Gender roles, decision-making and challenges to agroforestry adoption in Northwest Vietnam

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SUMMARY

Consideration of gender aspects is needed to ensure that none of the sexes are marginalised in agroforestry interventions. Globally, women farmers are known to have played significant roles in agroforestry, especially at the early stage of tree establishment and maintenance. However, there is very little documentation about this phenomenon in Vietnam. Based on a household socio-economic baseline survey conducted by the Agroforestry for Livelihoods of Smallholder Farmers (AFLI) project in northwest Vietnam, we examined women's participation in, and benefits from agroforestry, control and access to productive resources, decision-making, and the factors affecting agroforestry adoption. The study found that the key contraints to agroforestry adoption by both men and women is lack of technical knowledge on agroforestry technologies; however women, predominantly ethnic minorities, have more constraints in adopting agroforestry compared to men. For female headed households, this is due primarily to lack of land and labour, and collateral assets; for women in general, interlinked factors such as lack of knowledge, low educational level, and poor access to extension constrained adoption. The study recommends that agroforestry interventions should (i) promote practices that cater to labour-scarce female headed households; (ii) provide preferential credit access to female headed households; (iii) channel extension support to women's associations; and (iv) produce extension materials in the local dialect. The lack of attention to gender issues limits agroforestry interventions to deliver benefits for rural households in Northwest Vietnam.

Keywords: agroforestry, gender, Hmong, extension services, northwest Vietnam

Rôles, prise de décisions et défis liés au genre dans l'adoption de l'agroforesterie au Nord-Ouest du Vietnam

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La prise en compte des aspects genre est nécessaire pour s'assurer qu'aucun des sexes n'est marginalisé dans les interventions agroforestières. De manière générale, les agricultrices jouent un rôle prépondérant dans l'agroforesterie, en particulier dans les phases initiales de la mise en place et la gestion des arbres. Toutefois, des informations sur cette question au Vietnam sont très limitées. Dans une enquête de base socio-économique conduite avec des ménages dans le cadre du projet 'Agroforesterie pour le bien-être des paysans au Nord-Ouest du Vietnam (AFLI)', nous avons examiné la participation des femmes dans l'agroforesterie et les bénéfices qu'elles en tirent, le contrôle et l'accès de ces dernières aux ressources productives, la prise de décision et les facteurs déterminant l'adoption de l'agroforesterie. L'étude a montré que la contrainte majeure à l'adoption de l'agroforesterie est le manque de connaissance technique sur les technologies agroforestières, aussi bien pour les hommes que pour les femmes. Cependant, les femmes, et en particulier celles appartenant aux minorités ethniques, rencontrent plus de difficultés dans l'adoption de l'agroforesterie que les hommes. Pour les ménages dirigés par les femmes, les obstacles majeurs sont principalement dus à l'accès limité à la terre, à la main d'œuvre et aux biens collatéraux. Pour les femmes en général, les facteurs interdépendants, tels que le manque de connaissance, le faible niveau d'éducation et l'accès restreint aux services de vulgarisation, entravent l'adoption. L'étude recommande que les interventions agroforestières devraient: (i) promouvoir les pratiques qui prennent en compte la rareté de main d'œuvre dans les ménages dirigés par les femmes; (ii) procurer des crédits préférentiels aux ménages dirigés par les femmes; (iii) orienter les services de vulgarisation vers les associations des femmes; et (iv) produire du matériel de vulgarisation dans la langue locale. Une attention insuffisante aux aspects genre limiterait la capacité des interventions agroforestières à fournir, aux ménages ruraux du Nord-Ouest Vietnam, les bénéfices espérés.

Roles de género, toma de decisiones y desafíos para la adopción de la agroforestería en el noroeste de Vietnam

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Es necesario considerar los aspectos relacionados a género para garantizar que ninguno de los sexos sean marginados en las intervenciones agroforestales. Se sabe que a nivel mundial las mujeres agricultoras han jugado un papel importante en la agroforestería, sobre todo en la primera etapa de establecimiento y mantenimiento de los árboles. Sin embargo, hay muy poca documentación sobre este fenómeno en Vietnam.

Con base en una encuesta socioeconómica de hogares realizada por el proyecto *Agroforestería para los medios de vida de pequeños agricultores* (AFLI por sus siglas en inglés) en el noroeste de Vietnam, se analizó la participación de la mujer en la agroforestería, los beneficios que recibe de esta, el control y el acceso a los recursos productivos, la toma de decisiones y los factores que afectan la adopción de prácticas agroforestales. El estudio encontró que la principal restricción para la adopción de la agroforestería, tanto para hombres como para mujeres, es la falta de conocimientos técnicos en tecnologías agroforestales; Sin embargo las mujeres, principalmente las pertenecientes a minorías étnicas, enfrentan más dificultades en la adopción de la agroforestería en comparación con los hombres. En el caso de mujeres cabeza de hogar, esto se debe principalmente a la falta de tierra, mano de obra, y de activos que sirvan de garantía; para las mujeres en general, factores relacionados entre sí, como la falta de conocimientos técnicos, bajos niveles educativos y poco acceso a servicios de extensión limitan la adopción. El estudio recomienda que las intervenciones agroforestales deben: (i) promover prácticas que atienden la escasez de mano de obra de hogares encabezados por mujeres; (ii) facilitar el acceso a crédito preferencial para hogares encabezados por mujeres; (iii) canalizar servicios de extensión a través de asociaciones de mujeres; y (iv) producir materiales de extensión en el dialecto local. La falta de atención a las cuestiones de género limita los beneficios ofrecidos por intervenciones agroforestales a los hogares rurales en el noroeste de Vietnam.

