Gendered processes of agricultural innovation in the Northern uplands of Vietnam

Nozomi Kawarazuka and Gordon Prain
The Social and Nutritional Sciences Division, International Potato Center, Hanoi, Vietnam

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Abstract

Purpose – This paper aims to explore ethnic minority women's gendered perceptions and processes of agricultural innovation in the Northern uplands of Vietnam. The key research question asks how women develop innovations and learn new agricultural practices within patriarchal family structures.

Design/methodology/approach – In-depth interviews including life histories were conducted with 17 female and 10 male farmers from different socio-economic groups; participant observation and key informant interviews were also carried out.

Findings – Women's innovation processes are deeply embedded in their positions as wives and daughters-in-law. Their innovation tends to be incremental, small-scale and less technological, and they use innovation networks of women rather than those of the formal agricultural institutions, including bringing innovation knowledge from their birth family to the patrilocal household. Unlike men's perceived innovation, women's innovation is strongly linked to small-scale entrepreneurship, and it is a powerful approach in the sense that it strengthens the position of women in their families while improving the household economy.

Research limitations/implications – Identifying socially constructed innovation processes helps policymakers to rethink the introduction of ready-made innovation packages, both in terms of content and delivery, and to facilitate innovation for women, as well as men, in marginalized positions.

Social implications – Understanding the gendered processes of innovation instead of measuring gender gaps in innovation outcomes sheds light on women's interests and preferences, which can inform policies for supporting women's innovation and thereby lead to social change, including gender equity.

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Originality/value – This paper contributes to the understanding of gendered innovation processes and entrepreneurship associated with agriculture in rural areas in non-Western ethnic-minority contexts, which is an area that past and current research on entrepreneurship has relatively ignored.

Keywords Innovation, Vietnam, Ethnic minorities, Gender, Extension services, Adoption of technologies

Paper type Research paper

1. Introduction

Since the success of the Green Revolution, agricultural innovation has been seen as an important means to promote economic growth in rural areas in developing countries. However, when the term "innovation" is used in the agriculture sector, it often signifies sophisticated technology – similar to the application of the term within manufacturing and service industries (Spielman *et al.*, 2009). Within this meaning, agricultural innovation is gender-neutral and often narrowly defined, linked, for example to new, high-yielding varieties of crops, more intensive use of inputs, mechanization and the establishment of new markets. Studies that have applied a gender lens to agricultural innovation within this meaning of the term include those identifying the gender gap in access to resources (Doss and Morris, 2000; Ongayo *et al.*, 2001), assessing the degree of involvement in technology development by gender and/or ethnicity (Schut *et al.*, 2015) and analysing gender relations among the key stakeholders involved in agricultural innovations (Mbo'o-Tchouawou *et al.*, 2016). While these studies reveal women's limited access to mainstream agricultural technology development, other types of women's innovation associated with less-technological and low-investment activities, and linked to local small-sized enterprises, remain understudied. Furthermore, the conventional definition of innovation often emphasizes the economic value of innovation, while its social impacts are less acknowledged (Blake and Hanson, 2005).

To address these issues, recent feminist studies on innovation and entrepreneurship called for a change in the direction of research, from exploring what women lack, to understanding the gendered processes of innovation. This change may help to highlight the way perceptions and processes of innovation are highly gendered (Alsos *et al.*, 2013). Empirical studies reveal how women's processes of innovation are different from those of men and highlight how these differences are neglected in current research and policy on innovation (Ashourizadeh *et al.*, 2014; Schøtt and Cheraghi, 2014; Tillmar, 2016; Locke *et al.*, 2017). The aforementioned studies pay particular attention to women's negotiations with patriarchy as a necessary step for women to pursue innovation. In this process, women cross gender boundaries and create new gender practices. From a social and gender perspective, Tillmar (2016) suggests that crossing the gender boundaries is in itself innovation, as it is often a necessary condition for agricultural innovation. Feminist/gender approaches thus enable us to explain truly gender-transformative innovation processes, as well as the social impacts they can have, helping to inform policy for gender-responsive and inclusive support for innovation. This study builds on earlier research and explores ethnic minority women's agricultural innovation in the remote mountain context of Vietnam where gender norms are restricted and entrepreneurship opportunities for women are limited. Our key research question asks: How do women develop innovations and learn new agricultural practices within patriarchal family structures?

In socialist Vietnam, many family farms follow state-driven technological innovation, such as investments in hybrid varieties of maize and rice, and new cash commodities, such as coffee and cassava, as a way to improve livelihoods (Akram-Lodhi, 2005). Enterprises have been built

around transport, trade and processing of those new commodities, which are primarily men's domains in northern Vietnam, especially for ethnic minorities. While those mainstream technological innovations may bring economic impacts at regional and national levels, there are concerns over negative social consequences, such as an uneven distribution of benefits and worsening labour conditions for small-scale farmers (Voeten *et al.*, 2015). With the introduction of hybrid rice, for example, ethnic minority women face double disadvantages related to gender and ethnicity. While many women have had a strong decision-making role in traditional rice varieties, they have been excluded from decision-making about hybrid rice production and cultivation because of language barriers to understanding relevant information about the new technology and less access than men to the new markets for hybrid varieties (Bonnin and Turner, 2014). Thus, policy change without properly addressing the existing gender and social barriers can reinforce the existing power structures. Therefore, understanding ethnic minority women's gendered interests in agricultural innovation and identifying enabling conditions for women will be an important first step for the agricultural sector to develop inclusive policy proposals and intervention strategies in the context of Vietnam where agricultural development for ethnic minorities is a key challenge.

