REPORT

Outreach R&D Consulting Co.,Ltd

THE SURVEY ON THE INTERESTS OF VALUE CHAIN ACTORS ON THE SCP PRINCIPLES AND INTEGRATION INTO THEIR BUSINESS GOVERNANCE

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IKI INTERNATIONAL CLIMATE INITIATIVE

Collaborated by

The interests of Value Chain Actors on the SCP Principles and Intregration into Their Business Governance

Outreach R&D Consulting Co., Ltd

List of Abbreviations

GHG	:	Greenhouse Gase Emission
Outreach R&D	:	Outreach R&D Consulting Co., Ltd
KII	:	Key informant interview
FGD	:	Focuse Group Discussion
SCP	:	Sustainable Consumption and Production Roadmap
CPA	:	Community Protected Area
PDAFF	:	Provincial Department of Agriculture, Forestry and Fisheries
CAGR	:	Compound annual growth rate
SME	:	Small and Medium Enterprise
NTFPs	:	Non-Timber Forest Products

List of Table

List of Figure

Executive Summary

Understanding the supply chain structure, performance of key actors, and key challenges of vegetable and wild honey production are essential to engage the producers and wild honey harvesters into market. In addition, undersanding waste management practices of key actors are important to promote do no harm business on the environment. In this context, the survey on the interests of value chain actors on the SCP principles and integration into their business governance was conducted for the purpose of collecting all data and information on food value chain actors' interest in SCP principles and their integration into their business governance framework, as well as to identify value chain actors in Phnom Penh and Mondulkiri.

There were 168 respondents, including 1 provincial department of agriculture, 1 provincial department of environment, 22 restaurants (6 restaurants in Mondulkiri province), 4 vegetable farmers, 15 wild honey harvesters, 7 vegetable distributors, 12 honey distributors, 98 vegetable retailers, 4 honey retailers, 1 vegetable processor, and 3 honey processors, were selected purposively from Mondulkiri province, Phnom Penh and Kandal province. The result of survey are detailed as following:

Key findings:

Finding 1. Retail vegetable supply chain

1. Retailers in Mondulkiri province relied on local products (only 10% of vegetables are imported from Vietnam), while retailers in Phnom Penh and Kandal province are commonly procured from Doem Kor market.
2. Since vegetable sold fresh, the vegetable processing is limited in all studied areas
3. The contract agreement between retailers and suppliers are not commonly made, so the price fluctuation and irregular supply remain challenges for vegetable retailers.
4. The settlement is usually conducted immediately during the buying vegetables.
5. Majority of retailers in Phnom Penh and Kandal province are not willing to buy vegetables from Mondulkiri province because their selling dropped, difficulty to check the quality of vegetables, and not familiar with vegetables from Mondulkiri province.
6. Five conditions (stability of supply; product appearance; required clean, pack, and transport to shop by farmers; enough required volume; and stable price) are proposed from those who want to buy vegetables from Mondulkiri province
7. Market price setting and immediate payment by cash are preference condition for retailers in the studied areas.
8. Women have more involvement in vegetable business compared to men.
9. Waste classification is not frequently practised by retailers in the studied areas. Generally, waste is disposed in the personal and public trash bins. However, minority of retailers

disposed waste on the road or street, open space in public or market, and backyards, especially in Mondulkiri province.

10. Waste recycling was not commonly practiced by retailers in the studied areas.
11. Retailers know heard about environmental friendly packaging through Facebook, government, and NGOs. However, they did not use the environmental friendly packaging because the materials are difficult to find, expensive, and not required from customers.
12. Majority of retailers aware of food and plastic waste on the environment and are willing to change behaviors on the waste management practices
13. The approximately 73 plastic bags are used by each retailer per day
14. A plastic-free policy, a strategy for the environmentally friendly packaging utilization, and strategy to reduce transportation emissions are not existed in nearly all retailers.
15. A proximately 50% of retailers want to promote recyclable, compostable, and biodegradable packaging in their and businesses, plastic-free business. In addition, they want to save energy and water for economic and environmental benefits.

