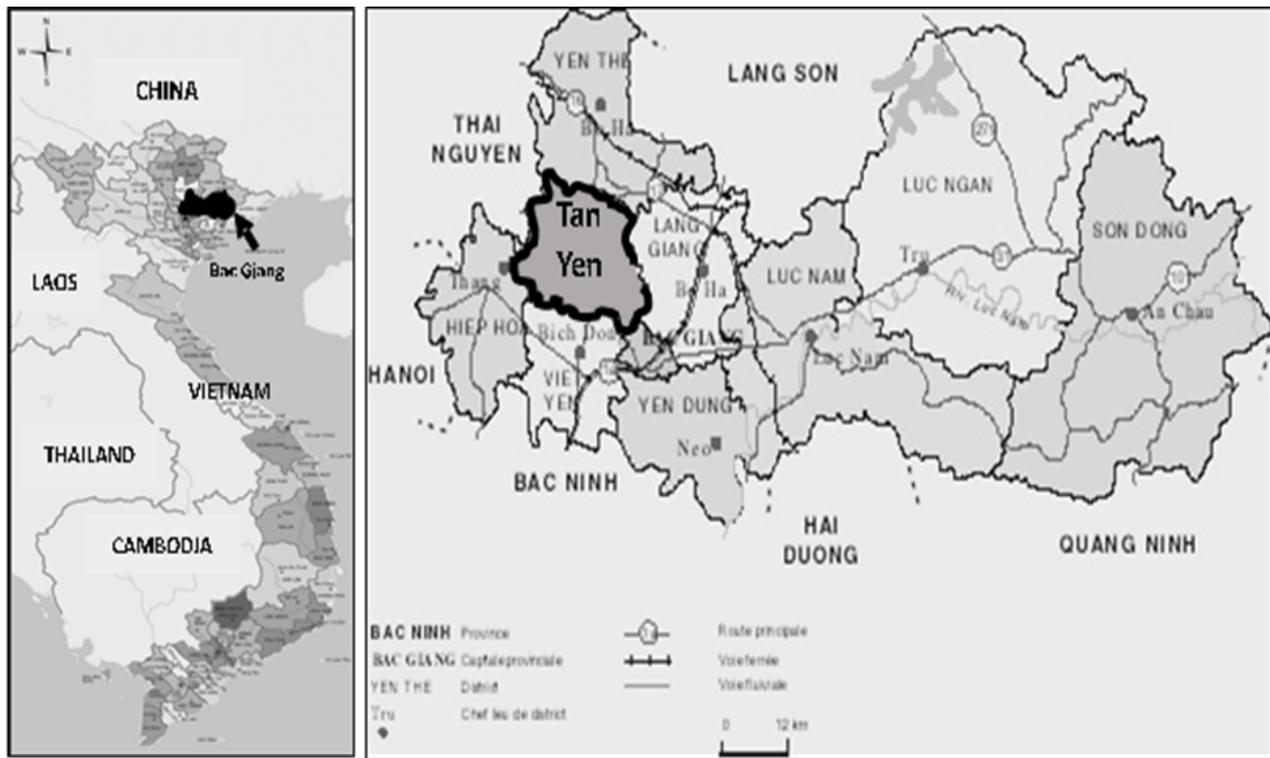
#### a) Physical characteristics

The northern mountainous Bac Giang is a mountainous province located far from Hanoi- Vietnam's capital is 50 km. Northern and northeastern Bac Giang border of Lang Son province, the west, and northwest border Hanoi, Thai Nguyen, southern and southeastern regions of Bac Ninh, Hai Duong, and Quang Ninh. Currently, Bac Giang has nine districts and one city, including six mountainous districts and one highland district (Son Dong); 229 communes, wards, and towns.

Bac Giang's terrain consists of two sub-mountainous and midland where has interleaved plain. The main characteristics of mountainous terrain (representing 72% of total area) are fragmental, complex, and significant differences in altitude. Many land areas are good, especially in the area where has a natural forest remaining. Low hills can plant more fruit trees and cash crops such as lychee, orange, lemon, custard, pink, soybeans, tea; breeding of cattle, poultry, and aquaculture. The characteristics of the midland's terrain (accounting for 28% of total area) are hilly land combined with interspersed vast plains. This area is suitable

for growing crops, fruits, and industrial crops, breeding cattle, poultry, fish, and other aquatic resources. Bac Giang's population was 1,555,720 with 26 ethnic groups, so many traditional production methods remained. In the study conducted in 2016 about cattle production in the mountainous area of Bac Giang, we found that more than 60% of directed cattle laborers in the research area are female, contributing to increasing farmer's revenue better than male labor. However, the women's role in the family is not recognized precisely because many of their activities are unpaid work such as collecting forage, feeding, cleaning or taking care of cattle, etc. Since this study, we continue choosing Bac Giang as a study site to handle remains problems.

We chose Tan Yen district (Figure 1) as a representative of the mountainous area of Bac Giang province for collecting data. This district has the basic features (topographic, climate) of Bac Giang; the number of cattle is much more than other districts and is increasing continuously; local government's projects support cattle farmers. Tan Yen divides into three areas: the moderately mountainous east and north, western midlands, and southern lowlands (GSO [12]). Tan Yen covers 20,442 ha, of which 62.7 % is devoted to agriculture and 37.3% to forestry and industry. Tan Yen's population is multi-ethnic, and it's culturally diverse. More than 94% of habitants live in rural areas. Its climate is tropical with two seasons, namely the dry and rainy seasons, making it suitable for animal husbandry (Cai [2]). To support the cattle farmer, the local government of Tan Yen launched a project: Developing the Herd of Cattle in Tan Yen, Phase 2014–2016. Alongside training in production techniques, farmers also received money to buy feed processing machines for biogas construction and veterinary services. It can be seen that Tan Yen has a lot of motivations to develop cattle production



**Figure 3: Study area**

(Source: GSO Bac Giang 2019)

### b) Economics characteristics

According to Bac Giang Statistic Year Book 2019, the size of 2019 Gross regional domestic product at current prices was estimated at 108,914.1 billion VND; Gross regional domestic product per capita was estimated at 60.2 million VND. Regarding the economic structure, there was a shift towards increasing the proportion of industry-construction activities, reducing agriculture, forestry, and fishery activities. As a result, the agriculture, forestry, and fishery sector accounted for 15.77%; the industry and construction sectors accounted for 57.63%; the service sector accounted for 24.31%. The rest was the product taxes fewer subsidies on production, which accounted for 2.29% (Table 1).

About the situation of land use, 77.43 % of the total land is used for agricultural production. The area of annual crops in the province covered 162,933 hectares, equalling 98.7% compared with the same period. The paddy area in the year is approximately 102,846

hectares; the size of maize is about 9,987 hectares; the region of vegetables accounted at 21,921 hectares. Besides rice production, fruit production is the strength of Bac Giang. The total area of perennial crops in the province was 51,258 hectares, mainly due to some paddy areas in mountainous districts was unable to actively control the water source and converted fruits that brought higher economic efficiency: the quantity of orange reached 44,511 tons; grapefruit reached 29,351 tons; litchi in the province reached 150,390 tons for the whole year.

**Table 1: Land use of Bac Giang in 2019**

	<b>Total (Ha)</b>	<b>Structure (%)</b>
<b>TOTAL</b>	<b>389.589,5</b>	<b>100,00</b>
<b>Agricultural land</b>	<b>301.626,8</b>	<b>77,43</b>
Agricultural production land	147.133,0	37,77
Annual cropland	80.686,9	20,71
Perennial cropland	66.446,1	17,06
Forestry land covered by trees	145.810,0	37,43
Water surface land for fishing	8.424,7	2,16
Others	259,1	0,07
<b>Non-agricultural land</b>	<b>84.570,3</b>	<b>21,70</b>
<b>Unused land</b>	<b>3.392,4</b>	<b>0,87</b>

(Source: Bac Giang Statistic Year Book 2019)

In term of livestock, in 2019, buffalo population in the province reached 44,255, an equal to 97.6% compared with the same period; cattle population reached 137,760 heads, with the living weight was estimated at 6,352 tons; pigs population advanced 620,928 leads, and poultry population reached 17,762 thousand, rose by 1.5% compared with the same period last year.

In forestry, the area of newly planted forests in the province was estimated at 8,344 hectares, equaling 99.4% compared with the same period. Wood production in 2019 in the region reached 649,398 m<sup>3</sup>, an increase of 7.6% compared with the same period.

c) Population and employment

The average population of Bac Giang in 2019 was around 1,810.4 thousand persons (Table 2), in which 11.45% of the total population live in an urban area, 88.55% of other people in a rural area; the male population was 908.7 thousand persons, accounted for 50.19%; the female population was 901.7 thousand persons, made up 49.81%.

**Table 2: Population and employment of Bac Giang in 2019**

<b>Population (person)</b>					
<b>Year</b>	<b>Total</b>	<b>By sex</b>		<b>By residence</b>	
		<b>Male</b>	<b>Female</b>	<b>Urban</b>	<b>Rural</b>
<b>2015</b>	1.666.978	832.559	834.419	189.12	1.477.858
<b>2016</b>	1.696.903	848.55	848.353	193.123	1.503.780
<b>2017</b>	1.736.787	869.567	867.22	198.225	1.538.562
<b>2018</b>	1.777.506	891.052	886.454	202.928	1.574.578
<b>2019</b>	1.810.421	908.672	901.749	207.37	1.603.051

<b>Employment (%)</b>					
<b>2015</b>	17,60	21,70	13,40	40,40	15,00
<b>2016</b>	17,70	21,90	14,70	42,40	15,60
<b>2017</b>	17,78	22,20	15,20	44,30	15,90
<b>2018</b>	17,80	22,70	15,80	44,80	16,20
<b>2019</b>	18,00	23,10	16,10	45,20	16,70

(Source: Bac Giang Statistic Year Book 2019)

The labor force aged 15 years and over in working age in urban and rural was 12.85% and 87.15%, respectively. The percentage of trained, employed workers aged 15 and overreached 18.0% (equivalent to 2018) (Urban area was 45.2% while the rural area was 16.7%). The unemployment rate of the labor force in working age was 1.37%, of which the unemployment rate of the labor force in working age in urban and rural was 4.45% and 1.01%, respectively.

#### d) Ethnicity

There are many ethnic groups in Bac Giang province, in which Kinh people are the majority, accounting for 88.1% of the total population (GSO, 2018). Vietnamese is the official language of the Kinh people. Approximately 11 % of people are a minority ethnic group that speaks their languages. Most of them live in remote areas with their customs. The language difference is a barrier to employment, so agriculture is their main livelihood.

#### 1.5.2. The situation of female labor in the rural area of Bac Giang

In Bac Giang, more than 80% of people live in the rural and mountainous region, of which half of them are female. It is easy to see that male labor's unemployment and underemployment rate is higher than female labor (Table 3).

**Table 3: The situation of rural laborers in Bac Giang**

<b>Underemployment rate of the labor force at working age (%)</b>					
<b>Year</b>	<b>Total</b>	<b>By sex</b>		<b>By residence</b>	
		<b>Male</b>	<b>Female</b>	<b>Urban</b>	<b>Rural</b>
<b>2015</b>	0,92	1,06	0,77	0,67	0,95
<b>2016</b>	0,82	0,78	0,86	0,63	0,84
<b>2017</b>	0,86	1,01	0,69	0,26	0,92
<b>2018</b>	0,96	1,28	0,60	0,25	1,05
<b>2019</b>	0,79	0,87	0,69	0,31	0,84
<b>The unemployment rate of the labor force at working age (%)</b>					
<b>2015</b>	2,07	2,32	1,59	2,61	1,75
<b>2016</b>	2,10	2,75	1,66	3,79	1,28
<b>2017</b>	2,15	2,45	1,62	2,56	1,53
<b>2018</b>	2,09	1,83	2,38	2,81	1,75
<b>2019</b>	1,37	1,66	1,04	4,45	1,01

(Source: Bac Giang Statistic Year Book 2019)

In reality, men have more opportunities to get paid work than women. However, the number of female laborers who are willing to work is much more than males. On the other hand, the underemployment rate in rural areas (0.84%) is much more than in urban areas

(0.31%). Apparently, under the lack of jobs, female rural laborers in general, remoteness women in particular, participate in working more than men. Besides, they also have to do housework and take care of children. But in reality, men are still considered the breadwinner of the family, have more power to make crucial decisions.

To deal with gender inequality, Bac Giang's government focused on training rural and mountainous women and improving the labor market. From 2011-2015, the number of rural female workers who got vocational training reached 26%. From 2016 to now, the proportion of rural female workers under 45 years old who got vocational training accounted for 50%. However, poor rural women or minority ethnic women still face challenges in the labor market.

## Note

- 1) In animal production, women involve majorly in caring, grazing, milking, and feeding animal (Pal, 2001). Women are the central labor who is taking care of cattle. Their participation was maximum in caring for pregnant animals (91.66%) followed by taking animals for pregnancy diagnosis (90.83 %). The study revealed that 90 percent of women were milking while 89.16 percent cared for newborn or young animals. The rural women were actively engaged in the cleaning of animal sheds (89.16 %), feeding the animals (87%), and disposal of cow dung (86.66 %) (Kathiriya,2013).
- 2) Related to women's involvement in crop production domains, Zwarteveen (1997) suggests that women in Hindu male-headed households contribute 54 percent of all labor in rice production, compared to 31 percent in Muslim male-headed households. When a comparison is made of labor allocation based on tasks, a modified labor pattern emerges. Besides traditional crop processing tasks, female family labor is also used for making seedbeds, uprooting seedlings and transplanting, fertilizing, weeding, and harvesting, all traditional male activities. Women, almost equal to the contribution of male family labor, carry out some 40 to 50 percent of field irrigation and non-farm water management. On the other hand, in general, land preparation and

plowing are seen as the responsibility of men, and activities like transplanting and weeding are regarded as women's jobs. In contrast, both men and women perform activities like harvesting and post-harvesting. However, in certain areas, at times of heavy demand for labor, women also undertake some of the more traditional severe male activities like land preparation (Rengalakshmi et al., 2002).

- 3) In household chores, women spent 13.16 hours/day on household chores and to make a living is about 10.94 hours/day (Ida Rosada (2016)). While younger and middle-aged women are responsible for most agriculture and forestry activities, older than and girl children help with household chores (Jieru, 1999).
- 4) About collecting goods for household using, Shiv Narayan (2011) resulted in women used more than 50% of their time for collection activities like fuelwood, drinking water, and fodder for cattle. Jieru (1999) noted that younger and middle-aged women are responsible for collecting activities (such as collecting fuel wood, non-timber products, and pine leaves for barn yard manure). Women make up about 8.5 percent of collective farmers (ADB, 2000).
- 5) Related to labor forces, ESCAP (1999) showed that women in rural areas make up 22.2 percent of the employed labor force. Besides, women account for 64 percent of home farm workers and almost 71 percent of household workers. Pal (2001) concluded that unpaid family workers, among whom women are disproportionately represented, are a significant source of labor in the agriculture sector. MWVA (2004) reported that women comprise 56 percent of the primary workforce in subsistence agriculture and 54 percent in market-oriented agriculture. UNICEF (1996) recorded that women and girls perform 50 to 70 percent of agriculture and productive tasks and household activities. Moreover, the participation of rural women in the labor force is highest - approximately 80 percent - among older age groups (30-34, 35-39, and 40-49 years) (Thonguthai et al. (1998)). Desai (2001) also found that women's labor accounts for an average of 69 percent of a household's total labor.
- 6) In household economic security, PK Roy (2017) found that the average annual women's contribution to household income was estimated at 43.52 percent of the

total income. Ida Rosada (2016) mentioned that women earn Rupia 890,500/month on average. Shiv Narayan (2011) reported that women are the breadwinners in many households, in contrast to the common perception that they are economically dependent on their male counterparts. If their work is monetarized, they earn more than men and contribute to significantly household economic security. Pal (2001) mentioned that rural women traditionally had played an essential role in a wide range of income-generating activities

- 7) Studying the participation of women in various types of performances in farmer households in Bangladesh, Pal (2001) also mentioned that rural women traditionally had played an essential role in a wide range of income-generating activities. They undertook many production activities, including post-harvesting, cow fattening and milking, goat farming, backyard poultry rearing, pisciculture, horticulture, food processing, cane and bamboo works, silk reeling, and so on. Many rural women, mainly from impoverished landless households, also engage in paid labor in construction, earthwork, and field-based agricultural work, activities that traditionally have fallen within the male domain. The tradition of female seclusion is overlooked to provide for the economic needs of the family. Unpaid family workers, among whom women are disproportionately represented, are a significant source of labor in the agriculture sector in Bangladesh
- 8) Researching women's contribution to dairy farming in Bangladesh, J. B. Kathiriya (2013) explored that women's participation was maximum in caring for pregnant animals (91.66%) followed by taking animals for pregnancy diagnosis (90.83 %). The study revealed that 90 percent of women were milking while 89.16 percent cared for newborn or young animals. The rural women were actively engaged in the cleaning of animal sheds (89.16 %), feeding the animals (87%), and disposal of cow dung (86.66 %). The farm women's participation was least in farm record maintenance (52.5%) and getting loans or credits from the banks (49.16 %). The study concluded that women participated mostly in non-financial activities, and there

is a need to educate farm women about scientific management practices for increasing livestock production

- 9) A study in Nepal, Acharya and Sharma (1999) found that many Nepalese women (40 percent) are economically active. Most of these women are employed in the agriculture sector, the majority working as unpaid family laborers in subsistence agriculture characterized by low technology and primitive farming practices. Indeed, as men increasingly move out of farming, agriculture is becoming increasingly feminized. In addition to a culturally based division of labor, women's workload has increased because of: i) geographic and infrastructure factors; ii) out-migration; and iii) new activities promoted under development projects.
- 10) In Tajikistan, provisional official statistics show that women's relative share of agriculture, forestry, and fishing increased from 18.8 percent in 1991 to 29.3 percent in 1998. However, women earned an average monthly wage of just \$6 in 1998. The agriculture sector employs 54.1 percent women and 46.2 percent men. Women make up about 8.5 percent of collective farmers. Employment status compared by type of enterprise and ownership shows that 29.9 percent of men and 40.6 percent women are represented; under the private farm category, 2.2 percent men and 2.4 percent women are included. Women's low wages function from occupational segregation into common paid occupations such as education and health and low skilled trades such as agriculture (ADB, 2000).
- 11) According to Ida Rosada (2016), Indian women spent 13.16 hours/day on household chores and to make a living is about 10.94 hours/day. Internal interaction in the family is about 5.23 hours/day on average and external exchange is 6.32 hours/day. Women earn Rp 890,500/month on average.
- 12) A case study in the mountainous Yunnan Province found that women perform 80 percent of agricultural work and engage in all activities (including cultivation, crop management, harvesting, and marketing) except for plowing. The involvement of women in agriculture appeared to be determined by their social position in the family. Younger and middle-aged women are responsible for most agriculture and forestry

activities (such as collecting fuel wood, non-timber products, and pine leaves for barn yard manure) during the slacker farming season from November to January. Women older than 60 do not perform any agricultural activities, while girl children help with household chores and look after their younger sisters or brothers. The efforts of boy children are relatively less structured (Jieru, 1999).

- 13) Regarding Bangladesh women's contribution to rural household income, PK Roy (2017) indicated that women participated in various income-generating activities such as crop production, post-harvest activities, poultry rearing, management of livestock and fisheries, etc. The average annual women's contribution to household income was estimated at about 43.52 percent of the total household income.
- 14) Shiv Narayan (2011) used the time survey method to estimate how women contribute to their household's economy. The result indicated that women used more than 50% of their time for collection activities like fuelwood, drinking water, and fodder for cattle. Women are the breadwinners in many households, in contrast to the common perception that they are economically dependent on their male counterparts; if their work is monetarized, they earn more than men and contribute to significantly household economic security. These estimates are an undervaluation and do not reflect the actual contribution of women owing to the omission of many activities, underreporting, and multitasking. Women work primarily in nonmarket household production activities, whereas men are engaged in paid market activities.
- 15) Alyssa Thomas (2021) mentioned the contribution of women fishers to household food security and livelihoods. The results demonstrate that women fishers provide critical contributions to their household food security via the three pathways: (1) the direct nutritional value of fish; (2) increased purchasing power (and thus a source of income) from selling fish and invertebrates; and (3) an improved economic status. However, their substantial contributions from harvesting both fish and invertebrates are not included in most official statistics. They, therefore, are overlooked and continue to be invisible, ignored, and unrecognized in fisheries management and policy development.

- 16) Itishree Pattnaik (2020) studied women's contribution to agricultural production in India. The primary data analysis derived from a survey of 800 households from the two Indian states of Gujarat and West Bengal establishes that women's work in the farm sector cannot be homogenized. Women's work as additional hands in family farms differs from that of wage laborers, which is casual.
- 17) A study covering three ecologically distinct and fragile regions in India concluded that, in general, land preparation and plowing are seen as the responsibility of men, and activities like transplanting and weeding are regarded as women's jobs. In contrast, both men and women perform activities like harvesting and post-harvesting. However, in certain areas, at times of heavy demand for labor, women also undertake some of the more traditional severe male activities like land preparation. For example, in little millet cultivation in the Kolli Hills, women are responsible for most agronomic practices and post-harvest operations, including seed storage, supply, and exchange (Rengalakshmi et al., 2002).
- 18) In Pakistan, (Bari, 2000) indicated that women are key players in the agriculture sector, employing almost 12 million women to produce crops, vegetables, and livestock. The cotton crop, accounting for half of the national export earnings, depends heavily on female labor. In addition, women have the exclusive responsibility for cotton picking, exposing themselves in the process to health hazards emanating from the intensive use of pesticides. Other research (Fafchamps and Quisumbing, 1999) found overwhelming evidence of a division of labor based on gender and family status, in which men are responsible for "market" work (such as farming, herding, and other income-generating activities) and women are responsible for "home production" activities.
- 19) Studying Southeast Asian rural women (MWVA, 2004) reported that nearly 80 percent of workers in the agriculture labor force are engaged primarily in subsistence agriculture; women comprise 56 percent of the primary workforce in subsistence agriculture and 54 percent of the workforce in market-oriented agriculture. Most of these women are unpaid family workers.