Drawing upon the concepts of technologies as gendered constructs (Wajcman, 2010) and innovation as relational (Blake and Hanson, 2005), the present study asks how the patriarchal family relations influence women's perceptions of agricultural innovation, and explores the ways in which they build enterprises in an ethnic minority context. A case study was conducted in a Thai ethnic minority village in northern Vietnam. The study highlights women's negotiations with their husbands and in-laws about new agricultural practices and enterprise opportunities and discuss implications for external agricultural interventions.

The following section presents the framework used in this study. Section 3 explains the methodologies and the research context. Section 4 draws mainly on six women's case stories about the processes of innovation strongly influenced by patriarchal family settings and their positions as ethnic minority women. Section 5 presents three key insights and discuss implications of these for agricultural interventions. The article concludes by presenting methodological implications and the areas where further research is required.

2. The conceptual framework

Innovation is defined in this study as the first attempt to carry an idea (for a new product or process) out into practice (Fagerberg *et al.*, 2005:4), which allows researchers to include broad meanings of innovation beyond technology. In the agricultural literature, innovation is recognized from various perspectives such as: development of a new product/technology; changes in agricultural organizations or institutional structures in which innovation takes place (organizational innovation); changes in agricultural and ecological systems (system innovation); and changes in a process of introducing/disseminating agricultural technologies (process innovation) (Leeuwis, 2013). While the recent studies pay more attention to system innovation or process innovation, the notion of power and agency is not fully included in the concepts of innovation in the agricultural literature (Kingiri, 2010).

Feminist/gender approaches emphasise that innovation processes are relational, reflecting the positions of individuals in the society, that shape what it means to be innovative and how innovative actions emerge for different actors (Blake and Hanson, 2005). In this respect, innovation is an outcome of complex interactions of power and agency (Wajcman, 2010), in addition to the quantity of resources and networks each innovator has. Exploring these processes allow researchers to investigate how innovation is facilitated or impeded by gendered social relations and gendered opportunities in organizations where innovation is promoted (Garud *et al.*, 2013). In rural farming contexts, agricultural innovation occurs in

family farms in which gendered relationships are central. Although current research on agricultural innovation focuses on innovation systems, which include exploring human interactions within institutions where technological innovation occurs and spreads (Knickel *et al.*, 2009), it does not fully address gendered processes in which power relations play out. This challenge faced by agricultural innovation research is very similar to that of research in innovation and entrepreneurship in non-agricultural sectors (Alsos *et al.*, 2013).

To explore women's agency and the power relations that exist in agricultural innovation processes, this study includes the concepts of gender relations and intersectionality. The studies of women farmers in rural areas have found that, unlike men farmers who are perceived as professional farmers, women farmers cannot easily escape from their position as farmer's wives, despite being professional farmers or entrepreneurs themselves, as their marriage to a farmer positions them in relation to their husband (Osterud, 1991; Brandth, 2002; GENNOVATE RTB-HT team, 2017). Women's agency is shaped by their social positions within the household and community. In the rural patriarchal contexts, women's agency is often orientated toward cautiously negotiating, instead of directly challenging the patriarchy (Kabeer, 2000; Schut *et al.*, 2015; Stark, 2016) because directly challenging the patriarchy is contrary to how society expects women to act (Whitehead, 1981). In addition, these women know what approaches work best for the subordinated situations in which they find themselves (Schut *et al.*, 2015). In Southeast Asia, although there have been dramatic changes in farming systems that have led to some change in gender relations, especially in farming roles and decision-making, nevertheless, deeply embedded patriarchal gender norms still persist in some farming domains (Lindeborg, 2012; Tickamyer and Kusujiarti, 2012). In the specific case of Vietnam, the economic reform, *đổi mới*, opened up opportunities for women in farming, but Confucian beliefs and practices still persisted, with expectations that women play a care-giving role, be obedient to all men, and be self-sacrificing for the family to maintain its harmony (Schuler *et al.*, 2006). In this context, rural women face specific gender-based challenges and constraints in agricultural entrepreneurship (Nguyen *et al.*, 2014). Women's agency in bringing about innovation can be shaped by what women are expected to be in the given cultural context, and how they bargain with patriarchy. Particular attention is, however, paid to the fact that women are not a homogenous group, and women from different ethnic groups, and even within the same village, have various innovation strategies, owing to their different social positions and power dynamics. Sensitivity to intersectionality (McCall, 2005) helps to clarify power relations co-existing in the family and in different ethnic groups, and helps to explain why women in the same cultural context have different strategies and face varying consequences of power relations. Multiple identities may co-exist within an individual. Rose (1993) calls it a 'paradoxical space', which creates dynamic and diverse forms of agency for each individual within the same social group. Thai ethnic minority women in the study site have multiple identities, with various social categories such as wife, daughter-in-law, mother, youth, ethnic minority, non-literate and farmer, all of which influence what women are expected to be or do. However, their positions as wife and daughter-in-law, for example, depend very much on each woman's family relationships, differentiating women's experiences and their approaches to exercising agency. The concept of paradoxical space thus helps explain why some individuals can change new ideas into practices, while others do not. Identifying those underlying reasons is a first step in providing gender-transformative support in facilitating agricultural innovation.