Finding 2. Wild honey supply chain

1. Wild honey market system is very traditional. Harvesters sell products to market through collectors, cooperatives, private company, and processors. Provincial Department of Environment, Ministry of Commerce, and NGOs, especially WWF have been promoting the wild honey production by forming CPA, provide training on harvesting techniques, quality control, and supporting CPA to register geographical indication (GI).
2. Honey is generally traded during dry season. Each distributor collected approximately 300 litre per season.
3. Honey is frequently procured from Pechreada and Kaoh Nhiek districts of Mondulkiri province. However, about 16% of honey sell in Mondulkiri procured from Preah Vihear, Kampong Cham, and Koh Kong provinces.
4. Almost of interviewed distributors and retailers procured honey from harvesters with immediate payment by cash.
5. Supply contract is not frequently practiced by distributors and retailers, so quality of produce unsatisfactory or inconsistent, inconsistent in supplying quantity, and high price fluctuation are commonly existed.
6. Approximately 52% of harvested honey is sold to end-users and retailers in Phnom Penh city, 46% sold in Mondulkiri province, and 2% sold to processors.
7. Price, product appearance and quality of products are the most influenced conditions for distributors and retailers to buy wild honey in Mondulkiri province
8. Procurement without contract, market price setting and direct payment by cash are preferred

choice for honey distributors and retailers.

9. Women have been involved in all business activities. However, decision on labor hiring is mainly decided by husband
10. Plastic and paper trash burning is practiced by distributors and retailers in Mondulkiri province.
11. The majority of waste placed in the personal and public bins. However, trash burning is in practice by distributor and retailers in Mondulkiri province.
12. Majority of honey distributors hear about environmental-friendly packing from Facebook, government institutions, and NGOs. However, they did not use these materials due to difficult to find, expensive, and not require from customers.
13. Majority of honey distributors and retailers aware of impact of food and plastic waste on environment and are willing to change behavior towards waste management practices.
14. Plastic bags used in the honey business is an average 56 bags per day.
15. A plastic-free policy, a strategy for the environmental friendly packaging utilization, and strategy to reduce transportation emissions are not existed in the honey retail business
16. Honey distributors and retailers are willing to promote recyclable, compostable, and biodegradable packaging and a plastic-free policy in their businesses. In addition, they were willing to reduce transportation for economic benefits for the business.

Finding 3. Vegetable procurement practices of restaurants

1. Senmonorum and Vietnam are main source of vegetables for restaurants in Mondulkiri, while various markets in Phnom Penh are source of vegetables for the restaurants in Phnom Penh. Elite restaurants generally have own suppliers.
2. Three types of vegetables (organic, GAP, and Conventional vegetables) are supplied to restaurants in Mondulkiri province, while conventional vegetables supplied to all interviewed restaurants in Phnom Penh city.
3. Supplied contract is not practiced by restaurants in Mondulkiri province. However, elite restaurants in Phnom Penh city procured vegetables with contract.
4. Immediate payment by cash is practiced by restaurants in Mondulkiri province, while elite restaurants in Phnom Penh city and Kandal province settled suppliers during 30 days (by bank transfer) after vegetables supplied.
5. Quality of products, product appearance, and price are influencing factors for restaurants to buy vegetables.
6. Almost restaurants in Phnom Penh are willing to buy vegetables from Mondulkiri province
7. Enough required production volume, Stability of supply, Cleaning and packing by farmers,

Product appearance and meeting the required grade are the most preference of restaurants to procure vegetables.

8. All restaurants procure vegetable daily
9. Monthly price setting is preferred by restaurants in Phnom Penh and Kandal province, while market price setting is required by restaurants in Mondulkiri province.
10. Women involved in the discussion to start up and manage the business.
11. Waste classification are commonly practiced by restaurants in the studied areas. Generally, they separated separating food and vegetable waste, plastic, cans, and glass.
12. Waste recycling is not practised by all interviewed restaurants
13. All of interviewed restaurants disposed the waste in the personal trash bins.
14. Majority of restaurants interviewed heard about environmental-friendly packing from Facebook, government institutions, and NGOs.
15. Environmental friendly packaging is not commonly used by restaurants in Mondulkiri province, while majority of interviewed restaurants used these materials, mainly paper bag and paper made from sugar can residue.
16. Almost of interviewed restaurants aware of impact of food and plastic waste on environment and are willing to change behaviour towards waste management practices.
17. Approximately 41 plastic bags are used by each restaurant per day.
18. A plastic-free policy, a strategy for the environmentally friendly packaging utilization, and strategy to reduce transportation emissions are not existed in all interviewed restaurants.
19. Most of restaurants are willing to promote recyclable, compostable, and biodegradable packaging and a plastic-free policy in their businesses. In addition, they were willing to reduce transportation for economic benefits for the business.