- 20) In Indonesia, women represent the mainstay of rural households, providing family as well as farm labor. Agriculture accounts for the highest share of rural employment, with 63 women working in agriculture per 100 men. Since most rural households control small amounts of land or have no land at all, rural women often seek to supplement household income and food security through off-farm employment in small and medium enterprises, some of which have links to agricultural production (Mugniesyah, 2002)
- 21) In Lao PDR, studies have recorded that women and girls perform 50 to 70 percent of agriculture and productive tasks in addition to household activities. Women farmers produce primarily for household consumption, and rural women obtain as much as 30 percent of the family diet and household needs from foraging (UNICEF, 1996).
- 22) Findings from a study of Khin Pwint Oo (2003) in Myanmar record rural women's key contributions to household food security marked by diversity in work patterns in agriculture and food production, but there is evidence of gender role flexibility as occasion demands. Traditionally, men's agriculture activities include land preparation, plowing, and leveling fields, whereas sowing, transplanting, weeding, and reaping are women's work. Post-harvest activities of threshing, winnowing, seed management, and transporting grains from field to home are the work of both men and women. Women from poorer households are more involved in agriculture fieldwork than those from less low-income families. Poorer women are also heavily involved as family farm workers and agricultural laborers to contribute to family income and food security. Women also participate in cultivating secondary crops and work as waged agricultural laborers in cash crop production. Home garden cultivation is the responsibility of women.
- 23) Thonguthai et al. (1998) studied Thailand women in rural production systems and income generation. There are 40 percent of women worked in agriculture in 1995. All members of smallholder households, regardless of age and sex, participate in agricultural production. Yet, the participation of rural women in the labor force is highest - approximately 80 percent - among older age groups (30-34, 35-39, and 40-

49 years). As opportunities for wage and self-employment outside rural households have increased along with economic transformation, the participation of rural women in the economy has begun to resemble that of urban women.

- 24) In Viet Nam, data from the recent Viet Nam Living Standards Survey have demonstrated the extensive participation of women in the agriculture sector. The data show that the contribution of rural women exceeds that of rural men in livestock production and equals that of men in crop production. The survey data further revealed that in the five years between 1992/93 and 1997/98, wage employment increased from 26 percent to 32 percent among male and female adults in the 18 to 64 year age group. Moreover, in the case of women, most of this increase occurred in rural areas; there was no change in urban areas. Another recent study corroborates these findings regarding women's contributions to rural production systems and reiterates the significant role of women in livestock rearing. It found that women's labor accounts for an average of 69 percent of a household's total labor (Desai, 2001)
- 25) In Kazakhstan's rural areas, women accounted for about 3 513 million of the agricultural population (7 107 million), which accounted for 46.2 percent of the entire female population. The wages for agricultural workers are the lowest among all sectors of employment. Economic difficulties complicate the lives of rural women (Zholaman, 1999).
- 26) Kumskova (1999) showed the economic reforms in Kyrgyzstan affect the economic conditions of rural women. In 1997, female employment in the agriculture sector was 37.5 percent which had decreased slightly since 1991. Home farming helps to ease economic hardship. The self-employment trend shows that women work on home farms, take the product to market, and sell their home garden produce. Most women also take up dairy and animal farming.
- 27) Women in the rural areas of Turkmenistan make up 22.2 percent of the employed labor force. The main areas of employment for rural women are farmer associations, farms, and the informal sector. Besides, women account for 64 percent of home farm workers and almost 71 percent of household workers. Hence, widespread home

farming and lease of agricultural land result in women and children as unpaid labor (ESCAP, 1999).

- 28) In the Republic of Uzbekistan, in 1998, most of the employment was still found in the rural areas with 39 percent employed in agriculture; men accounted for 60.3 percent and women for 39.7 of the total agriculture and forestry workforce. In agriculture, men work as highly qualified machine operators, whereas women remain unqualified, seasonal laborers. Nevertheless, female employment in agriculture was high. Privatization has not provided rural income and employment opportunities due to the interplay of complex factors. Women, however, have taken advantage of other possibilities such as food processing and the sale of agricultural products from their home gardening (ADB, 2001). Two types of data can measure the contribution of women in the farm labor force: statistics on the share of women in the economically active population in agriculture and time use surveys, which document the time spent by men and women in different activities.
- 29) Studied about decision-making among small-scale farmers in Uganda, Sell, M. and Minot, N. (2018) noted that the division of responsibility for economic decisions between spouses in the rural household is more heterogeneous than is sometimes appreciated. Men are more likely to play a more significant role in cash crop decisions, and women are slightly more likely to take a leading role in food crop production, but the pattern is weaker than expected. In the case of a decision on the use of income, men clearly have a greater role than women. Only 41% of women report input into all or most decisions on income from cash crops compared to 74% of men. The only exception is decisions on the use of income from wage and salary labor. Women report having input into all or most decisions similar to men (88% for men and 82% for women).
- 30) Comparing the differences of women's decision-making in rice farming and use of expense among four countries in Southeast Asia, Sonia Akter (2017) In Indonesia and Myanmar, men take a lead role in the field. Nonetheless, men listen to women's opinions, and husbands and wives make decisions jointly. In Thailand, female

participants mentioned that they have sole decision-making power in rice farming, while in the other half, decisions are jointly made with their husbands. In the Philippines, all rice farming decisions are jointly made by husbands and wives. About the income, in all study sites, the income of the husband and wife is pooled as family income and is managed by the wife. In the Philippines, the participants mentioned that they are responsible for deciding on the sale of crops and livestock and retain the money they earn from the sale. In other cases, the common practice is for men to sell the produce, collect the money, and then hand it over to the women to pay for household expenses. In Indonesia, participants mentioned that both husband and wife manage household income. Women make decisions about savings, food and non-food expenditures, and household needs.

- 31) Mengesha, 1990; defined the word decision-making. Decision-making centers around the nature of power itself. To speak about power mean that about the ability to influence others so that they do what we want them to do if they wish to do it or not. Power includes the right to delegate responsibility for certain decisions to others. Like many other relationships, in marriage and the family, there is a power interaction. Husbands empower the power of wives to make certain decisions. It implies that the wives make decisions on behalf of their husbands and are not, therefore, the actual ultimate decision-makers.
- 32) Bjornlund. H et al. (2019) provides an overview of the gender balance of many kinds of household decision-making by three countries in Africa. The husband and the wife predominantly make farm decisions, with other household members making a smaller proportion (ranging from 8% for cattle to 12% for irrigation). In Tanzania, men make most decisions, and this probably reflects social norms. Females make most decisions in Zimbabwe, which perhaps reflects that many men work away. However, both countries report 20% balanced decision-making. Balanced decision-making was rare in Mozambique, with decisions made mostly by men in one scheme and primarily by females in the scheme, where a large proportion of men work away in South Africa. In Zimbabwe, female-only decision-making is likely if the female

house head is widowed. Households, where females make all the decisions, accounted for 56% of widowed house-head, compared to 18% amongst other households. Across all schemes, decision-making about cattle is male-dominated while small stock is female-dominated (except for Mozambique). Apart from small stock, female decision-making is highest for irrigation: particularly in Zimbabwe and Mozambique, where the proportion of all-female decision-making is higher than for any other products and higher than male-only.

- 33) Daniel Sumner (2017) explored the differences between men and women in agricultural production and the livelihoods of farmer households in Cambodia. This study showed that men and women might both be involved in certain decisions about agricultural production, but there are gender-based differences in the extent of their participation. In the case of land preparation, 68 % of men indicated that they participate greatly and may make decisions even if other members of the household disagree; only 16 % of women said the same. However, most women (60 %) indicated they could not give their opinion, or their views did not affect the outcome of decisions related to land preparation. Men and women noted that this decision-making dynamic is due to men's greater responsibilities in agricultural activities. Men and women respondents indicated that gender differences in roles and responsibilities influence participation in decision-making; however, respondents stressed that women's roles and responsibilities in the house could impact the field, and men's responsibilities in the field could impact household decisions.
- 34) Researching women's decision-making in Vietnam, there is little topic related to agriculture or farmer households. Based on experimental data from rural Vietnam, Erwin Bulte (2016) documented that husbands' preferences indeed tend to dominate those of their wives. But this study also found that external interventions can fortify the bargaining position of wives. Lien (2018) analyzed the consumption decision-making in small households and found that while traditionally the sole responsibility of the husband and his family, surveyed data demonstrates the increasing role of the wife and her family in the house purchase. In particular, if the wife's family lives

closer or is the leading financial contributor, they now take on a more significant role in the decision-making.

- 35) Ramesh Balayar (2021) analyzed women's decision-making in vegetable production, marketing, and income utilization in Nepal's hills communities. This study found that young and educated women more commonly contest restrictive practices and participate in all types of important decisions. Women manage household cash, have more freedom to spend income, and feel a strong sense of dignity and empowerment. However, some women still rely on their husbands for important decisions and are hesitant to travel to markets for training and exposure visits. Overall, the authors provided clear evidence of women as active decision-makers, farm managers, and income earners.
- 36) C. Leigh Anderson (2017) used OLS and logistic regression to investigate variation in husband and wife perspectives on the division of authority over agriculture-related decisions within households in rural Tanzania. The study found that the level of decision-making authority allocated to wives and the authority allocated by wives to themselves vary significantly across households. In addition to commonly considered assets such as women's age and education, women's health and labor activities also appear to matter for perceptions of authority in rural agricultural households. When interviewed separately, husbands and wives frequently disagree over who holds control over key farming, family, and livelihood decisions.
- 37) Colfer, C. et al. (2015) analyzed that intra-household decision-making in Sulawesi had a link to gender issues, including agriculture, food, money, life chances, and attitudes toward domestic violence. The results showed considerable female involvement in decision-making and strongly democratic elements. Three issues were indicated that need greater attention for equitable landscape management to result. Women's decision-making spheres must be ascertained and taken into account, men's involvement in care needs to expand, and women's agency requires enhancement and external support.

- 38) Kavita Baliyan (2014) indicated some factors affecting the participation of women in household decision making, in which age and person-days spent on agriculture are found to have a strong positive impact on women's decision-making, while family income has a negative effect. Caste, the status of women in family and education has an expected positive impact on DMI, but regression coefficients are not significant. The size of the family also has a negative effect but is not statistically significant. The value of R square is 0.28. It indicates that the factors determining women's participation in decision-making are quite complex and depend upon several socio-economic factors, including traditional social and cultural values.
- 39) Bjornlund, H. et al. (2019) identified the household head, the owner of land and livestock, the percentage of farm work carried out by the house-head, the number of children in households. Where the house-head (HH) was male, decisions were significantly more likely to be male-dominated. Other factors are also significant, such as the larger the percentage of farm work carried out by the HH, the more males dominate rain-fed and cattle decisions; if the HH is widowed (most likely a female), cattle decisions are less likely to be male-dominated; and the larger the percentage of males, the more men dominate small stock decision-making. The last finding was unexpected and suggested that the more male-dominated the household, the more men infringe on the traditionally female-dominated area of small stock. There is a significant and negative relationship between the total land not owned by males only and the overall decision-making index. There is a similar relationship between the rain-fed and irrigated areas not owned by males only and the index for rain-fed and irrigated production. Females have a larger role in decision-making if they formally have full or partial control over the land.
- 40) Relating to determines women's participation in agricultural production in two rural areas of India, Itishree Pattnaika (2020) revealed that household economic status and landholding size are the major factors determining women's work in the agricultural sector. The higher the income, the lower the probability of female participation as cultivators and as wage laborers. The likelihood of female participation on family

farms is higher among the small landholding households compared to marginal landholders. The food security of households was expected to have a significant impact on women participating in any economic activity. The regression analysis also shows that caste barriers- the central social factors-strongly impact women engaged in economic activities. None of the individual characteristics showed a statistically significant impact on female participation on family farms. However, education was found to be a significant factor, negatively influencing female participation as wage laborers. Another factor is female participation in extension programs; though it did not witness any significant impact on women's work on family farms, it was seen to have a positive influence on their work as wage laborers.

- 41) C. Leigh Anderson et al. (2017) showed that women's education and women's health, for example, appear to be positively associated with a wife's allocation of overall household authority to herself, but not with corresponding allocations of overall authority by her husband. In contrast, higher women's education is associated with shared spousal views of greater women's authority over cash decisions, suggesting investments. Thus, education may improve women's bargaining power, but unevenly so across different decision types. Meanwhile, the effect of better women's health is associated with an increase in her authority over several key farms and household decisions, which ultimately suggests that, for agricultural populations, in particular, one's own physical capabilities are a crucial component of the bargain.
- 42) Sell (2018) indicated that some factors affect women's decision-making in small scale households in Uganda, including age, male-female educational differences, remoteness, and location. However, the individual and household characteristics we examine explain barely 13% of the variation in women's decision-making. Specifically, this study found that female decision-making varies significantly by region. It seems to reflect language differences, which are presumably a proxy for cultural differences across ethnic groups. In addition, we find the female empowerment is significantly and negatively related to travel time to a paved road. These results suggest that it may be possible to use geographic targeting, focusing on

specific areas where the challenges are more pronounced, to increase the cost-effectiveness of programs to address gender issues.

- 43) Sarah Yasmin et al. (2015) found some factors explain women's decision-making in the dairy household of Bangladesh, in which, the greatest factors were the support from the husband, the successful breakdown of traditional cultural norms, the ability to increase knowledge and skill, and finally the breed of cattle raised.
- 44) Studying about impacts on women's participation in decision-making, Henrik Wiig (2013) noted that women living in communities with titled plots participated in 70.2% of the household decisions that were effectuated, compared to 64.9% in the communities without titled plots. This 5.3 percentage point difference is significant at the 5% level. The strength of the effect rises to 15.5 percentage points when authors introduce both household-level and community-level variables in OLS models.

## CHAPTER II

### CATTLE PRODUCTION IN THE MOUNTAINOUS REGIONS OF BAC GIANG PROVINCE

#### 2.1. Introduction

Poverty in the mountainous region of Vietnam is deeper than in coastal areas, and river deltas and livestock ownership are particularly prevalent in the mountainous area Upton, M (2004). Cattle production is encouraged in mountainous regions because of its comparative advantage in comparison with flat areas. In the northern mountainous area, about 65.6 % of farmers keep cattle, and more than 25% of the total income of households is earned from rearing livestock (Epprecht, 2005). However, most cattle farmers are small scale farmers with an average herd size is 1.9 heads per household (Maltsoğlu et al. (2005), FAO (2018), and the efficiency of cattle production is low because of the unavailability of feed sources and low production techniques Sunderlin et al. (2005).

There are many studies about cattle production that were conducted in some regions of Vietnam. Tung (2008) and Pease (1996) showed that large-scale cattle farms have been economically efficient than small-scale farms. However, small-size households were still more prevalent than large-size households in rural areas of the Red River delta. Parson et al. [18] explained that the main constraints of cattle production in the south-central coast of Vietnam are cattle diseases and lack of feed. In relation to the mountainous area, Duong et al. (2014) and Ha (2012) show the differences in the existing cattle production system of ethnic groups. Stur et al. (2013) and Dinh (2017) indicated that the traditional grazing system in cattle production is inefficient and gradually replaced by stall-feeding. Hang (2008) pointed out that the grazing fields and natural forage sources favor cattle production. The efficiency of cattle production was mentioned in previous studies. However, these studies focused on cattle production in the plains. In the mountainous area, the efficiency of cattle production, cattle producer's income, and influence factors have not been clarified. Therefore, estimating the

factors influencing cattle farmers' income within the mountainous region is necessary and significant.

To clarify factors influencing cattle farmer's income in the mountainous area of Vietnam, we chose Bac Giang – a mountainous province to conduct our study. Bac Giang is one of the top 10 provinces in Vietnam noted for having a large proportion of poor households<sup>1)</sup>. In Bac Giang province, cattle production is considered a strategy for improving small-scale households' livelihood and reducing poverty (GSO, 2016). While the traditional cattle production<sup>2)</sup> such as cow-calf production or raising calves are being maintained in other mountainous areas, fattening beef cattle<sup>3)</sup> - a production model in which farmer feed feeder stocks to make them overweight, in a short time is gradually becoming popular in the mountainous region of Bac Giang. Therefore, we will focus on analyzing beef cattle fattening in Bac Giang as a new point of our research.

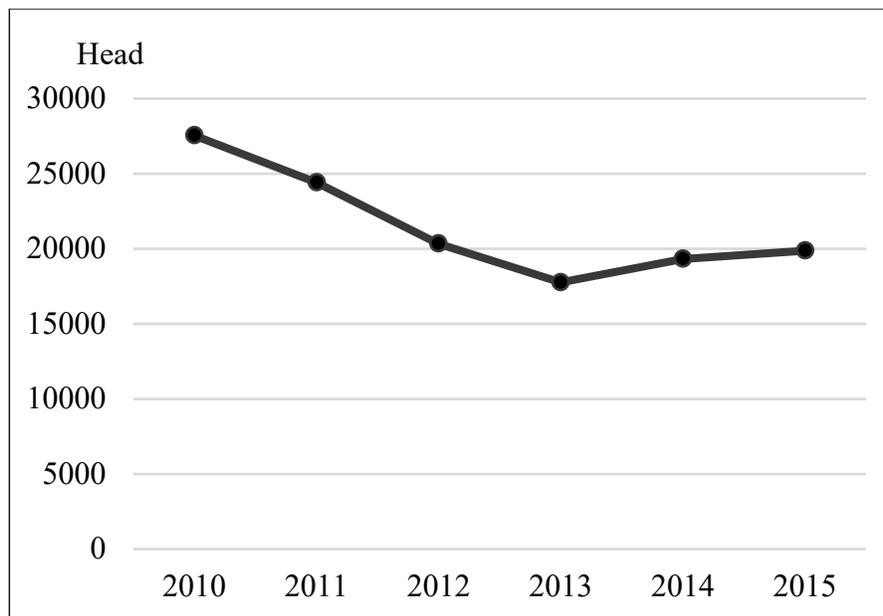
This study aims to analyze the situation of fattening beef cattle in the mountainous area of Bac Giang to understand its contribution to farm household's income. This study also estimates factors affecting the income of cattle farmers to define which factors are important for increasing farmer's income in the research area.

## **2.2. Methodology**

### **2.2.1. Sampling method**

We chose Tan Yen district (Figure1) as a representative of the mountainous area of Bac Giang province to conduct a survey because this district has the basic features (topographic, climate) of Bac Giang; the number of cattle is much more than other districts and is increasing continuously; local government's projects support cattle farmers. Tan Yen is divided into three areas, namely the moderately mountainous east and north, western midlands, and southern lowlands (GSO 2019). Tan Yen covers 20,442 ha, of which 62.7 % is devoted to agriculture and 37.3% to forestry and industry. Tan Yen's population is multi-ethnic, and it's culturally diverse. More than 94% of habitants live in rural areas. Its climate is tropical with two seasons, namely the dry and rainy seasons, making it suitable for animal husbandry (Cai, 2007).

From 2010 to 2014, cattle herds in Tan Yen declined from 27,543 head in 2010 to 19,304 in 2014. This was followed by an increase in the number of heads in 2015 (Figure 3). The number declined sharply in 2013 because of weather and rime. In 2015, 605 households owned more than three heads of cattle. At the end of 2016, the number of cattle households per commune in Tan Yen increase from 8 to 10 households (GSO ,2016). Apparently, raising beef cattle has gradually become an important income source for farmers in this area.



**Figure 4: The fluctuation of the cattle herd in Tan Yen district**

Source: GSO Bac Giang 2016

To support the cattle farmer, the local government of Tan Yen launched a project: Developing the Herd of Cattle in Tan Yen, Phase 2014–2016. “Developing the herd of cattle in Tan Yen, phase 2014-2016”. The main objectives of this project include:

- Developing the herd’s quantity and quality, improving the domestic breed that is low productivity
- Establishing large scale livestock farms
- Improving the raising method of breeders, decreasing the traditional methods

According to this project, 3000-4500 exotic cows in all of the communes were selected

to artificial inseminate. From that, the quality of the breed will be improved. 260 million VND is used to pay for insemination

About the feed, breeders are encouraged to apply the methods for reservation forages; change the low-value land production to VA-06 grass cultivation by supplying free seeds and training cultivation methods for breeders. The total value of support for grass cultivation is 240 million VND. The project also supports the large scale holders (more than five cattle): 1 million VND/holder for machines of feed processing; 3 million VND/holder for the building of Biogas; 500 thousand/holder for veterinary and other supporting. The total project value is about 1.789.000.000 VND.

Alongside training in production techniques, farmers also received money to buy feed processing machines for biogas construction and veterinary services. It can be seen that Tan Yen has a lot of motivations to develop cattle production.

### 2.2.2. Data collection

This study employs both primary and secondary information. Secondary information was collected from the Statistics Office of Bac Giang Province and the Statistical Yearbook of the General Statistics Office, Vietnam. Primary data was collected from livestock-raising households of Tan Yen District, which represents the mountainous area of Bac Giang. The survey was conducted in 2016. The key information person (KIP) method was applied to obtain information about cattle-raising in Bac Giang from a local governor and officers of the Tan Yen Department of Agriculture. Data collected included the number of cattle households, problems of cattle production, and trends in raising cattle in the area. We chose eight villages from two communes in Tan Yen using purposive sampling with such parameters as the number of cattle and cattle households. We selected 100 cattle-producing households randomly from a list of 300 provided by a local governor, and 80 respondents provided important information. The questionnaire consisted of both structured and semi-structured questions administered via face-to-face interviews with farmers.