3. Research contexts and methods

A case study was undertaken in a Thai ethnic minority village in Dien Bien province to explore the processes of innovation in a geographically and socially marginalized community where

poverty persists. Vietnam has over 50 ethnic groups in which more than 85 per cent is Kinh, the majority ethnic group. The minority people are concentrated in mountainous areas. The people in the study site belong to Black Thai sub-ethnic group (wearing black dresses). Men and young women can speak Vietnamese, while old women only speak Thai. In everyday life, they interact with another ethnic minority, Hmong, who live in neighbouring villages, and also the ethnic majority Kinh, who work as traders and shop owners in the district town. In general, Kinh people have more economic and social power than either of the ethnic minorities, while the relationships between the minorities are more or less equal.

The village has 512 people from 96 households. Both men and women maintain strong ethnic identities in relation to social norms, marriage rules and ceremonies. Agricultural land is limited, with around 70 per cent located in steep hill areas with poor soil fertility, where farmers grow upland rice, cassava and maize, and the remaining 30 per cent in the lowlands used for paddy rice for home consumption. Villagers have adopted some new varieties of cassava, maize and paddy rice. There are many forest areas and the villagers are free to collect firewood and bamboo shoots for home consumption and as cash income sources. In the study site, poor households have limited land to cultivate, and they depend more on forest resources as a source of income and food. Animal husbandry is an important source of income. Many families, except the very poor, keep fish in their small ponds and have some indigenous black pigs and local chickens and Thai ducks. Because incomes from agriculture are very limited, many men (especially young men) work as wage labourers outside the village. Women and youths also work as agricultural labourers in neighbouring Hmong ethnic minority villages to pick coffee beans and harvest maize on a daily basis. The seasonal migration of men means that women must necessarily assume additional farming responsibilities. As such, many small-scale, new agricultural and livestock practices are developed and spread through women's rather than men's social networks. There is a local market in a district capital, around 6 km from the village. Some women sell their produce in the market. Motorbike is a major transport means for both men and women, except some poor households who cannot afford it. Poverty remains a major problem in the village, with 56 out of 96 households living below the poverty line (VND 700,000, around US$30 per month, per person). This poverty rate is consistent with the average poverty rates for ethnic minorities in Northern Vietnam (around 60 per cent) compared to that of the Kinh majority (less than 10 per cent) (World Bank, 2009).

Data were collected through key informant interviews, in-depth interviews including the collection of life histories and observations in agricultural activities, cooking and market activities. The first author conducted interviews, and a female or male translator assisted interviews depending on the gender of the interviewees. The fieldwork started from key informant interviews with the village head, the male health worker and the woman's union, to capture a general picture of the village, its history and changes and non-changes in agricultural and social practices. With the guidance of the village leader, 17 female and 10 male farmers were selected from different households based on age and socio-economic statuses to include people from diverse family backgrounds. Among them, six "innovative women" were identified by the research team based on the local understanding of innovation (see next paragraph). In this paper, we mainly focus on those women's cases (see Table I).

Information obtained from other women were also used to describe diverse family relations. Although 10 men's stories were not explicitly described in this paper, which focuses on women's innovation processes, men's perceptions of innovation, their subjective notions of power, and ethnic identities influenced, and were reflected in data analysis. Guide questions for individual interviews were framed and structured around the research questions presented earlier and influenced by the theoretical frameworks discussed above. Interviews were semi-structured, with informality and flexibility to put respondents at ease

Name*(age)	Wealth status**	Ethnicity	Innovation
Loan (36)	Well-off	Thái	Adopting new varieties of coffee, maize and rice by learning technology and skills from ethnic Hmong people
Ân (26)	Poor	Thái	Introducing coffee and geese from her birth parents
Giót (38)	Well-off	Thái	Bringing technology of rearing pigs from her birth family, running a small shop to sell homemade tofu and rice wine
Trang (29)	Well-off	Kinh	Rearing and selling rabbits through social networking sites
Tuốt (34)	Very poor	Thái	Digging a pond to farm fish and selling them at the local market
Đanh (40)	Very poor	Thái	Rearing and selling piglets

Notes: *These are pseudonyms; **based on Vietnamese Government standard criteria (incomes and assets)

Table I.
The list of female innovators described in this paper

and to facilitate follow up questions. Capturing local perceptions of innovation without the bias of innovation as technology is critical for this type of research (Ahi *et al.*, 2010; Alsos *et al.*, 2013). In this study, the word "đổ*i mới*" is used to explain "innovation" or "innovate". Although đổ*i mới* is well known by foreigners as a word for the economic reform in the 1980s and 1990s, its core meaning in everyday lives is "change to new", that includes the ways of thinking, approaches/methods, practices and products/models. In addition, the adjectives "*sáng tạo*" (creative) and "*năng* đ*ọng*" (dynamic) cover in Vietnamese the conceptual space of the term 'innovative', though they can also have broader meanings.

The study also used the ladder of power and freedom framework (Petesch *et al.*, 2018, Table II) for understanding women's and men's subjective power positions within the family. Each interviewee was asked to choose their own perceptions about their positions between Steps 1 and 5 at current and past (immediately after marriage) times, and explain the reasons. Most respondents quickly understood the question and clearly explained the reasons. The answers remain confidential to other family members. This was aiming at visualizing women's perceptions of their own status as an entry point of analysis, but was not aiming to generalize information: gender analysis in this study is derived from social theory in which conversations, life histories and in-depth interviews were central.