Based on the results, followed recommendations are proposed.

1. Resilient agricultural technology should be promoted in Mondulkiri province to improve agricultural production, especially dry season.
2. Contract farming between producers and retailers should be promoted to resolve the price fluctuation during rainy season
3. Convert vegetable production in Mondulkiri province into GAP and local certified organic (PGS) for integrating in the Phnom Penh markets
4. Strengthen agricultural cooperative and CPA to collect honey products
5. Honey processing should be in Mondulkiri province
6. Awareness session on impact of food and plastic waste on environment
7. Waste recycling should be promoted

I. Background

Cambodia shifted from an agrarian-based to a service- and production-based economy through its fast-economic growth, reaching lower middle-income status in 2015 and aspired to attain upper middle-income status by 2030[1] and a high-income country by 2050. However, agriculture is still a backbone of the Cambodian economy. Nearly 61 percent of Cambodians live in rural areas, with 77 percent relying on agriculture, fisheries, and forestry for their livelihoods[2]. The agricultural sector in Cambodia plays an important role in poverty reduction and employment, comprising 22.1% of GDP[3] and generating 35% of the country's employment in 2019[4]. In contrary, agricultural sector has contributed to environmental deterioration due to application of pesticides, fertilizers and other toxic farm chemicals in the farming system. In addition, farming practices such as such as burning fields and using gasoline-powered machinery have significant contributions to increase the greenhouse gase emission (GHG) in the atmosphere[5]. To address these issues, with funding support from International Climate Initiative (IKI), The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), WWF Cambodia has been implementing the "IKI SCP Phase II Project on Establishing Sustainable Consumption and Production (SCP)", aiming to reduce emissions, increase adaptation and resilience to climate change through the implementation of complementary interventions that focus on connecting sustainable production to consumption to transform elements and behaviors in the food system, the agri-food sector.

Objective of Study

The aim of this study is to collect all data and information on food value chain actors' interest in SCP principles and their integration into their business governance framework, as well as to identify value chain actors in Phnom Penh and Mondulkiri.

Specific objectives

The study was guided by the following specific objectives:

- To assess the vegetable and wild honey value chain structure

[1] https://www.worldbank.org/en/country/cambodia/overview#:~:text=Over%20the%20two%20decades%20before,middle%2Dincome%20status%20by%202030.
[2] USAID Cambodia: Agriculture and Food Security
[3] Asian Development Bank (2021) Cambodia Agriculture, Natural Resources, and Rural Development Sector Assessment, Strategy and Road Map: https://www.adb.org/sites/default/files/publication/718806/cambodia-agriculture-rural-development-road-map.pdf
[4] The World Bank '' Employment in agriculture (% of total employment) (modeled ILO estimate) – Cambodia'' accessed by 10th January 2023: https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?end=2019&locations=KH&start=2018
[5] https://www.worldwildlife.org/industries/sustainable-agriculture#:~:text=Agriculture%20is%20the%20leading%20source,in%20the%20environment%20for%20generations.

- To identify the key value chain actors in the vegetable and wild honey value chain
- To identify the required standards of products, procurement mechanisms and market requirements (standards, conditions for delivery) of vegetable and wild honey
- To identify the requirements for the market linkage in case of wild honey and vegetables are to be supplied by members of community protected area (CPA members) in Mondulkiri province
- To identify the current waste management practices of key actors in the vegetable and wild honey supply chain
- To identify the interests of key actors in integrating SCP principles into their business goverancne

II. Methodology

2.1 Research Questions

The survey on the interests of value chain actors on the SCP Principles and integration into their business governance was guided by following research questions:

1) What is value chain structure of vegetable and wild honey production in Mondulkiri province?
2) What is interst of value chain actors on the SCP Principles and Intergration into their business governce?
3) What are key actors and their roles in the vegetable and wild honey value chain in Mondulkiri province?
4) What are required standards of products, procurement mechanisms and market requirements (standards, conditions for delivery) of vegetable and wild honey to be supplied in Mondulkiri and Phnom Penh?
5) What are requirements for the market linkage in case of wild honey and vegetables are to be supplied by members of community protected area (CPA members) in Mondulkiri province?
6) What are the current practices of vegetable and honey key actors in waste management?
7) Are key actors willing to integrate the SCP principles into their business goverancne?

