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Farmers' Characteristics and Awareness of Changing Cultivation Practices in the Central Highlands of Vietnam

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Abstract

Understanding the characteristics and awareness of respondents who participated in this study is critically important for policymakers, researchers, and traders. The study was conducted by interviewing 248 households in 89 villages throughout the Central Highlands. The results showed that males of the households played a large role in responding to outsiders (about 80.6% were male respondents). The age of most interviewees ranged from 30 to 50 years old (about 55.5%). Within the interviewed households, the ethnic group distribution was 21.4% indigenous people, 75.4% Kinh, and 3.2% other minority people. Most of the respondents were poorly educated (82.0% with a high school education or lower). The number of family members ranged from 4.0 (± 0.09) to 5.3 (± 0.29) persons per household, while the number of laborers for cultivation were from 2.25 (± 0.06) to 2.62 (± 0.26) persons per household depending on ethnic group. About 88.6% of the farmers were not aware of the changes in their local agriculture production, and 78.8% of the farmers did not respond or give any consideration to future changes. However, about 40% of the interviewed farmers wanted to change their cash crops. Therefore, understanding farmers might help to raise the urgent need to support capacity building for households with relevant policies and extension programs of the Government.

Keywords

Awareness, changing, characteristic, household (HH)

Introduction

Agriculture and food production have increased in developing countries (FAO, 2017), of which Vietnam's Central Highlands is one area of agricultural significance. This region encompasses five provinces with 5.87 million persons and 4.92 million ha of agricultural land (Vietnam Government, 2019a; b) and provides mainly coffee, black pepper, and other products to international

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markets. However, similar to other places around the world, agriculture in the Central Highlands of Vietnam has increasingly become knowledge-intensive and many farming smallholders had been confronted by constraints such as poor access to markets and financial services, low levels of human and physical capital, poor access to education, and weak information flows (FAO, 2017).

Decades of mono agriculture have resulted in plenty of problems, and consequently, farmers have looked to alternative solutions leading to more and more farmers applying agroforestry practices. About 65% of the surveyed households in a recent survey reported having applied agroforestry and multi/ inter-cropping practices, but almost all their farms were small (about 1.28-2.84ha per household). Consequently, the Central Highlands of Vietnam has been facing unbalanced and unsustainable development (Tran & Tran, 2024).

With a lack of markets, low skills, and weak capacity, agriculture across the developing world will have to overcome challenges like these in the future (FAO, 2017). Similarly, most farm households in the Central Highlands hold small farming areas (Tran & Tran, 2024) that could likely face the same challenges. Moreover, further understanding the characteristics of farmers (such as gender, age, minority groups, and education levels), who play a role in responding and making decisions in the household, is also important for approaching sustainable development. Additionally, a question needs to be answered - What do farmers think about the current and future changes of agri-cultivation? Thus, this paper set out to determine the characteristics of farmers in the Central Highlands and their awareness of cultivation systems in order to understand the real agriculture situation for making recommendations and policymaking suggestions on sustainable development at both the local and regional scales.

Study sites and Methods

Study location

Vietnam's Central Highlands includes five provinces (Gia Lai, Kon Tum, Dak Lak, Dak Nong, and Lam Dong). **Figure 1** shows the study sites that were distributed over the ecosystem zones of the regions, including the Ngoc Linh Mountains; Sa Thay lower mountains; Play Ku and Con Ha Nung Highlands; An Khe lower mountains; Cheo Reo, Phu Bon, and Ea Sup semi-plateau; Buon Me Thuot Highlands; M'Drak Mountains; Dak Nong and Dak Min Highlands; Chu Ang Sin mountains – Da Lat Armenian Highlands; and Di Linh and Bao Loc Highlands (Vu Tan Phuong *et al.*, 2012).

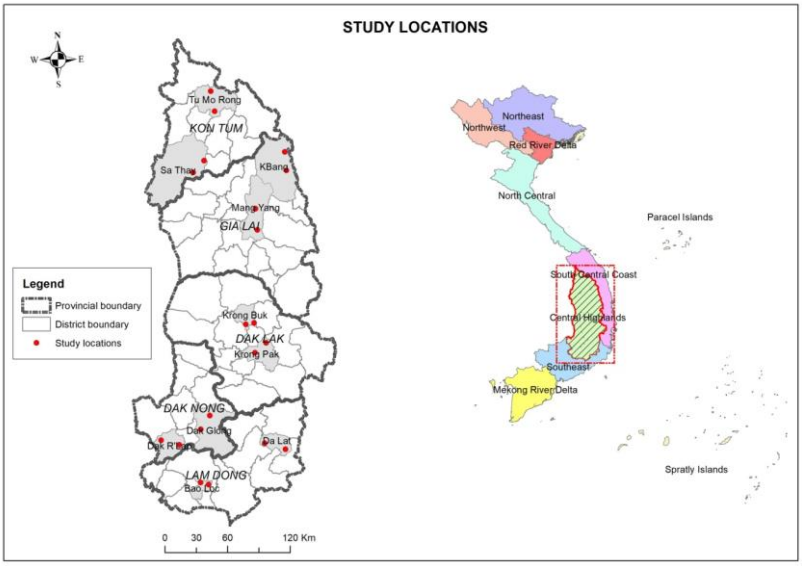


Figure 1. Map of the study sites in the Central Highlands, Vietnam

Source: Map based on data from the Department of Surveying, Mapping, and Geographic Information, Vietnam