Ethical issues were carefully considered during the data collection. Issues of confidentiality came up in relation to the families of several respondents, such as those with HIV, the existence of HIV and AIDS orphans, and a relative in prison. To protect anonymity, all names have been changed in this paper. Participants include youth, and the youngest participant was 18 years old. Although 18 years old is considered to be adult in this context, we explained the purpose of the study to her parents too, and obtained verbal informed consent from her father as well as herself. Given that this would be the first experience the

The ladder of power	Description
Step 5	Power and freedom to make almost all major life decisions
Step 4	Power and freedom to make many major life decisions
Step 3	Power and freedom to make some major life decisions
Step 2	Only a small amount of power and freedom
Step 1	Almost no power or freedom to make decisions

Source: Adapted from Petesch *et al.* (2018)

Table II.
Ladder of power and freedom

villagers had of having interviews with a foreign researcher, interviews were conducted in the place where the respondents felt the most comfortable, and took between one and a half to two hours. The most comfortable places included a kitchen, a farm and/or a dining room. In five cases, other family members were present, listening or participating in the interviews. In three cases, the family member(s) left after a few minutes. Family members were asked by the researcher to leave the room in cases where they had not left after 10 min. However, in two cases, a family member was still within earshot after leaving the interview, preventing sensitive issues being discussed in private. In those cases, we asked our interviewees to show us their gardens, where the interview continued in private. Sensitive questions were thus all collected in private, with their answers not compromised by the presence of others.

The study has two main limitations. First, conducting fieldwork in Vietnam involves a specific, unavoidable challenge for foreign researchers. There is a requirement to obtain a written authorization for the study from the provincial government and arrange interviews with respondents through the local government representatives at commune and village levels. Furthermore, these government officers are often present during the interviews. This situation creates challenging fieldwork conditions and is a common limitation in all studies conducted by foreigners in Vietnam (Scott *et al.*, 2006; Turner, 2013). However, by establishing good rapport with both the local government officers and the respondents, the researchers were able to create positive conditions for fieldwork (Bonnin, 2010). In this study, 3-6 government officials accompanied the research team when we visited each respondent's house. An effort was made to reassure the officers of the non-threatening, bona fide nature of the research, and therefore, there was no problem in them being present during interviews. To minimize their influence, the fieldwork was carefully planned. First, from previous experiences, we knew that government officers tended to follow the fieldwork only for the first few days. Therefore, male interviews were scheduled first. Second, to increase rapport with the respondents and reduce tension created through the presence of the government officials, the research team socialized through sharing teas and lunches in respondents' houses. Some women provided the first author with ethnic clothing, arranged her hair in the traditional black Thai style, taught some words of the Thai language and organized joint photographs. Through these interactions and conversations, rapport was established, and everyday lives and livelihoods were observed. By the time female interviews were conducted, the government officers were no longer concerned about the research, and were mostly absent. When the government officers were present, the interview concentrated on non-sensitive questions such as choice of crops and technological challenges in farming. Data used in the below analysis were therefore not compromised.

The second limitation of this study is that the data depends on a sample size within a single ethnic minority village. The study was not intended to be comparative. Instead, the study aims to involve in-depth understandings of gendered negotiation processes for agricultural innovation in a specific context. While the study findings are context-specific and not generalizable, there are certain commonalities in the ways women innovators in patriarchal societies overcome their gender-based obstacles, and this has policy implications beyond the immediate context of this study.

4. Findings

This section presents women's perceptions of their positions in the family so as to understand underlying power relations in social organization of the family where women's innovation emerges. It then explores six women innovators' detailed stories about agricultural innovation, highlighting women's negotiations over mobilizing resources and taking risks in the process of innovation and entrepreneurship.

4.1 Gender relations and women's perceived positions

According to in-depth-interviews, some married couples live with a wife's family for a few years, providing labour instead of bridewealth. Thereafter, they move to live with the husband's parents. The data on the degree of power and freedom show that a daughter-in-law is positioned at the bottom of the family hierarchy. For example, Ngà, 28, describes her power and freedom as the second lowest (Step 2) out of five (see Table II in Section 3), and explains that her husband is in the third (Step 3) and her mother- and father-in-law are in the fourth and fifth (Steps 4 and 5), respectively. Ngà explains that although the scope of her freedom and power has expanded over the past decade, she makes the point that a wife's power position should not exceed that of her husband and parents-in-law. Ngà's perception of her position gives us a general notion of what is expected of young Thai wives in the study site, although Thai women's perceptions of their power and freedom vary from one individual to the next.

Similarly, at the beginning of her marriage, Thuỷ used to live with 20 other people, including her husband's grandparents, parents, and siblings. She was in charge of not only upland farming, but also cooking for all the family while she had two young children of her own to look after. She recalled being in a Step 1 position at that time: of having to get permission from her husband or in-laws for every decision. However, she eventually gained the trust of the family by demonstrating her loyalty to them, fulfilling in-laws' expectations and by not challenging their ideas. She has now some autonomous domains where she can make some decisions on her own, such as cooking, and caring for the home garden, fishpond, poultry and pigs. Thuỷ perceives that her current level of power and freedom have advanced to Step 3. Nonetheless, she still seeks the agreement of her husband and in-laws in advance when she attempts to do anything new in the context of her autonomous domains to avoid being blamed for her failures. Similarly, other female respondents, Ngà and Loan, also increased their status from Step 1 to 2 and 1 to 3, respectively, by demonstrating their ability to handle multiple tasks, including raising fish, poultry and pigs in the ways their family wanted.