### 2.2.3. Data analysis

We synthesize and process data using Excel software. We applied descriptive and

comparative statistical analysis to describe the characteristics of cattle-producing households.

According to production theories, we use cost-benefit analysis to calculate the income of farmers. Which in our case is calculated as  $\text{Income}^{5)} = \text{Total revenue} - \text{Total cost (excluding family labor cost)}$

To define factors affecting farmer's income, we combine production theory and results of the previous research. Gender issue has an adverse impact on overall household income earned at the household level from livestock production (FAO, 2013). The success of any livestock enterprise relies heavily on the effective involvement of women as they are closely involved in livestock production (Shafiq, 2008). Time production (in our case is fattening time) is one of the variables which positively affects cattle's weight gain as well as cattle's value when they are sold (Ly, 1995) and Stur et al. (2013) concluded the grass cultivation has a positive effect to the economic efficiency of cattle farmers. Baset et al. (2002) revealed that grazing time has a negative impact on cattle production's efficiency. Koknaroglu et al. (2005) and Sturaro et al. (2013) show that the amount and kind of feed have a positive impact on the profitability of cattle production. Etafa et al. (2013) and Cocca et al. (2012) identified the number of laborers has positive influences on farmer's profit. From these above literature reviews, we selected and defined six factors influencing cattle farmer's income which is explained in table 4.

Table 4 reveals the specific variables of the regression model. The average fattening time in cattle production is around four months. Individually, some households kept their cattle until 11 months because of cattle disease. In the case of grazing cattle, the longest grazing time is 8 hours, with a mean time of 1.5 hours. The average agricultural labor of households is 1.5, although the largest household has four people. The mean household income from cattle production is VND 1.7 million per head. Some households only got about VND 0.5 million/ cattle; meanwhile, the household income at the top is about VND 13 million / cattle. Grass cultivation, the gender of workers, and feed regimes are dummy variables.

**Table 4 : Descriptive statistic of variables in the linear regression model**

Variable	Description	Min	Max	Mean	SD
Y	Income of farmer/head of cattle (Million VND/head of cattle)	0.51	12.92	1.67	2.11
Gend	Gender of main cattle labors who join most of production's step (1 if female, 0 if male)	0	1	.63	.49
Time	Fattening time (months between buying feeder stock and selling cattle)	2	11	4.09	4.35
Grass	Grass cultivation (1 if farmer cultivates grass, 0 otherwise)	0	1	.46	.50
Graz	Grazing time (hours/day)	0	8.0	1.48	2.25
Feed	Feed regimes (1 if the amount of industrial feed exceeds 50%, 0 if less)	0	1	.17	.38
Labor	Number of agricultural labors per household	1	4	1.51	.79

Note: SD is Standard Deviation

Linear regression is suited to estimating the impact of selected variables on cattle farmers' income, and SPSS statistics are used to analyze regression results. To estimate factor, we used the following model:

$$Y = \beta_0 + \beta_1 \text{Gend} + \beta_2 \text{Time} + \beta_3 \text{Grass} + \beta_4 \text{Graz} + \beta_5 \text{Feed} + \beta_6 \text{Labor}$$

Where: Y is the dependent variable. It is the income of the farmer/ head of cattle.

Independent variables consist of cattle worker's gender (Gend), fattening time (Time), grazing time (Graz), grass cultivation (Grass), feed regimes (Feed), and the number of workers (Labor).

## **2.3. The Result and Discussion**

### **2.3.1. Characteristics of cattle-raising households**

Table 5 shows that 65 households (81.3%) raised five or fewer cattle in a production period (small-scale farmers). In total, 15 surveyed households raised more than five heads per production period; only four households own more than ten cattle (large-scale farmers). Meanwhile, 11 households are considered to be medium-scale farmers. The production scale is classified base on the distribution of cattle farmers in the local government's project<sup>6)</sup>. Two or three generations commonly share a household. Parents often are agricultural workers; other residents are elderly or non-agricultural workers.

The average household cultivates 2,543 m<sup>2</sup>. In addition, rice, corn, and potatoes are planted for self-supply and serving livestock. Land devoted to livestock averages 179.2 m<sup>2</sup>/household and includes poultry, pigs, and cattle. Grasslands are about 262.5 m<sup>2</sup>/household but are fragmented and receive little investment.

All surveyed households said they use only family labor for raising beef cattle. Most agricultural labor is unskilled but experienced through the knowledge imparted by ancestors, friends, and neighbors. In the 80 survey households, about 77.5 % of households head were 40 to 60 years old, and 57.5% of main cattle labor are female. In the area studied, women provide most of the labor caring for collecting grass, feeding, and grazing cattle while men only attend negotiations.

**Table 5: Characteristics of surveyed households**

<b>Variables</b>	<b>Number</b>	<b>%</b>
Total households	80	100.0
Household members (people)		
≤ 2	5	6.2
3–4	35	43.8
> 4	40	50.0
Age of household's header		
<40	13	16.2
40–60	62	77.5
>60	5	6.3
Main cattle labor <sup>1)</sup> (people)		
Male	34	42.5
Female	46	57.5
Education level (year)		
< 9	17	21.3
9-12	63	78.7
Production scale (head of cattle)		
< 5	65	81.3
≥ 5	15	18.7
Production land (m <sup>2</sup> /household)		
Crop cultivation	2,543.0	
Livestock <sup>2)</sup>	179.2	
Grass cultivation	262.5	

Note: 1) People who join in most of cattle production's steps

2) Animal's shelter (pig, cattle, poultry etc.)

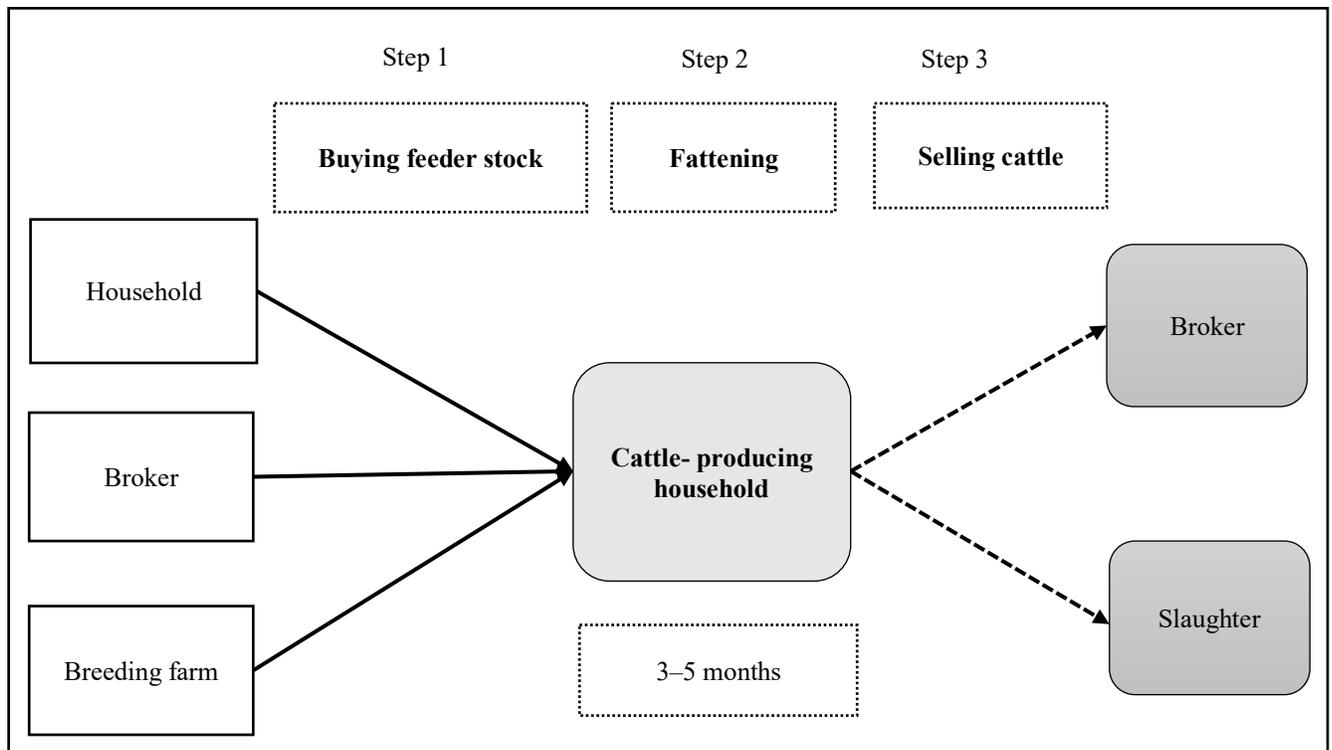
Source: Survey data

Apparently, most survey households are small-scale, untrained labor. The combination of livestock and crop production is still maintained as a feature of rural areas.

### 2.3.2. Beef cattle production model

Raising beef cattle is suited to small-scale farming. Its three main steps are buying feeder stock, fattening cattle, and selling (Figure 4).

Step 1: Rather than keep calves, survey respondents buy feeder stock from other households, brokers, and farms. They commonly raise two kinds of feeder stock. The first is *low-value cattle* used for plowing and transportation. Prone to disease and accidents, they gain weight slowly and fetch lower prices. The second type is the *low-productivity cows*. The surveyed area features numerous households with cow-calf operations, providing an abundant supply of feeder stock. However, a cow's fertility diminishes from improper fostering after reproduction and the low nutrition content of the feed. Therefore, they are usually sold at low prices.



**Figure 5: Production model**

Source: Survey data

Step 2: After buying feeder stock weighing an average of 110–150 kg, farmers fatten them for three to five months, primarily on green grass, industrial feed (or compound feed), and residual crops such as rice plants, corn stalks.

Step 3: Farmers sell the fattened cattle weighing 180–250 kg to brokers or slaughterers.

According to the production model above, we can see that beef cattle production in the research area is characterized by short time fattening, low investment than keeping calves, and suitable for small farmers.

### 2.3.3. Capital for cattle production

With small-scale households, capital is often the biggest challenge in any production performance. In beef cattle production, the cost of the breed is the biggest in total cost. However, only 30.6% of survey households in Tan Yen got a loan for cattle production, and most of them were large-scale farmers. About 96.8% of responders reported that it was easy to get a loan from the bank and other financial organizations. Clearly, approaching to loan became easier than previously due to the incentive policies to develop animal husbandry of local government; nevertheless, 70% of farmers said they did not need to use financial services. The main reason is small size production. As mention above, the level of investment for cattle production such as shelter, transportation, etc. is low, they just kept 1 to 3 cattle per farrow, the time of keeping cattle is short, so the breeder can use revenue of the first farrow to pay for the second farrow's cost. Hence, the household's budget is enough to serve their production.

### 2.3.4. Characteristics of trading feeder stock

The crossbred between Vang of Vietnam and Shind cattle of India or Pakistan is very popular in the northern area of Vietnam in general and Bac Giang in particular. Vang is a native breed of Vietnam. They have some strong points, such as they are easy to adapt to the hot and humid tropical climate, resistant to hardship conditions, shortages of feed, good resistance to diseases, and reproductive efficiency. However, they also have some weaknesses that could not be adapted with intensive production, such as slow growth, small stature and volume, and deficient meat production. Beef shoulder 103-110cm in height; 110-120cm in body length; 130-145cm in chest. The rate of the carcass is 43-44%. The volume of adult cows is 170-180kg, bulls 250-260kg. The volume of meat (beef bucket: headless, legs, skin, and organs) is from 75-80 kg/head. Pure meat (meat filter: after removal of bone) from 60-65

kg/head. (Dinh Van Cai, 2007).

On the other hand, Shind breed was imported to Vietnam in 1923. They have good Vang characteristics, but they also have beautiful color and shape, high volume, high yield, and superior traction than Vang. Therefore, Shind crosses with Vietnam cattle have many good characteristics of both breeds. The strategy to develop this cross-bred is conducted by Bac Giang province and the Vietnamese government from the 1980s. So, not surprisingly, 97% of respondents in the surveyed area chose crossbreeds and 3% exotic breeds.

Feeder stocks are generally traded face-to-face between buyers and sellers experienced enough to determine weights and prices. Table 6 shows three main types of trading in the area studied: household-to-household, household-to-broker, and household-to-breeding farm. Of the 80 surveyed households, 65% buy from households who keep calves, customarily in their commune or village. Most buy fewer than five heads per period, often from relatives or local citizens, to reduce transport costs. Also, they purchase few cattle at a time, making it difficult to buy from breeding farms.

**Table 6 : Trading feeder stock**

Seller	Trading method	Trading scale (Head)	Buyer	
			Number (Household)	Pct. (%)
Household	Oral negotiation	< 5	52	65.0
Broker	Oral negotiation	Options	24	30.0
Breeding farm	Contract	> 5	4	5.0

Source: Survey data

In the second instance, brokers contact sellers, negotiate prices, numbers purchased, and transportation fees. Hence, they will resell for buyers at a higher cost.

In the third instance, only 5% of respondents bought cattle from breeding farms <sup>7)</sup>. Breeding farms are usually far from residential areas because of environmental problems. Under the affecting of transportation fees, farms only accept big transactions (about five cattle

or more); meanwhile, small farmers only purchase 1 to 3 cattle. Therefore, the number of a transaction between farmers and farms is small. On the other hand, cattle farmers are interested in buying low-value feeder stock from brokers and their neighbors because of low price and short fattening time instead of high price calves in breeding farms.

It can be seen that trading feeder stock is a small transaction, mainly done locally and high risk because they have no guaranty of cattle's quality.

#### 2.3.5. Feed and feeding methods

Feed is one of the most important factors in cattle production. It affects not only the growth of cattle but also their meat's quality. In previous times, the free grazing method is popular in the mountainous region. Then, the main goal of cattle production is draft power; breeders just use locally available feed resources to minimize cost. Forage is mainly natural grasses, a wild grass that grows along the road or the forest and crop-residual. Natural grasses have a lower rate of legumes, so the protein components in the grass are very low. The natural pastures with native grasses, without management and fertilization, hence, they are accelerated degradation, low productivity, and quality (*Dinh Van Cai, 2007*). As raising beef cattle became the primary livelihood in the surveyed area, farmers changed feeding methods. Although natural grass is one source of feed, cultivated grasses and industrial feeds are more nutritious. All 80 respondents said they fattened cattle on grass, residual crops, and industrial feed.

In terms of grass, only 34 in 80 survey households cultivated grass with a total area of 7352 m<sup>2</sup>. According to the local government's project, grass seed will be freely provided for cattle breeders who breed more than five cattle; unsupported households often ask for sources from friends or relatives. Generally, grass cultivation in the study site is a fragment, low investment. The producer just utilizes home garden, fallow, roadside to plant grass; this is why low productivity and shortage of forage in the cold weather. In Vietnam's mountainous area, the lack of green grass for cattle in three months of winter is often available.

On the other hand, residual crop or agricultural by-product is low-cost feed and available sources in the most farmhouse.

The by-agricultural product includes main types, such as:

*Corn stalks after harvest:* It has the highest nutritional value in all kinds of cereal by-products, so it has a significant role in improving nutrition for animals. Corn stalks after harvest have 25-26% dry matter; 32% crude fiber; 68.7% neutral detergent fiber; digestibility of organic matter-energy 53.3% (Dinh Van Cai,1999). Although corn stalks have high nutrition, it is dry, complicated and difficult to feed without mechanical impact. On the other hand, breeders have no treatment method, so it is impossible for storage for a long time. This kind of feed is seasonal

*Rice straw:* In the research about the role of rice straw in beef cattle production in Bangladesh (*Rahman,2003*) reported that straw is the essential crop-residual; contribute a significant portion of the fibrous part of the diet of beef cattle. Many years ago, in Vietnam's mountainous region, when the traditional free grazing method was popular, farmers used rice straw was often used as fuel or burned to make fertilizer. However, 15 years recently, farmers varied breeding methods from free-grazing to semi-grazing or zero-grazing; meanwhile, the natural grazing field is narrowed by industrialization; therefore, rice straw is considered forage for cattle in the cold weather instead of grass. There are many methods to treatment rice straws to improve their quality. For example, acids or alkali are used to treat straw (*Schiere andIbrahim,1989*); using urea molasses to treat rice straw or in the study of *Acorda (1992)*, rice straw is used with various combinations such as soybean meal, urea, molasses...etc. However, 100% of respondents reported that they feed cattle by straw directly without any treatment method.

*Rice bran:* Its quality depends on the milling process. With the excellent rice bran, the husks are low, about 6-7%, bad quality rice bran can be up to 20%. Good rice bran is a valuable feed for cattle (Dinh van Cai,1999), but it is commonly used for pig and poultry production in the research area. The average price of rice bran in the research area is about 4000VND/kg.

Several factors limit the use of agricultural by-products. The collection is challenging due to manual harvesting methods. The source of feed is seasonal primarily and not worth it. Many chemical factors (plant protection products or chemicals sprayed on rice used during

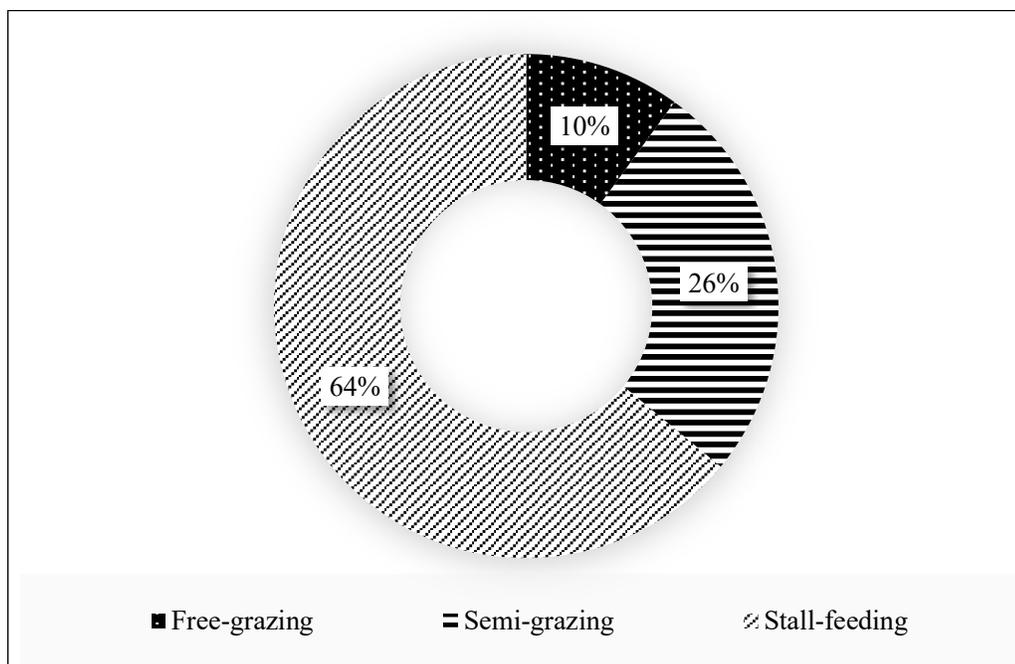
processing) and physical factors are limitations of using by-products to cattle. High water content in corn stalks is challenging to transport, storage. Some agricultural by-products are perishable because of their high oil content and sugar. Their nutritional value changed by a simple process and infected with fungi, bacteria, and some toxic for cattle. Most by-products lack one or more essential nutrients.

*Industrial feed* is an essential feed besides grass and crop-residual to increase cattle's weight in a short time. In Vietnam, industrial feed appeared in pig, poultry, and fish production many years ago, but many breeders use this kind of feed to fatten their cattle. Recently, demand for beef increases sharply; households and companies also develop beef cattle production. Therefore, the market of livestock feed is invested much more than previous. However, many feed production materials are imported, so the price of domestic feed is affected by the world price.

Survey respondents mainly use industrial pig feed for fattening cattle in the study site because it is more popular and cheaper than cattle feed. In the surveyed area, the average price of pig feed is VND 11,000/kg, whereas cattle feed is VND 25,000/kg.

Feeding methods include free grazing, stall-feeding, and semi-grazing. Free grazing is traditionally used in mountainous areas. Cattle are pastured in fields and feed freely, allowing farmers to use natural feed sources. However, this practice is unpopular currently, with only 10% of households use it (Figure 5).

Stall-feeding is new in the surveyed area. Cattle are kept in stalls<sup>9)</sup> and fed cut grass, residual crops, and industrial feed. About 64% of respondents apply this method. Semi-grazing combines pasture and stall-feeding. Farmer pasture cattle two to three hours in the field instead of cutting grass. Thereafter cattle are kept in stalls and fed by industrial feed and residual crops.



**Figure 6: Feeding method in fattening beef cattle**

Source: Survey data

Apparently, traditional grazing is no longer popular in Bac Giang. Although free grazing reduces feed cost, it entails the risk of accident, disease, and little weight gain. Moreover, this method cannot meet the requirements of long-term sustainable development as pasture fields narrow. Nevertheless, some small-scale farmers still utilize the free-grazing method because of tradition.

#### 2.3.6. Outcome of fattening beef cattle

Through changes in production methods and a favorable climate, raising beef cattle in the mountainous area of Bac Giang is increasing farmers' incomes and creating works for family labor. Characterized by small-scale production, the costs of raising beef cattle are concentrated on the cost of feeder stock, cost of feed, and loan interest (Table 7). Feeder stock constitutes the greatest percentage of expenses (80.6%). Their average price is about VND 120,000/kg to VND 150,000/kg. They are matured and weigh 150kg–180 kg. So, the average cost of feeder stock is approximately VND 18.7 million/head. It is difficult for respondents to expand the operating scale because most are small farmers with small budgets. According

to GSO [10], farmers in the surveyed area earn an average of VND1.963 million per month. Although loans are available, farmers fear to risk borrowing and remain small producers.