2.2 Identification of study areas

There are five types of vegetables: leafy, fruit, flower, fruit, and root have been grown by farmers in Mondulkiri province. Leafy, fruit, and flower vegetables are commonly grown by farmers. The production of these vegetables is 3,676 tonnes (accounting for 61%) of the total production in vegetable production in the province. The fruit and root vegetables are approximately 2,319 tonnes, accounting for 39% of vegetable production in the province in 2022. Three areas have been dominated by vegetable production. Senmonorum municipality is the largest vegetable growing area (169 hectares of harvested areas), followed by Pechreada (130 hectares of harvested areas) and Kaoh Nheaek district (110 hectares of harvested areas). The total production of the three areas represents approximately 77% of the total production in the province in 2022 (table 1). According to potentiality and representativeness of the vegetable production in the province, the consultant selected Kaoh Neaek, Pechreada, and Senmonorum municipality to be study areas.

Table 1.Distribution of vegetable production in Mondulkiri province

Districts	Leafy, stem, flower			Fruit			Root			Accummulated data		
	harvested areas (ha)	Yield (t/ha)	Total production (t)	harvested areas (ha)	Yield (t/ha)	Total production (t)	harvested areas (ha)	Yield (t/ha)	Total production (t)	harvested areas (ha)	Yield (t/ha)	Total production (t)
Kaev Seima	42.00	11.73	493.00	24.00	7.63	183.00	1.00	12.78	13.00	67.00	32.15	689.00
Kaoh Nheaek	72.00	12.47	898.00	35.00	8.58	300.00	3.00	11.09	33.00	110.00	32.14	1,231.00
Ou Reang	40.00	13.36	534.00	18.00	8.52	154.00	1.00	11.62	12.00	59.00	33.50	700.00
Pechreada	73.00	13.81	1,008.00	54.00	8.86	479.00	3.00	11.31	34.00	130.00	33.99	1,521.00
Senmonorom municipality	61.00	12.18	743.00	86.00	9.44	812.00	22.00	10.42	299.00	169.00	32.04	1,854.00
Summary	***288.00***	***63.55***	***3,676.00***	***217.00***	***43.04***	***1,928.00***	***30.00***	***57.22***	***391.00***	***535.00***	***163.81***	***5,995.00***

Source: Annual report of Mondulkiri provincial department of agriculture, forestry and fisheries 2022

2.3 Sampling method

To ensure the robust sample size selection method, the Crochran formula was used to calculate sample size.

Cochran Formula for indefinite population (Cochran, 1963) [6]

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{[(1.28)^2 * 0.5* (1-0.5)]}{(0.5)^2} = 164 \text{ respondents (detail in annex 2)}$$

Where:

e is the desired level of precision (i.e. the margin of error)=0.05
p is the (estimated) proportion (p=0.5) of the population which has the attribute in question
q is 1 – p= 1-0.5=0.5
Z value, according to Z table, for 80 % confidence level is 1.28
Alpha divided by 2 [=(1-95%)/2] 0.10

The purpose sampling method was used to selected respondents for inclusion in this research to ensure that the chosen respondents are sufficiently involved in local vegetable production and are adequately representative of key demographic subgroups. Based on the preliminary literature review of Cambodian vegetable and wild honey production described above, the Consultants identified key actors most relevant for inclusion in the quantitative portion of this research.

The Consultants will conduct interview with 82 key vegetable and wild honey actors in Mondulkiri province (1 Mondulkiri provincial Department of Agriculture, Forestry and Fisheries (PDAFF) staff, 1 provincial department of environment staff, 19 vegetable and wild honey distributors, 34 vegetable and wild honey retailers, 6 restaurants, and 2 wild honey processors) and 86 key actors in Phnom Penh city and Kandal province (16 restaurants, 68 vegetable retailers, 1 vegetable processors, and 1 wild honey processor) (table 2).