INTRODUCTION

Agroforestry is defined as a system of natural resources management that integrates trees on farms and in the agricultural landscape to diversify and sustain production. The World Bank estimates that over 1.2 billion people derive their livelihoods from agroforestry systems (World Bank, FAO and IFAD 2009). Women farmers are an integral part of agroforestry, as they are often responsible for managing trees especially at the early stages of establishment (Kiptot *et al*. 2014). Women are also known to be principal holders of knowledge and managers of traditional home gardens, and make up about 60% of the practitioners of innovative agroforestry practices such as domestication of indigenous fruit trees and production of dairy fodder (World Bank, FAO and IFAD 2009). Thus, the knowledge women have about trees, and of tree genetic diversity, and their roles as both suppliers and users of tree germplasm and genetic resources make them critical agents in scaling up agroforestry practices to improve livelihoods (World Bank, FAO and IFAD 2009).

Men's and women's participation in agroforestry, however, varies according to preferences and values of tree species and products, as well as to the level of complexity of practices. Generally in Africa, women's participation is low in agroforestry enterprises that are considered men's domains such as timber, and high in enterprises that have little or no commercial value, such as collection of indigenous fruits and vegetables; and women are often confined to the lower end of the value chain of agroforestry products (retailing), which limits their control over and returns from the productive process (Kiptot and Franzel 2012). For women's income, agroforestry value chains are particularly important, but low access to capital, technology and information, constrain women from developing their enterprises further (Degrande and Arinloye 2014). In the case of the fallow system in eastern Zambia (a type of traditional agroforestry), Gladwin *et al.* (2001) found that female headed households are more likely to adopt improved fallows than male headed households. Furthermore, tree species preferences in agroforestry also vary between male and female household members. A study in Pakistan highlighted that men were keen on eucalyptus species, as it had better survival rates; whereas women preferred *Dalbergia sissoo, Melia azedarach* and *Morus alba,* which could provide better income (Muhammad 2003).

The differences in adoption of agroforestry between men and women, and male and female headed households, are often linked to their variations in accessing and controlling related resources. Kiptot and Franzel (2012) add that the difference in decision making authority between men and women in the family is an important determinant for the adoption of agroforestry practices by both men and women. In general, despite women's important role in agroforestry, they remain disadvantaged due to cultural, sociological and economic factors (Kiptot and Franzel 2012). The gendered nature of resource use, access, control, and responsibility with respect to trees is highly multifaceted (Rocheleau and Edmunds 1997).

GENDER IN AGRICULTURE AND FORESTRY IN VIETNAM

In Vietnam, women account for 58% of the workforce in agriculture, forestry and fisheries, and deliver more than 60% of agricultural products (FAO 2015). Women continue to play important roles in all agriculture and forestry activities, including management and utilisation of natural resources as well as the practice of traditional knowledge on management and protection of forest and forest resources (ICARD 2012). At least since the 1990s, women have taken part in almost all production activities and in the decision-making processes related to agricultural production (UN-REDD 2013). Women contribute more hours of labour to cultivation, livestock raising, agricultural processing, and marketing of agricultural goods (UN-REDD 2013). In forestry, women also dominate the work force, especially amongst ethnic minority groups (UN-REDD 2013). Women tend to be highly involved in activities like nursery tending, seedling preparation and non-wood forest product (NWFP) collection, whilst activities such as thinning and pruning, forest rehabilitation and enrichment planting are undertaken by both men and women (FAO 2015). However, in general, men are more involved in timber and NWFP extraction for commercial purposes, while women's role in forestry is linked to subsistence needs for medicinal herbs, fuelwood, wild foods and fodder (UN-REDD 2013). In terms of agroforestry, more women tend to participate in processing and product sale than men. Hoang (2006) highlighted the labour division in cacao, an agroforestry system

wherein women were responsible for the associated annual crops particularly in weeding, and men were responsible for ploughing and pruning while harvesting was jointly done by both. However, despite women's involvement in the forestry sector, gender disparities exist due to cultural norms that reinforce forestry as a male profession, in that, women's work is of secondary importance (FAO 2015) – this issue has not been adequately addressed in national policies on agriculture extension services.