Due to the short time of production and utilizing by-products from crop production as well as natural grass, feed cost VND 4.3 million VND/cattle (18.3% of total cost). Using available sources of feed clearly reduces costs.

Cattle resist disease better than pigs and poultry, so veterinary costs are lower. Many farmers buy medicine from veterinary stores and spray or inject their cattle themselves to save money. They also apply traditional treatments such as herbs and saltwater to treat wounds and ailments. Although the number and quality of veterinary services have risen, their services remain unpopular. According to 78.5% of farmer’s responses, traditional experiences are good for taking care of cattle. Besides, cattle do not easily get diseases as compared to other animals, so farmers don’t want to waste money on veterinary services. Support from the local government has reduced fees for vaccinations and medicines to 0.1% of total expenses.

**Table 7: Average revenue, production cost, and income of cattle farmer**

	Group 1(n=65)	Group 2 (n=15)	Total (n=80)	Percentage (%)
Revenue	30.9	31.0	30.9	
Total cost	23.3	23.2	23.3	100.0
Feeder stock	18.7	18.6	18.6	80.6
Feed	4.3	4.2	4.3	18.3
Medicine	0.1	0.1	0.1	0.1
Loan	0.1	0.2	0.2	0.6
Equipment & other	0.1	0.1	0.1	0.4
Income	7.6	7.8	7.6	

Source: Surveyed data

Unit: VND million per cattle

As noted, investment in equipment by small-scale cattle farmers is slim. Although shelters are simple and inexpensive, they remain useful for 20 to 22 years. Farmers can repair

stables themselves because construction materials are inexpensive and accessible. Tools used to produce beef cattle often are multifunctional, so equipment costs are spread out over many uses.

A lesser percentage of cattle farmers obtains loans than others for agricultural production. Loans are mainly used to buy feeder stock and industrial feed and constitute 0.6% of expenses (Table 4). Generally, raising beef cattle enhances farm income in the surveyed area. Most respondents indicated cattle could grow 500g to 700g per day during the fattening period due to their feeding regimes<sup>10</sup>). When the cattle's weight reaches 180kg to 250 kg, they will be sold at the price of VND 180,000/kg. The average revenue of cattle farmers is VND 30.9 million per head of cattle, so they earn about VND 7.6 million/ cattle.

Comparison of two groups (Group 1 includes farm households who keep fewer than five cattle and Group 2 who have more than five cattle), we can see a little difference between them because their operating methods are similar. Both groups invest little in equipment and utilize natural forage and residual crops. It can be seen that there is no economy of scale in beef cattle production of the surveyed households.

Although the fattening of beef cattle in the surveyed area has been increasing farmer's income, we can see that it is not a stable production model. Firstly, feeder stock account for a majority of the total cost, but the quality is not guaranteed. More than 90% of transactions are oral, without any document to prove their origin. Therefore, risks associated with diseases are unavoidable. Furthermore, farmers have to cope with the fluctuation of feed resource availability. Most of the livestock households mainly depend on natural feed sources without hoarding forage actively. Therefore, the seasonable characteristic of natural feed sources will be a challenge for the stabilization of cattle production.

### 2.3.7. Factors affecting the income of cattle farmers

Regression results show that:

$$Y = -2.266 + 1.350 \text{ Gend} + 0.336 \text{ Time} + 0.974 \text{ Grass} - 0.04 \text{ Graz} - 0.316 \text{ Feed} + 0.251 \text{ Labor}$$

In Table 8, there are three variables that are significant: workers' gender, fattening time, and grass cultivation. The coefficient for the gender of workers is 1.350. This means that female workers increase farm income by 1.350 more units than males. Fattening time is significant at 1% and positive: the longer it is, the higher farmers' income. Grass cultivation is positive and significant at 10%: farmers who cultivate grass for feed increased their income by 0.974 units more than farmers who do not. Grazing time, feeding regimes, and the number of agricultural workers were not statistically significant and showed little relation to income. Adjusted  $R^2$  shows that the model explains approximately 52% of the variation in the dependent variable and is a good predictor of it.

According to regression results, grass cultivation, fattening time, and workers' gender are presiding influences on cattle farmers' income. First of all, grass cultivation is an important variable. Stur et al. (2013) also emphasized the role of grass cultivation in their study, such as planting forage significantly influences economic efficiency because gross margin and profit are 51% and 141% higher, respectively, for farms that had adopted cultivated grass. However, grass cultivation in the study site is facing two constraints. One of which is that farmers have not recognized its importance. Farmers still used natural grass and residual crops as the main green forage for cattle despite the fact that they shrink during the dry and cold seasons. The area of grass cultivated was 262.50 m<sup>2</sup>; however, it is small in scale, fragmented, and denied investment. Therefore, a lack of forage in the dry season will continue to be a problem. Furthermore, according to changes in the local government's land policies, land practices now favor non-agricultural uses (224.08 ha in 2018 and 234.28 ha in 2019) (GSO [12]). As a result, sources of natural grass decline as pastures decrease. In order to overcome these constraints, changes from both farmers and the local government are necessary.

Secondly, fattening time is also mentioned as a meaningful factor because it correlates to cattle weight. According to Cai (2007), a suitable fattening time of at approximately three months, during which cattle gain at least 455–569g/day. However, 8% of the surveyed farmers fatten cattle in under three months because they want to make more cash by reducing the production cycle. Apparently, farmers should be mindful of production time.

**Table 8 Analysis of Inferential Statistics**

Dependent variable Income/cattle	Unstandardized coefficients		
Independent Variables	B <sup>1)</sup>	t <sup>2)</sup>	Sig <sup>3)</sup> .
(Constant)	-2.266	-2.608	.012
Gend	1.350	2.697**	.009
Time	0.336	4.683***	.000
Grass	0.974	1.782*	.081
Graz	-0.040	-0.330	.742
Feed	-.316	-0.499	.620
Labor	0.251	0.836	.407
Adjusted R <sup>2</sup>	0.518		

Note: <sup>1)</sup> B is the unstandardized beta

<sup>2)</sup> t is the t test statistic: \*Significant at 10%, \*\*significant at 5%,  
\*\*\*significant at 1%.

<sup>3)</sup> Sig. is the significant

Lastly, the worker's gender is considered the most important variable. However, deep research is necessary to explain women's contribution and influences on the household's income.

## 2.4. Conclusion

This study revealed that fattening beef cattle improves farmer's incomes in the mountainous area of Bac Giang Province. Cost-benefit analysis shows that fattening beef cattle creates a stable income of approximately VND 7.6 million per cattle. Descriptive analysis indicates that most farmers surveyed keep fewer than five cattle per production period; farmers fatten cattle on grass, residual crops, and industrial feed; traditional grazing has almost been completely replaced by semi-grazing and stall-feeding in the province. According to the linear regression model, we tested the influence of 6 variables (worker's

gender, fattening time, grazing time, grass cultivation, feed regimes, and the number of workers) on farmer's income and found that: Among variables, grass cultivation, fattening time and worker's gender are considered important variables which have a more significant impact on farmer's income in comparison with the number of labor, grazing time, and feed regimes variable.

Our results generate several recommendations for livestock farmers and local governments in the mountainous area.

The problem of feed sources is the most significant barrier to the sustainable development of cattle production. The current source's feed is unstable, especial in green forage. So, the local government should encourage the farmer to convert the hillsides, mixed gardens, and agricultural farmland with low production efficiency to intensive planting high yield varieties of grass such as VA06, elephant grass, and citronella grass. Besides utilizing the crop-residual, the producer should apply the treatment methods in forage processing to increase the nutrient value of feed and storage capacity. Hence, producers will be active in feeding in the dry season. The stable feed source is the background to expand production scale in the future.

Next, according to the value chain, the producer should link to the processor to ensure the good breed sources, stable and safe feed sources, and the product is easy to approach the market, improve value-added to increase income for small farmers

In addition, cattle farmers should link together to become a group. So, they are easier to establish technology, approach breed and feed sources with colossal quantity and good quality, supporting to improve the efficiency of production. After linking, the group of small farmers can cooperate with other objects in the value chain, for example:

Cattle farmer also needs up to date new knowledge in place of relying mainly on traditional experiences in making a choice the suitable fattening time. This would thus improve the growth rate of cattle and, consequently, farmer's incomes.

The local governor should maintain a suitable area of land for agriculture and livestock to foster the development of cattle production in the local area. On the other hand, the local government can support cattle farmers by facilitating training classes to improve their

awareness about grass cultivation and production time.

Although our results are meaningful, we have not explained in detail why female workers influence household income. That issue remains for future study.

### **Note**

- 1) Poor household: It is defined as relying on the Vietnam government's poverty measurement index 2016-2020. In the rural area, the household that has monthly income/capita equal or less than VND 1 million is a poor household.
- 2) Traditional cattle production: Farmer feed cattle for many purposes (draft power, meat, and calves). In general, calves (male and female) will be raised until they can provide draft and reproduction. When cattle's productivity is low, the farmer will sell them for slaughterhouse or fattening beef cattle households.
- 3) Fattening beef cattle: Farmers purchase feeder stock and focus on feeding their cattle to make them overweight in a short time. After that, beef cattle will be sold to the slaughterhouse. The production time is approximately 3 to 5 months.
- 4) Small-scale farmer is people who own under five cattle per production period.
- 5)  $\text{Income} = \text{Total revenue} - \text{Total cost}$ . In which, total revenue is the number of  $x$  selling price; total cost (excluding family labor cost) is the sum of feeder stock cost (the number of feeder  $x$  price) + feed cost (the amount of  $x$  price) + loan cost + medicine cost + equipment and other costs.
- 6) Local government project "Developing the Herd of Cattle in Tan Yen, Phase 2014–2016". Household is distributed base on their own cattle (under five cattle is small scale and do not get supports).
- 7) The breeding farm is operated as a family farm. Differences between household and breeding farms are scale and production conditions. Unlike households, breeding farms have to adapt conditions of Vietnam animal husbandry law, such as minimum acreage, number of cattle, waste treatment system etc. Moreover, they need to obtain a certificate from the local government. Breeding farms focus mainly on cow and calf production.

- 8) VND: Vietnam Dong (\$1= VND 23,236.5) (the exchange rate in October 2016).
- 9) Stall: a shelter constructed of wood, brick, and thin cement slides. The average size is 25 m<sup>2</sup>. A stall includes some cages; each cage is about 7–8 m<sup>2</sup>.
- 10) Feeding regimes: Type and quantity of feed for cattle/day.

## CHAPTER III

### WOMEN'S CONTRIBUTION TO CATTLE HOUSEHOLD

#### 3.1. Introduction

A lot of studies confirmed women's contribution to farmer households. They participate in most household tasks, including production activities, child and elder care, household chores, etc. PK Roy (2017) indicated that women were participating in various income-generating activities. Through responses about the income contribution of respondents, the author reported the average annual women's contribution to household income was about 43.52 percent of the total household income. Meanwhile, Ida Rosada (2016) described the women's contribution through their working hours/ day in the household. The author noted that Indian women spent 13.16 hours/day on household chores, and to make a living is about 10.94 hours/day. Another recent study in Vietnam corroborates these findings regarding women's contributions to rural production systems and reiterates women's primary role in livestock rearing. It found that women's labor accounts for an average of 69 percent of a household's total labor (Desai, 2001). It is easy to see that women's contribution is vital in comparison with men.

Although women's contribution was quantified in previous studies, its accuracy and completeness are still argued because most women's works remain unpaid and undervalued. Therefore, these estimates are an undervaluation and do not reflect the actual contribution of women owing to the omission of many activities, underreporting, and multitasking (Shiv Narayan, 2011). Consequently, converting women's working to the market's rate seems necessary to evaluate women's contribution objectively.

On the other hand, most of the previous studies calculated all women's participation in many household tasks. Although these analyses provide a comprehensive view, it is not easy to identify clear women's contributions in a specific domain. Thus, analyzing women's

participation in each household's tasks is vital to understand how women contribute to their families precisely.

In addition, the result of our previous study revealed that women have a significant positive impact on cattle household income. However, the explanation why women's involvement has positive influences has remained. Therefore, this study is conducted continuously in the same region- the mountainous region of Bac Giang province. We will concentrate on estimating women's contribution to farm household cattle production to handle the remaining question partially. This study including two objectives: 1) calculate women's working hours in cattle production; 2) evaluate the market value of collected goods done by women.

## **3.2. Methodology**

### **3.2.1. Data collection**

The dataset used for our analysis is a result of a survey that we conducted covering approximately 240 cattle households from nine villages of the northern mountainous district of Bac Giang province at the end of 2019. The nine villages were selected purposively to represent regions where have high cattle production density. Within each village, a complete list of cattle households is provided by the local governor to choose 25 households randomly. The collecting data was conducted two times. The first time, a brief questionnaire was delivered to 240 households, and respondents in each household were asked to make a note of their daily working time in cattle production. After five days, these questionnaires were collected and summarized as a document for deep interviewing in the second survey. In the second time, researchers (seven females) discussed face-to-face with respondents in 30 to 40 minutes to collect the necessary information.

The complete questionnaire was designed to collect data according to a deep interviewing of respondents in each household. The time use survey methods were applied to collect data about the working time of men and women in household cattle production activities. The questions focused on five cattle production activities: grazing, feeding, cutting

grass, cleaning, and selling cattle. In each activity, respondents will indicate their working time.

### 3.2.2. Data analysis

To calculate women's contribution to cattle production, we used some methods.

- Firstly, we applied time use analysis to count the working hours of women in cattle production. We sum up all of the time which women spent on each activity of cattle rearing (grazing, feeding, cutting grass, cleaning, and selling cattle). The total working time is representative of women's contribution to the household.

- Secondly, we continue using the output method to calculate the amount of product that men or women collected, such as green grass for feeding cattle. After that, the value of grass was converted into money according to the market value. The market price was defined due to interviewing grass collectors and some companies in the local area. The limitation of this method was farmers only estimate the amount of green grass they collected per day instead of measuring them by measurement tools.

## 3.3. Result

### 3.3.1. The labor division in cattle household

Table 9 describes the socioeconomic characteristics of the female respondents in surveyed households. The average size of a household is 3.8 that is the popular family size in Vietnam recently. Not many women are the household header (only 13.3 % of total). In the case of the female household headed, they are a widow, or their husband is sick. Most women are in the age group under 60 years old. The educational level in Table 9 indicated that the majority of women join high school. More than 90 % of women depend on agriculture for their livelihood.

Figure 7 shows the labored division between men and women within cattle households. According to collected data from 240 surveyed households, if the respondents (men and women) answer that “both of us” or “other people,” we do not account for them since the

number of responses in each production activity is different. Among five activities of cattle production, only sale product is reported by all respondents, and the labor division is clear between men and women, without cooperation.

**Table 9: Socioeconomic characteristics of women in cattle household**

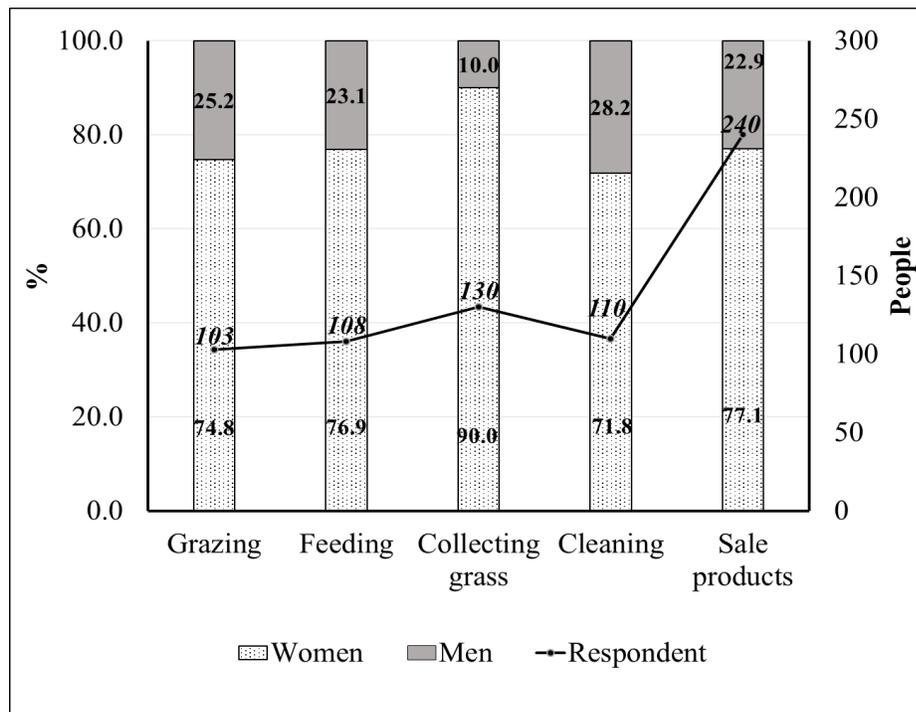
<b>Variable</b>	<b>Unit</b>	<b>Mean</b>
Household size	People	3.8
Household male-headed	% of household	86.7
Household female-headed	% of household	13.3
Women age	years	50.2
<i>Women 16-60 years old</i>	%	85.0
<i>Women over 60 years old</i>	%	16.0
Women's education	Years	8.5
<i>No involve school</i>	%	0.42
<i>Primary school (under six school years)</i>	%	10.8
<i>Secondary school (7-12 school years)</i>	%	88.78
Age-difference between spouses	Years	2.9
Age-difference between spouses	Years	1.5
Women working on-and off-farm	% of household	6.3
Women working off-farm	% of household	0.8
Cattle scale	Head/household	2.1
N	Household	240

Source: Surveyed data

It can be seen that women undertake many responsibilities in cattle production. In all five important production activities, women's involvement accounted for more than 70 percent compared to men. Collecting grass is one of the daily works of cattle farmers, with an average amount is approximately 30 kg. Tools for collecting grass are very simple, and transportation is majority bicycles. Although it is hard work, more than 90 percent of grass collectors are female. On the other hand, male's involvement in cleaning cattle shed seems

more than other activities. Maybe, this work does not waste more time outside the household, like grazing and collecting grass, so it is easy to be accepted by the male.

On the other hand, the number of males selling products is small (only 22.9 percent of respondents). This phenomenon needs to be noticed because selling or purchasing high-value products is commonly men’s responsibility as a traditional norm in a rural area in Vietnam. It seems that selling cattle requires real experiences to evaluate the bodyweight without any scale and estimate cattle's value and price. It means that women involved in production activities will be highly recommended for trading cattle than men.



**Figure 7: The labored division between men and women within cattle households**

Source: Surveyed data

### 3.3.2. Women’s contribution to cattle household

Table 10 provides evidence that women pay more time on cattle production than men. Among five production activities, grazing cots a lot of time, and it is generally done by women

who spend an average of 3.77 hours per day in grazing fields. There are two types of grazing cattle. Cattle are grazed in hillsides where far from the residential area because the natural grass fields around the village are gradually shrinking. This grazing type costs a lot of time because of the long distance to reach the fields. On the other hand, some farmers graze cattle in the crop field where cattle can look for grass in the field banks. However, this second type has some disadvantages, such as cattle destroy crops or the amount of grass in field banks is not enough for cattle.

**Table 10: Working time of men and women in cattle production**

	Grazing	Feeding	Cutting grass	Cleaning	Sale products	Total time(hour/day)	
						Excluding sale cattle	Including sale cattle
<b>Women</b>	3.77	2.12	2.13	0.82	1.18	8.84	10.02
<b>Men</b>	2.32	1.68	1.9	0.87	1.26	6.77	8.03
<b>N</b>	103	108	130	110	240		

(Source: Surveyed data)

In calculating working time, this study did not account for multitasking performed by the farmer, such as weeding in the rice field while grazing cattle or collecting grass. In terms of cutting grass, while natural grass is scarce, cattle farmers who do not cultivate grass have to move to many places for collecting grass. According to surveyed data, women spend an average of 2.12 hours per day to gather approximately 30 kg of grass, while men reported spending 1.68 hours to collect only 14.42 kg per day. Although this work is a hardship for women, a few men want to undertake it (only 13 male respondents).

In Table 11, the output method is used to measure the value of fodder-green grass collected by women and men. The grass is valued at a basic price at which it could be sold if offered for sale in the market. Green grass is gathered daily in spring and summer (from March to September). According to the price reported by grass collectors and some companies in the study area is VND 500/kg grass, women can get VND 14,620 per day, while men's

income is only VND 7,210 per day. In the winter, natural green grass becomes scarce; women will get higher income at VND 900/kg, corresponding to VND 26,316 per day.

**Table 11: Valuation of collected goods (green grass)**

Collectors	Quantity (Kg/day)	Market price <sup>1)</sup> (VND/kg)		Total value (VND1000)		N
		Case 1	Case 2	Case 1	Case 2	
<b>Women</b>	29.24	500	900	14.620	26.316	117
<b>Men</b>	14.42			7.210	12.978	13

Case 1: From March to the middle of September under hot and humid weather

Case 2: From October to February with cold and dry weather

1) This information was provided by grass collectors and De Heus company, Bac Giang province.

Source: Surveyed data

It is easy to see that women's contribution to cattle production is more than men's. They take care of most of the works, even if hard works such as collecting and transporting grass from long distances or paying a lot of time for grazing cattle. Although this result has remained some limitation in the calculation, it provided a precise monetary measurement about women's contribution to cattle production of household, which is essential proof for the social recognition of women.

### 3.4. Conclusion

Based on the diversification of the analysis method, this study described women's contribution to cattle production in households in many ways. The results pointed out that women cover most production activities, and their contribution to cattle household income is more than men.

Firstly, through a time use survey, we reflected that women participated in all of the cattle production performances, working longer than two hours than men. Specifically, in some traditionally men's activities, like grazing cattle, female farmers have to undertake and

spend more time.

Secondly, comparing the number of collected goods and their value, the difference between men's and women's contribution was revealed clear. Green grass is vital to feed cattle production. Although cultivating grass became popular, collecting natural forage is still the traditional habit of the farmer in the mountainous region. Female farmers majorly did collect grass, and they can earn twice as much as a male farmer.