Data and research methods

Primary data were collected from direct surveys in 2019 with 248 households in 89 villages of 20 communes participating as shown in **Table 1**. The interviewed households were selected by the snowball sampling method. This approach involves a minimum of two stages: (a) the identification of a sample of respondents with characteristic *x* at the zero-stage (s_0); and (b) the solicitation of referrals to other potentially eligible respondents believed to have characteristic *x* at snowball stages s_1 through sk (Goodman, 1961; Biernacki & Waldorf, 1981; Kirchherr & Charles, 2018). When applying this approach, the research conducted the zero-stage (s0) in each of the 20 communes in the study locations resulted in different numbers of referrals, and therefore, the numbers of villages and households surveyed, as shown in **Table 1,** were not equivalent.

Data were recorded, classified, and analyzed in Excel and R using the functions describe by ggplots and the Kruskal Wallis Test. The major criteria analyzed were the characteristics of the households (gender, ethnicity, number of household members, number of laborers, age, and education level), cultivation systems, and change perceptions of households.

Results and Discussion

Characteristics of the household interviewees in the Central Highlands of Vietnam

Gender characteristics of the household interviewees

The study surveyed 248 households distributed throughout the five provinces in the Central Highlands of Vietnam. Overall, more men (80.6% men; 200/248 samples) participated in the interviews than women (19.4% women; 48/248 samples), although the number of women interviewees was higher in Dak Nong Province than in the other provinces (29.2%) (**Figures 2a; b**)

Table 1. Sites and numbers of surveyed households using 'snowball sampling'

Provinces	Districts	Communes	Number of surveyed villages	Number of surveyed households
Kon Tum	Tumorong	Mang Ri	1	12
		Dak Ha	3	13
	Sa Thay	Sa Binh	4	12
		Yaly	5	12
Gia Lai	K'Bang	So Pai	4	12
		Son Lang	5	12
	Mang Yang	Lo Pang	3	12
		Kon Chieng	4	12
Dak Lak	Krong Buk	Tan Lap	3	15
		Ea Ngai	3	11
	Krong Pac	Krong Buk	7	11
		Ea Yong	6	14
Dak Nong	Dak R'Lap	Quang Tin	3	12
		Nhan Dao	6	12
	Dak Glong	Dak Ha	4	12
		Quang Son	6	12
Lam Dong	Da Lat	Ta Nung	5	14
		Xuan Truong	3	14
	Bao Loc	Loc Thanh	3	12
		Dam Bri	11	12

As many people living in rural regions of Vietnam have a traditional mindset, the man of the family is typically the representative to communicate in social life, while most women are usually too timid to communicate with researchers who are likely strangers.

Age characteristics of the interviewees

The age of the interviewees primarily ranged from 30 to 50 years old (55.5%), while those under 30 years of age accounted for 7.3% of the total and those over 50 years of age accounted for 37.1% (**Figure 3a**). The average age of all interviewees was 46.6 years old, and the average age of the indigenous minority interviewees was 39.52 (± 0.37) years-old, which was younger than both the Kinh people (48.52 (± 0.87) years-old) and other minority immigrants (55.12 (± 4.04) years-old) (**Figure 3b**), (χ^2 = 26.48, p = 1.776e^{-6}).

Ethnic characteristics of the household interviewees

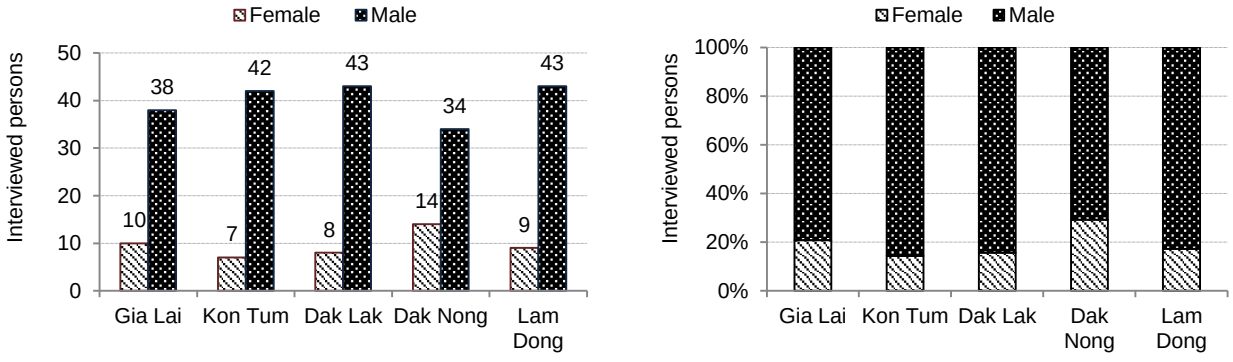
Analyzing the data by ethnic group (**Figures 4a and 4b**) revealed that there were three major groups, namely the indigenous minority group (I), Kinh group (K), and other minorities (immigrants) group (Other). The percentages of these groups varied, with 21.4% being indigenous people (53/248 samples), 75.4% being Kinh people (187/248 samples), and 3.2% being other minority people (8/248 samples). The largest percentages of indigenous people were located mainly in Gia Lai and Kon Tum provinces (37.5% and 59.2%, respectively).

