



INITIATIVE ON  
Nature-Positive  
Solutions

## WP2 Vietnam Baseline report

Developing farming systems towards sustainability and diversification and value chain development

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## List of abbreviations

CIAT	International Center for Tropical Agriculture
DHC	Diet health club
CGIAR	Consultative Group on International Agricultural Research
MS	Microsoft
NCD	Non-communicable diseases
NPS	Nature positive solution
NWO	Dutch Research Council
VCG	Value chain group
WP	Work package

## Executive summary

Sustainable resource management and biodiversity conservation have become a priority in agricultural production. A cross-sectional survey was conducted on 174 households who were members of Diet Health Clubs (DHCs) and Value Chain Groups (VCGs) using both quantitative and qualitative methods. Quantitative data was collected using the Kobo Toolbox application and analyzed using Stata v15.2 software, while qualitative info was recorded in MS Word and analyzed using MS Excel.

The results showed that the majority of the participants in DHCs and VCGs were female (86%) and former members of the NWO project (76.4%). Most of them (over 80%) had attended at least three training sessions in the previous time. Over 50% of households experienced land erosion, and the percentage of households with good soil quality was very low (upland: 14.5%, lowland: 27.9%, and home garden: 32%). On average, each household cultivated approximately 17 different staple crops and 10 vegetable ones and H'mong grew the fewest (14 and 10 respectively). Households in Mai Son, H'mong, and DHCs grew vegetables for sale and applied nature positive solutions (NPS) fewer than those in Sa Pa, Dao/Thai, and VCGs.

Regarding production over the past three months, Mai Son, Thai, and VCG exhibited larger vegetable production areas compared to other groups. The majority of households cultivate vegetables in their home gardens (86%) and predominantly utilize indigenous vegetable varieties (almost 78%). While the primary focus for farmers is self-consumption, 44% of households still engage in vegetable sales, with a concentration in the Dao and VCG groups. On average, each household cultivates nearly 10 types of vegetables, including three types of DGLV and four other types of vegetables. The Thai group tends to cultivate a higher number of DGLV types (4), and the Dao group cultivates more diverse types of other vegetables (5) compared to other groups. A majority of households (76%) rely on self-saved vegetable seeds for cultivation, but nearly 30% of households face challenges with seed germination. Approximately 77% of vegetables are used similarly in the last season for sowing purposes in the upcoming plan (82.6%).

On Nature Positive Solutions (NPS), many households adopt practices such as nutritional arrangement, intercropping, and reducing/eliminating the use of chemical pesticides and disease prevention spraying (67.8%, 67.7%, 67.2%, 61.5%), particularly in Sa Pa (92.7%, 89%, 87.8%, 85.4%) and the Dao group (90.8%, 90.8%, 90.8%, 90.8%). Meanwhile, Mai Son (96.7%) and the Thai group (94.8%) have the highest percentage of farmers using fertilizers.

In terms of food consumption, the average diversity food group score among ethnic households was 5, the NCD-Protect score was 3, and the NCD-Risk score was 2. Households in Sa Pa and among the H'mong and Dao ethnic groups had lower diversity and NCD-Protect scores than those of other groups. Additionally, very few households (17%) consumed all five recommended food groups, with this percentage being particularly low in the Sa Pa, H'mong, and Dao groups. On the other hand, households in Mai Son, Thai, and DHCs consumed vegetables fewer than the community average (73%), but these groups had a higher consumption of salty or fried snacks. Conversely, households in Sa Pa and the Dao group consumed more sweet foods. Men played a central role in decision on agricultural production, purchasing asset, economic development loans, or income utilization.

In-depth interviews with VCGs revealed that the Van Phuc cooperative had a larger scale and higher production costs for commercial vegetable cultivation compared to the Can Ho group, which primarily focused on seed production. Both groups faced challenges related to accessing high-quality seeds, harsh weather conditions, low prices, land degradation, seed wastage, weak marketing activities, and limited management capacity. Regarding seed use, the Van Phuc cooperative relied on sources from companies

and markets, while the Can Ho group could produce their own seeds for future seasons. Both groups had production and marketing plans for their crops but encountered difficulties related to weather, prices, and access to input materials, leading to deviations from their plans. Therefore, there is a need to enhance the capacity of DHC and VCG members in applying NPSs in production and consuming healthy food groups (vegetables, fruits, legumes). In addition, gender equality education for DHC members, expanding nursery production scale, developing local vegetable brands, and strengthening the capacity of VCG management should also be prioritized.

## **1. Introduction**

The OneCGIAR initiative on Nature-positive Solutions for Shifting Agrifood Systems to More Resilient and Sustainable Pathways (Nature+) aims to re-imagine, co-create, and implement nature-positive solutions-based agrifood systems that equitably support food and livelihoods on the ground, while simultaneously ensuring that agriculture is a net positive contributor to nature. Working with stakeholders across agriculture, economic, environment, and natural resource management sectors at farm- and community-level, the initiative will work to meet food demands of growing populations by stewarding biodiversity and improving soil and water management with integrated nature-positive solutions. This will include to i) Boost critical ecosystem services and enhance social and economic benefits, including equality. ii) Tackle the root economic and political causes of environmental degradation from agricultural production. iii) Harness the power of nature-based solutions and ecosystem services alongside advances in digital agriculture and agronomy to reverse negative trends around natural assets, including climate, biodiversity, land, and water.

WP2 will contribute to working with smallholder communities to ensure the sustainable, nature-positive management of biodiversity and other natural resources and improve production systems through nature-positive innovations, learning, and technologies. This will mainly be achieved through i) Participatory evaluation of the production and agrobiodiversity and capacity building of farmer groups in order to develop the farming systems towards sustainability and diversification and ii) Strengthening sustainable vegetable value chains to improve quality of produce and farmer household income. Understanding the use and potential of nature positive solutions is a possible entry point for improving diversity, sustainability in both production and consumption patterns. The activities of WP2 in Vietnam build on the work by the NWO vegetable seed systems project with seed/vegetable value chains groups and the diet health clubs, which align with Nature+. The strong focus on nutrition, market access, and women inclusion in the NWO project can be further strengthened, while paying more attention to (agro)biodiversity and environmentally friendly principles and practices.

## **2. Survey objectives**

The baseline survey was a part of WP2 of Nature+ initiative in Vietnam. Specific objectives of the baseline were:

- Identify nature positive practices among ethnic minority households
- Examine crop diversity in production and dietary diversity in consumption

## **3. Methodology**

### **3.1. Study design**

This was a cross-sectional descriptive study, combined with qualitative research methods. The qualitative research component was conducted simultaneously with the quantitative component, to supplement information regarding the advantages and challenges related to the organization and marketing in the value chain groups.

### **3.2. Survey respondents and sites**

*Quantitative survey:* All participants were ethnic household who are members of Diet Health Clubs (DHCs) and Value Chain Groups (VCGs) in Co Noi and Chieng Chan communes (Mai Son district, Son La province) and Ngu Chi Son commune (Sa Pa township, Lao Cai province).

*Qualitative survey:* Management board of directors of the 02 VCGs: Van Phuc cooperative in Co Noi commune (Mai Son district, Son La province) and Can Ho seed production group in Ngu Chi Son commune (Sa Pa township, Lao Cai province).

DHCs were instituted and centered around the core of the village women's union—a socio-political organization that represents the women's class. These entities play a constructive role in advancing the agricultural development process and the establishment of new rural areas. The objective of the DHCs was to provide a platform for capacity building and knowledge and skill exchange on seeds, production, and nutrition to enhance utilization and demand for groups of women at village level. On the other hand, VCGs comprise both female and male farmers engaged in the cultivation and marketing of vegetables and vegetable seeds. In the context of the NWO project, VCG aims to augment business revenue derived from agricultural products.

### **3.3. Survey sample size**

In terms of sample, the baseline survey was conducted with 174 members from 3 ethnic groups: Thai, H'mong, and Dao. The sampled groups were pre-selected for Nature+ WP2 activities. The detailed sample size collected is shown in the table 3.1 below

**Table 3.1. Sample size and research sites**

<b>District</b>	<b>Commune</b>	<b>Group</b>	<b>Ethnicity</b>	<b>Sample size</b>
Mai Son (95)	Co Noi (55)	Nong Quynh DHC	Thai	21
		Nong Mon DHC	H'mong	17
		Van Phuc cooperative	Thai	17
	Chieng Chan (40)	Na Hun DHC	Thai	19
		Tong Tai B DHC	H'mong	21
Sa Pa (86)	Ngu Chi Son (86)	Phin Ho DHC	Dao	19
		Xin Chai DHC	Dao	21
		Sin Chai DHC	H'mong	19
		Can Ho seed production group	Dao	27
<b>Total</b>				<b>181</b>

### **3.4. Data collection**

Data was collected in July 2023. For recruitment into the survey, FAVRI staff communicated with DHCs and VCGs leaders to inform them about the purpose and interview plan in each village. A list of eligible respondents was developed based on the result of group identification (task 1 in WP2). The list included group member's names, their gender, household's headers, village, and phone numbers.

Enumerators in two study sites were identified and involved in a 1 day-training course including theory and practice, on how to administer the quantitative and qualitative tools. "The survey tools were tested in Lech village, Co Noi commune (Mai Son district), and Ta Van Mong village, Muong Hoa commune (Sa Pa town), two locations with similar settings to the target ones but not within the survey sites. After the pre-test, the questionnaire was linguistically adjusted for appropriateness and logical consistency across the questions.

Enumerators reached out to the participants for interviews based on the prepared list. They introduced the objectives and content of the survey and obtained informed consent before conducting the interviews. All quantitative data was collected through the Kobo Toolbox application that was installed on the tablets.

Meanwhile, key-informant-interviews with the management board of directors of the VCGs were conducted by two enumerators using a semi-structured questionnaire on paper.

### **3.5. Data analysis**

*For quantitative data*, once all data collection was completed, quantitative data is converted to a Stata file for analysis. The analysis was conducted by a researcher of FAVRI using Stata v15.2 software. The data was fully analyzed to address the research questions/baseline survey objectives. Descriptive statistical results are presented in terms of frequencies, proportions, mean values, and standard deviations.

*For qualitative data*, information from the qualitative portion was transcribed and stored as Word files. The content of the KIIs was coded and grouped based on themes, using Excel 2019. Several important details of the subject were extracted to demonstrate the results of the survey.

### **3.6. Ethical approvals/ permission**

The survey obtained approval from the Institutional Review Board of the Alliance of Bioversity International and CIAT dated July 4, 2023. Informed consent was obtained from each participant. All analyses and reported results were aggregated to prevent individual disclosure.

## **4. Survey Findings**

The quantitative survey was conducted on 174 members of DHCs (130) and VCGs (44) in three communes located in Mai Son district (92) and Sa Pa town (82). The number of members in each ethnic group was relatively similar across the three minority ethnic groups: Thai (58), H'mong (51), and Dao (65). In addition, two in-depth interviews were conducted with members of the management board of Van Phuc cooperative (Mai Son district) and the Can Ho seed production group (Sa Pa town).