Land tenure is an important element in examining the position of Vietnamese women in society. The Vietnamese government promulgated the Land Law in 2001, which led to the issuance of land use certificates (LUC) at the plot level. Under the Law, household members could own multiple plots, and any plot under the common ownership of husband and wife is required by law to be registered under the names of both (Menon *et al.* 2014*)*. This large-scale reform has made Vietnam the subject of several studies examining the effect of land reform on agricultural productivity and household decision-making, with notable findings such as an increase in the proportion of cultivated areas planted with more profitable crops, increased labour supply in non-farm activities, and greater food security (Menon *et al.* 2014). Nevertheless, the United Nation's REDD+ Programme in Vietnam reported in 2013 that still, women in Vietnam generally have limited access to land, credit, infrastructure and information. This is possible since the implementation of the land allocation process has been very slow in some provinces. The Food and Agriculture Organisation (FAO) (2010) also reported that fewer female headed households have access to agricultural land compared to male headed households in Vietnam. Male headed households also have larger plots compared to female headed households. In addition, availability of farm equipment like tractors, generators, motorised insect sprayers and water pumps are more common in male headed households than female headed ones. Female headed households also suffer more from labour shortages and heavier activities because women are smaller and their households have fewer working-age members (FAO 2013). Women also experience more difficulties in accessing credit and loans than men despite the availability of various credit sources, because women have less control over the types of fixed assets necessary as collateral or mortgages for loans while credits generally require a high level of monitoring and return (Hoang 2006).

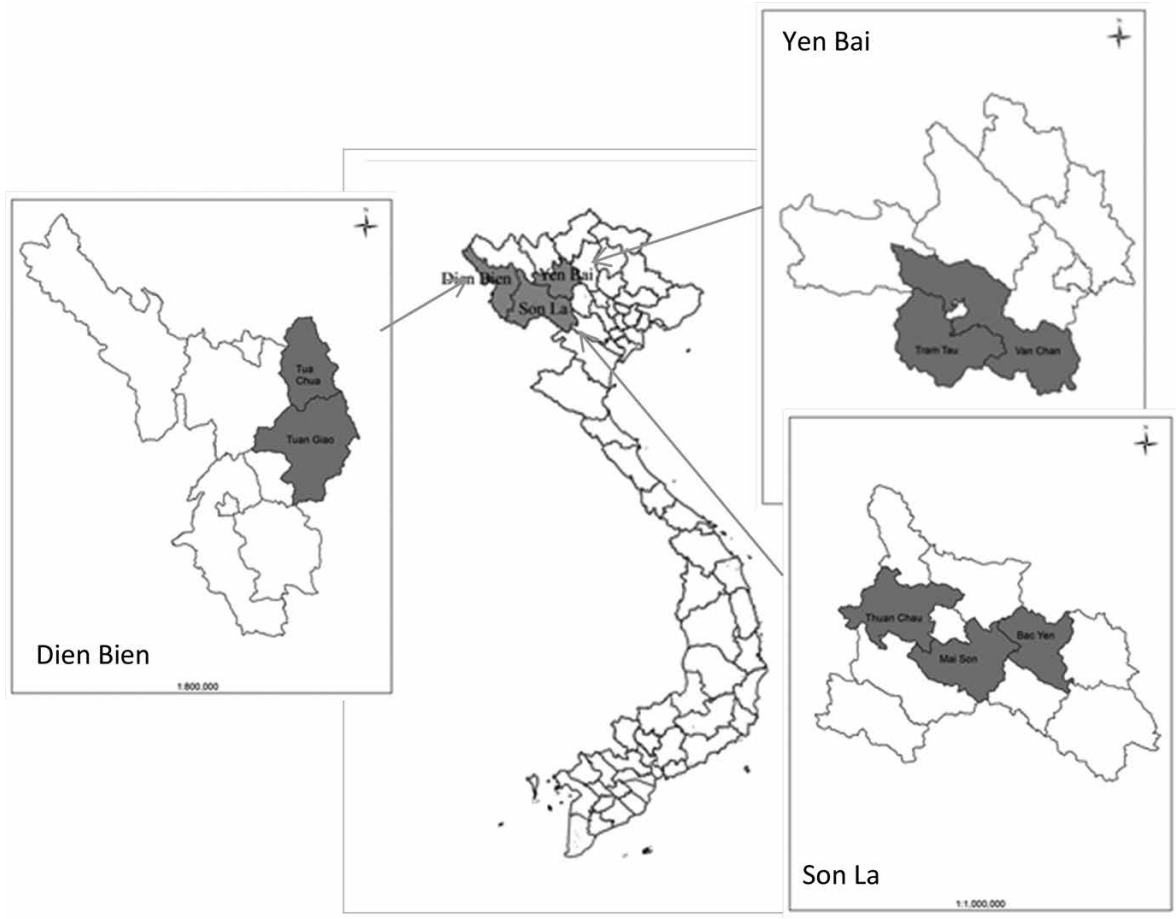
Furthermore, the national statistics on literacy in Vietnam show a lower level of literacy for women. Men have more years of schooling than women. Traditional cultures that consider education unnecessary for women and women's participation in the informal sector have led households to assign their daughters to both household and economic activities, thus taking them out of school after some years (Gebert and Nguyen 1996). The difference in literacy between men and women also partially results in their varied participation in extension activities and channels. The main topics for which men and women received information are new varieties, pest and disease control, animal disease control, fertilizer application, credit and markets for annual crops. The patterns of receiving information are linked to different information sources such as extension staff, training, meetings, mass media, relatives, friends and neighbours. However, in general, a smaller proportion of women are trained or able to receive information compared to men since women are most of the time, pre-occupied with their household and domestic duties, which leave them with very limited time to participate in meetings and training (Hoang 2006). Male headed households also have greater access to mass media. About 51% of male headed households received information through mass media as compared to 45% among female headed households because of higher ownership of mass media equipment (FAO 2010). In terms of marketing capacity for agricultural crops (maize, cassava and rice) and forestry products (bamboo), no significant difference between men and women was found; it was rather dependent on the proximity to urban centers or main roads (Gebert and Nguyen 1996). Our review suggests that the literature on gender in agroforestry is scarce; most of the literature focuses on understanding gender aspects in either agriculture or forestry.