Education characteristics of the respondents of the interviewed households

Figures 5a, 5b, 5c, and 5d show the education levels of the interviewees. Most of them only had a secondary or high school education (38.1% and 37.6%, respectively), while the percentage of interviewees who attended undergraduate was only 3.7%, and those who were illiterate was 6.3%. Within the 37.6% of respondents at the high school level, many farmers did not finish grade 12 (they stopped at Grade 10 or Grade 11). Of note, all the undergraduate and illiterate interviewees were male, and most of the illiterate respondents belonged to one of the indigenous minority groups (9/12 samples). Almost all of the female interviewees were at the secondary or high school level (30/34 samples; 14 others did not provide their education information).

Family member and laborer characteristics of the interviewed households

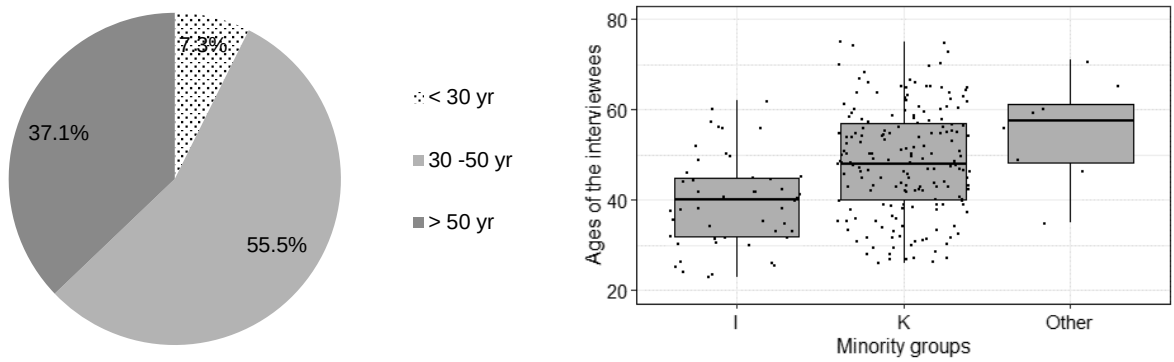
Within the surveyed data, household members ranged widely from 1 to 13 persons in each household but there was a significant difference among ethnic households (χ^2 = 18.352; P = 0.0001035). Particularly, the average number of family members of the indigenous households was 5.3 (± 0.29) persons, which was higher than that of the Kinh households at 4.0 (± 0.09) persons (**Figure 6a**). However, the number of family laborers for cultivation was not



(a) numbers of interviewees by gender

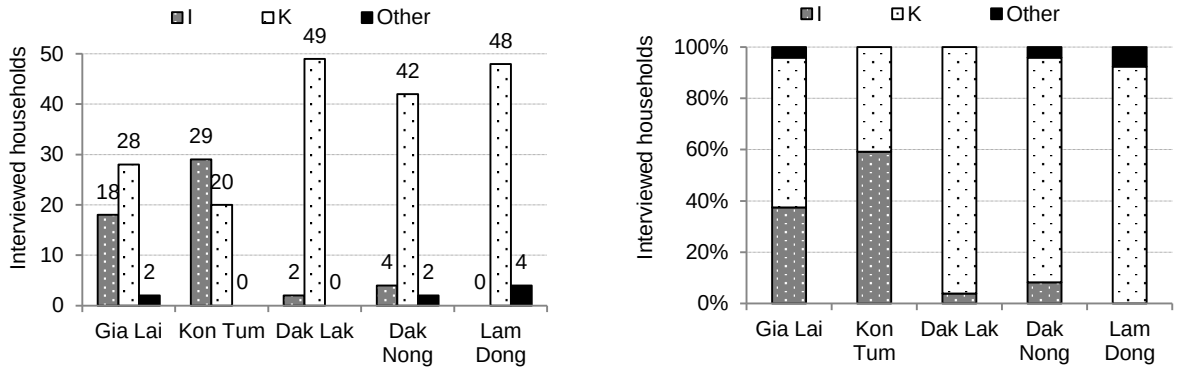
(b) percentages of interviewees by gender

Figure 2. Gender characteristics of the household interviewees at the study site



(a) percentages of interviewees by age (b) ages of interviewees by ethnic group

Figure 3. Age characteristics of the household interviewees at the study sites (I – indigenous minority group, K – Kinh group, Other – other immigrant minority group)