## 4.1. Household survey results

### 4.1.1. General characteristics

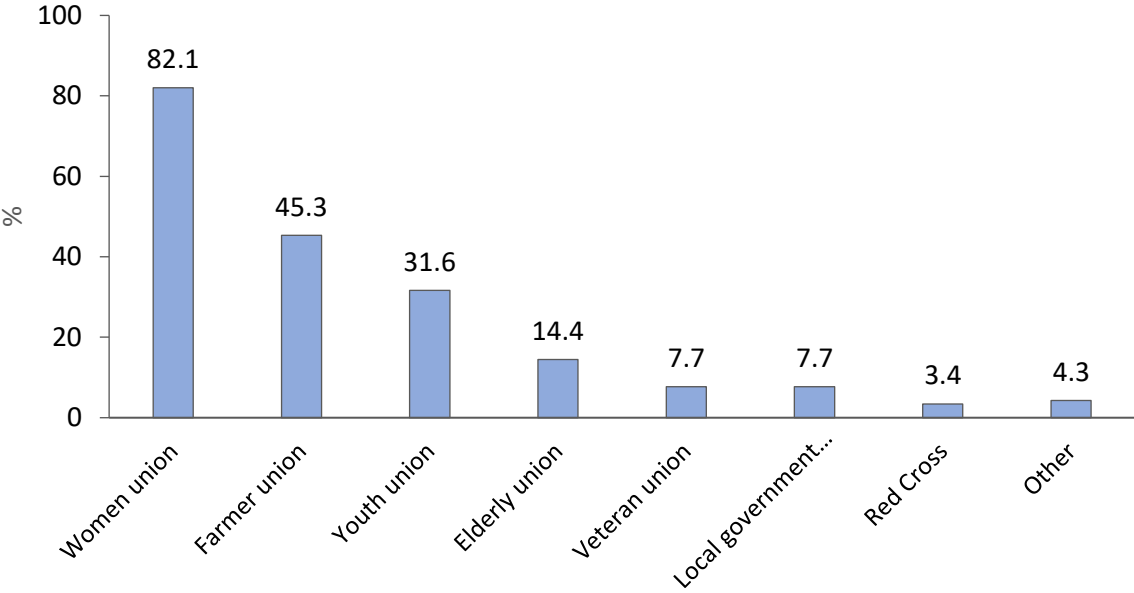
**Table 4.1. Household characteristics of respondents by district and ethnicity**

Indicator	District		Ethnicity			Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	
Age of respondent (mean ± SD)	36.9 ± 10.0 (18-61)	36.3 ± 10.6 (19 - 67)	37.3 ± 10.1 (18 - 61)	34.1 ± 9.2 (19 - 58)	37.9 ± 11.0 (21 - 61)	36.6 ± 10.2 (18 - 67)
Gender of respondent (%)						
<i>Male</i>	15.2	14.6	20.7	7.8	15.4	14.9
<i>Female</i>	84.8	85.4	79.3	92.2	84.6	86.1
Educational level of respondent (%)						
<i>No qualification</i>	38.0	50.0	19.0	68.6	46.2	43.7
<i>Primary school</i>	22.8	15.9	31.0	7.8	18.5	19.5
<i>Lower secondary school</i>	26.1	24.4	32.8	19.6	23.1	25.3
<i>Higher secondary school and above</i>	13.0	9.8	17.2	3.9	12.3	11.5
Number of household member (mean ± SD)	5.0 ± 1.5 (2-10)	5.7 ± 2.1 (2-11)	5.1 ± 1.5 (2 - 8)	5.3 ± 1.7 (3 - 11)	5.6 ± 2.1 (2 - 12)	5.4 ± 1.8 (2 - 12)
<i>Number of household member under     5</i>	0.5 ± 0.8 (0-3)	0.7 ± 0.9 (0 - 4)	0.4 ± 0.7 (0 - 3)	0.8 ± 0.9 (0 - 3)	0.6 ± 0.9 (0-4)	0.6 ± 0.8 (0 - 4)
<i>Number of household member under     6-12 years old</i>	0.8 ± 0.8 (0 - 3)	0.8 ± 0.9 (0 - 4)	0.8 ± 0.8 (0 - 3)	1.0 ± 0.9 (0 - 4)	0.6 ± 0.8 (0 - 3)	0.8 ± 0.9 (0 - 4)
<i>Number of household member under     13-18 years old</i>	0.7 ± 0.8 (0 - 3)	0.7 ± 0.9 (0 - 3)	0.6 ± 0.7 (0 - 2)	0.8 ± 0.9 (0 - 3)	0.6 ± 0.9 (0 - 2)	0.7 ± 0.9 (0 - 3)
<i>Number of household member under     19-60 years old</i>	2.8 ± 1.1 (2 - 6)	3.1 ± 1.5 (1 - 8)	3.0 ± 1.2 (2 - 6)	2.5 ± 0.8 (2 - 5)	3.3 ± 1.6 (1 - 8)	3.0 ± 1.3 (1 - 8)
<i>Number of household member under     above 60 years old</i>	0.3 ± 0.6 (0 - 2)	0.4 ± 0.7 (0 - 2)	0.3 ± 0.6 (0 - 2)	0.2 ± 0.6 (0 - 2)	0.4 ± 0.7 (0 - 2)	0.3 ± 0.6 (0 - 2)
Head of the household (%)	21.7	17.1	24.1	15.7	18.5	19.5
Educational level of household head (%)						
<i>No qualification</i>	28.3	48.8	13.8	58.8	43.1	37.9
<i>Primary school</i>	28.3	12.2	34.5	11.8	15.4	20.7
<i>Lower secondary school</i>	17.4	24.4	25.9	11.8	23.1	20.7
<i>Higher secondary school and above</i>	26.1	14.6	25.9	17.7	18.5	20.7
Household is an old members NWO DHC or VCG (%)	82.6	69.5	77.6	60.8	87.7	76.4

The study respondents were predominantly females (86.1%), with an average age of approximately 37 (±10) years, and the Dao ethnic group had the highest average age at 38 (±11). Nearly 44% of them did not have formal qualification, with the highest proportion observed in the H'mong group (68.6%) and in Sa Pa (50%). On average, a household consisted of a total of 5 members, with 3 members in the working age group (19-60 years old), and this pattern was consistent across districts and ethnicities. Approximately 20% of the respondents identified as household heads, with the highest proportion found in the Thai group (24.1%).

Approximately 38% of household heads did not have qualification, with the highest proportion observed among the H'mong group (nearly 59%) and in Sa Pa (almost 49%). The proportion of households participating in local group was 67.2%, with the highest rate in Mai Son (94.6%) and among the Thai ethnic group (98.3%).

The proportion of former members from the NWO project who continue to participate in the groups is 76.4%. This rate is higher in Mai Son compared to Sa Pa (82.6% vs. 69.5%). Among the ethnic groups, the Dao group has a higher rate than the Thai and H'mong groups (87.7% vs. 77.6%, 60.8%), and the DHCs have a higher rate than the VCGs (83.3% vs. 73.8%).



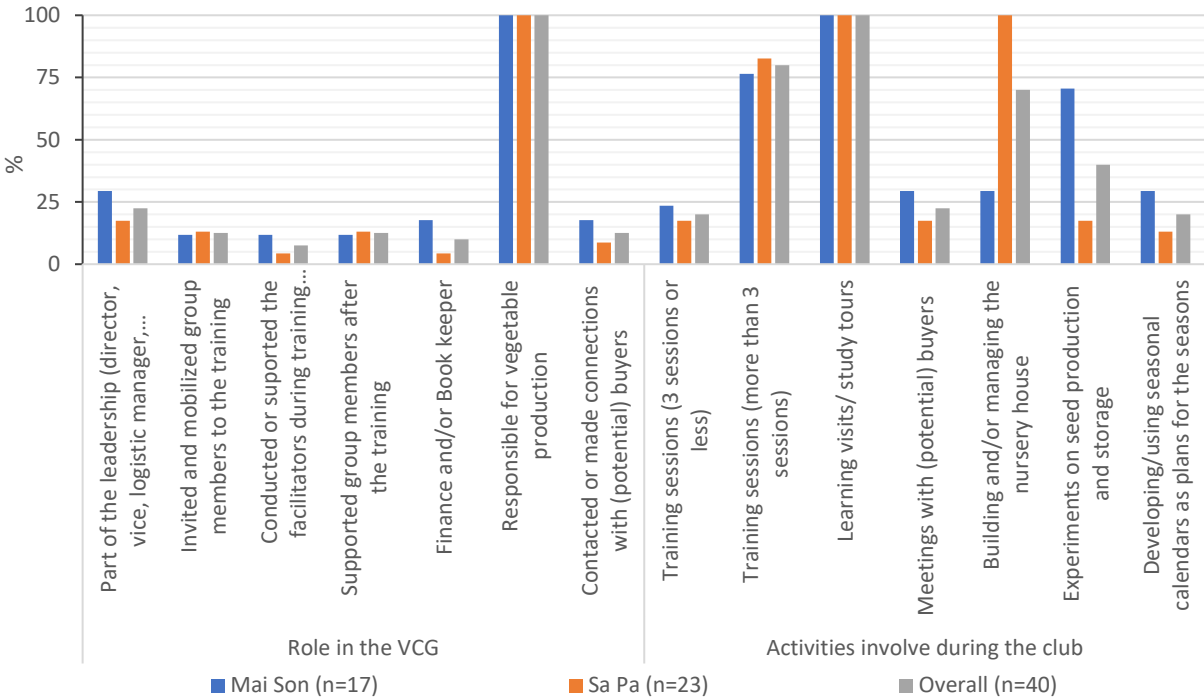
**Figure 4.1. Participation of local groups of respondent (n=117)**

Households were often members of women's associations (82.1%) and farmer associations (45.3%).

**Table 4.2. Participation in DHCs and expectation among member households by district and ethnicity**

Indicator	District		Ethnicity			Overall (n=93)
	Mai Son (n=59)	Sa Pa (n=34)	Thai (n=28)	Hmong (n=31)	Dao (n=34)	
Role in the DHC						
<i>Facilitate and support club</i>	11.9	5.9	10.7	12.9	5.9	9.7
<i>Only as a participant</i>	88.1	94.1	89.3	87.1	94.1	90.3
Activities involved in during the club						
<i>3 training sessions or less</i>	17.0	14.7	21.4	12.9	14.7	16.1
<i>More than 3 training sessions</i>	83.1	79.4	78.6	87.1	79.4	81.7
<i>Practical cooking sessions</i>	49.2	14.7	46.4	51.6	14.7	36.6
<i>Seed provision</i>	17.0	0.0	21.4	12.9	0.0	10.8
<i>Nutrition contest</i>	3.4	0.0	3.6	3.2	0.0	2.2

The majority of members participated in DHCs as attendees (90.3%), with a slightly higher percentage observed in Sa Pa and the Dao group (both 94.1%). Most group members attended at least three training sessions (81.7%) during their recent involvement with DHCs.



**Figure 4.2. Participation in VCGs and expectation among member households by district**

For the VCGs, all members have roles in vegetable production and participate in study tours in Hanoi and Dien Bien. Similarly, about 80% of them have participated in at least 3 training sessions, and 70% have established nursery gardens during their involvement with the VCGs in the recent period.

4.1.2. Land use

**Table 4.3. Number of plots and area of household’s land in the last season**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=57)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VC (n=44)	
# of land plots household owned (mean)	3.4	4.6	3.9	2.7	5.0	4.0	4.0	4.0
# of land plots household own and cultivate (mean)	3.3	4.5	3.9	2.4	5.0	3.8	4.0	3.9
# of land plots household own and but not cultivate (mean)	0.1	0.1	0.0	0.3	0.0	0.1	0.0	0.1
# of land plots household cultivated but not owned (mean)	0.2	0.0	0.1	0.3	0.0	0.1	0.0	0.1
Area of cultivated land plots (ha)	1.1	0.4	1.0	0.8	0.4	0.8	0.6	0.7

In the last 3 months, each household owned and cultivated around 4 parcels of land, with total area of 0.7 ha on average. The number of parcels owned by farmers in Sa Pa exceeds that of Mai Son by about 1. Among the various ethnic groups, the Dao community holds the highest number of parcels, totaling 5, while the Hmong community possesses the least, with nearly 3 parcels per household. Nevertheless, the

agricultural land area of households in Mai Son (1.1 ha) and the Thai community (1.0 ha) is larger compared to the other ethnic groups. In the fact that they generally are cultivating all the plots they own and hardly any they don't own.