The lack of understanding and documentation of gender dimensions and implications of agroforestry in Vietnam could result in overlooking gender issues in agroforestry interventions. Our study not only hopes to contribute to this knowledge gap but also generate insights for addressing gender and agroforestry issues in Vietnam. Based on the socio-economic baseline survey of the AFLI project (Agroforestry for Livelihoods of Smallholder Farmers) in Northwest Vietnam, we examined the challenges women face in adopting agroforestry. Specifically, we examined the following aspects: (i) gender roles in agroforestry; (ii) gender preferences on tree species, access to resources, and participation in decision-making; (iii) factors hindering women's adoption of agroforestry; and (iv) implications for agroforestry interventions. As mentioned above, our analysis relied on data from the baseline survey of the AFLI project, which was not necessarily designed for intra-household analysis.

STUDY SITE

AFLI is a five-year (2011–2016) collaborative research project of the World Agroforestry Centre (ICRAF) and the Australian Centre for International Agricultural Research (ACIAR), and involves six local partners. Aiming to improve the farming systems of smallholder farmers through agroforestry, the project is implemented in three provinces namely, Dien Bien, Son La and Yen Bai, in the Northwest region of Vietnam (Figure 1). Dien Bien province has a complex topography formed by high mountains running along the west border with Laos. The total land area of the province is 956,300 hectares, and has a population of 512,300 people. Son La's topography includes high mountains and plateaus. The province has a total area of 688,600 hectares and 1,119,400 inhabitants. Yen Bai province is characterized by three major mountains towards the northwest and southeast, dividing the province in two major areas: the highland on the west and the lowland in the east. The total land area of Yen Bai province is 688,628 hectares, and its population is 758,600 people.

FIGURE 1 *Location of study sites in Vietnam*



The dominant annual crops across the three provinces are maize, rice and cassava. Shifting cultivation with very short fallow periods (3 years maximum), monoculture cultivation of annual crops, and agroforestry in the form of home gardens are common practices across three provinces. Due to population growth and government interventions to halt shifting cultivation, intensive agricultural production, usually in smaller farm sizes and on fragile sloping lands, is becoming a concern as soil erosion intensifies and yields decline.

METHDOLOGY

The AFLI project baseline survey covered 310 randomly sampled households across 12 communes in the seven districts of Son La, Yen Bai and Dien Bien provinces (Bac Yen, Mai Son and Thuan Chau districts in Son La province, Tuan Giao and Tua Chua districts in Dien Bien province, Van Chan and Tram Tau districts in Yen Bai province). The survey was intended to establish socio-economic indicators that can be monitored by the project, and was not necessarily designed to examine gender relations and intra-household dynamics. Our sample consists of 240 male heads of households and 70 females of which 18 were household heads and 52 were women/spouses in male-headed households. Despite the limited number of women in the sample, the survey nevertheless provided information on gendered patterns including division of labour, access and control of resources, and factors in women's adoption of agroforestry. Data collection was carried out in September–December 2012, and was analysed using the Statistical Package for Social Sciences (SPSS 20).

Table 1 presents the distribution of respondents by ethnic grouping, of which, the Hmong is largest, followed by the Thai, the Kinh, and the Khang, respectively. In Vietnam, some terms are used to refer to non-Vietnamese ethnic groups that live within its territory. The commonly used term is *dan toc thieu so* (ethnic groups with few members) or *dan toc* (McElwee 2008). The Vietnamese government officially recognizes 54 ethnic groups, with the Kinh or ethnic Vietnamese most dominant (McElwee 2008). The ethnic minorities can be classified into three main categories such as minorities of the northern mountainous region, of the Annamite Cordillera and the Central Highland mountainous plateau, and of the lowland delta (McElwee 2008).