In contrast, women from better-off families tend to have more autonomy. Là's parents-in-law own a large fishpond, which they watch over throughout the day to prevent the theft of their fish. While two families live under the same roof, there is a clear demarcation of labour: Là has relative autonomy over everyday farming and household activities, with limited interference from her in-laws. If she wishes to invest in pigs, she can do so with the agreement of her husband, and does not need to ask her in-laws. Là also has time to visit other women who have more knowledge and experience than her to improve her skills and knowledge. Similarly, Giót was given a sow from her parents for free, which gives her a great deal of autonomy as compared to other women whose husbands or parents-in-law might have to assist with the investment. Women's autonomy and capacities for taking a risk in agricultural production are thus closely associated with their family relations and their perceived positions therein.

4.2 Women's negotiations with prevailing gender norms for agricultural innovation

What does agricultural innovation mean for men and women? Many male farmers in the study site associate the notion of innovation with a dramatic increase in yields or income, and they perceive that there is a lack of innovation in the village, apart from the use of hybrid rice which is supported by government policy. Only one male respondent, who was also the wealthiest in the village as well as working as a government officer, indicated that he had recently started coffee farming in a neighbouring province. He was assisted by a friend in setting up the enterprise, who provided high quality planting materials at reasonable prices, and taught him techniques in production, including investment in irrigation. Women, on the other hand, perceive innovation differently from men. Although innovation means new practices for women too, a new practice signifies small changes in their everyday practices, brought through

their own social networks or through their own initiative. Women respondents also perceive that innovative women in the study site have support and understanding from their husbands, which enabled them to take risks. This suggests that enabling factors for women's innovation are hidden within household negotiation processes.

Loan, 36, is an innovator who actively learns from a neighbouring Hmong village where she regularly works as an agricultural labourer. She is from a better-off family, living with her parents-in-law and two school-aged sons. Her husband works as a construction worker outside the village and only comes home once every two-three weeks. Loan sees herself as having an equal relationship with her husband (both Step 3). She considers that her parent in-laws have more power than either her or her husband (Step 4), although she also notes that as they get older and retire from most farming activities, their power is declining. Her gender position allows her to take risks in innovation, which she does within the scope of what she can manage on her own. She observes that Hmong people are very active, noting that they are successful in agriculture and with livestock, and that they have better soil conditions; the soil in the lands occupied by the Hmong is dark and fertile, while soil in the agricultural areas of the Thai village is reddish-yellow. Since 2006, she has introduced different varieties of upland rice, maize and coffee beans and new breeds of chickens by negotiating with the Hmong women with whom she has good relations. A new variety of upland rice has been particularly successful. She planted on a small-scale in the first season as a trial in the corner of her cassava crop, eventually expanding the rice area by reducing cassava production. After three years, she confirmed that the variety fits well with the soil conditions on her farm and she transitioned all of her cassava land to upland rice. Consequently, her family no longer eats cassava out of necessity. She is very proud that she was able to feed her sons rice instead of cassava, as rice was a symbol of wealth and success for a woman at that time. Other women who have observed her trial have also adopted the new variety after confirming her success. Currently, she is sharing her experiences of how to grow coffee seedlings with her female friends in the village. There are now several women within the village who follow Loan's example and grow coffee in their gardens on a trial basis, but none of these women have the experience as yet to handle large-scale coffee cultivation. Therefore, although time consuming and only small-scale, Loan has significantly improved her farming activities by using her own experiences and social networks. Furthermore, this gendered process of innovation has the potential to provide opportunities for other women with less autonomy in their families and with limited economic resources.

Nam, 28, has a wife called Ân who clearly fulfils local criteria of innovativeness. Nevertheless, Nam did not describe his wife's creative activities as innovation, but explained them as part of his own farming activities. Nam earns his livelihood as a transporter in the commune market, carrying traders' goods and agricultural produce to their stores. Ân is from Thuân Châu, Son La, and he first met her when he was working as an agricultural labourer at her relative's farm where he was helping them to harvest maize and coffee. He lived with Ân's parents for four months after their marriage, during which he observed and learned a number of agricultural practices. Four years ago, his wife brought coffee seedlings from her parents' farm, which she suggested that he should plant in their garden. This year was their first commercial coffee harvest and they sold one sack of beans to a trader in Thuân Châu. Another innovation initiated by Ân was the raising of geese. She bought a pair of geese on credit from her home village to diversify their poultry stock, which in itself was a first in their village. Many of the villagers are interested in learning how their geese grow, observing whether they can adapt to the Thai environment. Nam agreed with her purchase of the geese because they were from her relatives-in-law, who could be flexible with repayments, were trustworthy and could be relied upon to provide them with healthy geese.

Livestock trading through family networks is generally considered a secure form of transaction in the upland areas (Bonnin, 2015). This study confirms that the exchange and trade of livestock are shaped in a highly gendered way based on women's agency and strategies. By depending on their own family networks instead of their husbands', the success of livestock can be more clearly attributed to women's capacities and efforts, thereby, it could help increase the women's power position in their family.

Giót, 38, is a very active woman who runs a small shop selling home-made tofu and rice wine (20 litres per day) and some home-produced vegetables. It is located on the main road leading to the commune market, where many villagers and passers-by stop. Giót has a number of insecurities, that she is taller than many men, that she has only a limited education and that she married late. She therefore feels she has to work harder than many other women do to be accepted by her husband and in-laws. At the beginning of her marriage, she often visited her home village by walking for 2 h to pick up food and healthy cassava plantings. She learnt how to make tofu and rice wine from her sisters. Her parents gave her a pair of pigs and chickens, which enabled her to start raising livestock. In the first two-three years, she had only three-four pigs, because the piglets often died soon after birth. After five years, she had developed enough confidence with growing pigs that she purchased a new breed from a trader in a neighbouring province through her relative's connections. Her husband agreed with her "gambling" despite many losses: a number of the new pigs died, and she had to start saving money again. Nonetheless, Giót is currently one of the most successful women in the village with the capacity to buy 20-30 piglets at a time from the trader in the neighbouring province to grow and sell. Giót views her own success as a result of her hard work, which contributed to gaining her husband's trust. Several other women whom I interviewed attributed her success to her husband's trust and support of her innovative activities.