**Table 4.4. Soil erosion and quality of member households by district, ethnicity and group**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=57)	Hmong (n=51)	Dao (n=65)	DHC (n=126)	VCG (n=48)	
Soil erosion	70.7	40.2	67.2	56.9	46.2	57.1	54.2	56.3
The quality of the soil in the upland	Mai Son (n=91)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=125)	VCG (n=48)	Overall (n=173)
<i>Poor</i>	34.1	23.2	36.8	29.4	21.5	29.6	27.1	28.9
<i>Medium</i>	57.1	56.1	52.6	58.8	58.5	59.2	50.0	56.7
<i>Good</i>	8.8	20.7	10.5	11.8	20.0	11.2	22.9	14.5
The quality of the soil in the lowland	Mai Son (n=84)	Sa Pa (n=81)	Thai (n=57)	Hmong (n=44)	Dao (n=64)	DHC (n=119)	VCG (n=46)	Overall (n=165)
<i>Poor</i>	1.2	4.9	1.8	2.3	4.7	4.2	0.0	3.0
<i>Medium</i>	75.0	63.0	71.9	75.0	62.5	72.3	60.9	69.1
<i>Good</i>	23.8	32.1	26.3	22.7	32.8	23.5	39.1	27.9
The quality of the soil in the home garden	Mai Son (n=91)	Sa Pa (n=80)	Thai (n=58)	Hmong (n=51)	Dao (n=63)	DHC (n=125)	VCG (n=48)	Overall (n=172)
<i>Poor</i>	5.4	2.5	5.2	3.9	3.2	5.6	0.0	4.1
<i>Medium</i>	68.5	58.8	65.5	66.7	60.3	64.0	63.8	64.0
<i>Good</i>	26.1	38.8	29.3	29.4	36.5	30.4	36.2	32.0

Over 56% of households reported to have experienced soil erosion in their cultivated land in the past year, with the highest rate observed in Mai Son (nearly 71%) and among the Thai ethnic group (67.2%). Regarding soil quality in upland areas, only about 15% of households considered it to be good, with higher proportions in Sa Pa (20.7%), the Dao group (20%), and VCGs (almost 23%). Approximately 28% of households believed that the quality of lowland soil was good, with even higher percentages in Sa Pa (32.1%), the Dao group (32.8%), and VCGs (39.1%). Around 32% of households rated the quality of soil in their home gardens as good, with higher percentages in Sa Pa (nearly 39%), the Dao group (36.5%), and VCGs (over 36%).

### 4.1.3. Crop production

Around 87% of farming households produced ordinary maize, 40% glutinous corn, 55% sticky rice, and 49% ordinary rice. In terms of fruit production, nearly 44% had mango, 47% longans (primarily in Mai Son), 37.4% peaches (mainly in Sa Pa), and 47% plums, distributes across both districts (see Annex 4)

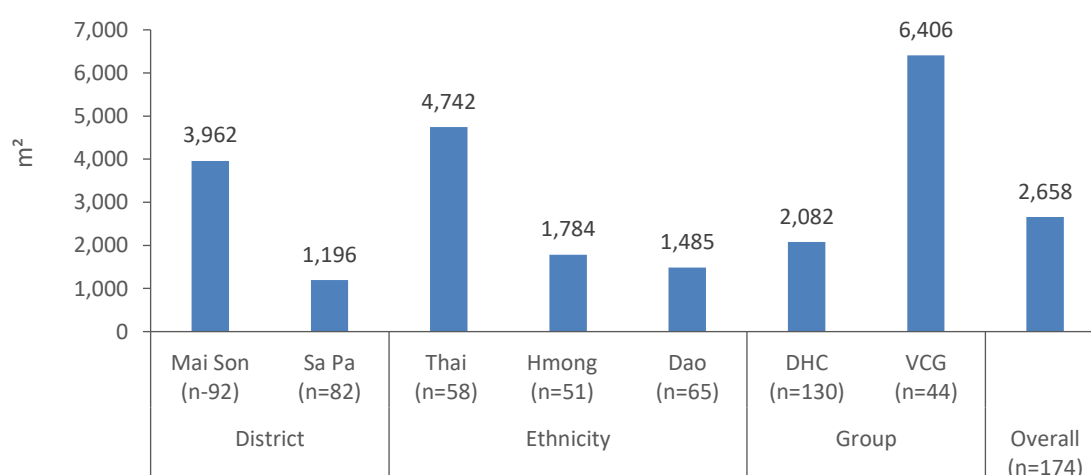
**Table 4.5. Food crop diversity in production of member households by district, ethnicity and group**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Average number of crops*	17.2 ± 7.3	16.5 ± 4.1	18.8 ± 7.5	14.3 ± 5.5	17.1 ± 3.9	16.9 ± 6.5	16.6 ± 4.1	16.9 ± 6.0
Grains	1.7 ± 0.9	3.0 ± 1.0	2.1 ± 0.9	1.6 ± 1.1	3.0 ± 1.0	2.2 ± 1.2	2.4 ± 1.1	2.3 ± 1.2
White roots and tubers	0.2 ± 0.4	0.2 ± 0.5	0.1 ± 0.4	0.1 ± 0.3	0.3 ± 0.6	0.2 ± 0.5	0.1 ± 0.4	0.2 ± 0.5
Legumes	0.8 ± 0.8	0.8 ± 0.6	0.8 ± 0.8	0.8 ± 0.8	0.8 ± 0.6	0.8 ± 0.8	0.8 ± 0.5	0.8 ± 0.7
Nuts and seeds	0.4 ± 0.5	1.0 ± 0.2	0.4 ± 0.5	0.6 ± 0.5	0.9 ± 0.2	0.7 ± 0.5	0.7 ± 0.4	0.7 ± 0.5
Vegetables	9.3 ± 4.5	9.9 ± 2.6	10.2 ± 4.6	8.0 ± 3.4	10.3 ± 2.5	9.6 ± 4.0	9.6 ± 2.9	9.6 ± 3.7
Fruits	4.8 ± 2.3	1.7 ± 1.3	5.3 ± 2.2	3.0 ± 2.2	1.8 ± 1.3	3.4 ± 2.6	3.0 ± 1.8	3.3 ± 2.4

\* Average number of crops that household grown in the last season (mean ± SD)

On average, each household cultivates approximately 17 (±6) different staple crops, with the H'mong group cultivating the fewest crops (14±6) and the Thai group cultivating the most (19±8) in the last 3 months. In terms of cereal, each household grows an average of about 2 (±1) unique crops, while Sa Pa (3 ± 1) and the Dao group (3 ± 1) have the highest number of cereal crops. For legume, each household grows an average of 1 (±1) crop, and this value is consistent across districts, ethnicities, and DHC/VCG groups. Regarding vegetables, each household grows an average of nearly 10 (±4) unique crops, with the H'mong group typically cultivating the fewest crops (8±3). Each household cultivates an average of 3 (±2) crops of fruits, with Mai Son growing more types than Sa Pa (5 vs. 2), the Thai group growing more types than the H'mong and Dao groups (5 vs. 3 and 2), and DHCs cultivating more types than VCGs (4 vs. 3).

### 4.1.4. Vegetable production



**Figure 4.3. Average area (m<sup>2</sup>) of vegetable production in the last season by household**

On average, each household uses 2,658 m<sup>2</sup> of land for vegetable cultivation in the past three months. Notably, Mai Son has produced area 3 times larger than Sa Pa (3,962 m<sup>2</sup> vs 1,196 m<sup>2</sup>). Thai has the largest

area at 4,742 m<sup>2</sup>, while VCGs has a vegetable production area more 2 times larger than DHCs by (6,406 m<sup>2</sup> vs 2,658 m<sup>2</sup>).

**Table 4.6. Purpose of vegetable production of member households by district, ethnicity and group**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Dark green leafy vegetables	(n=365)	(n=233)	(n=247)	(n=162)	(n=189)	(n=464)	(n=134)	(n=598)
<i>Sale</i>	9.9	31.3	14.6	0.0	38.6	9.5	48.5	18.2
<i>Consumption</i>	95.3	98.3	93.5	98.8	98.4	98.7	88.8	96.5
<i>Animal feed</i>	9.9	19.3	3.6	19.8	21.2	15.9	5.2	13.5
Vit A rich vegetables	(n=39)	(n=89)	(n=23)	(n=34)	(n=71)	(n=90)	(n=38)	(n=128)
<i>Sale</i>	12.8	20.2	21.7	0.0	25.4	6.7	44.7	18.0
<i>Consumption</i>	92.3	98.9	87.0	97.1	100.0	98.8	92.1	96.9
<i>Animal feed</i>	30.8	36.0	8.7	41.2	39.4	41.1	18.4	34.4
Other vegetables	(n=267)	(n=416)	(n=188)	(n=147)	(n=348)	(n=485)	(n=198)	(n=683)
<i>Sale</i>	24.0	28.8	34.0	0.0	34.5	13.0	61.1	26.9
<i>Consumption</i>	86.9	99.3	81.4	99.3	99.4	98.4	84.8	94.4
<i>Animal feed</i>	5.6	13.9	1.1	11.6	15.5	13.4	4.0	10.7
Condiment vegetables	(n=188)	(n=70)	(n=132)	(n=66)	(n=60)	(n=205)	(n=53)	(n=258)
<i>Sale</i>	1.6	22.9	2.3	0.0	26.7	3.9	20.8	7.4
<i>Consumption</i>	99.5	100.0	99.2	100.0	100.0	100.0	98.1	99.6

The main purpose of ethnic minority households in growing vegetables is for consumption, particularly Dark Green Leafy Vegetables (DGLVs) at 96.5%, Vitamin A-rich vegetables at 96.9%, condiment vegetables at 99.6%, and other vegetables at 94.4%. In Sa Pa, the Dao group, and VCGs have the highest proportions of growing vegetables for sale in most groups; DGLVs (31.3%, 38.6%, and 46.9%), Vitamin A-rich vegetables (20.2%, 25.4%, and 39.5%), other vegetables (28.8%, 34.5%, and 56.9%), and condiment vegetables (22.9%, 26.7%, and 20.4%).

**Table 4.7. Vegetable production practices in the last season**

Indicators	District		Ethnicity			Group		Overall (n=1,311)
	Mai Son (n=737)	Sa Pa (n=574)	Thai (n=520)	Hmong (n=314)	Dao (n=477)	DHC (n=983)	VC (n=328)	
The location of the plot growing (%)								
In the upland field	4.6	42.3	1.9	15.3	45.9	20.0	24.4	21.1
In the lowland field	5.3	7.5	5.8	6.1	6.9	5.6	8.2	6.3
Home garden	95.5	74.0	94.2	93.6	72.3	88.0	80.5	86.1
The primary decision marker for growing (%)								
Male	14.1	8.9	20.0	2.6	9.0	6.1	29.0	11.8
Female	85.9	91.1	80.0	97.5	91.0	93.9	71.0	88.2
Indigenous variety (%)	67.8	90.8	63.3	84.4	89.5	80.1	71.3	77.9
Apply inorganic herbicide	0.1	2.8	0.2	0.0	3.4	1.7	0.0	1.3
Apply organic herbicide	2.0	1.9	2.9	0.0	2.3	1.6	3.0	2.0
Apply inorganic pesticide	3.3	4.7	0.8	6.4	5.7	5.0	0.6	3.9
Apply organic pesticide	19.0	2.3	21.0	9.9	2.7	7.0	25.6	11.7
Apply fertilizer	39.3	98.4	42.3	53.2	98.1	58.9	84.1	65.2
Apply organic fertilizer (compost/ animal manure)	73.1	71.4	76.2	58.6	77.4	65.8	92.1	72.4
Sold vegetables	12.8	25.1	18.1	0.3	30.0	8.6	46.6	18.2

Most farmers engaged in vegetable cultivation within their home gardens, constituting 86% of the total. However, the prevalence of households growing vegetables in upland fields was notably high in Sa Pa (42.3%) and among the Dao group (almost 46%). Women played a significant role in deciding the cultivation of vegetables, accounting for 88.2%. Indigenous varieties made up the majority of cultivated vegetables, representing nearly 78%, with particularly high rates in Sa Pa (almost 91%) and the Dao group (89.5%).

The percentage of households applied (in) organic herbicides, pesticides was not significant. Approximately 65% of households used fertilizer in vegetable cultivation, with the highest adoption rates observed in Sa Pa (98.4%), Dao (98.1%), and VCGs (84.1%). Moreover, around 72.4% of households applied for organic fertilizer, with VCGs demonstrating the highest adoption rate at 92.1%.