[6] https://www.smartsurvey.co.uk/articles/calculate-sample-size

Table 2. List of samples

Type of respondents		Plan			Results		
	Commodity	Mondulkiri	PP+kandal	Total	Mondulkiri	Phnom Penh and kandal	Total Interviewed
PDAFF staff		1	-	1	1		1
Provincial Department of Environment		1	-	1	1		1
Restaurants		6	6	12	6	16	22
Farmers	Vegies	8	-	8	4		4
Harvesters	honey	8	-	8	15		15
Distributors	Vegies	15	-	15	7		7
	honey	15	-	15	12		12
Retailers	Vegies	15	72	87	30	68	98
	honey	3	5	8	4		4
Processors	Vegies	0	4	4		1	1
	honey	2	3	5	2	1	3
Total respondents				164			168

2.4 Survey Tools

The mixed method was used for this study. The consultants reviewed a series of existing documents related to vegetable and wild honey production in Cambodia, including Mondulkiri province and SCP principles before developing research tools. The questionnaires was developed based on type of respondents and research questions (stated in table 4). The consultant used hardcopy questionnaires for KII as tool to collect respondent profile including GPS coorninate Axis Order (X,Y). In addition, the dataset in SPSS will be developed in this stage to record the collected data from the field interview.

2.5 Field Data Collection

The field data collection started from October 23, 2023, to November 16, 2023. The survey was divided into 2 groups (each group consisted of one supervisor and 4 enumerators). All involved personnel were trained on the questionnaire and field data collection techniques in order them to understand the objectives of the survey, questionnaires, required information, data collection techniques, and data entry procedures prior to field work. Mock test questionnaires were also conducted during the training to ensure all questionnaires were able to collect field data. In addition, piloting questionnaires was conducted to confirm all questions would be clearly

understood by respondents, ensure the length of the interviews was appropriate, and prevent any possible risks to both data enumerators and respondents. Both online and offline interview methods were employed during the survey.

Data Quality Assurance/Confidentiality. Prior to beginning any interview, respondents were read a consent statement informing them of the nature of the research and their right to end the interview at any time and were asked to provide their verbal consent for participating in the research/survey. All filled questionnaires were reviewed by each enumerator and then submitted to field supervisors to review at the end of each day. In addition, all research data were kept as confidential for only client unless it is approved to share it.

2.6 Data anylysis and reporting

After field data collection, collected data were entered into the dataset, cleaned, and analyzed by SPSS, and triangulating the quantitative and qualitative findings. Descriptive statistics was used to analyze the data. Graphs, charts, and tables were used for data visualization.

3.7 Study Limitations

The results of this study were subject to several limitations. First, quantitative sampling: to accommodate resource constraints, the study conducted only 3 FGDs in Kaoh Nhiek, Pechreada, and Senmonorum. There were only 4 vegetable producers and 15 wild honey harvesters. While this does meet the minimum sample size requirements to reach the representativeness of farmers in the production, Second, the study focused on the vegetable and wild honey supply chains. However, input suppliers and financial institutions, which were key actors in both vegetable and wild honey production, were not included in the study. Third, there were limitations in the number of processors who participated in the survey. Only 1 vegetable processor and 3 wild honey processors participated in the survey. Therefore, it affected the generalization of the result. To address this challenge, the consultant reviewed secondary data to add to the study result.

III. Liturature Review

3.1 Overview of the Cambodian vegetable sector

3.1.1 Vegetable Production

In Cambodia, vegetables were the most profitable to produce when compared to cassava, maize, dry season rice, and wet season rice. Vegetable production results in the highest total revenue ($2,843/ha), followed by cassava ($1,297/ha) and dry season rice ($992/ha). Wet season rice and maize produce the lowest total revenue at approximately $750/ha[7]. Vegetable farming specifically represents one of the main sources of income for rural people in Cambodia. Kampong Cham, Kampong Chhnang and Kandal provinces are the main vegetable producing areas, accounting for approximately 34,686 hectares of growing areas and produced approximately 46% of the national production in 2022. Vegetable production has fluctuated and increased substantially in recent years, with the total land under cultivation expanding by approximately 63% in the seven years between 2015 and 2022 (from 47,373 hectares to 77,319 hectares). This has corresponded with dramatic increases in production during the same period, from 405,528 tons in 2015 to 1,117,895 tons in 2022 (table 3).

Table 3. Status of Cambodian Vegetable Production[8]

Items/year	2015	2018	2019	2020	2021	2022	CAGR %
Growing area (ha)	47,373	4,427	57,262	69,859	66,434	77,319	6.31%
Harvested areas (ha)	47,285	24,422	57,258	68,389	66,089	76,766	6.24%
Production (tons)	405,528	224,590	682,012	810,063	908,594	1,117,895	13.51%

Source: MAFF Annual report 2015-2022: https://elibrary.maff.gov.kh/books/5af3a999a04a5

3.1.2 Market Trends

Even if Cambodian consumers prefer to consume local vegetable products, believing them to be safer due to lower levels of chemical use, domestic production is not sufficient to meet domestic demand[9]. Local production covered approximately 48% of total daily market damand, while the remained 52% were filled by imported vegetables from overseas, especially neighboring Thailand or Vietnam.