The fourth case is Trang, a 29-year-old Kinh ethnic majority woman. Her approach differs significantly from the above three Thai women's cases, in which they use their extensive networks of friends and family. Trang married a Thai man who used to work in a factory in Than Hóa. She lives with her husband and their two children in the study village. Trang speaks fluent Thai and works in her small grocery store along the main road. She has recently started growing rabbits as an easy, low-investment livestock. Because she is away from her home village and does not have any biological relatives nearby, she has built a social network among local people to acquire knowledge and information. She checked the internet and found that rabbit farming was very successful in Son La, a neighbouring province. She later communicated with a farm owner through Facebook and visited the farm in Son La with her husband by motorbike and learnt how to farm rabbits, after which she bought a pair of rabbits for breeding purposes at VND 50,000 (US$2.50). She found that the grass in the village was suitable for the rabbits and that rabbit breeding was easier and faster as compared to raising chickens or pigs; as such, she sees great potential in rabbit farming. Trang is confident of her ability to market rabbit meat long into the future as she uses social networking services to identify interested traders. As a Kinh woman, Trang has not been expected to follow Thai gender norms and act like Thai women in relation to her husband and in-laws. Her process of innovation, therefore, differs from that of Thai women. She learned a new innovation through the internet and developed a business network through Facebook, while Thai women learn from their kin and peers and their entrepreneurship is built on their kinship. Thai women in the same village do not see her as a role model, and therefore her innovation is not spreading to the village. For Thai women, communicating with unknown traders through the internet is not respectable behaviour for a wife or daughter-in-law, and husbands and in-laws would not accept Thai women to

initiate entrepreneurship in this way. Intersectionality thus matters in this case. Although rabbit growing is a low-investment, quick-return activity, and therefore can be considered as favourable for women in the patriarchal context, as an innovation, it does not fit with Thai women's cultural context. This is because not only do they need much more careful negotiations with their husbands and in-laws, but also they themselves do not see the new practice of a Kinh woman as a respectable innovation, because she is from a dominant ethnic group in Vietnam and she does not follow Thai social norms. This clearly indicates that innovation is not limited to technological change but is shaped by people's gendered and ethnic identities and relationships.

The last two cases introduce innovations by two very poor women. They do not have sufficient income to adopt the new agricultural practices developed by the innovative Thai women described above, but they still try to engage in business as part of their livelihoods, although these activities may not be considered as innovation by outsiders. Particular attention is paid to their gendered ways for mobilizing resources, which have important implications for agricultural policy and development.

The first case, Tuốt grew up in a poor family and married a disabled man when she was 24. As she was considered too old to marry, she had no other option than to accept a marriage arranged by her parents and her future husband's foster father. The couple was given a small parcel of land by her parents and another parcel from his foster parents, and she did all the farming and housework alone, whilst her husband stayed at home. She explained to us that her husband did not fit with the social expectations of men, such as being a breadwinner and a household head, and that he struggled with the disparity between social norms of masculinity and his own reality. Perhaps in response to his situation, he became involved in drug dealing. Within a few weeks of this activity, he was arrested by the police and has been in jail over the past six years. Tuốt currently lives with her 8-year-old daughter. Despite the absence of her husband, Tuốt still lacked power and freedom because she did not have many options in daily life. She described herself as being in Step 1. She knew that some women in the village were making an income for themselves and their families through diversifying their agricultural businesses. Unlike these women, however, Tuốt was completely dependent upon her own labour, climbing up mountains to collect firewood to sell, and cultivating upland rice for home consumption. In 2012, she dug a hole in her garden with the help of her sisters, and based on their advice, she now grows fish during the rainy season to sell them at the local market. She states that a small fishpond was the only new activity for which she had the capacity. She feels her situation as very far from other women who are more respected in the village. Depending on forest resources and upland farming for family subsistence is perceived negatively by the villagers, being a reminder of the earlier 'hunger time'. Farming fish and selling them by herself is a way for her to be one step closer to the current social expectations of women in the village, thereby to strengthen her confidence and self-esteem. Her case illustrates the fact that even for very poor women, their perceptions of innovation are strongly linked to small-scale entrepreneurship, which is a way for rural ethnic minority women to strengthen their power and confidence in this context.