In the past three months, legume production among farmers primarily involved the cultivation of French beans (46%) and long beans (roughly 28%). In terms of vegetable production, 90.8% of households cultivate pumpkins, 73% grow Hmong mustard, 44.6% grow chayote, 37.4% grow chili, and 33.3% grow Hmong cucumbers (see annex 5).

**Table 4.8. Fruit and vegetable diversity in production of member households by district, ethnicity and group**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Vegetables								
<i>Dark green leafy vegetables</i>	4.0 ± 1.8	2.8 ± 1.0	4.3 ± 1.9	3.2 ± 1.4	2.9 ± 1.1	3.6 ± 1.7	3.0 ± 1.3	3.4 ± 1.6
<i>Vitamin A rich vegetables</i>	0.4 ± 0.6	1.1 ± 0.4	0.4 ± 0.6	0.7 ± 0.6	1.1 ± 0.5	0.7 ± 0.6	0.9 ± 0.7	0.7 ± 0.6
<i>Other vegetables</i>	2.9 ± 1.9	5.1 ± 1.6	3.2 ± 2.0	2.9 ± 1.7	5.4 ± 1.6	3.7 ± 2.1	4.5 ± 1.8	3.9 ± 2.1
<i>Condiment vegetables</i>	2.0 ± 2.2	0.9 ± 0.7	2.3 ± 2.4	1.3 ± 1.6	0.9 ± 0.6	1.6 ± 2.0	1.2 ± 0.9	1.5 ± 1.8
Fruits								
<i>Vitamin A rich fruits</i>	1.0 ± 0.5	0.01 ± 0.1	1.0 ± 0.5	0.6 ± 0.7	0.01 ± 0.1	0.6 ± 0.7	0.3 ± 0.5	0.5 ± 0.6
<i>Other fruits</i>	3.8 ± 2.0	1.7 ± 1.3	4.3 ± 2.1	2.4 ± 1.7	1.8 ± 1.3	2.9 ± 2.2	2.6 ± 1.5	2.8 ± 2.0

In the last 3 months, each household cultivated an average of about 3 (±2) different crops of Dark Green Leafy Vegetables (DGLVs), with the Thai group (4 ± 2) and Mai Son (4 ± 2) cultivating more species of these vegetables. In terms of other vegetables, on average, each household grew approximately 4 (±2) crops, while Sa Pa (5 ± 2), Dao (5 ± 2), and VCG (5 ± 2) cultivated more species of these crops than other groups. Conversely, each household grew an average of 2 (±2) types of condiment vegetables, with Sa Pa, Dao, H'mong, and VCG growing only one crop of the vegetable, which is lower than the other groups. Each household cultivated an average of 1 crop of Vitamin A-rich vegetable (mainly pumpkin), with Sa Pa and the Dao group growing slightly more varieties of these vegetables than other groups.

Regarding fruit, on average, about 2 households grew 1 crop of Vitamin A-rich fruit, while in Mai Son and the Thai group, on average, 1 household grew 1 type of this fruit. Conversely, each household typically cultivated about 3 (±2) other types of fruit trees, with the Thai group (4±2) and Mai Son (4±2) being the groups that cultivated the most varieties of fruit trees.

#### 4.1.5. Vegetable seed

**Table 4.9. Vegetable seed by district, ethnicity, and group**

Indicator	District		Ethnicity			Group		Overall (n=1,311)
	Mai Son (n=737)	Sa Pa (n=574)	Thai (n=520)	Hmong (n=314)	Dao (n=477)	DHC (n=983)	VC (n=328)	
Source of seed (%)								
District market or shop	1.2	5.6	0.6	2.5	6.3	3.5	2.1	3.1
Commune market or shop	13.0	1.4	14.6	7.0	1.3	6.5	12.2	7.9
Local/ village market or shop	9.6	0.3	11.5	3.5	0.4	6.2	3.7	5.6
Bought from other farmers/ farmer groups	1.6	1.6	2.1	0.3	1.9	0.5	4.9	1.6
Exchange/ shared (neighbors, relatives, friends)	9.6	1.7	9.0	8.9	1.3	6.8	4.3	6.2
Self-saved seed	65.9	89.2	61.3	81.8	88.5	79.0	67.4	76.1
Other	3.3	2.4	4.6	0.3	2.7	1.0	8.5	2.9
The germination quality of the seed (%)								
Low	1.1	0.2	1.0	1.0	0.2	0.7	0.61	0.7
Medium	37.0	13.9	39.8	24.8	14.3	29.8	18.3	26.9
High	61.9	85.9	59.2	74.2	85.5	69.5	81.1	72.4
Household produce or save seed	67.8	89.2	63.8	82.5	88.3	80.4	67.7	77.2
Main purpose of seed production/ saving seed (%)								
Sale	0.2	2.2	0.3	0.0	2.6	1.0	1.8	1.2
Consumption	3.8	28.3	3.0	15.8	26.8	14.6	22.1	16.2
Saving for next seasons	96.0	69.5	96.7	84.2	70.6	84.4	76.1	82.6

The result reveals that 76% of households saved seeds, with elevated rates observed in Sa Pa (89.2%) and among the Dao (88.5%). Specifically, the Dao group predominantly acquired vegetable varieties from district markets or stores (6.3%), while the Thai group often purchased vegetable seeds at the commune market or store (14.6%). Around 72% vegetable seeds had high germination rate, while nearly 27% exhibited at medium level.

Furthermore, over 77% of farming households engaged in seed production and storage, with notably high rates in Sa Pa (89.2%), Hmong (82.5%), Dao (88.3%), and DHCs (80.4%). The primary purpose behind seed production/storage was for next seasons, accounting for nearly 83%.

#### 4.1.6. Nature-Positive Solutions

**Table 4.10. Nature positive solutions of member households by district, ethnicity and group**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Nutrient placement	45.7	92.7	50	58.8	90.8	63.8	79.5	67.8
Reduce/eliminate chemical pesticides use	48.9	87.8	58.6	47.1	90.8	60	88.6	67.2
Intercropping	46.7	89	51.7	52.9	90.8	59.2	88.6	66.7
Manure fertilizer	96.7	24.4	94.8	72.6	26.2	67.7	47.7	62.6
Reduce/eliminate prophylactic spraying	40.2	85.4	48.3	39.2	90.8	56.9	75	61.5
Use biological (or other non-chemical) pesticides	35.9	72	41.4	41.2	72.3	44.6	77.3	52.9
Use selective (as opposed to broad-spectrum) pesticides	19.6	87.8	22.4	39.2	87.7	45.4	70.5	51.7
Crop rotation schemes	62	34.2	65.5	47.1	35.4	47.7	52.3	48.9
Preparation of bunds, terraces and trenches to reduce water runoff and erosion etc.	34.8	57.3	39.7	39.2	55.4	40.8	59.1	45.4
Compost production	43.5	25.6	60.3	17.7	26.2	23.8	68.2	35.1
Use other biocontrol measures (Pheromone traps, Protein baits, etc.)	10.9	48.8	15.5	13.7	52.3	25.4	38.6	28.7
Zero or minimum tillage	7.6	50	8.6	15.7	53.9	23.8	38.6	27.6
Ponds to conserve water including rain water collection	29.4	4.9	34.5	15.7	4.6	13.1	31.8	17.8
Apply an economical irrigation process	26.1	2.4	39.7	2	3.1	9.2	31.8	14.9
Use cultural pest management practices (e.g., rotation, intercropping, changing planting time, etc.)	8.7	19.5	13.8	0	24.6	11.5	20.5	13.8
Use classic biocontrol (introduction of natural enemies)	1.1	14.6	1.7	2	16.9	6.9	9.1	7.5
Mulching	6.5	7.3	10.3	5.9	4.6	3.8	15.9	6.9
Treated wastewater for irrigation	3.3	6.1	5.2	3.9	4.6	3.1	9.1	4.6
Flower strips or hedgerows around crop fields to attract beneficial insects	3.3	1.2	5.2	0	1.5	0.8	6.8	2.3
Cover crops	1.1	0	1.7	0	0	0.8	0	0.6

The five most common Natural Pest Management Strategies (NPSs) among the surveyed households are nutrient replacement (67.8%), reducing/eliminating the use of chemical pesticides (67.2%), intercropping (66.7%), using manure fertilizer (62.6%), and reducing/eliminating prophylactic spraying (61.5%). Additionally, biological pesticides are used by 52.9% of households, and 51.7% employ selective pesticides.

Except for manure fertilizer, the aforementioned NPSs are more commonly applied by households in Sa Pa (72-93%), the Dao group (72-91%), and VCGs (77-90%) compared to the other groups. Conversely, manure fertilizer is more frequently utilized by households in Mai Son (96.7%), the Thai group (94.8%), and DHCs (66.7%).

The finding from group interviews indicates that both Van Phuc cooperative and the Can Ho group have applied NPSs when producing as a group. These solutions include intercropping, crop rotation, preparation of bunds, terraces, and trenches to reduce water runoff and erosion while facilitating seepage, use of manure fertilizer, composting, constructing ponds to conserve water, reducing or eliminating prophylactic spraying, utilizing selective pesticides instead of broad-spectrum ones, implementing cultural pest management practices, such as rotation, intercropping, and adjusting planting times. Furthermore, Van Phuc cooperative has implemented other solutions such as compost production, using treated wastewater for irrigation, and classic biocontrol. These NPS strategies are applied to crops like cabbage, spinach, pumpkin, cucumber, and tomato in both groups, as well as to rice and maize in the Can Ho group.

#### 4.1.7. Household food consumption

**Table 4.11. Food diversity of food consumed by member households by district, ethnicity and group over 24 hours**

Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Food group diversity score (mean ± SD)	5.4 ± 1.6 (3 - 10)	5.0 ± 1.7 (2 - 10)	5.6 ± 1.4 (3 - 10)	4.9 ± 1.6 (2 - 8)	5.1 ± 1.8 (2 - 10)	5.2 ± 1.6 (2 - 10)	5.3 ± 1.8 (2 - 10)	5.2 ± 1.6 (2 - 10)
Consumed all five recommended food groups <sup>1</sup> (%)	20.7	12.2	22.4	13.7	13.9	16.2	18.2	16.7
NCD-Protect score <sup>2</sup> (mean ± SD)	3.2 ± 1.4 (1 - 7)	2.8 ± 1.6 (0 - 8)	3.3 ± 1.3 (1 - 7)	2.6 ± 1.6 (0 - 6)	3.0 ± 1.6 (1 - 8)	3.0 ± 1.5 (0 - 7)	3.0 ± 1.5 (1 - 8)	3.0 ± 1.5 (0 - 8)
NCD-Risk score <sup>3</sup> (mean ± SD)	2.3 ± 1.4 (0 - 7)	2.6 ± 1.6 (0 - 6)	2.4 ± 1.3 (0 - 7)	2.2 ± 1.4 (0 - 5)	2.6 ± 1.6 (0 - 6)	2.3 ± 1.4 (0 - 6)	2.6 ± 1.6 (0 - 7)	2.4 ± 1.5 (0 - 7)
Global Dietary Recommendations <sup>4</sup> (GDR) score (mean ± SD)	9.9 ± 1.6 (7 - 14)	9.4 ± 1.8 (5 - 14)	9.9 ± 1.6 (7-14)	9.4 ± 1.8 (5 - 14)	9.3 ± 1.8 (5 - 13)	9.6 ± 1.8 (5 - 14)	9.3 ± 1.7 (7 - 13)	9.5 ± 1.8 (5 - 14)

<sup>1</sup> Consuming all five food groups typically recommended for daily consumption in food-based dietary guidelines around the world: fruits; vegetables; pulses, nuts, or seeds; animal-source foods; and starchy.

<sup>2</sup> A score based on food consumption from 9 healthy food groups (0-9): whole grains, pulses, nuts & seeds, VitA rich vegetables DGLVs, other vegetables, VitA rich fruits, citrus, other fruits; a higher score indicates inclusion of more health-promoting foods in the diet.