In short, this study is essential evidence for women's contribution to the household. Although these estimations do not reflect all of the women's actual contributions, they partially improved the women's role in the family.

## CHAPTER IV

### WOMEN'S DECISION-MAKING

#### 4.1. Introduction

Decision-making plays an essential role in farm management, and each decision impacts the farm household. In the household, the distribution of decision-making authority between women and men can be expected to affect the allocation of household resources (Anderson et al., 2017). Household income is strongly influenced by the household decision-making process and the gender balance of decision-making (Bjornlund, Zuo et al., 2019). However, in the developing world, rural women face even greater constraints than their male counterparts in accessing essential productive and decision-making power between them is unbalance (FAO, 2020).

In Vietnam, the percentage of women who are working in agriculture is 63.4%, compared to 57.5% of men (GSO, 2018). Women are an important and key labor force in agricultural production. However, women still face many barriers, difficulties, and challenges. They do not have many opportunities to make decisions of household economics in comparison with men. Specifically, the mountainous regions were characterized by a high level of poverty; with the population relying heavily on agriculture for income, women seem to have no voice in the crucial decisions of the family. Therefore, the Vietnam government launched a National Strategy on Gender Equality for the 2011-2020 period with many programs to support rural and ethnic minority women in making decision's economic (vocation training, educational scholarship etc.). Understanding the situation of women' making-decision in rural households will contribute to evaluating this program's impactions in the future.

Many studies (Alwang et al. 2017; Akter et al. 2017; Sell et al. 2018) have revealed that decision-making plays a vital role in farm management and that each decision impacts

the farm household; total household income is strongly influenced by the household decision-making process as well as the balance between men and women in making decisions (Bjornlund et al. 2019). Although Bjornlund previously mentioned that households with a higher female than the male contribution to decision-making generated a higher total income than households in which only men or only women made all of the decisions, this study covered both on- and off-farm income in general. Therefore, a paper that focuses deeply on women's decision-making and household on-farm income is required.

Although women play a diverse role in creating the farmhouse economy in the developing world, they face greater constraints than their male counterparts, and the decision-making power between the genders is unbalanced. An understanding of women's decision-making, its determinants, and its relationship to household income is necessary to explore strategies to improve both women's roles and farmers' incomes.

This study aims to examine the relationship between women's decision-making and cattle household income in the mountainous area of Bac Giang province—an impoverished region of Vietnam. Specifically, our paper will discuss three aspects of this relationship: 1) the involvement of women in household decision-making, especially in cattle production; 2) the factors influencing women's decision-making in cattle production, and 3) how women's decision-making impacts cattle income.

## **4.2. Methodologies**

The dataset used for our analysis is a result of a survey that we conducted covering approximately 240 cattle households from nine villages in the mountainous area of Bac Giang province at the end of 2019. The nine villages were selected purposively to represent regions where have high cattle production density. Within each village, a complete list of cattle households is provided by the local governor let us randomly choose 25 families. In a household, the selected purposively respondents were women (wife). The data were collected through interviews with women individually (without the interference of men).

A modified Women's empowerment in Agricultural Index (WEAI)<sup>2</sup> is used in our

questionnaire. The questions focused on decision-making, specifically the level of participation in the decision made about five areas of cattle production (purchase feeder cattle, purchase inputs, production method (feeding and grazing), sell cattle, and use cattle proceed). For each area, respondents have to answer five decision questions. Within each decision question, respondents were asked to indicate their level of involvement from provided list: No involvement, only opinion, negotiation, involves most of decision, decision-maker.

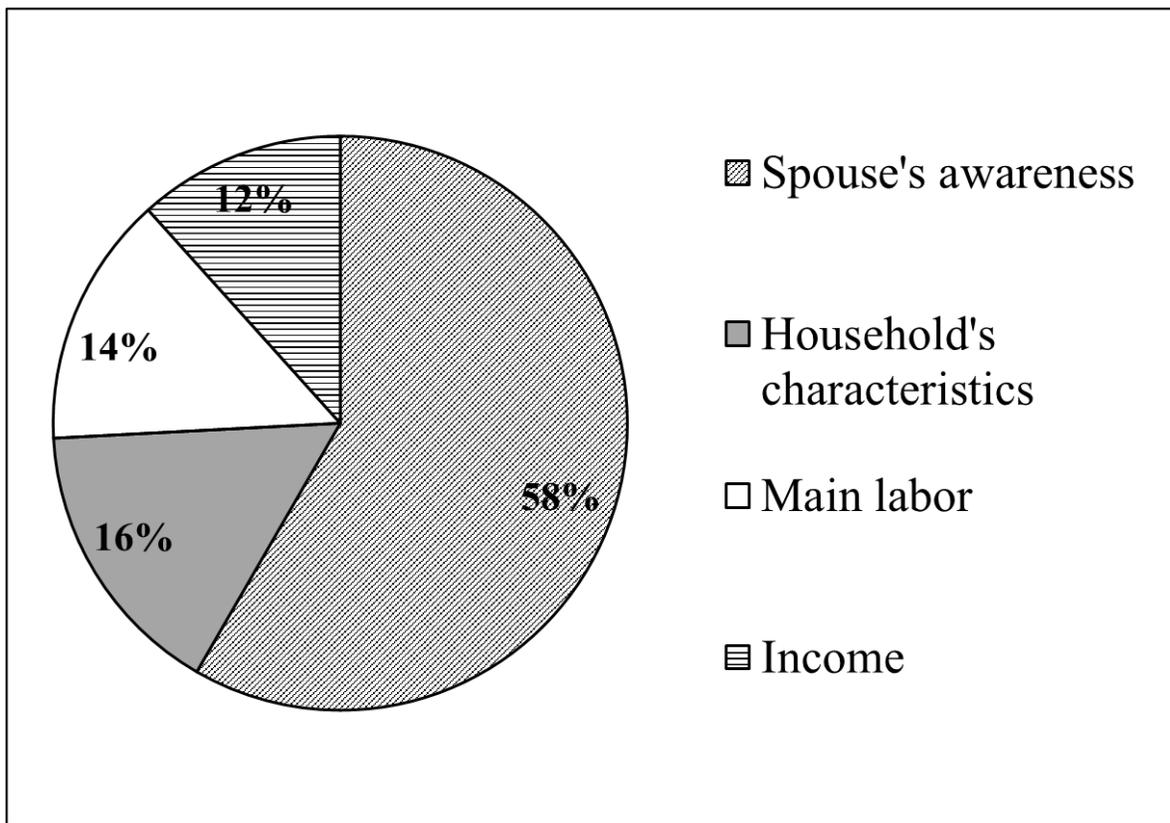
To estimate decision-making power, decision-making indexes (DIs) have been used in many studies in Africa (Bjornlund et al. 2019; Colfer et al. 2015; Sell et al. 2018). Through the similar characteristics between farm households in previous studies and our study (small scale farmers, engaging in cattle production, and facing the gender inequality issue), we decided to use DIs as an indicator to measure women's decision-making.

To create DIs, we firstly code the responses to each decision questions, corresponding to the following value: 1 = no involvement, 2 = only opinion, 3 = negotiation, 4 = involved in most of decisions, 5 = final decision-maker. Next, we sum up the score from five decision questions in each decision-making area. Therefore, we had four decision-making indexes, corresponding to four decision-making areas. The higher the DI, the higher the level of women's involvement in decision-making. Finally, an Overall DI will be calculated by taking the average of the four aforementioned decision-making indexes.

**Table 12: Definition of variables**

Variable	Description	Min	Max	Mean	SD
Household characteristics					
House-head	The household's leader (1 is a woman, 0 is a man)	0.0	1.0	0.1	0.3
Household size	The family members	1.0	6.0	3.3	1.2
Agri-labor	Family members who work on the farm (people)	1.0	4.0	1.9	0.6
Fuel	Fuel for cooking (1 is gas or electric, 0 is otherwise)	0.0	1.0	0.9	0.3
Cattle house	The size of cattle stall	0.0	80.0	24.3	14.1
Cattle scale	The head of cattle/household	1.0	13.0	2.1	1.4
Grass-cultivation	Household cultivates grass for feed (1 is Yes, 0 is No)	1.0	1.4	321.5	2.9
Farmland	The cultivated land area (m <sup>2</sup> )	370.0	66.0	3.8	5.0
Grazing	Household applies grazing method (1 is Yes, 0 is No)	0.0	1.0	0.7	0.5
Age-difference	The age of women subtracted from the age of men	-31.0	45.0	4.2	5.1
Edu-difference	Women's school years subtracted from men's school years	-5.0	9.0	0.5	2.2
Ethnic-difference	The ethnic difference between men and women (1 is No, 0 is Yes)	0.0	1.0	0.1	0.3
M-participation	Men join household farming (1 is Yes, 0 is No)	0.0	1.0	0.9	0.3
W-participation	Women join household farming (1 is Yes, 0 is No)	0.0	1.0	0.9	0.3
Individual characteristics					
W-age	Women's age (year)	27.0	76.0	50.2	10.7
M-age	Men's age (year)	32.0	78.0	47.9	16.4
W-ethnic	Women's ethnicity (1 is un-minority ethnic, 0 is minority ethnic)	0.0	1.0	0.9	0.1
W-nonfarm	Women participate on off-farm jobs (1 is Yes, 0 is No)	0.0	1.0	0.1	0.2
M-nonfarm	Men participate off-farm jobs (1 is Yes, 0 is No)	0.0	1.0	0.1	0.2
So-union	Women join local social unions (1 is Yes, 0 is No)	0.0	1.0	0.1	0.2

Relating to influences on decision making, some previous studies (Colfer et al. 2015; Sell et al. 2018; Sousa et al. 2017) have indicated a range of socio-economic factors such as household head, gender, educational level, age, ethnicity, marital status, and health.<sup>3)</sup> Additionally, some other factors were also reported by respondents in the survey area. Nearly 60% of respondents agreed that the educational level of spouses is an important factor of women’s decision-making power. The participation in household farming of women and men were also mentioned as the determinants (Figure 8)



**Figure 8: Responding about influences on women’s decision-making**

Sources: Survey data

Combining the results of existing literature and responses, it can be observed that women’s decision-making is impacted by two main factors: individual and household characteristics (Table 12). The following linear regression model was used to define the

determinants of women’s making decisions:

$$Y_i = \beta_0 + \beta_1 x_i + \beta_2 h_i + u_i$$

Where  $Y_i$  is women’s decision-making index in household  $i$  (DI);  $x_i$  is a vector of women’s characteristics;  $h_i$  is a vector of the characteristics of household  $i$ ; and  $u_i$  is an error.

In terms of influence on livestock income, Stur et al. (2013) and Sousa et al. (2017) revealed that production scale and method, labor characteristics, household head, and household conditions were significant variables. Therefore, we use ordinary least squares (OLS) regression analysis to clarify the impact on cattle income.

$$I = \alpha X + \mu$$

Where  $I$  is cattle income;  $\alpha$  is a vector of parameters to be estimated;  $X$  is a vector of independent variables (i.e., Overall DI) and other factors; and  $\mu$  is an error term.

**Table 13: Demographics of cattle households**

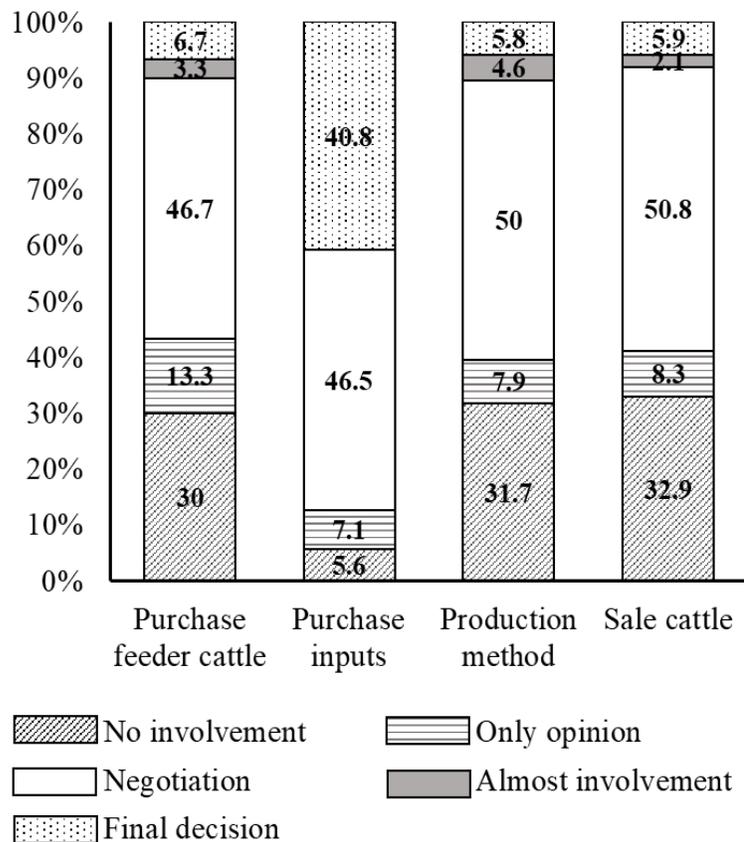
Variable	Unit	Number
Mean household size	People	3.8
Household head		
Male	% of household	86.7
Female		13.3
Mean W-age	Years	50.2
Mean W-education	Years	8.5
Women working on- and off-farm		6.3
Women working off-farm	% of household	0.8
Age-difference	Years	2.9
Edu-difference	Years	1.5
Mean Cattle scale	head	2.1
Mean Cattle-house	m <sup>2</sup>	41.5
Mean Grass cultivation	m <sup>2</sup>	321.5

Source: Survey data.

### 4.3. Results

#### 4.3.1. Women’s involvement in household decision-making

Table 13 shows the basic data of the surveyed households and women’s characteristics. Generally, men are the household head; female-headed households accounted for only 13.3% of all respondents. Of the total 240 female respondents, only 0.8% of them worked in an off-farm sector, and respondents, 6.3% of them combined on-farm and off-farm work. The ages and education levels of women and men were similar, and women’s educational level was not high (e.g., only 8.5 years of schooling). In short, the surveyed households were traditional families in which the man was the breadwinner. Women generally have a lower educational level, and most engage in agriculture.



**Figure 9: Women’s involvement in cattle production decisions**

Source: Survey data.

In terms of cattle production, most of the households are small farmers with production under three heads of cattle. Cultivated grass area also expanded from 262 square meters (m<sup>2</sup>) per household in 2016 to 321.5 m<sup>2</sup>/household in 2019. Farmers gradually reduced their dependence on natural pastures to feed cattle, instead stall feeding with cultivated grass.

Figure 9 depicts an overview of how women are involved in cattle production decisions. In general, women can negotiate with men in all cattle production activities, but few can make final decisions. Over 30% of females admitted that they did not participate in cattle purchase or sale decisions or choice of production methods. However, 40.8% of the respondents stated that they could purchase inputs without their husband's agreement. This result highlights that women can make their own decision in small transactions but have limited involvement in larger ones.

#### 4.3.2. The influences on women's decision-making

The results of linear regression analysis in Table 14 demonstrate the influences on women's decision-making in several ways.

There are five variables that have a significant impact on Overall DI—household size, agri-labor, women's age, women's ethnicity, and husband's participation in household farming. Household size, that is, the number of family members, is the first statistically significant variable. If the number of household members increases, the women's decision-making index still improves. A larger amount of agri-labor in households is associated with a lower women's Overall DI.

Regarding age, we found that women's age also significantly impacts their decision-making. The older women become, the greater their involvement in decision-making. Notably, "older women" does not mean the grandmothers in a household; it indicates women who spend more of their lifetimes taking care of their families and contributing to their own household economies whose decision-making power was improved.

Another significant variable is women's ethnicity. If a woman belongs to the Kinh ethnic group, her decision-making index increases by 1.056 unit. This implies that women in the majority ethnic group have more decision-making power than those living in minority

ethnic communities. The last significant variable is men’s participation in household farming. Its relationship to the women’s decision-making index is positive, suggesting that more male involvement in household farming is associated with a higher level of female decision-making

**Table 14: Influences on women’s decision-making in cattle households**

Dependent Variable	<i>B</i>	<i>t</i>	Sig
(Constant)	0.018	0.017	0.986
House-head	0.326	1.542	0.125
Household size	0.111	2.185**	0.030
Agrilabor	-0.339	-3.458***	0.001
W-age	0.014	2.170**	0.031
W-education	0.033	1.050	0.295
W-ethnic	1.056	2.122**	0.035
So-union	-0.022	-0.078	0.938
W-nonfarm	0.043	0.176	0.860
W-participate	-0.007	-0.012	0.991
M-nonfarm	-0.006	-0.021	0.984
M-participate	0.964	2.517**	0.013
Age-difference	0.01	0.841	0.401
Edu-difference	-0.003	-0.108	0.914
Ethnic difference	0.561	1.492	0.137
R <sup>2</sup>	0.64		

Note: Independent variable: Overall DI.  
 B is Unstandardized Coefficients  
 \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Although many respondents reported the impact of education, the regression results show that there is no significant relationship between women’s decision-making and this variable. A similar result was also observed in previous studies by Bjornlund et al. (2019) and Sell et al. (2018).

### 4.3.3. The relationship between women’s decision-making and cattle income

The results of the ordinary least square in Table 15 shows the impact of many factors on household cattle income. Importantly, women’s decision-making (Overall DI) and cattle income have a positive relationship. If Overall DI increases one unit, cattle income will increase by 6.893 units. Mean that the more women involved in decision-making, the more cattle income increase.

**Table 15: OLS modeling of influences on cattle income**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.193	7.264	-2.367	0.019
Overall DI	6.893	1.416	4.868	0.000
Cattle-house	0.611	0.103	5.930	0.000
Cattle-scale	5.492	1.051	5.228	0.000
Fuel	5.169	4.348	1.189	0.236
Grass-cultivation	0.021	0.004	4.948	0.000
Farmland	0.000	0.000	-1.185	0.237
Grazing	-6.828	2.923	-2.336	0.020
House-head	-4.186	4.460	-0.939	0.349
Ethnic-difference	6.307	5.554	1.136	0.257
Edu-difference	0.422	0.601	0.701	0.484
Age-difference	-0.449	0.237	-1.890	0.060
R-squared		0.543		34.258
Adjusted R-squared		0.521		25.594
S.E. of regression		17.722		8.636
Sum squared resid		71610.342		8.810
Log likelihood		-1024.348		8.706
F-statistic		24.589		1.741
Prob(F-statistic)			0.000	

Note: \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Unsurprising, grazing has a negative impact on household cattle income, meanwhile, grass-cultivation will improve it. In Dan et al. (2020), the same phenomenon is also indicated. This suggests that traditional grazing methods, that aim to utilize natural grass, are no longer

suitable. Besides, some factors which are also significant variables include: the increased cattle house and cattle scale which improves cattle income; a greater age difference between husband and wives is associated with the lower cattle income.

#### **4.4. Discussion**

Using collected data from surveyed households and combining the descriptive and regression analyses, our study explores some important points related to women's involvement in household decision-making, its underlying determinants, and its relationship with household cattle income.

First, our results show that women's involvement in making final decisions is limited, especially important decisions. This issue is quite common in the mountainous areas of Vietnam where men are more respected than women and have the power to make most household decisions as a consequence of traditional norms.

Second, the results indicate that ethnic characteristics significantly influence women's decision-making. There are many ethnic groups in Bac Giang province, in which, Kinh people are the majority, accounting for 88.1% of total population (GSO, 2018). Vietnamese is the official language of the Kinh people. Approximately 11 % of population is a minority ethnic group that speaks their own languages. Most of them live in the remote areas with their own customs. The language difference is a barrier to employment, so agriculture is their main livelihood. It should be understood that minority ethnic people, especially women, face many difficulties in making transactions, acquiring an education, and participating in social activities because of language differences. Some minority ethnic groups still maintain backward customs that ignore the women's role in the family. As a result, the involvement of minority ethnic women in household decision-making is limited. In a previous study, Sell et al. (2018) mentioned that women's decision-making varies significantly by language and cultural differences across ethnic groups, mean that women who spoke a minority language had more decision-making power than those who spoke the most common languages. It can be seen that our finding is contrary to the previous study, making it a novel contribution to

policy design.

This study also confirmed that the number of family members that work on-farm has a negative relationship with women's decision-making. According to survey data, the number of agri-laborers per household is quite large, accounting for 67.7% of all household members. The presence of more adults who participate in household agricultural production might possibly dilute the wife's role in making decisions. This issue needs to be noticed.

Lastly, our results prove that women's involvement in decision-making contributes to improving cattle incomes. According to the collected data, women who only worked on the farm spent 8.8 hours per day on cattle production, 2.2 hours more than men. Spending a lot of time on production activities enables women to understand cattle production better (i.e., features, strength, weaknesses etc.) and therefore makes more accurate decisions. There is no doubt that women's decision-making plays an important role in improving cattle income. This result is contrary Bjornlund (2019), who concluded that decision-making influences total household income but has no correlation with livestock income. This is another new finding of our research, which suggests that women should be encouraged to participate in making decisions.

#### **4.5. Conclusion**

This study explored how women make decisions in cattle production and its influences on household income. The results showed that:

Firstly, women involve all of the decisions, but they can make a small decisions such as purchase input. Their voice in making important decisions (sale and purchase cattle) is quiet. The men are still decision-makers in the household even if they do not participate in production activities.

Secondly, although the women's decision-making power in the household is small, it has a positive impact on household income.

Thirdly, women's decision-making is impacted by factors: age, ethnicity, household size, the number of agri-labor, the men's participation in household farming.

According to these results and new findings, our study has several implications that support women in the study site and other mountainous areas of Vietnam, improving their involvement in household decision-making. First, policies should target women in minority ethnic groups who face many challenges related to linguistic differences and backward norms. Besides, husbands should encourage their wives to become more involved in household decision-making, including important decisions, by sharing their decision-making power with their wives.