In order to fulfill the inquiries posed by our study, gender-specific questions suggested by the Harvard analytical framework (also known as the Gender Roles Framework) developed by the Harvard Institute of International Development, were included in the survey questionnaire to elicit information on gender roles in agroforestry, access and control of productive resources. These questions helped to

TABLE 1 *Distribution of respondents by ethnicity*

Province/Ethnic group	Hmong	Khang	Kinh	Muong	Thai
Dien Bien	44	0	18	1	37
Son La	35	16	0	0	72
Yen Bai	48	0	39	0	0
Sub-total	127	16	57	1	109
Total	310				

identify the challenges and issues faced by women in adopting agroforestry.

It has been recognised that there is a risk of women's exclusion in household surveys (Mai *et al.* 2011), as conducting interviews with the heads of households alone, at times leads to assuming that the households are egalitarian units of equal income distribution (Coe 2008). Studies have shown that men and women in the same household have different preferences and opportunities and that households can be arenas of intense competition over resources (Alderman *et al.* 1995, Falkingham and Baschieri 2009, Nightingale 2011, Quisumbing 2004, Rocheleau 2008). We therefore recognised the male-bias of our data since it was derived from randomly sampled households. Nevertheless, without neglecting the male respondents, our analysis focused on the 70 female respondents (sub-sample) that reported on their participation in crop production and agroforestry activities. We also carried out Focus Group Discussions (FGDs) separately with male and female participants to further understand the gender aspects of agroforestry in Nhop village, in Chieng Bom commune, Thuan Chau district where adoption of multi-strata coffee system was highest (80 out of 89 households) among the 12 surveyed communes.

RESULTS

Agroforestry adoption

Surveyed households adopt different agroforestry practices wherein trees are planted around farm boundaries, with annual crops, in hedges, and in home gardens. The most dominant adopted agroforestry practice is tree integration in home gardens where 19 species of fruits and timber trees were found, followed by tree planting with annual crops, multi-strata, fallow, hedgerow, and woodlots. Female headed households were found to have fewer tree species on their home gardens. Table 2 presents 19 different agroforestry tree species planted by respondents. Farmers also practice mono-cultivation of maize, rice, cassava and some vegetables.

TABLE 2 *Agroforestry tree species planted by surveyed households*

	Number of households planting different tree species
Mango	40
Coffee	40
Longan	36
Pine	27
Plum	21
Eucalyptus	19
Banana	18
Docynia Indica	15
Bamboo	15
Acacia	15
Peach	10
Teak	6
Jackfruit	5
Apricot	5
Lychi	2
Orange	1
Lemon	1
Pomegranate	1
Canarium	1

TABLE 3 *Gender roles in farming activities*

	Number as reported by males (*n = 228*)			Number as reported by females (*n = 66*)		
Farm operations	**Male**	**Female**	**Joint**	**Male**	**Female**	**Joint**
Layout	135	19	74	33	12	21
Brushing	55	45	127	13	21	31
Ploughing	127	20	81	27	14	24
Planting	60	44	124	18	18	30
Fertilizing	53	56	116	13	24	28
Spraying	141	27	60	35	16	14
Weeding	17	81	130	10	25	31
Harvesting	30	57	141	17	16	33
Sorting	50	61	117	11	27	28
Packaging	73	30	125	26	12	28
Marketing	130	10	88	45	6	15

Gender division of labour

Table 3 provides information on labour division between men and women in crop and agroforestry production. As reported by both genders, men and women share many of the farming tasks. Women's participation is higher than men's in terms of fertilizing, weeding, harvesting and sorting crops, whilst men are more into lay out the farm, ploughing, planting, spraying, packaging and marketing products. Buying tree seedlings was reportedly a man's task. Interestingly, a good number of men (81) reported that ploughing is also jointly performed despite it being a difficult task for women, while weeding appears to be predominantly a woman's task (as reported by both genders). FGDs revealed that cattle raising is done on a very small scale, and does not require a significant amount of time from either men or women. Households located close to the main road have more opportunities to earn from off-farm sources however; these are mostly taken up by men.

As mentioned above, the Nhop Village was chosen for follow-up FGDs since 90% of households had adopted a multi-strata coffee agroforestry system. Farmers intercropped fruit trees such as *longan,* jackfruit, mango, *Docynia Indica*, and multi-purpose species like *Canarium nigrum Engler,* to provide shade to coffee. Farmers also plant annual crops such as maize and cassava. Results of gender-segregated FGDs revealed that men and women play different roles in the coffee-agroforestry system. Buying inputs such as seedlings and fertilizer is a task for men, while women and men are both involved in land preparation, planting trees, fertilizer application, and pruning coffee trees. In addition, men are responsible for spraying, a task that requires physical strength for a 10-kg knapsack sprayer; however, gender division in harvesting is not straight-forward. Harvesting coffee is considered labour intensive, so both men and women are involved, but marketing is performed by men alone, while for fruits, both harvesting and marketing are a task usually performed by women.