<sup>3</sup> A score based on food consumption from 8 food groups to limit or avoid (0-9): soft drink, baked/ grain-based sweets, other sweets, processed meat (score=2), unprocessed red meat, deep fried food, fat food & instant noodles, and package ultra-processed salty snacks. A higher score indicates higher consumption of foods and drinks to avoid or limit, and correlates negatively with meeting global dietary recommendations.

<sup>4</sup> The GDR score is a score with a range from 0 to 18 that indicates adherence to global dietary recommendations, which include dietary factors protective against non-communicable diseases. The higher the GDR score, the more recommendations are likely to be met.

The average dietary diversity score of households in this survey is 5 (±2). Among them, Mai Son (5.4 ± 1.6) and the Thai group (5.6 ± 1.4) appear to have a higher diversity score compared to Sa Pa and the other ethnic groups. The NCD-Protect score averaged 3 (±1.5) among households, with Sa Pa (2.8 ± 1.6) and the H'mong group (2.6 ± 1.6) scoring lower than the overall survey average. The NCD-Risk score for ethnic minority households is 2.4 (±1.5), and it is quite similar across districts, ethnicities, and DHCs/VCGs groups.

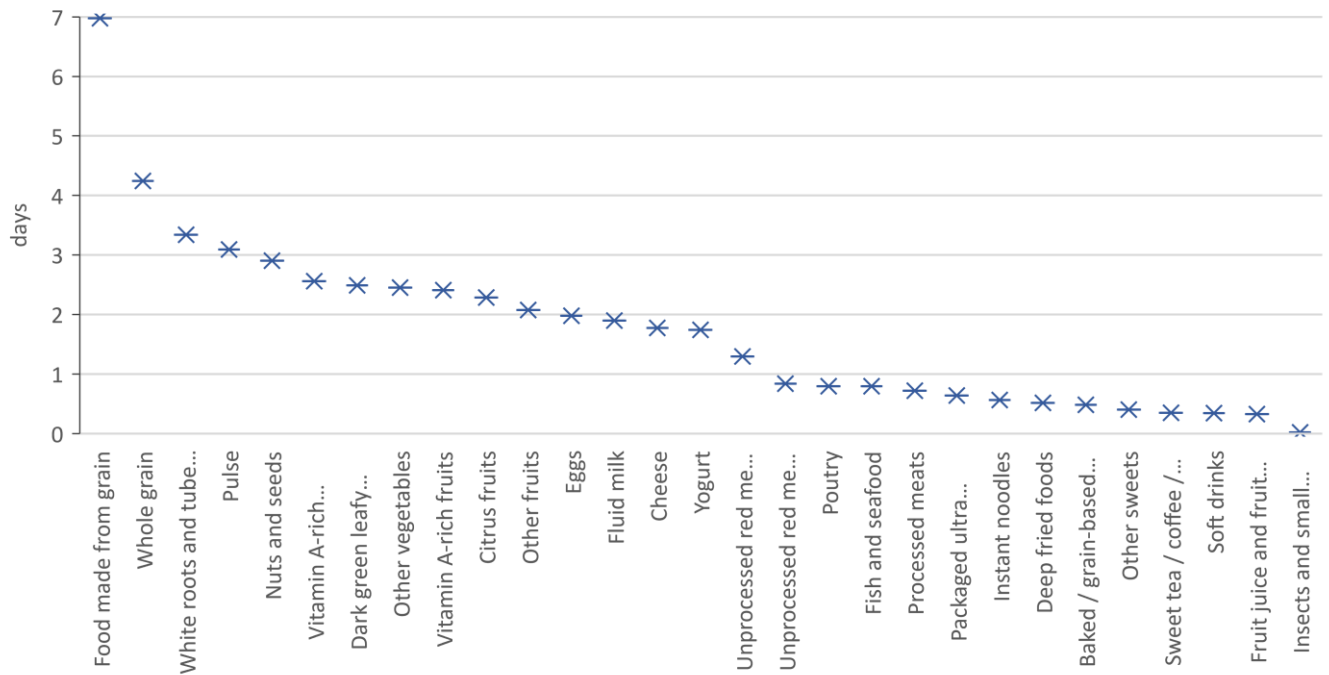
The GDR score averaged 9.5 ( $\pm 1.8$ ) for farmers, with Mai Son ( $9.9 \pm 1.6$ ), the Thai group ( $9.9 \pm 1.6$ ), and DHCs ( $9.6 \pm 1.8$ ) scoring slightly higher on average than the other groups. Approximately 17% of households consumed all five recommended food groups, with the highest proportion found in the Thai group (22.4%) and Mai Son (20.7%).

**Table 4.12. Food consumption of member households by district, ethnicity, and group over 24 hours**

Consumed by food group (%)	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Starchy staple	100.0	98.8	100.0	100.0	98.5	100.0	97.7	99.4
Vegetables	63.0	84.2	65.5	62.8	87.7	71.5	77.3	73.0
Fruits	78.3	35.4	91.4	41.2	41.5	57.7	59.1	58.1
Pulse, nuts and seeds	26.1	29.3	24.1	31.4	27.7	26.2	31.8	27.6
Animal-source food	97.8	92.7	100.0	96.1	90.8	95.4	95.5	95.4
Dairy	41.3	31.7	43.1	35.3	32.3	36.9	36.4	36.8
Egg	27.3	36.6	19.0	41.2	35.4	33.1	25.0	31.6
Processed meat consumption	41.0	50.0	41.4	43.1	50.8	39.2	63.6	45.4
Sweet beverage consumption	40.2	48.8	43.1	35.3	52.3	43.9	45.5	44.3
Sweet foods consumption	31.5	41.5	25.9	41.2	41.5	34.6	40.9	36.2
Salty or fried snack consumption	63.0	52.4	67.2	56.9	50.8	57.7	59.1	58.1

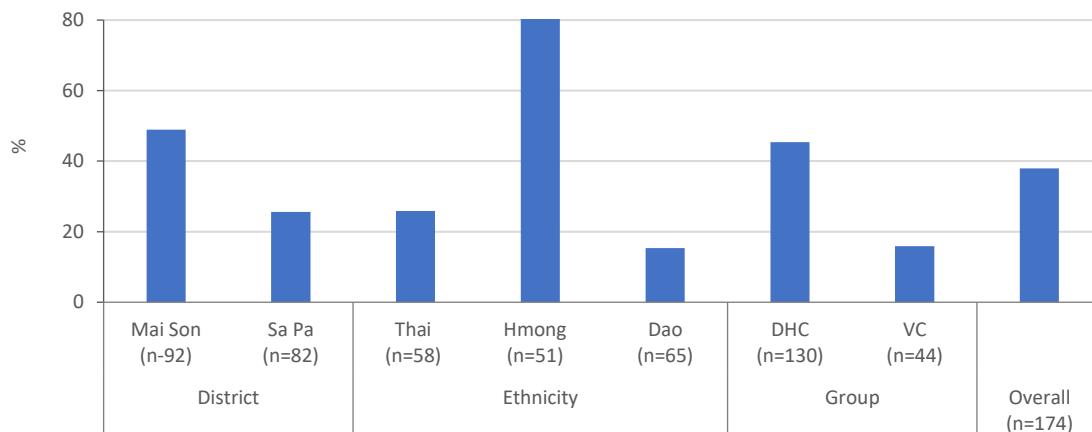
Almost all households consumed starchy staples (99.4%) and animal-source food (95.4%) in the past 24 hours. The proportion of households consuming animal-source food is lower in the Dao group (90.8%) and Sa Pa (92.7%) compared to other groups. Over 70% of households consumed vegetables, with the highest proportions found in Sa Pa (84.2%), Dao (87.7%), and VCGs (79.2%). Conversely, the Thai group (91.4%) and Mai Son (78.3%) had the highest fruit consumption rates, which were higher than the average rate of 58.1%. Very few households consumed dairy (almost 37%), eggs (31%), and pulse, nuts, and seeds (27.6%).

Meanwhile, nearly 60% of households consumed salty or fried snacks, with higher rates in the Thai group (67.2%) and Mai Son (63%). Conversely, the proportion of households consuming sweet beverages and sweet foods was higher in the Dao group (52.3% and 41.5%) and Sa Pa (48.8% and 41.5%) compared to other groups.



**Figure 4.4. Average food consumed days among member households by food groups over 7 days**

The food groups consumed with a frequency of three days or more per week, included food made from grain (7 days), whole grain (4 days), white roots and tubers (3 days), pulses (3 days), nuts and seeds (3 days). In contrast, food groups such as vegetables and fruits are consumed approximately 2 days per week.



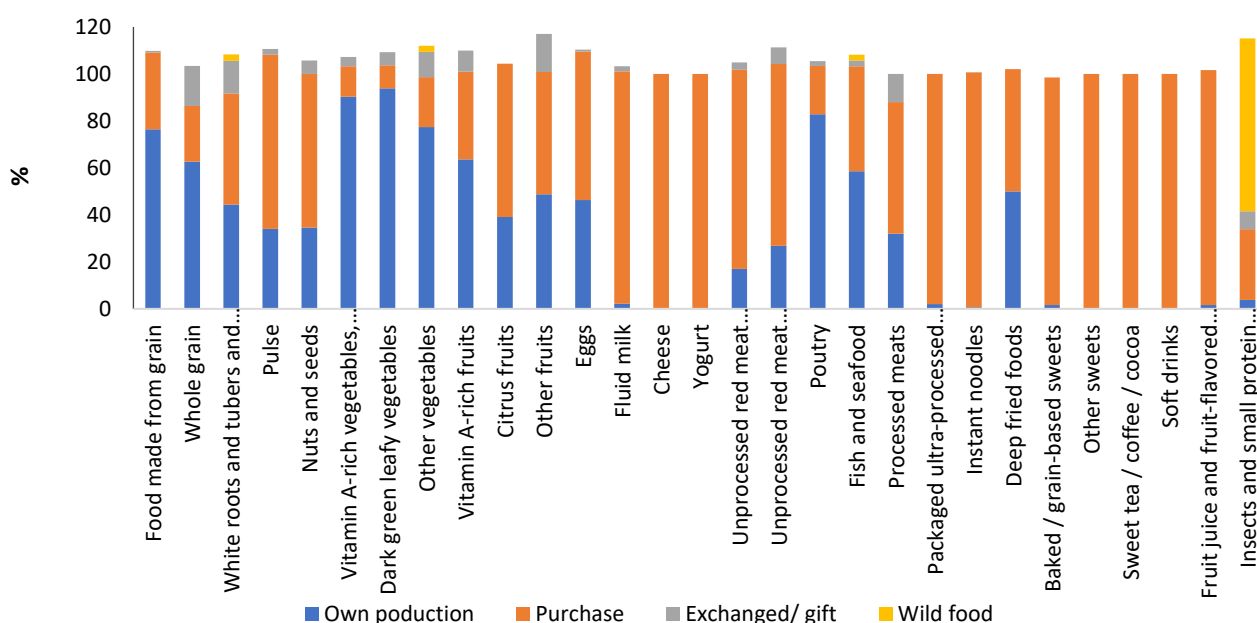
**Figure 4.5. % household have a shortage of vegetables to eat at any time in the past 1 year**

Roughly 38% of agricultural households experienced a shortage of vegetables in the past year, with the highest rates reported among the Hmong (80.4%), Mai Son (nearly 49%), and DHCs (45.4%).