(a) numbers of interviewees by ethnic group (b) percentages of interviewees by ethnic group

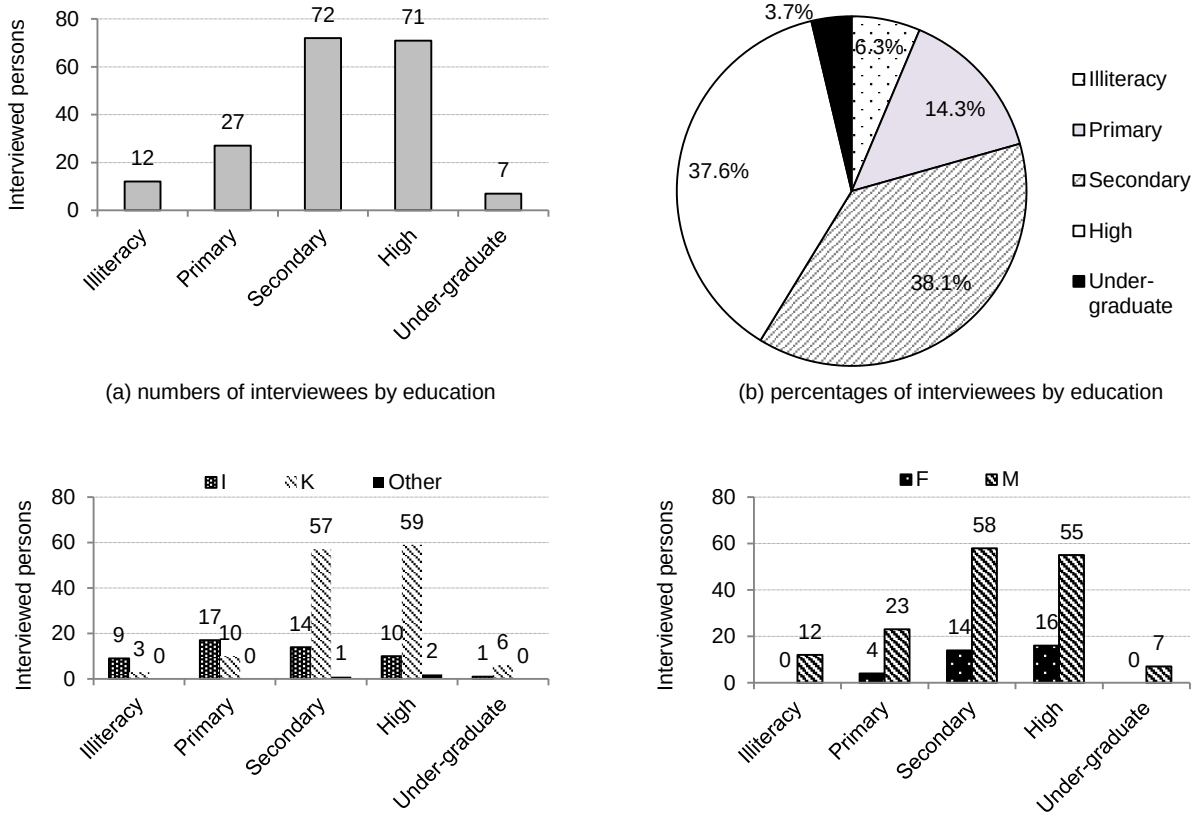
Figure 4. Ethnic characteristics of the household interviewees at the study sites (I – indigenous minority group, K – Kinh group, Other – other immigrant minority group)

the indigenous households averaged 2.47 (± 0.15) persons, while laborers of the Kinh households averaged 2.25 (± 0.06) persons, and other minority households averaged 2.62 (± 0.26) persons (**Figure 6b**), (χ^2 = 5.2725; p = 0.07163). Family members and laborers could be factors for the households when considering and making decisions about cultivation applications, and could likely connect to their awareness.

Awareness of changes in cultivation systems in the Central Highlands

The study set out to determine whether farmers could identify changes in their farms and local agriculture production. Any changes which farmers might realize, such as crops, trees, planting area, and cultivation techniques, were considered in this study. Based on the survey results, farmers realized changes with black pepper (12.9% of sampled households), coffee (31.5% of sampled households), avocado (21.0% of sampled households), durian (12.9% of sampled households), other fruit crops (9.3% of sampled households), other industrial crops (5.6% of sampled households), other crops (3.2% of sampled households), forest plants (10.1% of sampled households), animals (2.4% of sampled households), cultivation techniques (15.7% of sampled households), irrigation systems (11.7% of sampled households), semi-processing and storage (2.4% of sampled households), and other technologies (9.7% of sampled households) (**Figure 7a**).