The second case, Đanh, 40, has been ill since she was a child, thus leaving her physically weak. Given that physical labour is a primary means in earning a livelihood for both men and women, her weak physical condition has left her at a disadvantage, necessitating that she delayed marriage. Her parents arranged a marriage for her with a man in the same village who had a kidney disease. "It was not a desired marriage. I did not want to marry," she repeated during the interview. They had three children, but life has been very hard for this family. She told us that if she knew that her children were destined to have such a harsh life, she would have preferred not to have had any children; as a mother, it is too painful for her to

even imagine her children's suffering. Her first son dropped out of school when he was 13 years old to help his parents and to work as a labourer in the surrounding towns, being put into contact with employers through his uncle's connections. His employers, however, often cheated him because he was so young and because he came from an ethnic minority village. Like Tuốt, her family depends heavily on upland farming, such as upland rice for home consumption. The situation was far from the ideal for a Thai wife, of having some entrepreneurial activities beyond subsistence farming. So Đanh began raising piglets. She initially got piglets by using the local government's social support scheme for poor households. At first, she was unable to raise them to maturity because of her limited financial resources and knowledge, so she decided to sell them earlier, before reaching maturity. This allowed her to earn an income on a short cycle, reduced her overheads and also the risk of economic loss caused by porcine diseases in the adult pigs. Pig farming represents an innovation within her means and capacity and allows Đanh to fulfil at least some of the social expectations associated with being a good Thai wife and successful income earner. Đanh's case shows that her social position as an ethnic minority woman from a poor family with a disabled husband affected her situation, determining innovation opportunities. Yet her case also highlights women's agency to change the current circumstances.

5. Discussion

Three key insights emerged from the study. First, the perceptions of agricultural innovation and innovative behaviour for Thai women are shaped by their perceived opportunities and capacities in the context of prevailing gender norms, and they are therefore necessarily different from the perceptions of men in the same village. Men's perceptions of agricultural innovation are often linked to hybrid crops, the paradigmatic, Green Revolution version of innovation. This may be closely associated with social expectations of men as breadwinners, so that innovation is meaningful for them if it links to greater production and incomes, as well as their greater opportunities for interacting with official government in the innovation processes. On the other hand, women associate agricultural innovation with small-scale entrepreneurship which they can handle without incurring the high risks associated with dependency on their husbands and in-laws for financial and/or labour support. Thai women's innovations mostly exist outside the official agricultural organizations for disseminating new technologies. Two women (Giót and Ân) introduced agricultural practices adopted in their birth villages to a new community into which they married. In this respect, they were not creating something new, rather they were transferring their own practices and skills to a new geographical and cultural context. This has important implications for agricultural research and development activities. While women may be seen by their husbands, in-laws and extension workers as lacking experience and knowledge in the geographical and agronomic context in which they are living, when they have acquired diverse skills, knowledge and practices from their birth village and introduced them into their marriage location, they can play an important role in disseminating agricultural technology and practices. Women's locally introduced/adopted innovations have a power that facilitates rapid dissemination and scaling up. Innovations practiced by Thai women within the same village are trusted by other women. These innovations enable other women to convince their husbands and in-laws that they should take them up, as the outcomes are visible. This finding is consistent with the literature on gender and innovation, suggesting that women use their own private networks through family and friends, whilst men tend to use established public networks in the workplace, their profession and the market (Schøtt and Cheraghi, 2014). The implication of these for the agricultural interventions and research is that there is a need to not only encourage women to participate in innovation processes in

the formal organizations (which often reflect men's needs and interests) but also rethink the contents of innovations to include women's needs and interests. Also, a peer-to-peer learning approach is most promising for supporting agricultural innovations and scaling up for ethnic minority women.

Second, negotiating with the patriarchy is an essential process that allows women to innovate, making innovation relational to their social positions and relationships (Blake and Hanson, 2005). The negotiation process is implicit and also itself innovative (Kabeer, 2000). Rather than challenging gender norms, women cautiously try new practices at a very small-scale and gradually develop it so that their husbands and in-laws can accept and support it. This negotiation process is critical for their success, shaping their choices of innovation and entrepreneurship. When new agricultural technologies are to be introduced by external agencies with monitoring of adoption and adaptation processes, these women's cautious approach should be considered as their own innovation mode that needs to be accommodated to external monitoring processes. The gender-specific innovation processes that involve implicit negotiation with their husbands and in-laws is commonly observed in other contexts (Locke *et al.*, 2017). While this is a constraint, in this process, women create new gender models, challenging and changing norms in both implicit and explicit ways, and gain self-confidence. Giót, for example, has helped to build a new, desirable image of Thai women as an income earner who interacts with traders outside the village. This new image inspired other Thai women who normally depended on forest resources and were engaged in subsistence farming. Giót is now a role model for many Thai women in the village. Loan has brought new varieties such as rice and coffee from a neighbouring Hmong village. Rice was a symbol of wealth at that time as they no longer needed to eat cassava thereafter. Given the respect she receives from both men and women in the same village, her activities seem to have contributed to increasing women's status overall. At an individual level, even very poor women such as Tuốt and Đanh tried to establish small businesses which helped them to be one step closer to the new Thai women's role models as pioneered by Loan and Giót, thereby increasing self-confidence. These gendered innovation behaviour and normative changes echo behaviour in other geographical contexts. Karen, a Tanzanian female innovator with an organic poultry business took up this innovation only by challenging gender norms which designated the poultry business as a masculine activity, and which were opposed to single women traveling alone (Tillmar, 2016). Tillmar points out that the idea of crossing the boundary of these gender norms is itself innovation. It is transformative in the sense that Karen creates new pathways for other women to follow. Acknowledging these social innovations, especially those that impact on women's sense of empowerment is an important first step for inclusive agricultural development policy. This also has implications for a broader aspect of gender and development. Embracing women's own context-specific approaches to innovation, rather than encouraging women to participate in existing male-orientated innovation processes, has great potential for gender transformation.