**Table 4.13. Which months households had a shortage vegetables for consumption**

Months	District		Ethnicity			Group		Overall (n=66)
	Mai Son (n=45)	Sa Pa (n=21)	Thai (n=15)	Hmong (n=41)	Dao (n=10)	DHC (n=59)	VC (n=7)	
Jan	13.3	0.0	6.7	12.2	0.0	8.5	14.3	9.1
Feb	35.6	9.5	26.7	31.7	10.0	27.1	28.6	27.3
Mar	73.3	38.1	40.0	70.7	60.0	59.3	85.7	62.1
Apr	57.8	19.1	13.3	61.0	30.0	47.5	28.6	45.5
May	33.3	9.5	6.7	39.0	0.0	28.8	0.0	25.8
Jun	31.1	14.3	26.7	31.7	0.0	28.8	0.0	25.8
Jul	22.2	38.1	26.7	26.8	30.0	30.5	0.0	27.3
Aug	11.1	33.3	6.7	17.1	40.0	20.3	0.0	18.2
Sep	11.1	4.8	6.7	12.2	0.0	10.2	0.0	9.1
Oct	11.1	0.0	6.7	9.8	0.0	8.5	0.0	7.6
Nov	15.6	0.0	6.7	14.6	0.0	11.9	0.0	10.6
Dec	20.0	0.0	6.7	19.5	0.0	15.3	0.0	13.6

The period of vegetable shortage among farmers was concentrated in March (62.1%) and April (45.5%)



**Figure 4.6. Food sourcing of households by food groups**

Food groups primarily sourced from own production included DGLVs (93.9%), Vitamin A rich vegetables (90.3%), poultry (82.9%), other vegetables (77.3%), and grain (76.4%). On the other hand, cheese, yogurt, instant noodles, sweet tea/ coffee/ cocoa, soft drinks, milks, and salty snacks are entirely purchased foods. Additionally, meat (77.5%-84.8%) and pulses (74.1%) are also commonly purchased by households. Insect and small protein foods are predominantly sourced from natural origins (roughly 74%).

#### 4.1.8. Gender Equity

**Table 4.14. Gender equity of member households by district, ethnicity and group**

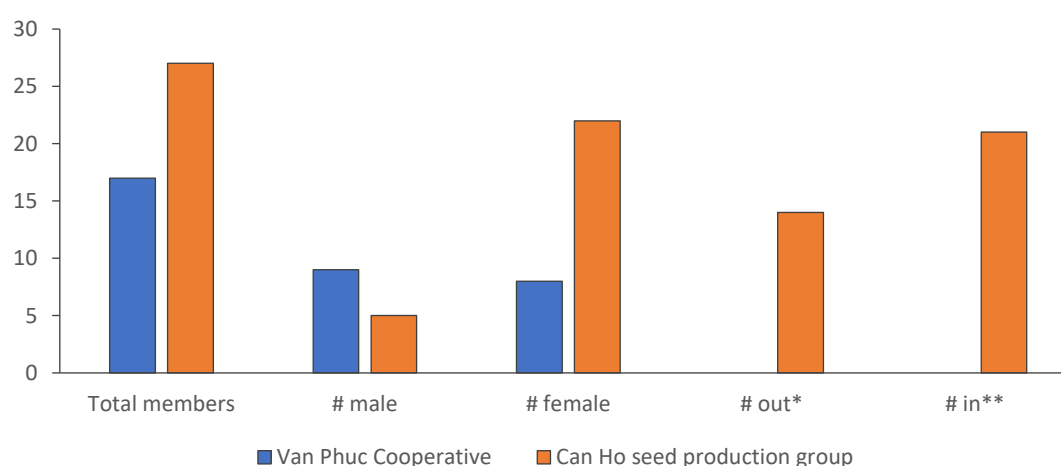
Indicator	District		Ethnicity			Group		Overall (n=174)
	Mai Son (n=92)	Sa Pa (n=82)	Thai (n=58)	Hmong (n=51)	Dao (n=65)	DHC (n=130)	VCG (n=44)	
Major decisions on what food crops and/or animals to produce								
Male	69.6	45.1	75.9	60.8	40.0	55.4	65.9	58.1
Female	30.4	54.9	24.1	39.2	60.0	44.6	34.1	42.0
Major decisions on purchasing, selling, or transferring of households' assets related to agriculture (land, cattle, equipment)								
Male	75.0	57.3	75.9	72.6	53.9	63.1	77.3	66.7
Female	25.0	42.7	24.1	27.5	46.2	26.9	22.7	33.3
Major decisions on borrowing for agricultural production								
Male	80.4	59.8	82.8	74.5	56.9	66.9	81.8	70.7
Female	19.6	40.2	17.2	25.5	43.1	33.1	18.2	29.3
Major decisions on how the household income is used								
Male	71.7	46.3	70.7	72.6	40.0	60.8	56.8	59.8
Female	28.3	53.7	29.3	27.5	60.0	39.2	43.2	40.2

Male in ethnic minority households continue to be the primary decision-makers regarding what food crops and/or animals to produce (58.1%), the purchasing, selling, or transferring of household assets related to agriculture (66.7%), borrowing for agricultural production (70.7%), and how household income is utilized (nearly 60%). The proportion of men making these key decisions is higher in Mai Son (70-80%), the Thai group (71-83%), and VCGs (66-82%) compared to other groups.

#### 4.2. Value Chain Groups qualitative interviews

The results of in-depth interviews with the management boards of the groups indicate differences in terms of the number of members, production methods, and marketing approaches between Van Phuc cooperative and the Can Ho vegetable seed production group. Specifically:

##### 4.2.1. Membership



\*: The former members (from the NWO project) no longer actively engages in the group; \*\*:new group members.

**Figure 4.7. Number of members from each VCG**

The Van Phuc cooperative has a total of 17 members, comprising 9 males and 8 females, and this membership composition has remained unchanged for the past 8 months. Meanwhile, the Can Ho

vegetable seed production group consists of a total of 27 members, including 5 males and 22 females. Over the past 8 months, 14 members have left the group, and 21 new members have joined, including 15 members who transferred from the nutrition group of Can Ho B (Work Package 2 - NWO project).

The challenges in maintaining member participation in the groups are as follows: i) Difficulty in mobilizing centralized production due to households' preference for individual farming practices (Van Phuc cooperative), ii) Mobilizing the participation of group members in corn and rice crops (Van Phuc Cooperative) or the forestry season (Can Ho Group) proves to be challenging. , and iii) Some centralized production contracts incurred losses, leading to reduced trust in the management board and decreased participation in the group's collective production activities (Van Phuc cooperative).

#### 4.2.2. Crop production and marketing

**Table 4.15. Summary of vegetables produced and marketed as a group in the last cropping season**

Group	Name of vegetables	Total yield of production	Total revenue (VND)	Buyers	Support from buyers	Type of agreement
<b>Fresh vegetables</b>						
Van Phuc	Spinach	8,000 kg	36,000,000	Traders from other districts (Dong Bao company)	Received inputs on credit	Formal/ written contract
	Sweet corn	140,000 kg	742,000,000	Traders from other districts (Dong Bao company)	Received inputs on credit	Formal/ written contract
<b>Seedling production</b>						
Can Ho	Cabbage	6,000 seedlings	2,500,000	Traders within the commune and consumers/ community members	Market information	Verbal agreement
	Napa cabbage	4,000 seedlings	1,000,000	Traders within the commune and consumers/ community members	Market information	Verbal agreement
<b>Seed production</b>						
Can Ho	H'mong mustard	10 kg	3,000,000	Traders within the commune and consumers/ community members	Market information	Verbal agreement
	Kohlrabi for leaves					
	Local cabbage					

The Van Phuc cooperative primarily focuses on commercial vegetable production, with a jointed cultivation area of 100,000 m<sup>2</sup> in the last cropping season. Within this area, they cultivated 30,000 m<sup>2</sup> of spinach, yielding a total of 8 tons and generating revenue of 36 million VND. They also cultivated 70,000 m<sup>2</sup> of sweet corn, resulting in a revenue of 742 million VND from the harvest of 140 tons of produce. All the harvested products were sold under a written contract to the Dong Dao Joint Stock Company, a trader from another district. Additionally, the company provided inputs on credit (seeds and fertilizers) to the cooperative during the production process. On the contrary, the Can Ho group primarily focuses on seed and seedling production, with a shared greenhouse area of 75 m<sup>2</sup>.

Regarding seedling production: In the last cropping season, the Can Ho group produced 6,000 seedlings of cabbage and 4,000 seedlings of napa cabbage, generating revenue of 3.5 million VND for the group. These products were sold to traders within the commune through verbal agreements and to community members. The interaction between the group and traders within the commune was regarding market information.

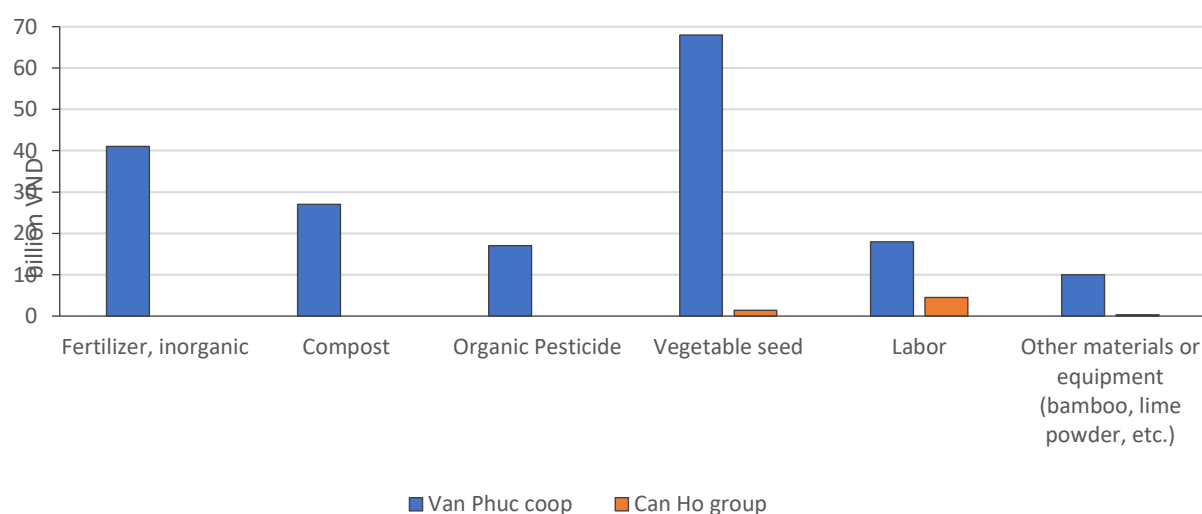
Regarding seed production: The Can Ho group produced over 10 kilograms of seeds, including H'mong mustard greens, kohlrabi for leaves, and local cabbage. These seeds were primarily sold to community members, generating an income of around 3 million VND for the group.

**Table 4.16. Summary of vegetables individually produced by members but marketed as a group in Van Phuc cooperative (n =15 households)**

Name of vegetables	Total yield of production (kg)	Total revenue (thousand VND)	Buyers	Support from buyers	Type of agreement
<b>Fresh vegetables</b>		<b>2,285,000,000</b>			
H'mong mustard	25,000	125,000,000	Traders within the commune, from other communes, from other districts, from other provinces, local markets	None	None
French bean	20,000	120,000,000		None	None
Cabbage	60,000	240,000,000		None	None
Wax gourd	300,000	1,800,000,000		None	None
<b>Seed production</b>		<b>23,000,000</b>			
H'mong mustard	25	20,000,000	Traders from other districts, from other provinces, local markets	None	None
French bean	10	3,000,000		None	None

Only the Van Phuc cooperative had vegetables and/or seeds produced by individual members but sold collectively through the cooperative's management board. Specifically, in the last cropping season, the cooperative produced 25 tons of H'mong mustard, 20 tons of french bean, 60 tons of cabbage, and 300 tons of wax gourd, generating revenue of 2.285 billion VND. Additionally, the cooperative also engaged in vegetable seed production, producing 25 kilograms of H'mong mustard and 30 kilograms of french bean g bean seeds, generating revenue of roughly 23 million VND. These products were sold to traders from other districts, traders from other provinces, or local markets without contracts and support from buyers.

**Regarding revenue sharing:** At Van Phuc cooperative, the management board deducts 3% of members' income for the cooperative, and the remainder is distributed based on production shares to the members. After 15-30 days of product delivery, the income is transferred to the cooperative's account, and then the management board will make payments to the members. In contrast, the Can Ho group has not distributed revenue to its members and has used the funds for further investments. Because the initial profit is still low, they prefer not to share it with each household because and instead consider it as investment capital for the next production cycle.