#### Note

2) WEAI is a survey-based index designed to measure women's empowerment in the agricultural sector that asks household respondents to indicate their level of involvement in household decision-making. It provided input into the choice of indicators of which the index is comprised.

3) Marital status and health do not appear as variables in Table 1 for the following reasons. First, when conducting the survey, we purposely selected married women who lived with their husbands in a household (we use the word "wives" to indicate marital status). Second, related to the "health" variable, when interviewing, we only accepted women in good health at the time of the interview. If they could not complete the full interview, their response was removed.

## CHAPTER V

### THE RELATIONSHIP BETWEEN WOMEN'S CONTRIBUTION AND DECISION-MAKING

#### 5.1. Introduction

Women are considered a key role in agricultural production and farmer households in developing communities. Many researchers approached women's roles through their participation in domestic work performances, field labor, market transactions, and decision-making (FAO, 2011; Sonia Akter, 2017; Sell, M. and Minot, N. 2018; Bjornlund, Zuo, et al. 2019).

Relating to women's contribution, FAO (2011) indicated that women participate in most household tasks, including production activities, child-rearing, and household chores. Women's labor accounts for an average of 69 percent of a household's total labor (Desai, 2001). Women spend more than 13 hours per day on household chores, and to make a living is about 11 hours per day (Ida Rosada, 2016). In addition, women join various income-generating activities, and the average annual women's contribution to household income is about 44 percent of the total household income (PK Roy, 2017).

Regarding women's decision-making, Anderson et al. (2017) concluded that the distribution of decision-making authority between women and men could be expected to affect the allocation of household resources in the household. Household income is strongly influenced by the household decision-making process and the gender balance of decision-making (Bjornlund, Zuo, et al., 2019). However, in the developing world, rural women face even greater constraints than their male counterparts in accessing essential productive and decision-making power between them is unbalance (FAO, 2020).

It is easy to see that previous studies exploited many aspects of women's contribution

and decision-making in farmer households. However, the relationship between women's contribution and women's decision-making has been undiscovered. There is also a remaining issue of women's studies in Vietnam.

In Vietnam's mountainous regions, women have to face many disadvantages in access to social resources, education, and training and speak out as social norms. Although the gender gap in these regions is integrated with the national strategies targeting social-economics development, women still face challenges in developing their internal capacities and self-determination in the family and community.

This paper aims to handle these issues by surveying farmer households in the northern mountainous region of Vietnam. In this paper, three research questions will be addressed: 1) how do women contribute to their household through participating in livestock production of households; 2) how do women make decisions in livestock production and using its proceed; 3) how women's contribution influences women's decision-making? This paper's outcomes are significant support for rural women's studies and policy design targeting to improve women's role and household income in the mountainous region of Vietnam.

## **5.2. Methodology**

### **5.2.1. Data collection**

The dataset used for our analysis is from a survey covering approximately 240 cattle households from nine villages of Bac Giang province at the end of 2019. The villages were selected purposively to represent regions where have high cattle production density. Within each village, the local governor provided a complete list of cattle households, let us choose 25 households randomly.

The data collection was conducted two times. The first time, a brief questionnaire was delivered to 240 households, and respondents made a note of their daily working time in cattle production. After one week, these questionnaires were collected and summarized as a document for the following deep interview. In the second time, interviewers discussed face-to-face with respondents in 30 to 40 minutes using a full questionnaire to collect the necessary

information. The complete questionnaire includes two sections:

- In the first section, the time use survey methods were applied to collect data about the working time of men and women in cattle production activities. The questions focus on five cattle production activities: grazing, feeding, cutting grass, cleaning, and selling cattle. In each activity, respondents will indicate their working time.

- In the second section, a modified Women's empowerment in Agricultural Index module (WEAI) was applied to designed questions. The questions focused on participation in decisions made about five areas include of purchase of feeder cattle, purchase of inputs, feeding method, sale of cattle, and use of proceeds. In each area, respondents will answer five decision questions. In each question, respondents indicate their decision-making level, corresponding to the following list: no involvement, only opinion, negotiation, involvement in most decisions, and final decision-maker. The selected purposively respondents were women (wife), and the data were collected through interviews with women individually (without the interference of men).

### 5.2.2. Data analysis

To calculate women's contribution to cattle production, we used some methods. Firstly, we applied time use analysis to count the working hours of women in cattle production. We sum up all of the time women spent on each activity of cattle rearing (grazing, feeding, cutting grass, cleaning, and selling cattle). The total working time is representative of women's contribution to the household. Secondly, we continue using the output method to calculate the amount of product that men or women collected, such as green grass for feeding cattle. After that, the value of grass was converted into money according to the market value. The market price was defined due to interviewing grass collectors and some companies in the local area. The limitation of this method was farmers only estimate the amount of green grass they collected per day instead of measuring them by measurement tools.

To estimate women's decision-making, we construct a decision-making index introduced by Bjornlund et al. (2019), Sell. M et al. (2018) and Colfer et al. (2015). Firstly, we code the level of women's involvement in decision-making, corresponding to the following value: 1=

no involvement, 2= only opinion, 3= negotiation, 4= involve in most decisions, 5= final decision-maker. Next, the score of women's participation in five decision questions per area is totalized to become a decision-making index. Therefore, five decision-making indexes-DI are created (purchase feeder cattle DI, purchase inputs DI, production methods DI, sale cattle DI, and use of proceeds DI). The higher DI, the higher level of women's involvement in decision-making. Finally, an overall decision-making index (Overall DI) is counted by taking the average of five decision-making indexes.

To estimate the influences of women's contribution to women's decision-making, we used the linear regression analysis. According to an assumption that the more women's contribution to the household, the higher their decision-making index, the following linear regression model is estimated, using SPSS software:

$$Y_i = \beta_0 + \beta_1 X_i + u_i \quad (1)$$

$Y_i$  is women's decision-making index in household  $i$ - dependent variable;  $X_i$  is dependent variables- the factors of women's decision-making (consisting of women's working time on cattle production- representing women's contribution, and other factors);  $u_i$  is error.

To define factors  $X_i$  in the model (1), we used Bayesian Model Average (BMA) method . It is a technique of multivariate selection to select optimal linear regression models. In BMA method, parameters of each model were measured base on the probability that those models are correct, or a parameter estimate (or a prediction of new observations) is obtained by averaging the estimates (or predictions) of the different models under consideration, each weighted by its model probability.).

The optimal selection process corresponding three follow steps: step 1, through literature reviewing (Colfer et al. 2015, Alwang et al. 2017; Akter et al. 2017; Sell et al. 2018, Lien et al. 2018, Meinzen-Dick et al. 2012, Kabir et al. 2013, Anderson et al. 2017, Doss et al. 2014, Sousa et al. 2017), we found a group of influences on women's decision-making, including individual characteristics (age, education, ethnic) and household's characteristics (household's leader, household's size, education ethnics, and age differences between spouse, production scale, household's situation); step 2, applying BMA method in R software, we got five optimal models, in which necessary independent variables ( $X_i$ ) are indicated; the last step, we chose

the best model among the five optimal models, basing on Bayesian Information Criterion (BIC) and Posterior inclusion probability. BIC is a criterion for model selection among a finite set of models. When fitting models, it is possible to increase the likelihood by adding parameters but doing so may result in overfitting. The BIC resolves this problem by introducing a penalty term for the number of parameters in the model (Schwarz, Gideon E. (1978). Posterior inclusion probability is the model-averaged probability of including a certain predictor in the model, given the observations; an indicator of how relevant a predictor is across all possible models). Hence, factors  $X_i$  are also defined (Table 16).

**Table 16: Explanation of variables**

Variable	Description	Min	Max	Mean	SD
Working time	The working hours of women in cattle rearing. It is considered a women's contribution to households.	1	12	5.92	3.33
House-head	The household's leader (1 is a woman, 0 is a man)	0	1	0.18	0.38
Household size	The family members	1	6	3.24	1.15
Agri-labor	Family members who work on the farm (people)	1	4	1.92	0.63
Age-difference	The age of women subtracted from the age of men	-17	8	-2.34	3.30
Edu-difference	Women's school years subtracted from men's school years	-5	9	0.75	2.23
Ethnic-difference	The ethnic difference between men and women (1 is No, 0 is Yes)	0	1	0.11	0.32
M-participation	Men join household farming (1 is Yes, 0 is No)	0	2	0.92	0.37
W- ethnic	Women's ethnicity (1 is minority ethnic, 0 is others)	0	1	0.01	0.12
W- age	Women's age (year)	28	76	51.06	9.67
W-nonfarm	Women participate on off-farm jobs (1 is Yes, 0 is No)	0	1	0.04	0.19
M-nonfarm	Men participate off-farm jobs (1 is Yes, 0 is No)	0	1	0.04	0.21
So-union	Women join local social unions (1 is Yes, 0 is No)	0	1	0.04	0.19
Working time x Agri-labor	Interaction variable- created as computed Working time and Agri-labor	1	36	11.31	7.19
Working time_centered	Created as the value of Working time minus the Mean of working time	-2.81	8.69	2.61	3.33
Agri-labor_centered	Created as the value of Agri-labor minus the Mean of Agri-labor	-0.98	2.02	-0.06	0.69
Working time x Agri-labor_Centered	Created as computed Working time_centered and Agri-labor_centered	-7.53	11.51	-0.204	2.01
Number of samples	134				

### 5.3. Results

As mentioned in the above chapters, women's contribution to cattle production is more than men's due to their working hours and earnings from collecting grass. Although this result has remained some limitation in the calculation, it provided a precise monetary measurement about women's contribution to cattle production of household, which is virtual proof for the social recognition of women.

In the case of women's decision-making, we changed the calculation method in this chapter compared to it in the previous chapter. Women's decision-making index will be sum up from five decision-making areas as mentioned in the methodology part. (Figure 9)

First of all, purchase feeder cattle is an important activity of cattle households. It costs a lot of the household's budget (about VND 20 million), whereas the average income of farmers was only VND1.93 million/ month (Dan et al. 2020). Therefore, discussion among household members is necessary. However, women's involvement in negotiating about purchase cattle seems to be limited compared to other activities.

Notably, 40.8% of women spoke that they could decide to purchase inputs without their husbands' agreement. Apparently, women can make their own decision in small transactions, but their involvement is limited in the larger ones. In fact, this issue is quite common in the mountainous area of Vietnam, where men are more respected than women, and they have the power to decide most household tasks as a consequence of traditional norms.

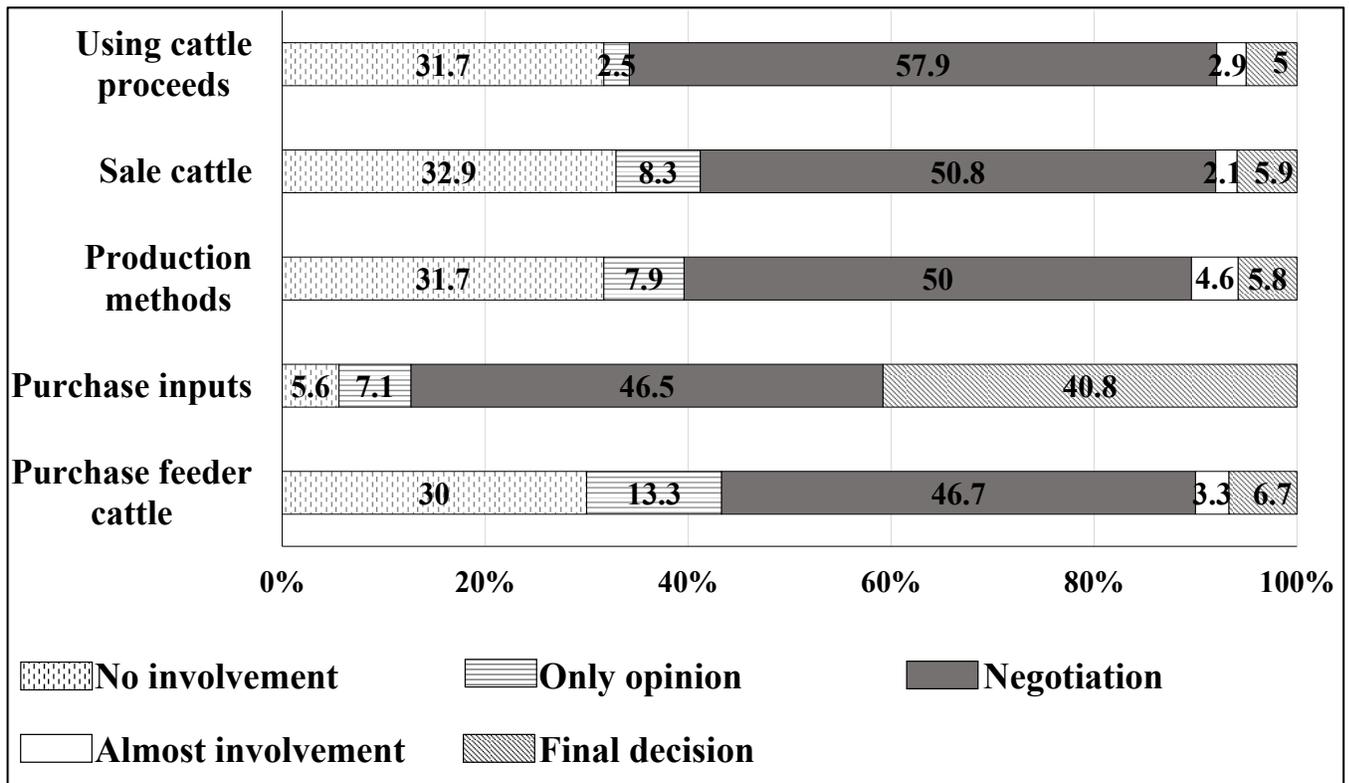
Relating to making decisions about production methods or how farmers feed their cattle, Dan et al. (2020) indicated three types of feeding: free grazing, semi-grazing, and stall feeding. The free grazing method was no longer suitable. Stall feeding gradually became popular, with more than 64% of households applied this method. In semi-grazing, grazing time was reduced and replaced by cutting grass. Grazing and cutting grass mainly did by women. Although the female final decision maker is trivial (only 5.8% of total respondents), the number of women almost involved in decision-making is more significant than those in the activities mentioned above.

Looking at the selling cattle, it is a contradiction that although 77.1 % of women

undertake this work, few of them can decide by themselves (approximately 5.9 % of total responses). Women claim that they can determine the time for sell cattle, evaluate the cattle price, negotiate with buyers, but their husbands dominate in decisions about the last price. Thus, even if men do not involve directly in production activities, their power is still revealed in the household's important decisions.

About using cattle proceed, when we asked respondents to indicate their involvement in using cattle proceeds, only 5% of the total 240 respondents reported that they could decide how to use cattle proceed without the husband's agreement. Meanwhile, 31.7% of them admitted they have no involvement at all. This phenomenon is not surprising in farmer households where men have more financial decisions (Lien et al., 2018).

In short, it is easy to see that women can make negotiations with men in all activities of cattle household generally, but most of them cannot make final decisions.



**Figure 10: Women's participation in making decisions**

Source: Collected data

To test the relationship between women’s contribution and decision-making, we first have to identify the optimal model. 14 independents and one dependent variable were tested on R software. The explanation of the variables is revealed in the appendix. Consequently, we chose the five best models based on cumulative posterior probability (0.45). In table 4, models were arranged base on BIC indicator. The lower BIC, the better model.

**Table 17: The outputs of BMA method**

	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	3.63	3.35	3.56	3.25	2.23
Working time	-0.09	-0.08	-0.01	-0.08	-0.09
House-Head	.	.	.	0.48	.
Household size	.	0.10	.	0.1	.
Agri-labor	-0.34	-0.38	-0.32	-0.36	-0.31
Women-age	.	.	.	.	0.01
W_Ethnic	-1.09	-1.08	.	.	.
W_Edu	.	.	.	.	0.07
Age_difference	.	.	.	.	.
W_Nonfarm	.	.	.	.	.
So-Union	.	.	.	.	.
Edu_difference	.	.	.	.	.
Ethnic_difference	.	.	.	.	.
H_Nonfarm	.	.	.	.	.
H_Participate	.	.	.	.	.
nVar	3	4	2	4	4
r2	0.19	0.20	0.18	0.18	0.2
BIC	-34.4	-34.0	-32.8	-34.4	-31.7
post prob	0.16	0.13	0.07	0.06	0.04
Cumulative posterior probability					0.45

Focusing on Table 17, model 1 has the highest recommendation because its BIC is the lowest. The indicator *nVar* is 3, which means that three independent variables were suggested in this model: Working time, Agri-labor, and W\_Ethnic. The indicator *r2* is 0.19 means that three independent variables explain 19% of the variation of the dependent variable. The last indicator post prob is 0.16 means that the appearance probability of Model 1 is 16%. Although *r2* in other models (2, 5) is higher than Model 1, their post prob is small. Thus, the Model 1

is the best choice.

Through the output of BMA method, an optimal linear regression model was constructed as follow:

$$Y_i = \beta_0 + \beta_1 \text{Time} + \beta_2 \text{Agri\_labor} + \beta_3 \text{W\_Ethnic} + u_i \quad (2)$$

In which:  $Y_i$  is women decision-making index (DI\_Overall)- dependent variable. Among independent variables, Working time is considered to represent women's contribution.

To identify the influences of factors on women's decision-making in the model (2), we use linear regression analysis and SPSS software. Besides, we estimate the main impact of independent variables and the influences of their interaction term on dependent variables.

In terms of detecting the interaction between predictors (independent variables), *Max Kuhn et al.* (2019) pointed that predictors are said to interact if their combined effect is less or greater than what we would expect if we were to add the impact of each of their effects when considered alone. The author also emphasized that correlations between predictors, for example, are not directly related to whether there is an interaction effect or not. Also, from a notational standpoint, the individual variables are referred to as the main effect terms outside of an interaction. From this above report, we found an interaction between agri\_labor and women's working time in our regression model because the effect of the interaction term is different from the main effect. Since a new model was created as follow:

$$Y_i = \beta_0 + \beta_1 \text{Working time} + \beta_2 \text{Agri-labor} + \beta_3 \text{W\_Ethnic} + \beta_4 \text{Working time} \times \text{Agri-labor} + u_i \quad (3)$$

In model (3), the interaction variable Working time  $\times$  Agri-labor was designed by computing Working time and Agri-labor variables. Suppose the effect of the interaction term is a positive value. In that case, it will imply that the more agricultural labor in the household, the greater the impact of total time on women's decision-making and vice-versa.

To avoid the multi-collinearity, we center variables which relate to interaction term in model (3), corresponding two follow steps: The first step, we created mean variables from Working time and Agri-labor variables; the second step, we subtracted Working time, Agri-

labor from the mean variables to make the centered variables; the last step, we computed two above centered variables. In general, models with interaction effects should also include the main effects of the variables that were used to compute the interaction terms, whether these main effects are statistically significant or not. Therefore, we have the model (4):

$$Y_i = \beta_0 + \beta_1 \text{Working time\_centered} + \beta_2 \text{Agri-labor\_centered} + \beta_3 \text{W\_Ethnic} + \beta_4 \text{Working time\_centered} \times \text{Agri-labor\_centered} + u_i \quad (4)$$

Table 18 showed results of linear regression analysis, in which influences of each factor were indicated.

**Table 18: The output of linear regression analysis**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.789	0.106		26.221	.000
W_Ethnic	-1.293	0.696	-0.143	-1.858	.065
Working time_centered × Agri-labor_centered	-0.148	0.046	-0.271	-3.219	.002
Working time_centered	-0.124	0.025	-0.378	-4.927	.000
Agri-labor_centered	-0.244	0.146	-0.139	-1.674	.097
	R <sup>2</sup>	0.37			

Dependent Variable: DI\_Overall

The W\_ethnic variable is statistically significant, meaning that if women are minority ethnic people, her decision-making index decreases 1.293 compared to others. The Agri-labor\_centered and Working time\_centered variables also have a negative impact on women's decision-making. In the case of the interaction variable (Working time\_centered × Agri-labor\_centered), it also has a statistically significant influence on women's decision-making,

meaning that the nature or strength of the relationship between women's contribution and women's decision-making changes as a function of the relationship Agri-labor variable. Regarding the result in Table 5, model (4) will become:

$$Y_i = 2.789 - 0.124 \text{ Working time\_centered} - 0.244 \text{ Agri-labor\_centered} - 1.293 \text{ W\_Ethnic} - 0.148 \text{ Working time\_centered} \times \text{Agri-labor\_centered} \quad (5)$$

To estimate effect of interaction term, we put the values of the Agri-labor variable (corresponding from 1 to 4) minus mean of Agri-labor (1.98) on the model (5). If the number of agri-labor is 1, the slope of the line relating women's contribution (Working time) and women's decision-making (DI\_Overall) is estimated to be 0.021 (= -0.124 - 0.148 × (1-1.98)). That is, in households with one agri-labor, women's decision-making will increase by 0.021 units when their working time increases by 1 hour.

$$Y_i = 3.03 + 0.021 \text{ Working time\_centered} - 1.293 \text{ W\_Ethnic} \quad (6)$$

When the number of agri-labor in household increase to 2 people, the slope of the line is estimated to be -0.126 (= -0.124 - 0.148 × (2-1.98)). Means that, if the number of an agricultural worker per household growth up to 2 peoples, the women's decision-making will be reduced 0.13 unit (model 7)

$$Y_i = 2.74 - 0.126 \text{ Working time\_centered} - 1.293 \text{ W\_Ethnic} \quad (7)$$

Similarly, when the number of agri-labor in household change to 3 people per household, the slope will also change be -0.275 (= -0.124 - 0.148 × (3-1.98)) as the following model (8)

$$Y_i = 2.54 - 0.275 \text{ Working time\_centered} - 1.293 \text{ W\_Ethnic} \quad (8)$$

Lastly, the number of the agricultural worker in the household increase by four people, the line related to women's working time and DI\_Overall go down, and its slope is estimated at -0.423 (= -0.124 - 0.148 × (4-1.98))

$$Y_i = 2.30 - 0.423 \text{ Working time\_centered} - 1.293 \text{ W\_Ethnic} \quad (9)$$

It is easy to see that women's contribution to cattle production is more than men's due to their working hours and earnings from collecting grass collection. Although this result has remained there is some limitation in the calculation, it this result provided a precise monetary measurement about women's contribution to cattle production of household, which is a virtual proof of the social recognition of women

#### **5.4. Discussion**

In this study, detecting and analyzing the interaction effect plays an essential role in improving the models' predictive performance.