Third, intersectionality matters in agricultural innovation in terms of gender, age and ethnicity. Young Thai women have little autonomy and power because of restrictive gender norms and ideas about age hierarchies, even if, as has been seen, they do eventually gain more power in later life as their relationships change over time. Furthermore, agricultural innovations for women in the study site are more likely to be developed and disseminated among middle-age women, and then shared with younger women. In terms of being an ethnic minority women's access to and choices of innovations are affected. Thai women in the study site did not copy the innovation developed by Trang, an ethnic majority Kinh woman, although her innovation is low-risk and has a quick return, and is therefore easy for women to adopt. Even though some Kinh families are living within or on the outskirts of the

village, Thai women have limited learning interactions with them. On the other hand, Thai women do often closely interact with Hmong ethnic minority women. This suggests that women proactively choose innovations that fit well with their social as well as economic conditions. Furthermore, Thai women's situations vary with their intersectional positions. Tuốt and Đanh face specific challenges with their positions as wives of a disabled man and an imprisoned man, respectively. Giót's success is attributed to her supportive husband, while Ân's wife's success is closely associated with her natal family. In terms of socio-economic status, two Thai women from relatively well-off families had not only better access to resources for innovation but also greater autonomy within their families. Therefore, the content of and approaches to innovation necessarily differ significantly between well-off and poor women. Women in the same gender and ethnic group thus live in paradoxical space (Rose, 1993) where multiple identities and relationships co-exist, shaping their agency to turn new ideas into practices. Agricultural interventions for supporting innovations for ethnic minority women need to consider those social aspects instead of applying the approaches used for the majority ethnic group. The five Thai women described in this paper are not very different from the other 11 female respondents in terms of their varied socio-economic conditions and educational levels. However, the five women appear to have greater agency to change current agricultural practices and greater bravery to take risks than the other 11 females who only innovate after observing the successes of admired women. It is critical for agricultural extension workers to identify innovative women who can be a role model in the community and can contribute to disseminating new practices that are suitable and feasible for women.

6. Conclusion

This article explored ethnic minority women's gendered perceptions and processes of agricultural innovation in the northern uplands of Vietnam. The key research question asked: how do women develop innovations and learn new agricultural practices within patriarchal family structures? To address this question, the study used a concept of women's gendered agency and power to change (Kabeer, 2000), and of gendered innovation and technologies (Wajcman, 2010; Alsos *et al.*, 2013; Eriksson, 2014) to provide a framework for carrying out critical analysis of gendered processes of innovation.

The findings have shown that although women's agricultural innovation tends to be small scale in terms of economic outcomes, its social processes have significant meanings for both increasing women's confidence and disseminating new agricultural practices to their peers. Women are cautious in their approach to innovation, minimizing both economic and social risks so that their activities can be supported by their husbands and in-laws. Their experiences, knowledge and resources from their birth families and their peers play significant roles in disseminating new agricultural practices in the patrilocal household. The results suggest the need to broaden the current mainstream agricultural extension approach, which tends to be male-focused and oriented towards 'high tech' agricultural innovation such as promoting highbred varieties. Agricultural interventions could include alternative approaches built on women's own innovation pathways to facilitate women's innovation and entrepreneurship. Closely looking at women's context-specific innovation processes and contents is therefore an entry point for supporting women farmers who have great capacity for agricultural entrepreneurship.

This study methodologically challenges much mainstream agricultural research that has tended to de-link gendered power dynamics from analysis of innovation processes and technological outcomes. While research on agricultural innovation has shifted from a purely technological focus to include an understanding of the organizational, institutional

and systems dimensions of innovation (Knickel *et al.*, 2009), gender is treated as a variable to measure the gaps between men and women in participating in male-orientated agricultural innovation, and the aspect of women bargaining with patriarchy is overlooked. Gender analysis enables researchers to visualize power and provides fresh ideas that might be useful for designing more effective agricultural interventions for the minority women and men in Vietnam. If agricultural interventions are meant to make a difference for members of poor and marginalised population in upland areas, then it is essential to understand the social dimension of innovation, in which gendered power relations are central, rather than only evaluating outcomes of production. We have seen that multiple elements of women's identify affect their involvement in agriculture and the extent of their power and agency in the family, which in turn affects their agricultural businesses. Context-specific, theoretically informed gender analysis is critical to understand these processes and contribute to transforming agricultural research and interventions for social and gender equity.

Further research in gender and agricultural innovation would be very useful in the areas such as understanding changes in gendered innovation processes over time in relation to changes in mobilization of family labour along with feminization of agriculture; documenting socially marginalized men's agricultural innovation processes; and comparing women's agricultural innovation processes among different ethnic and/or age groups.

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About the authors

Nozomi Kawarazuka is an Associate Scientist at International Potato Center, CGIAR, based in Hanoi, Vietnam. Her research focusses on understanding gender and social dimensions of agricultural innovation, labour migration and its impacts on agriculture and ethnic minority youth in agriculture in Vietnam. She has a PhD in development studies from the University of East Anglia, UK. Nozomi Kawarazuka is the corresponding author and can be contacted at: n.kawarazuka@cgiar.org

Gordon Prain is an independent consultant who advises CGIAR centres on issues related to rural and urban food and nutrition security, gender and the institutional and social dimensions of agricultural change. Most recently, he was the Leader of Social and Nutritional Sciences Division at the International Potato Center, spent 10 years as the Global Coordinator for Urban Harvest, the CGIAR system-wide programme on urban and peri-urban agriculture, and has worked extensively with ethnic minorities in hill areas of Asia and Latin America on technological and institutional innovation processes. In all, he has more than 30 years of experience working as a leader or member of interdisciplinary teams across multiple sectors to support improved livelihoods for rural and urban households in the global South. He has a PhD in social anthropology from the University of Cambridge, UK.