**Figure 4.8. Major costs that the group incurred in the last season during collective production and/or marketing**

Regarding production costs, Van Phuc cooperative invested 181 million VND, significantly more than the Can Ho group (6.2 million VND) in the last season. The expenses for Van Phuc cooperative include 68 million VND for vegetable seeds, 41 million VND for chemical fertilizers, 27 million VND for compost, 18 million VND for labor, 17 million VND for organic pesticides, and 10 million VND for lime powder. Meanwhile, the Can Ho group spent 4.5 million VND on labor, 1.4 million VND on vegetable seeds, and 300 thousand VND on bamboo for the nursery house.

At Van Phuc cooperative, the costs for compost and organic pesticides have increased due to rising prices and increased demand from member households. Costs for vegetable seeds and labor remained relatively consistent with previous seasons. In contrast, the costs for inorganic fertilizers decreased as more households shifted towards using compost and manure. In the Can Ho group, production costs remained relatively unchanged compared to previous seasons.

During the production, the groups encountered several challenges:

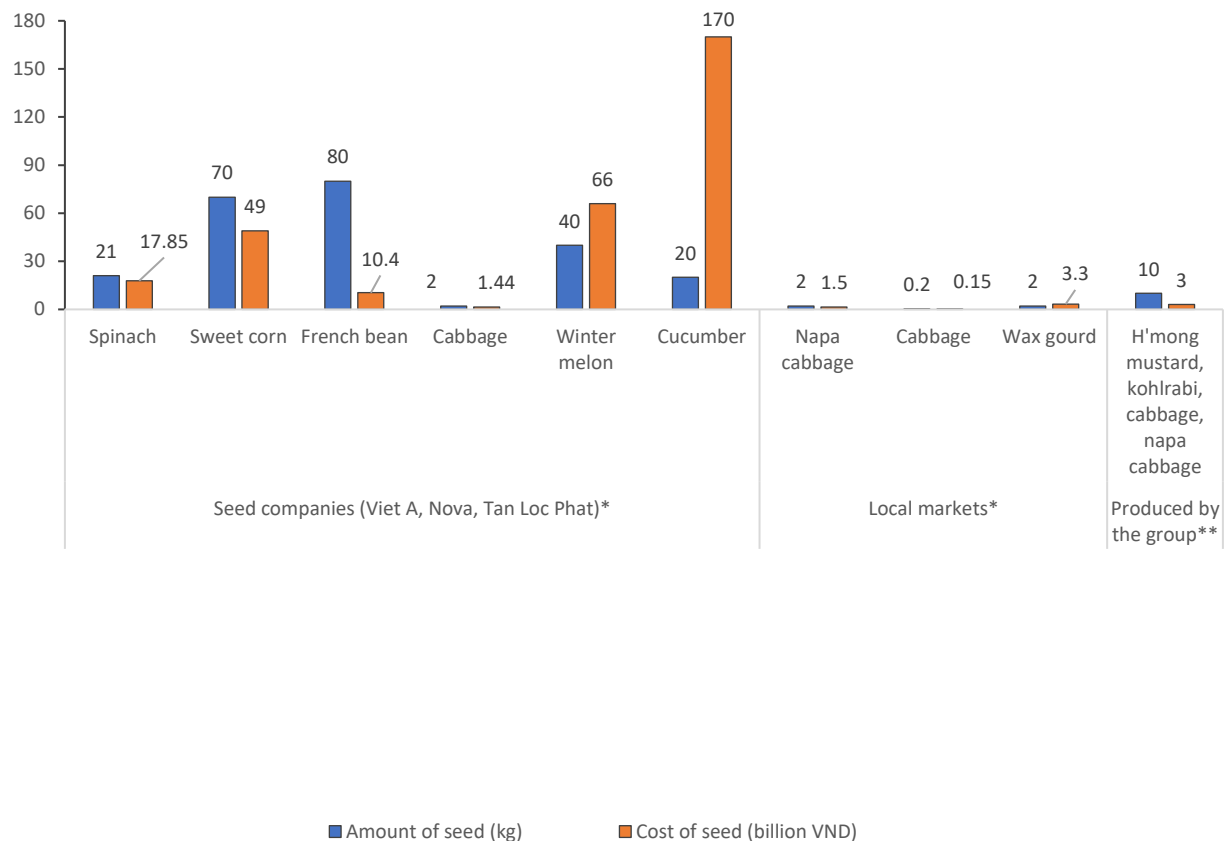
- Limited access to high-quality seeds: "*There are no seed vendors in the commune; when needed, we have to go to the town of Sa Pa to buy seeds,*" and insufficient supplies: "*Sometimes we cannot buy fertilizer and organic fertilizer*" (Can Ho group).
- Weather-related production difficulties leading to lower product quality: "*Heavy rain damaged the seeds, and the plants grew unevenly*" (Can Ho group). Price fluctuations: "*Even in the high season, the prices are low, so growing vegetables is not profitable*" (Van Phuc cooperative).
- Additionally, land degradation and soil nutrient depletion due to continuous cultivation were also issues (both groups).
- Limited nursery areas (27 m<sup>2</sup> per household at Van Phuc cooperative and 75 m<sup>2</sup> for the shared nursery of the Can Ho group).
- Both groups also lacked storage facilities or offices for meetings and community activities.
- Despite having marketing officers, the groups had difficulty securing many contracts. Most of the contracts they secured were small, low-priced, and had delayed payments.
- Irregular participation and limited focus on production activities by some group members. In addition, the leadership and management capacity of the group leaders were weak.
- Accounting and record-keeping were not detailed, and some members had limited computer skills.

In response to these challenges, the groups implemented several solutions:

- They used QR codes to verify the origin of seeds and supplies.
- They selected potential households for concentrated production: these members labeled their products to create a brand identity and reduced the use of chemical fertilizers and pesticides while increasing the use of organic fertilizers. They improved soil quality by using lime and charcoal to control fungus.
- They focused on producing goods for companies when vegetable prices were low, increased off-season vegetable production to sell to the market, and minimized vegetable cultivation during periods of water scarcity.
- They conducted training and capacity-building programs for group management (facilitated by the district and provincial authorities and connected to local residents).

- They emphasized quality over quantity in production.
- They sought more fixed-price contracts with buyers.
- They applied for collaboration with organizations and units to purchase computers and participate in software training (Sorimachi).

#### 4.2.3. Seeds



\*: Van Phuc cooperative, \*\*: Can Ho group

**Figure 4.9. Seed used in the last season from each VCG**

Regarding the use of seeds in the last cropping season, Van Phuc cooperative primarily obtained seeds from companies such as Viet A, Nova, and Tan Loc Phat for various vegetables, including: spinach (21 kg, equivalent to 17.85 million VND), sweet corn (70 kg, equivalent to 49 million VND), cucumber (20 kg, equivalent to 170 million VND), wax gourd (40 kg, equivalent to 66 million VND), French bean (80 kg, equivalent to 10.4 million VND), and baby corn (2 kg, equivalent to 1.44 million VND). According to the cooperative's management board, seeds obtained from seed companies had high germination rates, resulting in healthy plant growth with fewer disease issues. In addition to seeds from seed companies, the cooperative also purchased a small quantity of seeds from local markets, including: 2 kg of baby kale seeds (equivalent to 1.5 million VND) and 2 kg of butternut squash seeds (equivalent to 3.3 million VND). However, the germination rate of seeds purchased from local markets was very low, with mixed quality and a higher presence of male plants compared to seeds from seed companies. Additionally, seeds purchased from local markets often lacked clear labeling, leading to difficulties for the cooperative's management board when procuring seeds for the cooperative members.

In contrast, the Can Ho group primarily used seeds that the group had saved, including 10 kg of seeds for baby mustard greens, water spinach, baby corn, and baby kale. According to the group's management board, the quality of self-saved seeds was ensured. However, the uniformity of these seeds was not high due to the lack of standardized harvesting and seed storage procedures.

#### *4.2.4. Production and marketing plans*

The production and marketing plan for the last cropping season was established by the management board members in November 2022 for Van Phuc cooperative and in January 2023 for the Can Ho group. This plan is reviewed and updated every six months for the following two crop seasons. However, due to prolonged sunny and dry weather conditions, Van Phuc cooperative planted sweet corn more than a month later than planned. As a result, the costs for seeds, fertilizers, and labor increased. Additionally, due to a lack of funding for production, the cooperative was unable to expand its vegetable cultivation area as planned for the most recent crop season.

Currently, 80% of member households in the cooperative are implementing and adhering to both production and marketing plans, while the remaining 20% produce according to their own preferences. In the upcoming plan, Van Phuc cooperative intends to focus on the production and marketing of certain indigenous vegetables such as cherry ground and erythralum scandens which are preferred in city markets. In parallel, the cooperative is proposing the development of a brand for these indigenous vegetables in collaboration with the district agricultural department and provincial agricultural department. Additionally, the cooperative plans to emphasize the production of culinary herbs, especially basil, as it requires minimal investment, is easy to cultivate, has high demand in both provincial and out-of-province markets, and commands a favorable price.

Similarly, heavy rainfall in Sa Pa and the unavailability of materials impacted the production season for baby corn seeds. Furthermore, limited seedling techniques among some members delayed the supply of seedlings to the market as per the initial plan. In the near future, the Can Ho Group will prioritize the production of grafted tomato plants in the upcoming plan to meet market demand. This strategy is devised based on recent market surveys conducted by team members. Additionally, the group is directing its efforts towards supplying seedlings for vegetables such as Brussels sprouts and local cabbage to select customers in Sa Pa town.

## **5. Discussion and Conclusion**

### ***5.1. Crop production***

On average, each household had 4 parcels for crop productions with 0.7 ha of area for cultivating 17 different staple crops, including 10 different vegetable ones in the last season. The Thai ethnic group in Mai Son grew highest number of staple crops, because they planted a greater number of fruit crops (5 in total) than other ethnic groups, such as strawberry, longan, sweetsop, plum, mango, and avocado. Meanwhile, the H'mong ethnic group grew the fewest number of different staple crops (14). They are residing in highland locations, far from the town center and markets, which hinders their development of market-oriented products. Consequently, the H'mong group tends to cultivate fewer number of different vegetable and fruit crops. Despite ethnic households cultivated a range of vegetables, there is a poor diversity when it comes to the cultivation of legumes. On average, each household only grows one type of legume. This result is quite logical since many households that had consumed legumes the previous 24 hours had purchased them.

## **5.2. Vegetable production**

In Mai Son, the vegetable production area was larger than in Sa Pa, because the land area for production in general was larger in Mai Son. Additionally, Van Phuc Cooperative in Mai Son specialized in commercial vegetable production, contributes to an average vegetable growing area per household of about 10,000 m<sup>2</sup>. While most farmers tend to cultivate vegetables in their home gardens, the Dao group had a higher prevalence of vegetable cultivation in upland fields. This was attributed to the majority of Dao farmers growing vegetables for sale to traders in Sa Pa town or Hanoi markets, focusing on substantial areas of chayote, Hmong mustard, and pumpkin.

The application of organic fertilizer was more prominent in VCGs compared to DHCs. This discrepancy was attributed to the larger production scale of the VCG group, making the composting process more convenient on a larger scale. Particularly in Sa Pa, the cold weather conditions necessitated larger compost quantities for effective fermentation. Consequently, VCG in Mai Son boasts the highest proportion of farmers engaged in composting activities.

With the exception of the VCG group, which specialized in commercial vegetable production, farmers primarily cultivate vegetables for personal consumption. However, the Dao and Thai groups shown a relatively higher proportion of vegetables grown for sale. These two ethnic groups were in closer proximity to the market compared to the Hmong group and had informal agreements to sell vegetables to traders within the commune or district.