The first point that needs to be focused on is the combination between Agri-labor\_centered and the Working time\_centered variable has a statistically significant effect on women's decision-making, meaning that the two above predictors work in conjunction with each other. In fact, the interaction between the number of household labor and women's contribution had ever been mentioned in a previous study by PK Roy et al. (2017). Authors reported that if the number of female earning member in household increase 1 percent, women's contribution to household income increase 0.083 percent respectively. It can be seen that though authors discussed the impact of household labor, they focus on female laborers who can earn money without division income source from on-farm or off-farm works. Differently, our study explained more deeply the influences of household labor, specifically agricultural labor (including male and female labor), on women's contribution, corresponding to three groups of labor.

In the second point, we will discuss the effect of the interaction term on the dependent variable. Concentrated on the different interactions between women's contribution (Working time\_centered) and their decision-making (DI\_Overall) regarding the changes of agricultural labor, we can deeply understand the interaction term's impact. As you can see, when the number of farming workers increases from 1 to four people per household, the line relating to women's working time and DI\_Overall change direction from up to downtrend, means that women's decision-making power decreases whether their contribution to their household still increases. To explain this phenomenon, we turn back the characteristic of the surveyed

household. According to collected data, in families with only one agricultural labor, 94.6 % are females. So, they have more opportunities to involve and make decisions in cattle production activities. Consequently, they have more power in making decisions. On the other hand, when the number of agri-labor per household goes up, other family members also participate and interfere in household decision-making, women's involvement in making decisions will be reduced. So, under the pressure of increasing agri-labor, the relationship between women's contribution and decision-making more and more hostile.

On the other hand, corresponding to the outcome of women's decision-making analysis in the previous chapter, we found that household cattle income will increase if women have more power in making decisions. In contrast, these income sources will decrease when women's decision-making is reduced. Therefore, under the negative impact of the interaction term, women's decision-making fell, which means that household cattle income also toward negative changes.

In short, regarding to women's contribution and their decision-making relationship analysis, we confirm that women contribute to improving the household cattle income. Still, it is constrained by the number of agricultural workers in the household.

## **5.5. Conclusion**

Women's contribution and women's decision-making were mentioned in a lot of previous studies in the world. However, the relationship between two concepts is still a new topic that has not been discovered yet. Therefore, the result of this study is considered a unique and important finding. We found that the number of agricultural laborers in a household constrains the relationship between women's contribution and decision-making. Consequently, a women's contribution negatively impacts her decision-making power if the number of agri-labor in the family increases by more than one person. It is an important finding of our study that contributes significantly to policy design targeting women's empowerment.

Besides the significant findings above, the study's outcome also confirms the importance

of the interaction effect analysis in doing research. Based on analyzing the interaction term effects, we explored the nature of the relationship between women's contribution and decision-making. However, if we assess only to main effects, it can be a mistake that women's contributions only have a negative impact on their decision-making. Therefore, when we have statistically significant interactions in the model, we cannot interpret the main effect without considering the interaction effects.

# CHAPTER VI

## CONCLUSION AND POLICY IMPLICATION

### 6.1. Conclusion

This study analyses the women's contribution and decision-making in cattle production of farmer households in Vietnam's mountainous region. By combining many qualitative and quantitative methods in data analysis, this study provides a comprehensive literature review about the role of women and some significant findings (Figure 10).

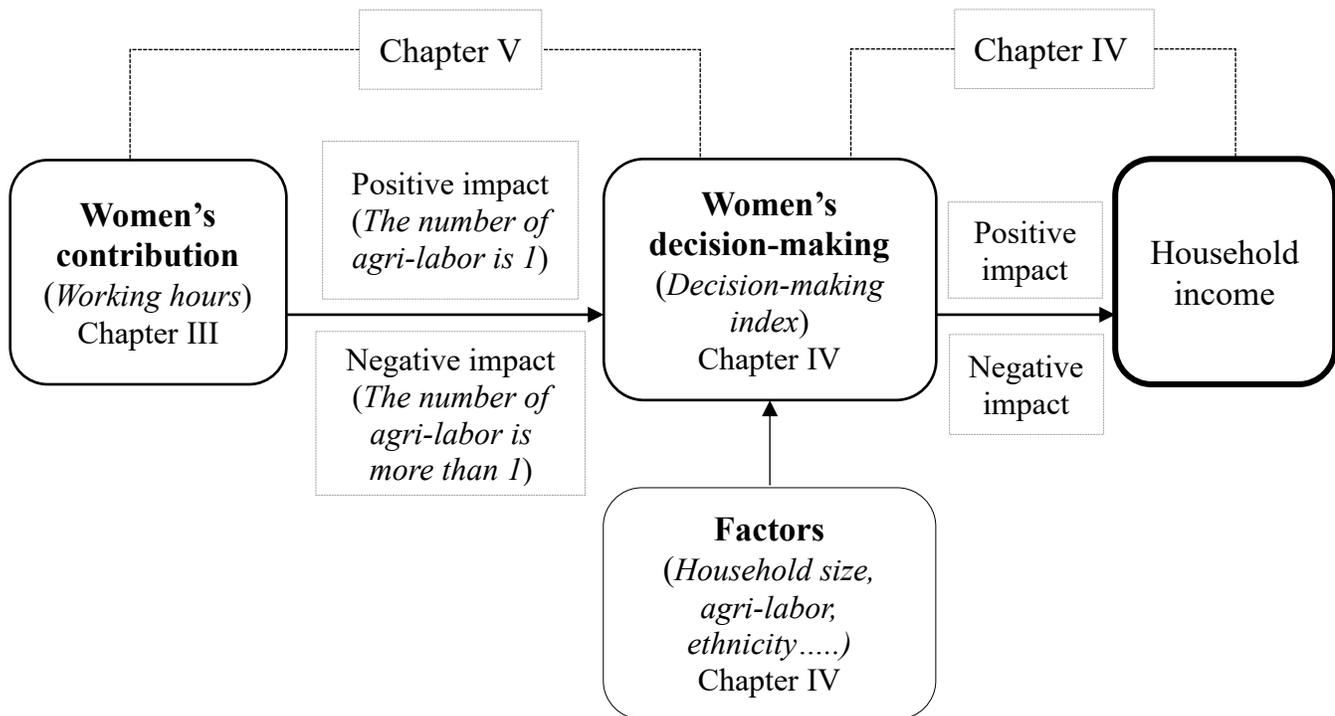


Figure 11: The result of the study

First of all, by analyzing cattle households' situation, we explored that cattle production is considered the main livelihood of the farmer in the mountainous region. It created a sustainable income for farmers. Especially, females are considered the primary labor of cattle production, and female labor positively impacts household cattle income.

Secondly, to understand why female labor positively impacts household income, we analyze how women contribute to cattle production of the household. Based on calculating the working hours and the value of collected goods, the results show that women spent more than two hours compared to men on cattle production. In addition, regarding the number of collected goods per day, women also created more income than men due to selling these goods. Since we can confirm that women have more contribution to household cattle production than men.

Next, continuing to identify how women make decisions in cattle production, the outcome showed that although women's decision-making power in the household is low, it still positively impacts household income. In addition, when analyzing influences, we explored that women's ethnicity, agri-labor, has a linkage with their decision-making.

Lastly, after understanding how women's contributions and decision-making impact household income, we check the relationship between them. The results revealed that women's working time impacts women's decision-making, but it is constrained by the number of agricultural labor in the household. When the number of farmworkers per household is small (only one person), if women contribute one more hour to cattle production, their decision-making power will increase. Contrastary, the size of agricultural workers per household is expanded more than one people, women's decision-making decreases even if they have more contribution on cattle production. In short, having too much agri-labor in farm households negatively impacts women's role in the households. It is an important finding of our study that will contribute significantly to policymakers in the research area.

The above findings are valuable literature for researchers and local governors in design policies for women's empowerment and reduce the gender gap in the future.

## **6.2. Policy implication**

Through the above findings, we try to provide some implications to the local government and cattle households in the mountainous region to improve cattle household's income and the position of women in the family.

#### 6.2.1. Developing cattle production

In cattle rearing, farmers should cultivate grass earnestly to stabilize sources of forage for cattle. There are many cattle household still rely on cutting natural grass for feeding cattle. However, the narrowing of grazing fields and decreasing the amount of green grass will affect cattle production. Therefore, the farmer can convert inefficient crop-land to cultivating grass. In addition, farmers should up-to-date new knowledge instead of relying mainly on traditional experiences to choose the suitable fattening time. It would thus improve the growth rate of cattle and, consequently, farmer's incomes.

Through the development strategies of local government, many agricultural lands are converted for other purposes. It will affect sources of forage for cattle production include residual crops and green grass. Those are the reason for the overuse of compound feed and increased production cost. Therefore, the local governor should maintain a relevant land area for agriculture and livestock to foster the development of cattle production in the local area. Besides, developing the wholesale cattle market in the local area is a good suggestion. Recently, most farmers in the mountains regions are small-scale production, so they have to face challenges in purchasing feeder cattle. They cannot access good cattle in breeding farms because of small transactions and have to buy cattle from the broker at a higher cost. With a wholesale market, they are easier to choose suitable cattle.

The local government should also support cattle farmers by facilitating training classes to improve their awareness about grass cultivation and production time. The type of participant should be expanded instead of only large-scale farmers.

#### 6.2.2. Improving women's role in household

In terms of improving the role of women, we have three recommendations for local government and households

- Policies also should support the local labor market to create more part-time jobs for

agricultural labor. Getting a part-time job will improve household income and the women's role in their family. In the study area, fruit production, construction, and handicraft provide many part-time jobs for the local agri-labor.

Besides raising cattle and crop cultivation, fruit production is an essential industry of the mountainous region. Fruits will be harvested and sold to brokers. Therefore, fruit harvesting has become a popular part-time job for local agricultural labor because it is suitable for many people, including women and the elder. However, this kind of work is available quickly and is unstable due to seasonal characteristics. So, the local government should encourage and support for fruit producers to develop post-harvest technology. Thus, the value of fruit will be increased and create many jobs for local labor.

Constructing workers are also a popular job, but is most suitable with the male. Although the wage is more than agricultural production and does not require many skills, it is hard work without insurance. So, local government should strictly manage the enforcement of labor laws of employers.

Traditional handicraft production supports tourism (a strategy to establish the mountainous region's economy) and provides stable jobs for free agri-labor in the local area. However, the fragmented terrain and undeveloped transportation system lead to the high production cost and circulation of goods, connection with localities, and difficulty to attract social resources to expand this industry. Although the government established many programs, policies, and investments, it has not met the needs of this region, especially investments in the essential infrastructure. Therefore, the local government should prioritize allocating capital to invest in transportation systems for inter-regional connectivity, freight transport, and tourism development. As a result, many jobs will be created for local laborers.

- Policies should target women in minority ethnic groups who face many challenges related to linguistic differences and backward norms. According Ministry of Home Affairs Vietnam (2020), the mountainous areas are the primary residence of ethnic groups. The gender gap within ethnic minority groups and between ethnic minorities and Kinh (majority ethnic group) is still significant and persists in many socio-economic fields. Especially, ethnic minority women are disadvantaged and vulnerable groups. Moreover, minority ethnic women and girls

are always weaker in the family and the community because of social prejudices such as "respecting men and disrespecting women." Thus, they face discrimination and suffer from double inequalities in ethnicity and gender stemming from their living environment. In addition, the difference in language is a barrier for minority ethnic women to access social resources and awareness about gender equality compared with Kinh women. So, policy should focus firstly on improving awareness of minority ethnic groups, especially women, about the gender gap.

- Within the household, husbands should encourage their wives to become more involved in household decision-making, including important decisions, by sharing their decision-making power with their wives. To do this, the involvement of the local communities may be necessary.

- Lastly, further research needs to be conducted to understand the difference in women's decision-making between women from minority and majority ethnic groups. Furthermore, defining which factor impact to minority ethnics women may result for practical policy implication in future.

## REFERENCES

1. Anderson, C.L., et al. (2017). Husband and Wife Perspectives on Farm Household Decision-making Authority and Evidence on Intra-household Accord in Rural Tanzania." *World Development* 90: 169-183
2. Acharya, M.P.M., Acharya, B. & Sharma, S. 1999. Women in Nepal: Country briefing paper. Asian Development Bank. Manila.
3. Addis Tiruneh (2001). Gender differentials in agricultural production and decision making among smallholders in Ada, Lume and Gimbichu Woredas of the Central Highlands of Ethiopia. Mexico, D.F: International Maize and Wheat improvement Center (CIMMYT) and Ethiopian Agricultural research Organization (EARO)
4. Aiken, L. S., West, S.G., Raymond (1991). *Multiple Regression: Testing and Interpreting Interactions*. Sage Publication.
5. Akter, S., Rutsaert, P., Luis, J., Htwe, N. M., San, S. S., Raharjo, B. and Pustika, A. (2017) Women's empowerment and gender equity in agriculture: A different perspective from Southeast Asia, *Food Policy*, 69: 270–279.
6. Alwang, J., Larochelle, C. and Barrera, V. (2017) Farm Decision Making and Gender: Results from a Randomized Experiment in Ecuador, *World Development*, 92: 117–129.
7. Alyssa Thomas, Sangeeta Mangubhai, Margaret Fox, Semisi Meo, Katy Miller, Waisea Naisilisia, Joeli Veitayakid, and Salote Waqairatube(2021). Why they must be counted: Significant contributions of Fijian women fishers to food security and livelihoods. *Ocean & Coastal Management*. Volume 205, 1 May 2021, 105571
8. Asian Development Bank. 2000. *A study of rural Asia: An overview - Beyond the green revolution*. Hong Kong, Oxford University Press.
9. Asian Development Bank. 2000. *Women in Tajikistan: Country briefing paper*. Manila.
10. Asian Development Bank. 2001. *Women in the Republic of Uzbekistan: Country briefing paper*. Manila.
11. Bari, F. 2000. *Women in Pakistan: Country briefing paper*. Asian Development Bank. Manila.

12. Baset, M.A., Rahman, M.M., Islam, M.S., Das, G.B., Ara, A., (2002). Beef Cattle Production in Bangladesh- A Review,” *Online Journal of Biological Science*, No.2, Vol.6, pp.429-435
13. Bjornlund, H., Zuo, A., Wheeler, S.A., Parry, K., Pittock, J., Mdemud, M. and Moyoe, M. (2019) The dynamics of the relationship between household decision–making and farm household income in small-scale irrigation schemes in southern Africa, *Agricultural Water Management*, 213: 135–145.
14. Byrne, K.A. & Worthy, D.A. (2013). Do narcissists make better decisions? An investigation of narcissism and dynamic decision-making performance. *Personality and Individual Differences*, 55, 112-117
15. Cai, D.V., (2007). Beef cattle production. Technique- Experience- Efficiency,” Vietnam Agriculture press (in Vietnamese).
16. C. Leigh Anderson A, Travis W. Reynolds B And Mary Kay Gugerty A (2017). Husband and Wife Perspectives on Farm Household Decision-making Authority and Evidence on Intra-household Accord in Rural Tanzania. *World Development* Vol. 90, pp. 169–183.
17. Colfer, C. J. P., Achdiawan, R., Roshetko, J. M., Mulyoutami, E., Yuliani, E. L., Mulyana, A., Moeliono, M., Adnana, H. and Ernie. (2015) The Balance of Power in Household Decision-Making: Encouraging News on Gender in Southern Sulawesi, *World Development*, 76: 147–164.
18. Cocca, G., Sturaro, E., Gallo, L., Ramanzin, M., (2012). Is the abandonment of traditional livestock farming systems the main driver of mountain landscape change in Alpine areas? *Land Use Policies*, Vol.29, No.4, pp.878-886.
19. Chris M. Mwangu (2017). Survey data of intra-household decision making and smallholder agricultural production in Northern Uganda and Southern Tanzania. *Elsevier Data in Brief* 14 (2017) 302–306
20. C. Leigh Anderson (2016). Husband and Wife Perspectives on Farm Household Decision-making Authority and Evidence on Intra- household accord in Rural Tanzania. *World Development* Vol. 90, pp. 169–183, 2017

21. Dan, L. T., Yamamoto, N., Kano, H. and Sakai, N. (2020) Beef Cattle Production and Factors Affecting Farmer's Income in The Mountainous Area: A Case Study in Bac Giang Province, Vietnam, *Food and Agriculture Economics*, 71(2): 11-23.
22. Dan, L.T., Nhung , T.T., Sakai, N. (2020) The Relationship between Women's Decision-Making and Household Income: Evidence from Cattle Farmers in the Mountainous Areas of Bac Giang, Vietnam. *Japanese Journal of Farm Management*, 59 (2).
23. Daniel Sumner, Maria Elisa Christie & Stéphane Boulakia (2017). Conservation agriculture and gendered livelihoods in Northwestern Cambodia: decision-making, space and access. *Agriculture and Human Values* volume 34, pages347–362(2017)
24. Desai, J. 2001. Viet Nam through the lens of gender: Five years later: Preliminary results of second Viet Nam living standards survey. Report submitted to FAO Regional Office for Asia and the Pacific, Bangkok and UNDP Viet Nam, Hanoi.
25. Duong, N.H., Pham, V.H., Nguyen, T.T.H., Bonney, L., Ives, S., (2014). Impacts of Socio-Cultural Factors on Beef Cattle Value Chain: A Case Study of Producers in the Northwest Region of Vietnam. Conference paper, Proceeding of the 16th AAAP Animal Science Congress, Gadjah Mada University, Yogyakarta, Indonesia, Vol.2, pp.1000-1004.
26. Dinh, T.X., (2017). An Overview of Agricultural Pollution in Vietnam: The Livestock Sector.<http://documents.worldbank.org/curated/en/203891516788731381/pdf/122935-WP-P153343-PUBLIC-Vietnam-livestock-ENG.pdf>
27. Ellen Hilbom (2017). The family farms together, the decisions, however are made by the man” —Matrilineal land tenure systems, welfare and decision making in rural Malawi. *Land use policy*, Volume 70, January 2018, Pages 601-610
28. Erwin Bulte, Robert Lensinka, NhungVu (2016). Gender training and female empowerment: Experimental evidence from Vietnam. *Economics Letters*. Volume 145, August 2016, Pages 117-119
29. Epprecht, M., (2005). Geographic Dimensions of Livestock Holdings in Vietnam. Spatial Relationships among Poverty, Infrastructure and the Environment. PPLPI Working paper, No.24, <https://assets.publishing.service.gov.uk>

30. Etafa, A., Kasim, K., Esmael, Y., Debela, M., (2013). Cattle Production in West Hararghe: An Opportunity and Constraints Assessments in Darolabu, Odabultum, Gemechis, and Chiro Districts, Oromia Regional State, Ethiopia. *International Journal of Livestock Production Research*, Vol.1, No.1, pp.1-15.
31. Fafchamps, M. & Quisumbing, A.R. 1999. Social roles, human capital, and the intrahousehold division of labour: evidence from Pakistan. FCND Discussion Paper (73). Washington, DC, International Food Policy Research Institute.
32. FAO (2013). Understanding and integrating gender issue into livestock projects and programs. A checklist for practitioners. <http://www.fao.org/3/a-i3216e.pdf>
33. FAO (2014). Gender-specific approaches, Rural institution and technological Innovations
34. FAO (2018). Small family farms country factsheet Vietnam. <http://www.fao.org/3/i8358en/I8358EN.pdf>
35. Grace B Villamor (2014). Gender differences in land use decision: shaping multifunctional landscape. The study of beef market structure and channel competition in Ho Chi Minh City, Vietnam. *Current opinion in Environmental Sustainability*.6: 128-133.
36. Guy Genilloud (2000). A New Definition for the Concept of Role, and Why it Makes Sense. OOPSLA workshop. 2000)
37. GSO Vietnam, “Socio-economic situation in 2016,” General Statistic Office of Viet Nam. [https://www.gso.gov.vn/default\\_en.aspx?tabid=622&ItemID=16194](https://www.gso.gov.vn/default_en.aspx?tabid=622&ItemID=16194)
38. GSO Bac Giang (2016). Socio-economic situation of Bac Giang in 2016. Bac Giang Department of Statistic, (in Vietnamese).
39. GSO Bac Giang (2019). Socio-economic situation of Bac Giang in 2019. Bac Giang Department of Statistic (in Vietnamese).
40. GSO (2018) Socio-economic situation in 2018, General Statistic Office of Viet Nam. <https://gso.gov.vn>
41. Ha, Q.D., (2012). Sustainable developing animal husbandry in the northern mountainous area of Vietnam. Summary report of Vietnam Ministry of Agricultural and Rural Development’s project (in Vietnamese).