A study in 2020 showed that Cambodia requires approximately 489,000 metric tons of vegetables per year to meet the local demand. However, Cambodian farmers could produce about 45% of market demand during the wet season and up to 70% during the peak production period occurring during the dry season. Therefore, Cambodia need to import around 114,000 tons of vegetables per year

[7] World Bank. (2015). Cambodian agriculture in transition: Opportunities and Risks (Economic and sector work report no. No. 96308-KH
[8] Source: MAFF Annual report 2015-2021: https://elibrary.maff.gov.kh/books/5af3a999a04a5
[9] USAID (2015). An Analysis of Three Commodity Value Chains in Cambodia

to meet local demand, which presents a substantial opportunity for local actors within the vegetable value chains[10].

Rapid economic growth, urbanization, and an expansion of the tourism sector in major cities such as Siem Reap and Phnom Penh have driven an expansion in demand for processed vegetables and fruits in Cambodia. Fresh cut vegetables, dried vegetables, pickles, sauces, fruit juices, ketchups, puree, and wine represent increasingly popular processed food and beverage products consumed in Cambodia[11]. Rising demand within international markets in the region has also contributed to the expansion of Cambodia's fruit and vegetable exports in recent years. Vietnam, China, Thailand, and Japan are major importers of fresh produce from the country. The Royal Government of Cambodia has made major agreements with importing countries to have a direct access to these export markets without relying on intermediary partners. For instance, the country has gained direct export access of its bananas to China from the General Administration of Customs of China (GACC) [12].

3.1.3 Overview of restaurants and vegetable retails in Phnom Penh city

3.1.3.1 Vegetable retails

The vegetable products reached to customers by wet market and muti-purposed retail stores- store selling vegetable, fruit, and other kind of processed products. There are approximately 76 Fruit and vegetable stores have been operating in Phnom Penh city 2023[13].

3.1.3.2 Restaurants

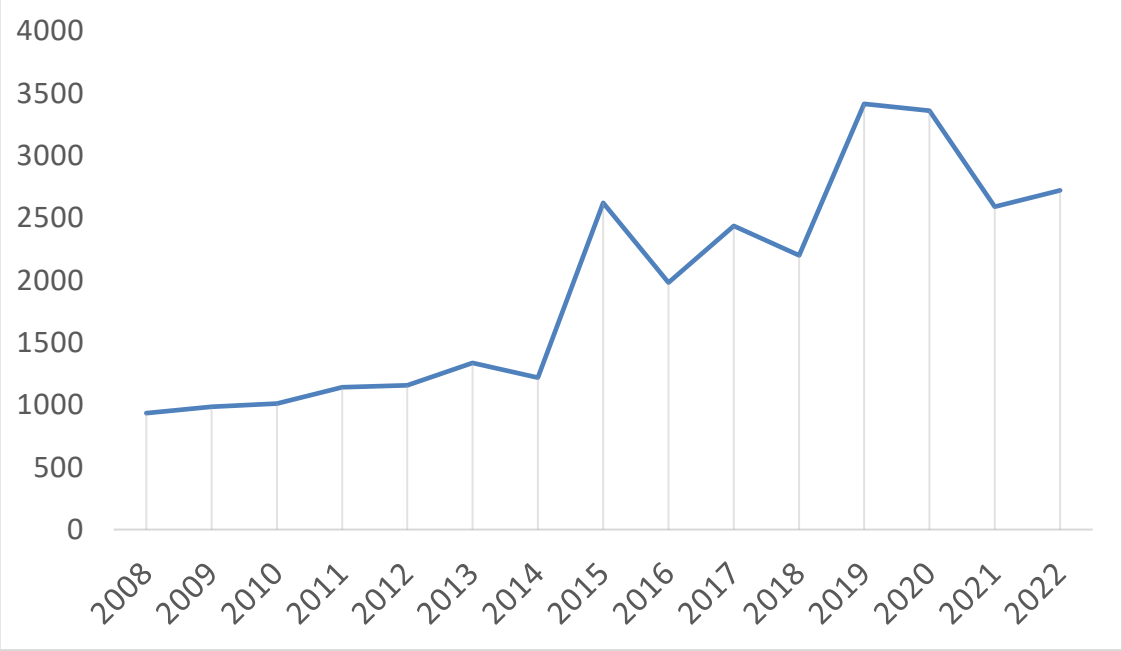
The restaurant is one of main consumers of vegetable production. There are six different types of restaurants have been operating in Phnom Penh city. First, fine-dining restaurants often stand alone as a single restaurant and sometimes they are parts of or reside within luxurious hotels. Customers of these restaurants are mostly foreign tourists and expatriates. Second, casual dining restaurants serve all day-dining foods but some of them may serve only breakfast or lunch. These types of restaurants are most common in Phnom Penh. However, all day dining casuals are uncommon because most of these restaurant types can only absorb during a time of certain dining. Third, fast-food restaurants often serve from late morning until late night. Foods are usually fast served within 1 or 2 minutes. Foods are usually chicken fries, pizza, and several other westernized food types along with soft drinks. Fourth, Cafes have been recently influenced by the Westerners, serving Asian and western coffee along with other drinks and fresh juice. Bakeries and cookies are served to complement their drinks. These types of restaurants are often well- decorated and designed to serve customers who look for meeting friends and