Households tend to cultivate more other vegetable (4) and DGLV crops (3) than condiment (2) and vitamin A-rich vegetables (1). Due to favorable market access and suitable hot and humid conditions for growing summer seasonal vegetables such as water spinach, saupous, jute, ceylon spinach, and spinach, etc., farmers in Mai Son and the Thai ethnic group cultivated a greater number of DGLV crops (4) than other ethnic groups. Meanwhile, the cooler climate, suitable for vegetables like chayote, cabbage, and tomatoes, led farmers in Sa Pa and the Dao ethnic group producing more number crops of other vegetables (5).

Among the two VCGs, Van Phuc Cooperative places its primary emphasis on the commercial cultivation of vegetables, whereas the Can Ho Group focuses on the export of seeds and seedlings. Consequently, the Van Phuc Cooperative exhibits significantly greater dimensions in terms of land area, production scale, and associated production costs when compared to the Can Ho Group. Moreover, initial efforts in marketing and partner engagement have already generated income for the participating farming households in the Van Phuc Cooperative. In contrast, the Can Ho Group grapples with challenges in identifying appropriate distribution channels for their seed and seedling products. Furthermore, even though the Van Phuc Cooperative's central focus is not on seed production, its output surpasses that of the Can Ho Group, yielding a substantial source of revenue. However, both of these VCGs confront a multitude of challenges during their production processes, which encompass limited access to high-quality seeds, weather-related obstacles in production, constraints in nursery areas, issues pertaining to marketing, and constraints in the management board's capacity.

The majority (77%) of vegetable seeds was saved by farmer's selves for the next crop and about 28% of seeds had not good germination. The Hmong group in Sa Pa had a highest rate of self-saving vegetable seeds, because the group focused on growing indigenous vegetables such as local pumpkin and Hmong mustard. In addition, being far from district and commune centers makes it more difficult for this group to access vegetable seeds, so focusing on self-saving seeds is a good way to maintain local vegetable variety diversity. On the contrary, the Thai and Dao groups are close to the district and commune centers,

so they can easily buy many other vegetable seeds, so the percentage of self-saving seeds was lower than other groups. Thai, Mai Son and DHCs groups had difficulty with seed germination, respectively about 40%, 38% and 30% of households had not good germination. It can be caused by purchasing seeds of unstable quality at markets or seed shops in the commune/district.

### **5.3. Nature-Positive Solutions**

Among the five most popularly NPSs, the Sa Pa, Dao, and VCGs had a higher proportion (from 72% to 93%) that had adapted the practices than those in Mai Son, Thai, H'mong, and DHCs on nutrient replacement; eliminating pesticides use; intercropping, reducing prophylactic spraying; biological pesticides use; and selective pesticides use. This disparity can be attributed to the commitment and adherence of Dao groups in Sa Pa to production processes aligned with VietGap standards, which they have entered into agreements with purchasing companies. Consequently, they implement practices such as reducing or eliminating chemical pesticide usage, minimizing prophylactic spraying, using biological pesticides, and opting for selective pesticides more consistently. Similarly, the VCGs have gained access to organic farming methods, safe seed production, and training programs through district initiatives and international organization projects. This exposure has led them to employ NPSs more effectively than the DHCs. As a result, the soil quality trends for arable land, farmland, and home gardens among the VCGs surpass those of the DHCs. A higher percentage of VCG households possess high-quality soil types compared to the DHCs, with rates of 22.9% vs 11.2%, 39.1% vs 23.5%, and 36.2% vs 30.4%, respectively.

### **5.4. Household food consumption**

The Hmong in Mai Son experienced a more pronounced shortage of vegetables in the past year compared to other ethnic groups. Generally, the period when farmers face a shortage of vegetables is primarily during March and April. It occurred in both Sa Pa and Mai Son, as it coincides with the commencement of the dry season, resulting in a frequent lack of water for vegetable production.

The mean of food group diversity score of target households is at a moderate level (averaging 5 out of 10). Mai Son and the Thai group (roughly 6) exhibit higher food group diversity scores than the other groups. This could be attributed to their easier access to local markets, which allows them to purchase foods that their families do not produce daily, such as animal-source foods (97.8% vs. 92.7% and 100% vs. 90.8%). Additionally, Mai Son and the Thai group cultivated a wider of fruit crops, resulting in increased consumption of these food groups on a daily basis (78.3% vs. 35.4%; 91.4% vs. 41.2% and 41.5%). As a result, the Thai group (22.4%) and Mai Son (20.7%) have a higher proportion of households that consume all five recommended food groups compared to the other groups.

A positive note is that the NCD-Risk score among ethnic minority households is relatively low (2 out of 9). However, nearly 60% of households consume salty or fried snacks, with the highest prevalence in the Thai group (67.2%) and Mai Son (63%). This may be due to the easy accessibility of markets in these areas, where processed foods such as fried glutinous rice doughnuts, sausages, and spring rolls are readily available. Conversely, the proportion of households consuming sweet beverages and sweet foods is higher in the Dao group (52.3% and 41.5%) and Sa Pa (48.8% and 41.5%). This may be attributed to these households' tendency to access simple grocery stores in their villages to purchase sweet foods such as bread, cookies, candies, jellies, and sweet beverages like sting, twister, and green tea, etc.

The average NCD-Protect score among ethnic minority households is relatively low (3 out of 9). This indicates that ethnic households consume fewer foods from healthy food groups in their daily meals, highlighting the need for communication interventions to promote healthier and more diverse food consumption behaviors. Notably, in Sa Pa and among the H'mong group, the NCD-Protect score is even

lower than the community average. This aligns with the fact that households in Sa Pa and the H'mong group typically have less diverse diets, with a focus on grain products and mustards over other food types.

## **6. Recommendations**

### **6.1 Diet Health Clubs**

- Increasing the application of NPS for member households within DHCs, focusing on soil improvement (such as intercropping, crop rotation, nutrient replacement), the use of organic fertilizers, and biological pest control
- Encouraging the cultivation of a variety of Vitamin A-rich vegetables (such as pumpkin, carrot, and orange-flesh sweet potatoes)
- Implementing capacity building programs to enhance knowledge and consumption of various legumes and fruits while reducing the consumption of salty or fried snacks, sweet beverages, and sugary foods
- Providing education on gender equality to empower women in decision-making related to food crop production, the acquisition of agricultural assets, borrowing for agricultural production, and the use of household income
- Continue to enhance farmers' skills in selecting good and quality seeds when purchasing and storing seeds for self-saving
- Provide training on market linkage for commercial vegetables and similar produce for members of DHC.

### **6.2. Value Chain Groups**

- Maximizing existed nurseries, expand collaborative production models, and focus on improving quality to establish a strong competitive brand in the market, thus avoiding price disadvantages
- Engaging in contract-based production with favorable pricing to generate profits for the group and prevent food wastage and losses
- Enhancing techniques for seed preservation and post-harvest vegetable storage to ensure consistent product quality
- Strengthening management and finance capabilities for the board of VCGs
- Addressing the potential for expanding seed and vegetable production, especially for indigenous vegetables that are favored in large cities, such as cowpeas and purslane.

## Annex

### Annex 1. List of Diet Health Clubs and Value Chain Groups

Group	Commune	District
Nong Quynh DHC	Co Noi	Mai Son
Nong Mon DHC		
Van Phuc cooperative		
Na Hun DHC	Chieng Chan	
Tong Tai B DHC		
Phin Ho DHC	Ngu Chi Son	Sa Pa
Xin Chai DHC		
Sin Chai DHC		
Can Ho seed group		

### Annex 2. Quantitative NPS baseline survey tool



WP2 NPS\_baseline  
household survey\_toc

### Annex 3. Qualitative guideline on VCG interview



Interview guide for  
VCG leaders\_28Jun.doc

**Annex 4. Proportion of households growing the different crops (excluded vegetables and pulses)**

<b>Crops</b>	<b>Freq.</b>	<b>%</b>	<b>Crops</b>	<b>Freq.</b>	<b>%</b>
<b>Cereals</b>			<b>Other fruits</b>		
Maize/ corn (ordinary)	151	86.8	Ambarella	1	0.6
Maize/ corn (sticky)	69	39.7	Avocado	4	2.3
Ordinary rice	85	48.9	Banana, common varieties	40	23.0
Sticky rice	96	55.2	Banana, dwarf cavendish	18	10.3
<b>White tubers and roots</b>			Dragon fruit	14	8.0
Cassava, tuber	6	3.4	Grape	1	0.6
Potato, white	2	1.1	Guava	30	17.2
Sweet potato, white flesh	13	7.5	Jackfruit	32	18.4
Taro, root	11	6.3	Litchi	6	3.4
<b>Vit A rich fruits</b>			Longan	82	47.1
Mango	76	43.7	Olester	1	0.6
Papaya	13	7.5	Orange	4	2.3
Persimmon	1	0.6	Passion fruit	5	2.9
			Peach	65	37.4
			Pear	24	13.8
			Pineapple	11	6.3
			Plum	82	47.1
			Pomegranate	1	0.6
			Pomelo	23	13.2
			Royal banana	1	0.6
			Star fruit	1	0.6
			Strawberry	22	12.6
			Sweetsop	13	7.5
			Wampee	5	2.9
			Watermelon	1	0.6

## Annex 5. Proportion of households growing the different pulses and vegetables

Vegetables and pulses	Freq.	%	Vegetables and pulses	Freq.	%
<b>Pulses</b>			<b>Other vegetables</b>		
Black bean, seed	3	1.7	Bamboo shoot	2	1.1
French bean (climber plants)	80	46.0	Bitter gourd	34	19.5
French bean (herbaceous plants)	3	1.7	Cabbage	47	27.0
Local bean	1	0.6	Calabash	3	1.7
Long bean, Chinese	48	27.6	Chayote	81	46.6
Soybean (green skin)	1	0.6	Cherry tomato, small fruit, local	44	25.3
Soybean, yellow skin	1	0.6	Colocasia indica	1	0.6
Sweet pea	3	1.7	Cucumber	36	20.7
Peanut	8	4.6	Eggplant	34	19.5
<b>DGLVs</b>			Eggplant, Thai	10	5.7
Amaranth, red	9	5.2	Eggplant, wild	1	0.6
Amaranth, spineless	8	4.6	Hmong cucumber	58	33.3
Amaranth, white	1	0.6	H'mong cucumber	8	4.6
Broccoli, leaves and stem	1	0.6	Kohlrabi	4	2.3
Ceylon spinach	30	17.2	Lettuce, romaine, leaves	13	7.5
Ceylon spinach (introduced)	2	1.1	Napa cabbage	3	1.7
Chinese flowering cabbage/ choysum	6	3.4	Radish, white	4	2.3
Chrysanthemum, leaves	4	2.3	Sponge gourd	14	8.0
Erythralum scandens	1	0.6	Sponge gourd, Japanese	3	1.7
Green mustard/ Choysum	2	1.1	Tomato	4	2.3
Groundcherry, leaves	9	5.2	Water taro, shoots	7	4.0
Hmong mustard	127	73.0	Winged bean	1	0.6
Local mustard	4	2.3	Winter melon, long fruit	15	8.6
Mustard	7	4.0	<b>Condiment vegetables</b>		
Mustasa	16	9.2	Balm mint	4	2.3
Pak choy	1	0.6	Basil, sweet, leaves	11	6.3
Pumpkin, leaves	158	90.8	Chilli, green, big fruit	26	14.9
Sauropus	49	28.2	Chilli, spice, small fruit	65	37.4
Savoy cabbage	3	1.7	Condiment vegetables	11	6.3
Sorrel leaves, Von Ven	1	0.6	Coriander, leaves and stem	33	19.0
Water spinach	25	14.4	Dill	1	0.6
Winter melon, leaves	3	1.7	Garlic	24	13.8
<b>Vit A rich vegetables &amp; tubers</b>			Ginger, rhizome	36	20.7
Bell pepper, red	1	0.6	Lemon	1	0.6
Carrot	1	0.6	Lemon grass	11	6.3
Pumpkin	158	90.8	Sawtooth herb / Culantro	6	3.4
Sweet potato, orange flesh	17	9.8	Spring onion	29	16.7