42. Hang, L.T., (2008). Developing the cattle production in the northern mountainous area, Vietnam. *Journal of Vietnam Animal Husbandry*, Vol.5, No.3 pp.26-31 (in Vietnamese).
43. Henrik Wiig (2013). Joint Titling in Rural Peru: Impact on Women's Participation in Household Decision-Making. *World Development* Volume 52, December 2013, Pages 104-119
44. International Fund for Agricultural Development. 1995. The status of rural women in China [www.ifad.org/gender/learning/role/workload/34/htm](http://www.ifad.org/gender/learning/role/workload/34/htm).
45. Ida Rosada Nurlian (2016). A Review on Multi-roles of Women and Their Influence on the Change of Functional Structure in the Farmer's Household. *Agriculture and Agricultural Science*. Volume 9, 2016, Pages 47-53
46. Itishree Pattnaika and Kuntala Lahiri-Duttb (2020). What determines women's agricultural participation? A comparative study of landholding households in rural India. *Journal of Rural Studies* Volume 76, May 2020, Pages 25-39
47. J. B. Kathiriyal, d. M. Damasia, b. B. Kabaria (2013). Role of rural women in dairy farming of Rajkot district. *Tamilnadu j. Veterinary & animal sciences* 9 (4 ) 239 – 247.
48. Jieru, W. 1999. Case study in Lijiang County, Yunnan Southwest China. In Gurung. J.D., ed. *Searching for Women's Voices in the Hindu-Kush Himalayas*. pp. 38-60. Kathmandu, International Centre for Integrated Mountain Development.
49. Jordans, E. & Zwarteveen, M. 1997. *A well of her own: Gender analysis of irrigation programs in Bangladesh*. Colombo, International Irrigation Management Institute and Dhaka, Grameen Krishi Foundation.
50. Kaileigh A. Byrne (2012). Gender Differences in Reward Sensitivity and Information Processing during Decision-Making. *Journal of Risk and Uncertainty*.
51. Kativa Baliyan (2014). Factors Affecting Participation of Woman in Household Decision Making: Implication for Family Welfare and Agriculture Development [https://www.indiastat.com/SOCIO\\_PDF/103/fulltext.pdf](https://www.indiastat.com/SOCIO_PDF/103/fulltext.pdf)
52. Koknaroglu, H., Loy, D.D., Wilson, D.E., Hoffman, M.P., Lawrence, J.D., (2005). Factor Affecting Beef Cattle Performance and Profitability. *The Professional Animal Scientist*, Vol.21, No.4, pp.286-296.

53. Khin Pwint Oo. 2003. Gender profile in agriculture and rural development in Myanmar. Report submitted to FAO Regional Office for Asia and the Pacific, Bangkok.
54. Kumskova, N.H. 1999. Strengthening income-generating opportunities for rural women in Kyrgyzstan. [www.unescap.org/rural/doc/women/II.Kyrgyzstan.PDF](http://www.unescap.org/rural/doc/women/II.Kyrgyzstan.PDF).
55. Lien N.H, Kate Westberg, Constantino Stavros, Linda J. Robinson (2018). Family decision-making in an emerging market: Tensions with tradition. *Journal of Business Research*. Volume 86, Pages 479-489
56. Ly, L.V., (1995). Cattle production and research in the central region of Vietnam. Exploring approaches to research in the animal sciences in Vietnam, 31 July-3 August, ACIAR proceeding, No.68, pp.200-203 (in Vietnamese).
57. Maltoglou, I., Rapsomanikis, G., (2005). The Contribution of Livestock to Household Income in Vietnam: A Household Typology Based Analysis. PPLPI Working paper, No.21, <http://www.fao.org/3/bp213e/bp213e.pdf>
58. Matthews, R. & Nee, V. 2000. Gender inequality and economic growth in rural China. *Social Science Research*, 29 (4): 606-632.
59. Mengesha, Astair Gebremariam (1990). The role of women in agricultural production and household decision making: A cross-cultural comparison between India and Cameroon. Iowa State University Ames, Iowa.
60. Max Kuhn and Kjell Johnson(2019) Feature Engineering and Selection: A Practical Approach for Predictive Models
61. Mugniesyah, S.S.M. 2002. Role and empowerment of rural women in food security: Indonesia case. In *The roles and empowerment of rural women in food security: Proceedings of the workshop*. Tokyo, Japan FAO Association, Japanese Ministry of Agriculture, Forestry and Fisheries and FAO.
62. Parson, D., Lane, P.A., Ngoan, L.D., Ba, N.X., Tuan, D.T., Van, N.H., Dung, D.V., Phung, L.D., (2013). Systems of cattle production in South Central Coastal Vietnam. *Livestock Research for Rural Development*, Vol.25, No.2, <https://www.lrrd.cipav.org.co/lrrd25/2/pars25025.htm>

63. Pandey RN. (1999). Estimating Workforce Using Time Use Survey Data—Indian Experience. New Delhi, India: Central Statistical Organization, Ministry of Statistics and Programme Implementation
64. Pease, E.D.,(1996). Beef cattle production in Vietnam. CIDA Report, <http://salerscattle.com/CIDAREpo.pdf>
65. Pal, M.S. 2001. Women in Bangladesh: Country briefing paper. Asian Development Bank. Manila.
66. PK Roy, S Haque, A Jannat, M Ali1, MS Khan (2017). Contribution of women to household income and decision-making in some selected areas of Mymensingh in Bangladesh. *Progressive Agriculture* 28(2):120
67. Ramesh Balayar, Robert Mazur (2021). Women’s decision-making roles in vegetable production, marketing, and income utilization in Nepal’s hills communities. *World Development Perspectives*. Volume 21, March 2021, 100298
68. Rengalakshmi, R. & Research team. 2002. Rural and tribal women in agrobiodiversity conservation: An Indian case study. RAP Publication 2002/08. M.S. Swaminathan Research Foundation. Chennai and FAO Regional Office for Asia and the Pacific. Bangkok.
69. Sarah Yasmin & Yukio Ikemoto (2015). Women’s Empowerment through Small-Scale Dairy Farming in Selected Areas of Bangladesh. *Asian Social Science*; Vol. 11, No. 26.
70. Shafiq, M., (2008). Analysis of the Role of Women in Livestock Production in Balochistan, Parkistan. *Journal of Agriculture and Social Science*, Vol.4, No.1, pp.18-22.
71. Sell, M. and Minot, N. (2018) What factors explain women's empowerment? Decision-making among small-scale farmers in Uganda?, *Women's Studies International Forum*, 71: 46–55.
72. Shiv (2011). Women’s Contribution to Household Food and Economic Security: A Study in the Garhwal Himalayas, India. *Mountain Research and Development*, 31(2):102-111
73. Slovic, P., & Lichtenstein, S. (1983). Preference reversals: A broader perspective. *American Economic Review*, 73, 590-605

74. Sonia Akter (2017). Women's empowerment and gender equity in agriculture: A different perspective from Southeast Asia. *Food Policy* 69 (2017) 270–279
75. Sousa, W. d., Ducrot, R., Munguambe, P., Bjornlund, H., Machava, A., Etevaldo Cheveia, E. and Faduco, J. (2017) Irrigation and crop diversification in the 25 de Setembro irrigation scheme, Mozambique, *International Journal of Water Resources Development*, 33(5): 705–724.
76. Sturaro, E., Marchiori, E., Cocca, G., Penasa, M., Ramanzin, M., Bittante, G.,(2013). Dairy systems in mountainous areas: Farm animal biodiversity, milk production and destination, and land use. *Livestock Science*, Vol.158, No.1-3, 2013, pp.157-168.
77. Stur, W., Khanh, T.T., Duncan, A., (2013). Transformation of smallholder beef cattle production in Vietnam. *International Journal of Agricultural Sustainability*, Vol.11, No.4, pp.363-381.
78. Sunderlin, W.D., Huynh, T.B., (2005). Poverty Alleviation and Forests in Vietnam,” Centre for International Forestry Research, [https://www.cifor.org/publications/pdf\\_files/books/BSunderlin0501E0.pdf](https://www.cifor.org/publications/pdf_files/books/BSunderlin0501E0.pdf)
79. *Tarrant, J.R.* (1974): *Agricultural geography*. Newton Abbot: David and Charles.
80. Thonguthai, P., Thomson, S., & Bhongsug, M. 1998. *Women in Thailand: Country briefing paper*. Asian Development Bank. Manila.
81. Tung, L.T.,(2008). Economic efficiency in rural cattle production system in the Southern agro-ecological region of Vietnam. *Journal of Vietnam animal science and technology*, Vol.11, No.4, pp.1-8 (in Vietnamese).
82. UNICEF. 1996. *Children and their families in the Lao People's Democratic Republic: A situation analysis*. Vientiane.
83. United Nation (2015). *The World's Women. Trends and Statistics*.
84. Upton, M., (2004). *The Role of Livestock in Economic Development and Poverty Reduction*. PPLPI Working paper, No.10, 2004, <http://www.fao.org/3/a-bp224e.pdf>
85. Van den Bos, R., Homberg, J., & de Visser, L. (2013). A critical review of sex differences in decision-making tasks: Focus on the Iowa Gambling Task. *Behavioral Brain Research*, 238, 1, 95-108.

86. Zholaman. R. 1999. Strengthening income-generating opportunities for rural women in Kazakhstan (available at [www.unescap.org/rural/doc/women/Kazakhstan.pdf](http://www.unescap.org/rural/doc/women/Kazakhstan.pdf)).

## APPENDIX

### QUESTIONNAIRE FOR HOUSEHOLD SURVEY

**Response:**

**Address :**

#### I. General information of household

##### 1. Household member

<b>Member</b>	<b>Age</b>	<b>Nation</b> (1.Kinh 2. Other)	<b>Gender</b> 1. Male 2. Female	<b>Education</b> (Years of school)	<b>Job</b> 1. Agri 2. Non-agri 3. Mix	<b>Attending to household's agricultural production</b> (1. Yes 2. No)
1 Head						
2. Members						

##### 2. Agricultural land

<b>Type</b>	<b>Unit</b>	<b>Area</b>	<b>Ownership</b> 1. Own 2. Rent
<b>Total area</b>			
<b>Crop productionn</b>			
Rice			
Crop			
Fruit			
Grass			
Other			
<b>Livestock</b>			
Cattle			
Smaller stocks			
<b>Other</b>			

**2.1.Sources for cooking used?**

- a. Electricity    b. Gas    c. Charcoal    d. wood    e. Other (

**2.2. Source of water used**

- a. Pipe bourne water treated                      b. Rain                      c. Other

**2.3. How far from your house to reach the center of village?**

**3. Household’s characteristic**

**3.1. Type of house**

- a. Construction    b. Un-construction    c. Other:

**Acreage:** ..... (m2)

**3.2. Toilet**

- a. Flus toilet    b. Traditional pit latrine    c. Others

**3.3. Cooking fuel**

- a. Electricity    b. Gasoline    c. Coal    d. Wood    c. Other

**3.4. Water**

- a. Canal    b. Underground water    c. Rain water

**4. Average income**

Type	Unit	Amount	Note
<b>Total income</b>			
<b>1.Agricultural production</b>			
Cultivation			
Livestock			
Detail: Cattle production			
Other			
<b>2.Non- agriculture</b>			
<b>3.Paid work</b>			
<b>4.Others</b>			

**II. WOMEN’S CONTRIBUTION ON HOUSEHOLD**

**A. Household tasks**

**5. How about the distribution of your household chores and spending time**

Chores	Men		Women			
	Husband	Wife	Daughter	Grandmother		
Shopping						
Cooking						
Cleaning						
Maintaning						
Taking care childs and elders						
<b>Spending time</b> (hour/day)						

## B. Agricultural production

### 6. Cultivation

<b>6.1. Number of crop/year?</b>	
<b>6.2. How long land preparation is done?</b>	(hours/day)
<b>6.3. Who is in charge of land preparation?</b>	a. Household member (.....) c. Hired labor b. Household member & hired machine d. Other
<b>6.4. In case of hiring labor, how about the wage?</b>	
<b>6.5. Who is in charge of weeding?</b>	a. Household member (.....) b. Hired labor c. Other (.....)
<b>6.6. How long for weeding?</b>	(hour/day)
<b>6.7. Who is in charge of harvesting and transporting?</b>	a. Household member (.....) b. Hired labor c. Other (.....)
<b>6.8. How long harvesting and transporting are done?</b>	(Tiếng/ngày)
<b>6.9. In case of hiring labor, how about the wage?</b>	(1000VND/hour) (1000VND/day)
<b>6.10. Is crop sold</b>	a. Yes b. No
<b>6.11. If Yes, who is done?</b>	
<b>6.12. Where crop is sold?</b>	a. Local market b. Broker c. Other (.....)
<b>6.13. Selling frequency?</b>	a. Everyday b. Other (.....)
<b>6.14. Speding time for selling crops?</b>	(Hour/day)

### 7. Livestock

<b>7.1. What type of livestock production?</b>		
<b>7.2. Who is in charge of follow works? (*)</b>	<b>Work</b>	<b>People</b>
	Purchase breeds	
	Feeding and taking care	

	Cleaning	
	Selling	
<b>7.3. What type of cattle production?</b>	a. Beef cattle	b. Cow c. Mix
<b>7.4. The number of cattle in your household?</b>	Beef cattle	
	Cow	
	Calf	
<b>7.5. In cattle production, cattle is grazed?</b>	a. Yes	b. No
<b>7.6. If Yes, who dose graze cattle? (*)</b>		
<b>7.7. How long dose cattle is grazed?</b>	<i>(Hour/day)</i>	
<b>7.8. Who is feeding cattle and cleaning (*)</b>		
<b>7.9. How about spending time for feeding and cleaning?</b>	<i>(hour/day)</i>	
<b>7.10. Who is cutting grass and colleting residual-crop for cattle?</b>		
<b>7.11. How about speding time for cutting and colleting?</b>	<i>(hour/day)</i>	
<b>7.12. How is amount of cutting grass and residual-crop per day?</b>	<i>(Kg/day)</i>	
<b>7.13. If you have to buy grass/residual crop or hire labor for collecting them, how is wage?</b>	Buying.....	(1000VND)
	Hire labor :.....	(1000VND)
<b>7.14. Where is cattle sole?</b>	a. In household	b. Other place
<b>7.15. If answer is b, who is sell cattle and how long is selling? (*)</b>		

### C. Non-agricultural production

#### 8. Handicraft

<b>8.1. Is there any kind of handicraft does your household has?</b>	a. Yes	b. No
	<i>(If No, please move to question 9)</i>	
<b>8.2. If Yes, What is it?</b>		
<b>8.3. Who is joining handicraft activities in your household?</b>		
<b>8.4. Their spending time for handicraft activities per day?</b>	<i>(hour/day/person)</i>	
<b>8.5. Is there any hired labor? If yes, how about wage?</b>	a. Yes	b. No
	Wage.....	
<b>8.6. Does product is sole?</b>	a. Yes	b. No
<b>8.7. If Yes, Where product is sole?</b>	a. Local market	b. Broker
	c. Other.....	
	<i>(If answer is b,c please move to question 9)</i>	
<b>8.8. If product is sole in local market, who is in charge of selling? (*)</b>		
<b>8.9. How about selling frequency?</b>	a. Everyday	b. Other

<b>8.10. Spending time for selling products?</b>	<i>(hour/day)</i>
--	-------------------

**9. Business and services**

<b>9.1. Is there any kind of business or service in your household?</b>	a. Yes <span style="float: right;">b. No</span> (If answer is No , please move to question 10 )
<b>9.2. If Yes, what is it?</b>	
<b>9.3. Who are joining to your household's business and services?</b>	
<b>9.4. Spending time for doing business and services?</b>	<i>(hour/day)</i>
<b>9.5. Is there any hired labor. If Yes, how about wage?</b>	a. Yes <span style="float: right;">b. No</span> Wage:.....

**10. Other collecting activities**

<b>10.1. Is there any collection activities accept grass and residual-crop?</b>	a. Yes <span style="float: right;">b. No</span> (If No, please move to question 12)
<b>10.2. If Yes, what is it?</b>	
<b>10.3. Who is collector?</b>	
<b>10.4. The frequency of collection?</b>	.....(day/week) .....(hour/day)
<b>10.5. The amount of collected product/day?</b>	
<b>10.6. Collected product's uses?</b>	a. Household consumption <span style="float: right;">b. Selling</span> c. Other:.....
<b>10.7. If selling, how much money you can get?</b>	(1000VND)

**D. Paid works**

**11. Occasional works**

**11.1. Is there any household member has occasional work?**

a. Yes b. No

*If No, please move to question 12*

<b>11.2. If Yes, please fill in this table?</b>	<b>Member</b>	<b>Type of work</b>	<b>Frequency</b> <i>(day/week)</i>	<b>Work time</b> <i>(hour/day)</i>	<b>Income</b>

<b>11.3. Please talk about the wage of occasional work that you are doing now?</b>
--

**12. Permanent work**

If any member in your household has permanent works, please provide some information in below table

Member	Type of work	Work time (hour/day)	Income

**III. WOMEN AND DECISION MAKING IN HOUSEHOLD**

**A. MAKING DECISION IN PRODUCTION ACTIVITIES**

**13. Agricultural production**

**13.1. Do you make decisions that relate to buying or renting production land?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**13.2. If answer is no input, please inform who is decision maker about production land ?**

- a. Husband
- b. Other member
- c. Other (.....)

**13.3. Do you make decisions that relate to buying seeds and materials for crop production?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**13.4. If answer is no input, please inform who is decision maker about buying materials for crop production?**

- a. Husband
- b. Other member
- c. Other (.....)

**13.5. Do you make decisions that relate to using pesticide and fertilizer in crop production?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**13.6. If answer is no input, please inform who is decision maker about using pesticide and fertilizer?**

- a. Husband
- b. Other member
- c. Other (.....)

**13.7. Do you make decisions that relate to selling crops?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker



d. Input into most of decisions e. Last decision maker	d. Input into most of decisions e. Last decision maker
---	---

**12.16. If answer is no input, please inform who is decision maker about selling livestock products?**

General livestock production	Cattle production
a. Husband b. Other member c. Other (.....)	a. Husband b. Other member c. Other (.....)

**13.17. Do you make decisions that relate to using income from livestock production?**

General livestock production	Cattle production
a. No input b. Give ideas only c. Negotiate and make decision with other d. Input into most of decisions e. Last decision maker	a. No input b. Give ideas only c. Negotiate and make decision with other d. Input into most of decisions e. Last decision maker

**13.18. If answer is no input, please inform who is decision maker about using income from livestock products?**

General livestock production	Cattle production
a. Husband b. Other member c. Other (.....)	a. Husband b. Other member c. Other (.....)

**14. Non-agricultural production**

**14.1. Do you make decisions that relate to type of non-agricultural production activities that your household have?**

- |   |                                |
|---|--------------------------------|
| a. No input                               | d. Input into most of decision |
| b. Give ideas only                        | e. Last decision maker         |
| c. Negotiate and make decision with other |                                |

**14.2. If answer is no input, please inform who is decision maker about type of non-agricultural production activities in your household?**

- |            |                 |                  |
|------------|-----------------|------------------|
| a. Husband | b. Other member | c. Other (.....) |
|------------|-----------------|------------------|

**14.3. Do you make decisions that relate to managements of non-agricultural production activities in your household?**

- |   |                                |
|---|--------------------------------|
| a. No input                               | d. Input into most of decision |
| b. Give ideas only                        | e. Last decision maker         |
| c. Negotiate and make decision with other |                                |

**14.4. If answer is no input, please inform who is decision maker about managements of non-agricultural production activities in your household?**

- |            |                 |                  |
|------------|-----------------|------------------|
| a. Husband | b. Other member | c. Other (.....) |
|------------|-----------------|------------------|

**14.5. Do you make decisions that relate to using income from non agricultural production activities?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**14.6. If answer is no input, please inform who is decision maker about using non agricultural production activities's income?**

- a. Husband
- b. Other member
- c. Other (.....)

**15. Paid work**

**15.1. Do you make decisions that relate to paid-work (*kind of work, work time, work place...etc*) you are doing now?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**15.2. If answer is no input, please inform who is decision maker about kind of paid-work, working time, work place...etc in your household?**

- a. Husband
- b. Other member
- c. Other (.....)

**15.3. Do you make decisions that relate to using income from paid-work ?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**15.4. If answer is no input, please inform who is decision maker about using income from paid work in your household?**

- a. Husband
- b. Other member
- c. Other (.....)

**B. MAKING DECISION ABOUT OTHER HOUSEHOLD TASKS**

**16. Household's consumption**

**16.1. Do you make decisions that relate to how much money is spent for daily household's consumption?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**16.2. If answer is no input, please inform who is decision maker about daily household's consumption?**

- a. Husband
- b. Other member
- c. Other (.....)

**16.3. Do you make decisions that relate to purchasing great value assets in your household?**

- a. No input
- d. Input into most of decision

- b. Give ideas only
- c. Negotiate and make decision with other
- e. Last decision maker

**16.4. If answer is no input, please inform who is decision maker about it?**

- a. Husband
- b. Other member
- c. Other (.....)

**17. Other issue**

**17.1. Do you make decisions that relate to household's chores distribution among household's members?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**17.2. If answer is no input, please inform who is decision maker about it?**

- a. Husband
- b. Other member
- c. Other (.....)

**17.3. Do you make decisions that relate to household's member education?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**17.4. If answer is no input, please inform who is decision maker about it?**

- a. Husband
- b. Other member
- c. Other (.....)

**17.5. Do you make decisions that relate to health care services for household's member?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**17.6. If answer is no input, please inform who is decision maker about it?**

- a. Husband
- b. Other member
- c. Other (.....)

**17.7. Do you make decisions that relate to your own leisure and community activities?**

- a. No input
- b. Give ideas only
- c. Negotiate and make decision with other
- d. Input into most of decision
- e. Last decision maker

**17.8. If answer is no input, please inform who is decision maker about it?**

- a. Husband
- b. Other member
- c. Other (.....)

**C. FACTOR AFFECTING TO WOMEN'S DECISION MAKING**

**18. In your opinion, what kind of factor that influent to your making decision's ability about household's productive activities?**

.....  
 .....  
 .....

**19. In your opinion, what kind of factor that influent to your making decision's ability about other household's task?**

.....  
.....  
.....