[10] Need Assessment of the Traceability System for Vegetable Value Chain 2020:https://www.techostartup.center/media/uploads/resource/files/Traceability_Vegetables.pdf
[11] Report linker ''Cambodia Fruits and Vegetables Market – Growth, Trends, and Forecast (2020 - 2025)'' accessed by 6th December 2022: https://www.reportlinker.com/p05891636/Cambodia-Fruits-and-Vegetables-Market-Growth-Trends-and-Forecast.html
[12] Report linker ''Cambodia Fruits and Vegetables Market – Growth, Trends, and Forecast (2020 - 2025)'' accessed by 6th December 2022: https://www.reportlinker.com/p05891636/Cambodia-Fruits-and-Vegetables-Market-Growth-Trends-and-Forecast.html
[13] https://rentechdigital.com/smartscraper/business-report-details/ ambodia/phnom-penh/phnom-penh/fruit-and-vegetable-stores

business partners while also enjoying drinks and light snacks. A few of these restaurants also serve breakfast and lunch. Fifth, specialized soup restaurants serve certain types of soup and other dinner types during the evening and late evening. They are designed for different groups of customers, from low-class to top-end. The majority of soup restaurants are intended for middle-class to top-end customers. Sixth, night clubs, bars and restaurants often serve light dinner but heavy alcohol drinks. These types of restaurants are intended for entertainment and their serving time is during late evening. Karaoke clubs are among these types[14]. The number of restaurants in Phnom Penh city has fluctuated and increased by approximately 191% during 15 year period from 934 restaurants in 2008 to 2,721 restaurants in 2022 (Figure 1) as a result of increasing living standards of the population, number of tourists, and income of Cambodian population[15].

Recently, the tourism-related sector, including restaurants was strongly hit by the covid-19 pandemic. Almost half of tourism-related businesses in Cambodia have been forced to close their doors due to the impacts of the COVID-19 pandemic[16]. To address this issue, the Cambodian government developed a roadmap for recovery of Cambodia Tourism During and Post Covid-19. In addition, some restaurants expanded their sale through online channels such as Nham24, Food Panda, and other apps.

Figure 1. Evolution of restaurants in Phnom Penh city



Source: Ministry of Tourism. tourist statistics report 20222

[14] Hoem Seiha (2014) restaurant leader survey in Phnom Penh city
[15] https://www.phnompenhpost.com/post-plus/restaurants-buffets-increase-number-and-quality
[16] https://thediplomat.com/2021/08/report-reveals-covid-19s-deep-impact-on-cambodian-tourism-economy/

3.1.4 Vegetable production in Modulkiri province

Mondulkiri is a potential area for vegetable production since it has favourable weather condition and rich red soil[17]. However, vegetable production in this province is relatively small, accountinf for approximately 0.5% of national production in 2022. The total vegetable harvested area is decreased during the seven year period from 479 hectares in 2015 and 353 hectares in 2022. However, the production has been fluctuated and increased sharply during the seven years from 976 tonnes in 2015 to 5,924 tonnes in 2022 (table 4). As a result of agricultural mechanization has been improved in the province.