Specifically, households reported identifying the changes in black-pepper production involving area increases (22 out of 248 respondent households, equivalent to 8.9%), area decreases (6 out of 248 respondent households, equivalent to 2.4%), and multi- and/or inter-cropping increases (4 out of 248



(a) numbers of interviewees by education

(b) percentages of interviewees by education

(c) numbers of interviewees by education and ethnic groups

(d) numbers of interviewees by education and gender

Figure 5. Education characteristics of household interviewees at the study sites [I – indigenous minority group, K – Kinh group, Other – other immigrant minority group; Education: Primarily school (grades 1 to 5); Secondary school (grades 6 to 9); High school (grades 10 to 12); and undergraduate (college or university), education of interviewees did not necessarily mean they completed the grade level or earned a degree]

respondent households, equivalent to 1.6%), but 87.1% of respondent households were not aware of the changes in the area of black pepper production in the region (**Figure 7b**).

In terms of coffee production, households identified the changes involving area increases (24 out of 248 respondent households, equivalent to 9.7%), area decreases (27 out of 248 respondent households, equivalent to 10.9%), multi- and/or inter-cropping increases (9 out of 248 respondent households, equivalent to 3.6%), and re-growing (18 out of 248 respondent households, equivalent to 7.3%), however, 68.5% of the respondent households were not aware the changes in the area of coffee production in the region (**Figure 7b**).

Households identified the changes in avocado production involving area increases (39 out of 248 respondent households, equivalent to 15.7%), area decreases (1 out of 248 respondent households), multi- and/or inter-cropping with avocado increases (11 out of 248 respondent households, equivalent to 4.4%), and re-growing (1 out of 248 respondent households), but 79.0% of the respondent households were not aware the changes in the area of avocado production in the region (**Figure 7b**).

The changes the households identified in durian production involved area increases (26 out of 248 respondent households, equivalent to 10.5%), area decreases (1 out of 248 respondent households), multi- and/or inter-cropping with durian increases (5 out of 248 respondent households, equivalent to 2.0%), and re-growing (e.g. 1 out of 248 respondent households,) however 79.0% of the respondent households were not aware the changes in the area of durian production in the region (**Figure 7b**).

When classified by ethnic group, 10.3% of the indigenous minority households (71

individual answers out of 53 sampled households), 11.5% of the Kinh households (279 individual answers out of 187 sampled households), and 17.3% of the other minority households (17 individual answers out of 8 sampled households) responded and gave answers to the thirteen categories listed in **Figure 7**.

Therefore, most of the interviewed households (about 88.6% of the 248 sampled households) did not identify the changes in their local agriculture production systems. Of which, most farmers mentioned changes in the areas of some major crops as presented above. The observed changing areas of such crops are likely related to the techniques, investments of the households, and markets in which farmers might consider. The limitations of the farmers' awareness of changes were influential in preventing them from making better decisions in choosing plants and animals, and learning and sharing experiences and market information. The above awareness of the farmers also indicated the reality of poor cooperation and links between the farmers themselves and outsiders. These could likely be considerations for recommending sustainable market-based agriculture development in the Central Highlands.

Farmers' considerations for future changes of their cultivation systems

To provide further understanding, the awareness of farmers on future changes in agriculture production was analyzed based on their responses to the eleven categories shown in **Figure 8**, which were collated through open questionnaires during the surveys. The interviewed households gave considerations about future changes involving general cultivation techniques (121 out of 248 sampled

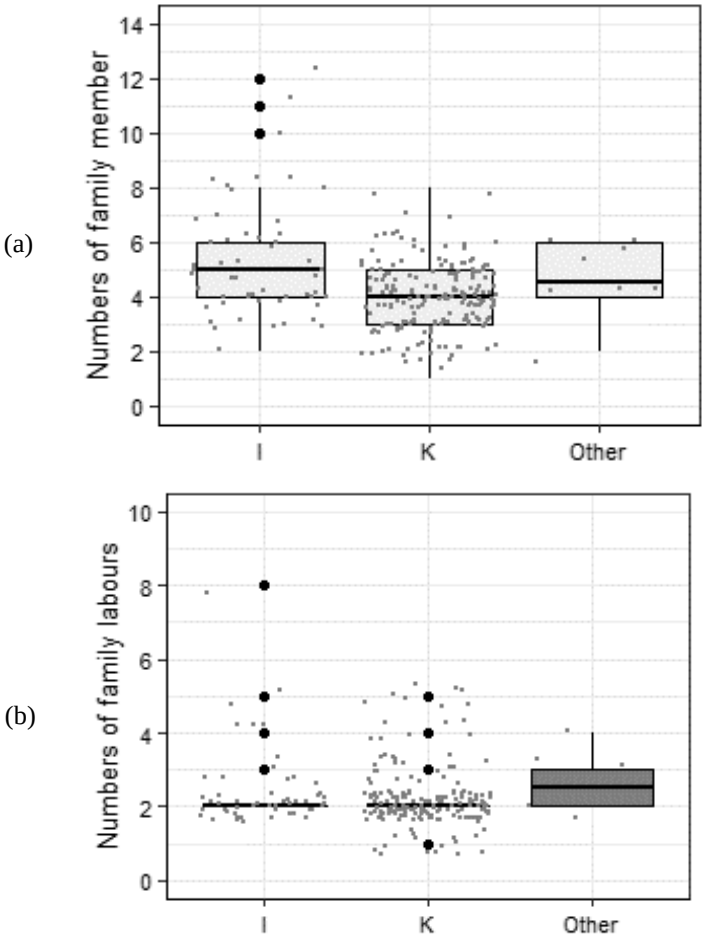


Figure 6. Numbers of family members and laborers of the interviewed households at the study sites (a – members per household; b – laborers per household)