In summary, the survey and FGD revealed that the tasks for monoculture crop production and agroforestry, albeit generally gender demarcated, are also significantly shared, particularly activities such as planting, fertilizing, brushing, harvesting, sorting and packaging—this result conforms to findings from studies reported by various authors such as Degrande and Arinloye (2014), Kiptot and Franzel (2012) and Rocheleau and Edmunds (1997).

Benefits, access and control of productive resources

Land and labour

We compared the survey results between male and female-headed households for land and labour, and found that male-headed households own larger areas of cultivated paddy fields and upland farms compared to female headed. Based on field observations, trees are more commonly planted in sloping farms than in paddy fields. There is also a difference in household size and labour availability between male and female headed households, but both reported a shortage in labour (Table 4).

TABLE 4 *Land, household size and labour of male- and female-headed households*

	Average total area of paddy (ha)	Average total cultivated upland area (ha)	Household size (average no of persons)	Household labour (average no of persons)	Encountered farm labour shortage (%)
Male headed	.25	1.4	4.64	3.04	45
Female headed	.12	1.2	4.06	2.61	47

Access to benefits and financial resources

Gender-segregated FGDs revealed that benefits are accessed both by husband and wife. Both men and women disclosed that the woman's role is to keep all income, but decisions on what to use the income for, or how to invest are agreed by both. This type of gender relation is confirmed in the survey wherein the reported difference between males and females is not significant, in terms of their access to income and income sources, including agroforestry products.

Minimal credit is available for all households in the study sites. Often, accessing credit is rather a household decision than by gender. However, there were more male headed households (44%) accessing credit during the past 12 months compared to female headed (33%). This is because of the collateral requirement in accessing loans. The survey shows that the main constraints for households to access credits are (i) lack of property to use as collateral (39%); (ii) high interest rates (22%); and (iii) complicated bank procedures (22%). Although these constraints affect both male and female headed households, the latter are more disadvantaged since they are usually the ones with little or no property to mortgage. The type and quality of property owned by female headed households could rarely pass as collateral since they are often low in quality, and in poor condition. All surveyed female headed households have clay tiles as roofing material for their house, whilst the male headed houses have steel trusses and more durable roofing materials. Furthermore, the survey has shown that many female headed households own only one house, while the male headed have more than one.

Access to inputs and markets

Agroforestry requires inputs such as seedlings and fertilizer. To be more efficient, men would rather buy these inputs in the nearest town where they could also deliver their produce to a bigger market while the women are left with their household chores. Beside their reproductive tasks, women's participation in marketing activities beyond the village is limited by distance to markets. The main transportation used in these areas is motorbike or bicycle. Although many Vietnamese women cycle and drive a motorbike, men are probably more skilled in driving motorbikes with heavy loads of products and inputs. Furthermore, it was found that female headed households own fewer motorbikes and bicycles, as well as televisions than their male counterparts.

Access and sources of information

As shown in Table 5, neighbours or farmers were the main source of information on farming, tree management, markets and market prices, followed by government extension workers and media (radio and TV programmes). The survey and FGDs revealed that both men and women were able to access, or have contacted extension officers for agricultural information. More men have asked their neighbours for information on tree planting and product marketing, while women ask for information on general farming practices. However, men are accessing more extension information through media compared to women. This is because women reported less time to watch television or listen to radio programmes due to their reproductive roles and lesser ability in the Kinh language. Also, it has to be noted that ownership of radio and television is lower in female headed households (Table 5).

There is a link between communicating with extension officers and women's educational level and speaking the Kinh language. Television shows and radio programmes are often aired in the Kinh language, and most extension workers speak in Kinh, being the official and widely spoken

TABLE 5 *Sources of information for men and women*

	General farming		Tree planting		Markets & price	
Information sources	**According to males (*n = 240*)**	**According to females (*n = 70*)**	**According to males (*n = 240*)**	**According to females (*n = 70*)**	**According to males (*n = 240*)**	**According to females (*n = 70*)**
Neighbour/Farmer	51	6	40	8	29	3
Extension worker	4	1	na	1	na	na
Radio	25	7	9	1	34	6

language in Vietnam. In contrast, and compared to men, most ethnic minority women could hardly speak the Kinh language due to their low educational level, which limits their interaction with extension workers. Our data shows that 55% of surveyed women have never been to school, which is more than twice the percentage of men who have not gone to school (24%). The ratio of men who quit school at the time they reached high school is higher than women; women tend to quit schooling at the primary level. Our data further shows that nearly 62% of respondents mentioned that men from their households join all trainings offered by extension workers and non-government organizations (NGOs), 12% reported only women attended, while 26% reported that both men and women in their households participated in trainings. This clearly shows that women in the study site have little exposure to training, due to the language barrier, low educational level, and their reproductive tasks, although there was no evidence that participation in agricultural training is traditionally assigned to men.

Male respondents also report that farmer unions, which were organised by the government back in the Communist era have effectively served as information and learning channels in the village. Farmer unions and women's associations are the main and longest-running collective action groups in Vietnam. Farmer unions are concerned with all aspects of village development, including farming and are mostly attended by men, while women's associations (exclusively for women) focus on health and maternal issues. Seventy four percent of the respondents reported that only men in their households participated in collective action groups, while 3% reported only female members, and 23% reported both men and women. Men's involvement in collective action activities may have facilitated information flow on farming practices across the village.

Despite the asymmetrical distribution of males and females in our sample, the results point out, and support the findings of many studies (Degrande and Arinloye 2014; FAO 2013; Kiptot and Franzel 2012; Doss 2001; Mehra and Rojas 2008; Hoang 2006), that female headed households in rural areas are often disadvantaged due to lack of labour and other productive resources.

Decision making

Respondents revealed that men play a dominant role in making decisions regarding crops and varieties, as well as tree species to plant, although many decisions are also jointly made (Table 6). A smaller proportion of women (9%) reported their involvement on deciding what crop or tree to plant, and how much to sell from the produce—decision on these aspects are thus, largely held by men. Men's dominance in decision-making may have been due to the fact that, compared to women, they have more access to new agricultural information through membership in farmer unions, participation in trainings, project activities, and have better extension contacts.

Perceptions of agroforestry benefits

The survey revealed a similar perception between males and females regarding soil erosion and agroforestry's role in addressing it. Both admitted that soil erosion is a serioius problem in the area. Female respondents in male headed households reported that their interest in agroforestry is more linked to preventing soil erosion, and additional income from fruits. The survey results were supported by findings in FGDs, in that both men and women recognised the value of integrating fruit trees with coffee, to control soil erosion, provide shade, and increase coffee yields and income. The survey also asked whether men and women would prioritise agroforestry in the future. The results revealed that both men and women gave a low priority for agroforestry (Table 7). A lower priority is found among men than women. Eight percent of women respondents prioritised agroforestry to improve soil fertility, while only 5% of men did. In addition, only 2% of surveyed men indicated a high priority for

TABLE 6 *Decision-making on farming activities by males and females*

	As reported by males (%) (*n = 228*)			**As reported by females (%) (*n = 66*)**		
Decision-making on	**Male**	**Female**	**Joint**	**Male**	**Female**	**Joint**
What crop or tree to plant	65	2	30	57	9	34
What variety or species to plant	55	14	31	43	22	35
When to plant	51	13	36	41	26	33
What fertilizer to use	47	16	37	45	22	32
Where to plant	54	11	35	50	24	26
How much to sell from produce and where	60	3	37	59	9	32

TABLE 7 *Agroforestry prioritization by men and women*

	Integrate trees to improve soil fertility		Integrate trees to improve income	
Priority level	**Male (%) (*n = 228*)**	**Female (%) (*n = 66*)**	**Male (%) (*n = 228*)**	**Female (%) (*n = 66*)**
No priority	90	77	93	89
Low	2	3	1	2
Moderate	3	12	4	3
High	5	8	2	6

integrating trees on farms to improve income, while 6% is found among women. In addition, female headed households were less interested in adopting agroforestry due to lack of technical knowledge and labour.

However, in FGDs in Nhop Village, both men and women expressed interest in expanding the multi-strata coffee system, presumably because the system was reportedly highlighly profitable. Women prefer intercropping coffee with fruit trees such as plum and apricot, and *Docynia Indica,* a native timber tree species, while men were more interested in other fruit and multipurpose trees species such as *Michelia Macclurei Dandy*, which is a good source of timber. Macadamia, which commands a higher price in the market but requires higher investments was of interest to men, as well.

Factors constraining agroforestry adoption by men and women

In the end, both men and women expressed difficulties in adopting agroforestry due to lack of technical skills (37% men; 39% women), lack of time and labour (22% men; 21% women), and high investment cost (3% men; 7% women) (Table 8). These constraints may be linked to the lower priority given by both men and women to agroforestry as a future undertaking, although the percentage of women prioritsing agroforestry is slightly higher than men (see Table 7). This may be because fewer women find it technically difficult to adopt agroforestry (4%) compared to men (11%). Technical knowledge and skills as generic limitations to agroforestry adoption should thus be addressed, with special attention to the specific training needs of women, especially since more women appear to be more interested in agroforestry but also appear to have more difficulties than men.