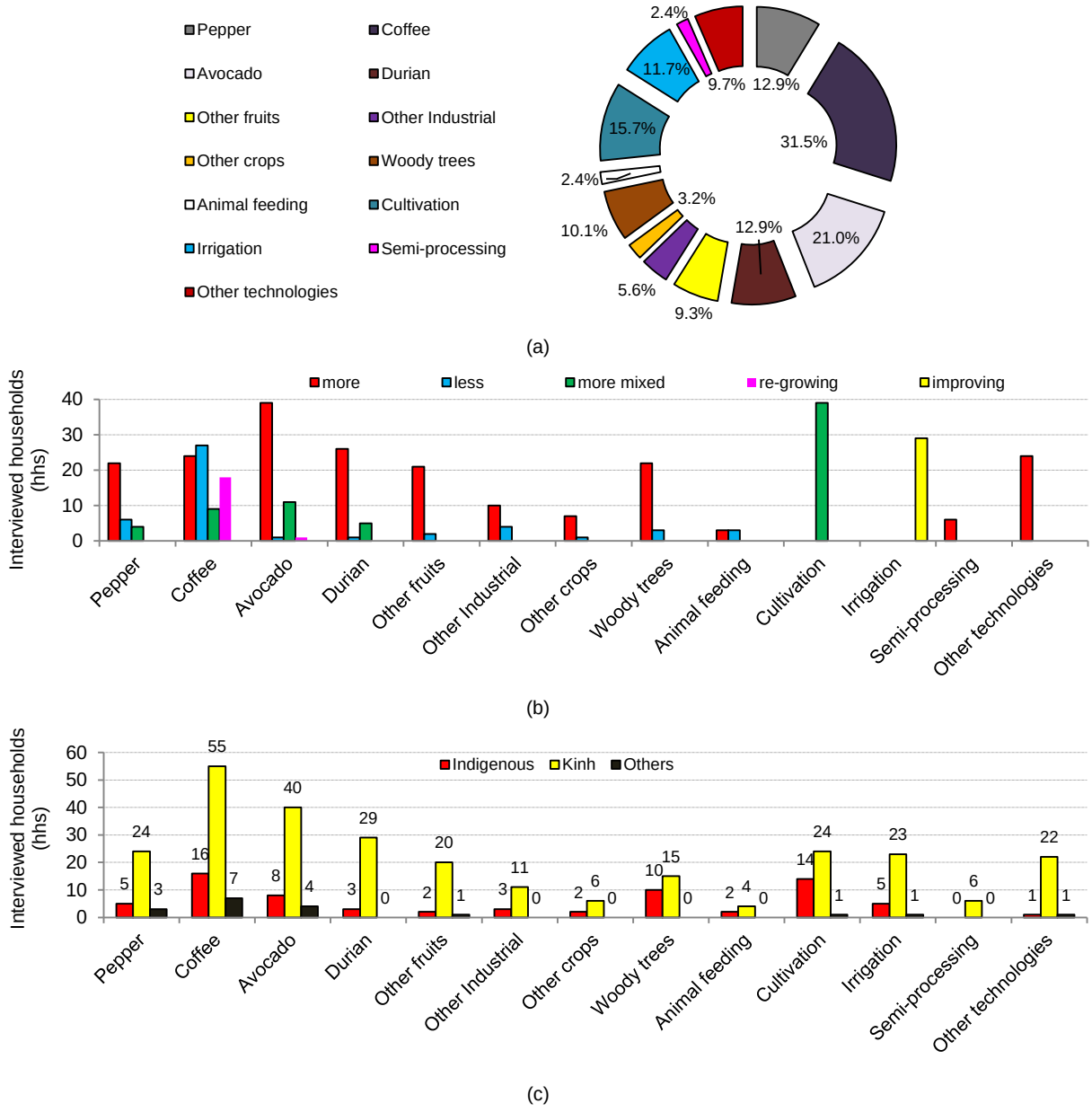


Figure 7. Household responses on existent changes in agriculture production at the study sites (a – percentages of households; b – numbers of households by type of change; c – numbers of households by ethnic group)

households, equivalent to 48.8%), using more manure (25 out of 248 sampled households, equivalent to 10.1%), growing forest plants (38 out of 248 sampled households, equivalent to 15.3%), increasing diversity in cultivation (59 out of 248 sampled households, equivalent to 23.8%), using chemical pesticides (30 out of 248 sampled households, equivalent to 12.1%), varieties of plants and animals (7 out of 248 sampled households, equivalent to 2.8%), markets (25 out of 248 sampled households, equivalent to 10.1%), efficient production (46 out of 248 sampled households, equivalent to 18.5%), prices of agricultural products (6 out of 248 sampled households, equivalent to 2.4%), keeping current production strategies (no changes) (112 out of 248 sampled households, equivalent to 45.6%), and shifting current production strategies (changing) (101 out of 248 sampled households, equivalent to 40.7%) (**Figure 8a, b**). When analyzing the data by ethnic group, 18.9% of the indigenous minority households (110 individual answers out of 53 sampled households), 21.5% of the Kinh

households (442 individual answers out of 187 Kinh sampled households), and 21.6% of the other minority households (19 individual answers out of 8 sampled households) responded to and considered the eleven categories listed in **Figure 8**. Of which, the indigenous minority households mainly responded and gave considerations to general cultivation techniques (23 out of 53 sampled households, equivalent to 43.4%), growing forest plants (10 out of 53 sampled households, equivalent to 18.9%), increasing diversity in cultivation (9 out of 53 sampled households, equivalent to 16.9%), and efficient production (9 out of 53 sampled households, equivalent to 16.9%); while the Kinh households mainly responded and gave considerations to general cultivation techniques (92 out of 187 sampled households, equivalent to 49.2%), growing forest plants (28 out of 187 sampled households, equivalent to 14.9%), increasing diversity in cultivation (49 out of 187 sampled households, equivalent to 26.2%), using chemical pesticides (25 out of 187 sampled households, equivalent to 13.4%), markets (22 out of 187 sampled households, equivalent to 11.8%), and efficient production (36 out of 187 sampled households, equivalent to 19.3%); and the other minority households mainly responded and gave considerations to general cultivation techniques (6 out of 8 sampled households) (**Figure 8c**).

When gathering opinions about changing or not changing the current cultivation systems, 50.9% (27 out of 53 households) of the indigenous minority households answered "NO" and 37.7% (20 out of 53 households) answered "YES"; while 42.2% (79 out of 187 households) of the Kinh households answered "NO" and 42.2% (79 out of 187 households) answered "YES"; and 75% (6 out of 8 households) of the other minority households answered "NO" and 25% (2 out of 8 households) answered "YES". The remaining households had no ideas (**Figure 8c**).

Generally, 78.8% of the sampled households did not respond or give any consideration to future changes in the above categories. Only a few of the respondents were aware of the changes in local farm production that farmers could likely adapt to mitigate future opportunities and problems. Of those who did respond, about 40% of the interviewed households would like to change their cash crops. However, most farmers poorly understood or lacked market information, which increases the challenges to agriculture in the Central Highlands.

Discussion on the farmers' traits and awareness in the Central Highlands

Being aware of the changes in farming practices is a big challenge for farmers who are limited in both internal and external capacities. Age, gender, experience, attitudes, and beliefs are personal traits that are common determinants of behavior that drive farmers to perceive information and make decisions (Rose *et al.*, 2018). Worldwide, the awareness among farmers covers a wide range of topics such as good agriculture practices (Joshi *et al.*, 2019), knowledge (Bonephace *et al.*, 2022), and organic farming (Rahul, 2021), among others. The characteristics of households in the Central Highlands of Vietnam presented above likely influence the behaviors, knowledge, and internal capacities of farmers as they apply their chosen cultivation systems. Within this study, most respondents did not report perceiving any changes. Identifying changes in plant growing areas, types of crops, and practices in communities are topics that are very familiar to farmers, however, only a few respondents were aware. Poor capacity among farmers in the Central Highlands of Vietnam is evident, and it is also a big gap that the government needs to consider filling with appropriate programs.

Recommendations

The study results showed big challenges in terms of the farmers' awareness, therefore multiple approaches are needed to deal with sustainable development in the Central Highlands. First, policies must be refined to address the limitations of both the internal and external capacities of small farmers, particularly related to indigenous ethnic groups. They need support in developing capacity-building programs for land tenure, financial access, and technical knowledge. However, it is necessary for appropriate training programs to involve