DISCUSSION

The lower priority given to agroforestry by men and women heightened efforts to promote agroforestry by AFLI project staff and local partners, particularly the local extension department. The study shows that the barriers to agroforestry adoption in the project site are not only linked to gender-specific differences, but also to interlinked socio-economic factors and extension approaches. Although our study included a lower number of females compared to males, the analysis has shown not only gender demarcation in terms of labour, but also work sharing in many farming activities, which confirms many of the experiences reported in the literature. Women in

TABLE 8 *Factors constraining agroforestry adoption*

	Annual crops with timber and fruit trees				Annual crops with tree-crops (e.g. coffee)			
Constraints	**Male (*n = 228*)**	**%**	**Female (*n = 66*)**	**%**	**Male (*n = 228*)**	**%**	**Female (*n = 66*)**	**%**
Lack of technical capacity	78	37	22	39	68	31	17	29
Lack of money	3	1	1	2	3	1	2	3
Lack of labor and time	47	22	12	21	20	9	7	12
Difficult to practice	24	11	2	4	45	21	6	10
High initial investment	6	3	4	7	6	3	5	8
Others	52	25	15	27	74	34	22	37

our study site participate more than men in fertilizing, weeding, harvesting and sorting crops while men are more into land preparation activities, such as farm lay-out, ploughing, planting, spraying, packaging and marketing products. Gender roles were also found to differ according to tree species in these agroforestry systems.

Our study revealed that female headed households are more poorly-resourced than male headed ones, with respect to land and labour, knowledge, household assets and finances. This corroborates the findings of other authors such as Doss (2001) and Mehra and Rojas (2008) who concluded that in many contexts, women have less access than men to productive resources and opportunities such as land, labour, education, extension, financial services and technology. The fact that all female headed households in the survey planted fewer trees in their home gardens can be associated with interlinked factors mentioned above. The smaller landholdings of female headed households, labour shortages, lack of credit capacity, and poor mobility may all have hindered their ability to expand their economic activities. There is thus a need for agroforestry to be designed in ways that address labour scarcity among female headed households. In terms of access to credit, female headed households should be given preferential treatment to address their disadvantaged position due to lack of collateral assets.

In contrast to many reports about women's knowledge of trees in the literature, women in our study site appear to be lacking in knowledge and skills on agroforestry due to lack of exposure to training and limited interaction with extension workers, resulting from the language barrier, low educational levels, and their assigned reproductive tasks. It is the men who easily access information from media sources and attend training courses since women have less time to either watch television or listen to radio programmes, and even less to attend trainings, due to their household work. The situation is worse for female heads of household. This calls for future agroforestry efforts to invest in producing extension materials in Hmong and Thai languages, as well as directly training women on agroforestry practices. The agenda of women's associations can be also expanded to include agricultural concerns, since these have been an important information source for women; agroforestry training can thus be included in the activities of women's associations.

That men in general are the decision makers in many aspects of production places women on an unequal playing field. Some authors point out that low decision-making power on household income allocation, livestock, cash crop production and marketing, and water management are often rooted in cultural and social norms (Akeredolu *et al.* 2007). The Thai people are traditionally organised into hierarchical social structures with matrilineages (Mellac 2006) while the Hmong's social structure is more horizontal with a patrilineal lineage system (Corlin 2004). This explains why Hmong girls have a very low school attendance, marry at a young age (majority group in the study sample), and are, in many ways disadvantaged by their own cultural traditions.

However, the study revealed no striking difference between men and women, in their access and control over income and income sources, and decisions are jointly taken by the husband and wife in terms of what to buy, and invest from household earnings. This suggests positive power relations that may overcome the gender disparities mentioned above. Apparently, this positive power relation between men and women is reinforced by Vietnam's Land Law mentioned above, as well as the Marriage and Family Law of 2000, which required LUCs obtained by husband and wife during the marriage to be considered their common property, in that the names of both husband and wife should be inscribed in the LUC (Menon *et al.* 2014*).* Pro-women policies such as these improve gender relations, providing positive effects on women.

Nevertheless, the sheer difficulties faced by women, particularly heads of households, in adopting agroforestry are significant, and need attention especially since women expressed more interest in agroforestry than men. The contexts and associated issues underpinning these difficulties should be also addressed if they are to benefit from agroforestry interventions.

CONCLUSION

We examined the gendered roles, access and control of resources from agricultural production in general, and agroforestry in particular, in the context of rural ethnic households in the mountainous region of northwest Vietnam. Farm labour was found to be gender demarcated, albeit many tasks are also significantly shared. Decisions regarding crop production and agroforestry are generally held by men. Women participate less in deciding what trees or crops to plant, and how much of the produce should be sold to the market. Gender disparities in terms of decisions with respect to farming activities and access to productive resources exist, but may be outweighed by equal access to benefits through joint decision-making in income utilisation and future investments. Lack of technical knowledge and labour constraints generally limit agroforestry adoption, but women in general, and heads of households in particular, face more challenges than men, which cannot be single-handedly addressed by a typical agroforestry intervention that has a linear focus on trees and crops alone. Agroforestry interventions must be designed holistically, in connection with extension and credit systems. We recommend that in overcoming women's constraints to agroforestry adoption, the AFLI project and future agroforestry interventions should (i) promote practices that cater to labour-scarce female headed households; (ii) provide preferential credit access to female heads of households; (iii) channel extension support to women's associations; and (iv) produce extension materials in local dialects. The lack of attention to gender issues limits agroforestry interventions to deliver benefits for rural households in Northwest Vietnam.

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