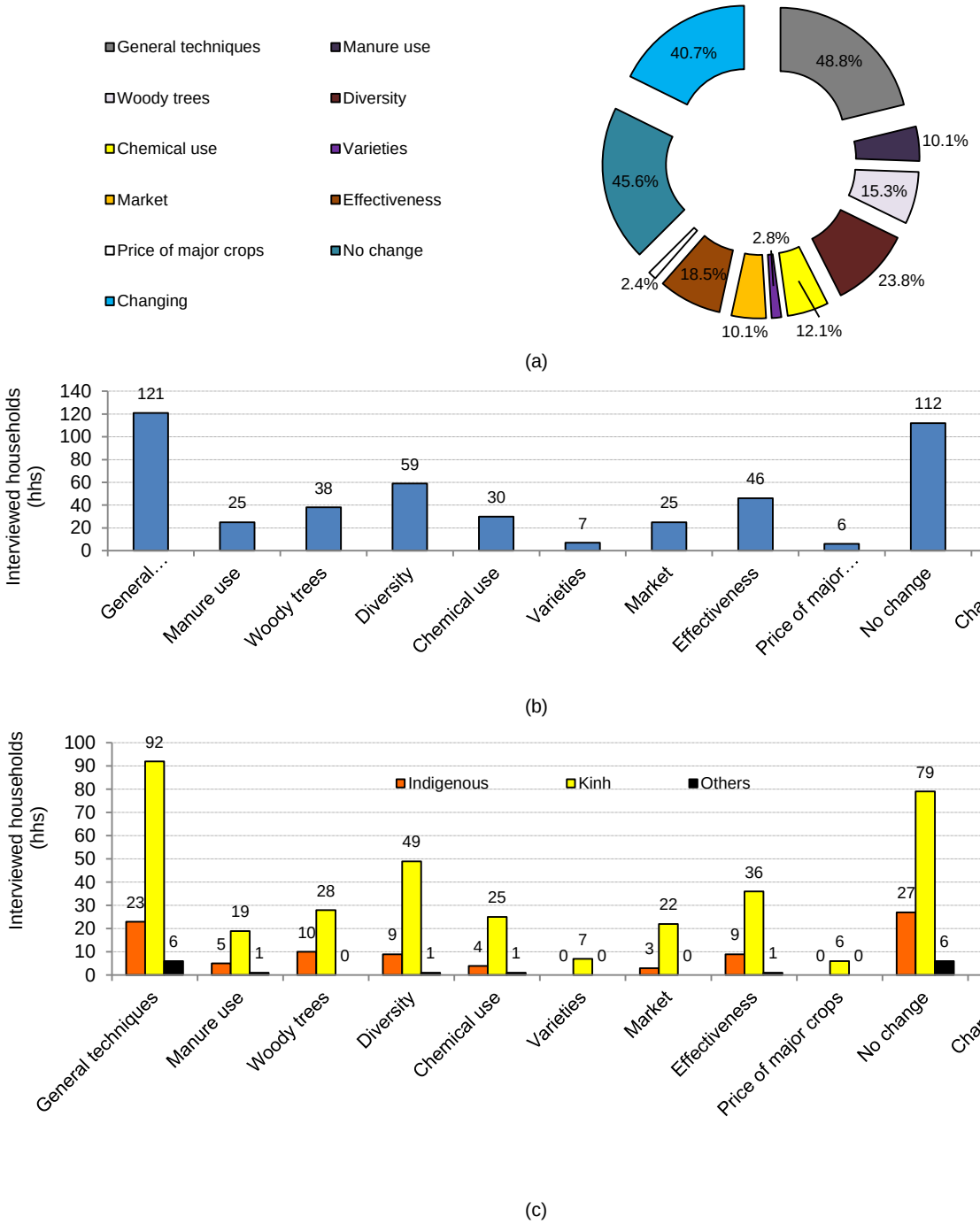


Figure 8. Farmers' considerations on future changes in agriculture production at the study sites (a – percentages of households; b – numbers of households by types of change; c – numbers of households by ethnic group)

indigenous trainers for training indigenous farmers using their local languages such as Ede, Bana, and Giarai.

Secondly, market access for cash crop products must be improved. This can be achieved by establishing cooperatives, strengthening value chains, and fostering partnerships with private companies. Lastly, strengthening the collaborations among research institutions, universities, and extension services to help farmers optimize land use, diversify their production, and increase their resilience to climate change in the individual provinces and within the whole region of the Central Highlands.

Conclusions

Farmers who participated in the survey at the study sites had many characteristics in common, including (i) the men played a larger role (80.6%) in responding to outsiders (interviewers) even within the indigenous people of Ede and Giarai who traditionally have female heads of the family; (ii) the ages of the interviewees mostly ranged from 30 to 50 years old (55.5%); (iii) the ethnic group distribution was 21.4% indigenous, 75.4% Kinh, and 3.2% other minority people; (iv) most of the interviewees reported secondary or high school as their highest level of education (38.1% and 37.6%, respectively), and illiteracy was 6.3%; (v) the average number of family members of the indigenous households was 5.3 (± 0.29) persons, which was higher than that of Kinh households at 4.0 (± 0.09) persons, but the numbers family laborers for cultivation were not different among ethnic households (2.47 (± 0.15) persons for the indigenous group, 2.25 (± 0.06) persons for the Kinh group, and 2.62 (± 0.26) persons for the other minorities group).

Most farmers (about 88.6%) did not identify the changes around their local agriculture production, and 78.8% of farmers did not respond or give any considerations to future changes. However, some farmers (about 40% of respondents) would change their cash crops. The limitations of the farmers' awareness of changes were influential aspects that prevented them from making better decisions in choosing plants and animals, or learning and sharing experiences and market information.

These results will help policymakers, researchers, and traders better understand farmers in the Central Highlands of Vietnam, who likely lack awareness about their cultivation systems. Thus, an urgent need for farmers is support in building up their capacities through relevant policies and extension programs from the Government.

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