Table 4.Vegetable production in Mondulkiri province

Items/year	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*CAGR %*
Growing area (ha)	479	406	412	25,554	107	498	613	353*	-3.74%
Harvested areas (ha)	479	406	412	25,554	107	498	613	353*	-3.74%
Production (tons)	976	912	997	72,522	455	1,281	6,083	5,924*	25.28%

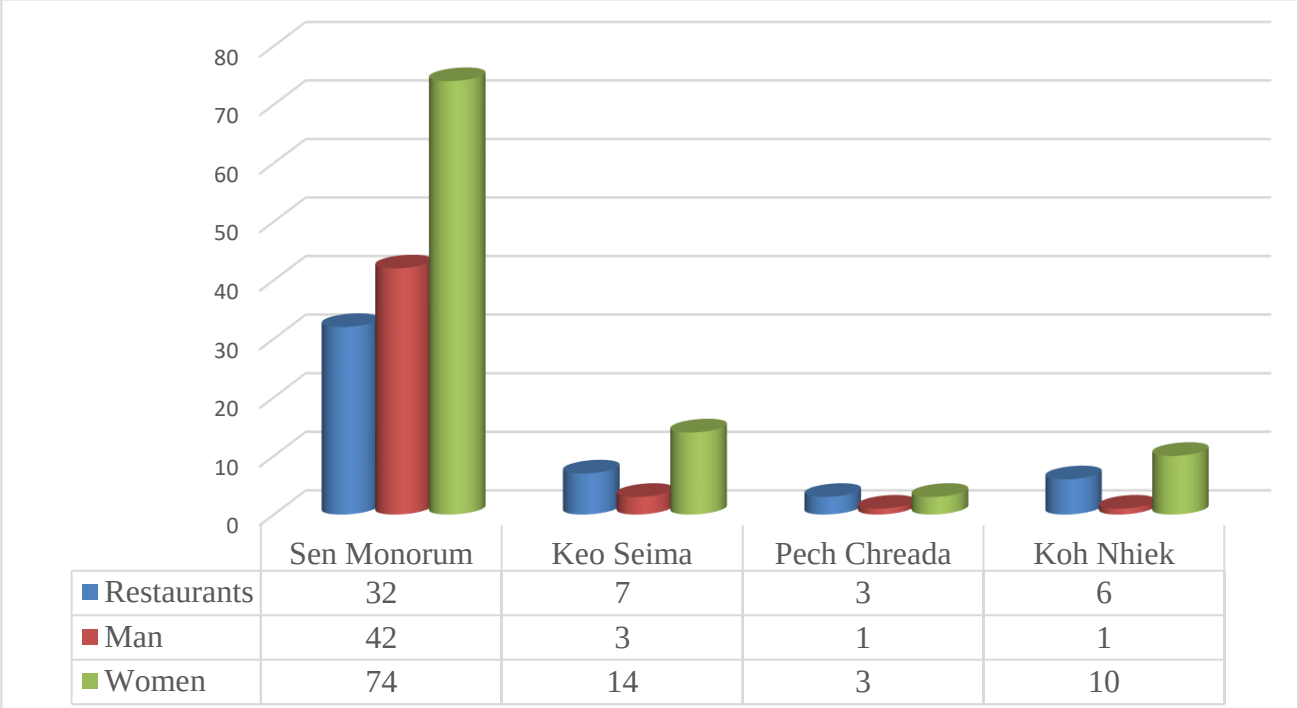
Source: General Directorate of Agriculture: annual report 2015-2021; * Annual Report of Mondulkiri Provincial Department of Agriculture, Forestry and Fisheries 2022

3.1.5 Overview of restaurants operating in Mondulkiri province

Mondulkiri Province is one of the eco-tourist sites in Cambodia. According to the Mondulkiri Provincial Department of Tourism, there are 48 restaurants operating in Mondulkiri province in 2023. The majority of restaurants (representing 67% of total restaurants) are located in Senmonorum municipality. These restaurants provided jobs to 148 people (101 women)(Figure 2), with salaries ranging from 93 USD to 200 USD per month.

Figure 2. Status of Restaurants in Mondulkiri province 2023

[17] https://www.khmertimeskh.com/501032159/mondulkiri-considered-as-potential-crop-production-land/



	Sen Monorum	Keo Seima	Pech Chreada	Koh Nhiek
Restaurants	32	7	3	6
Man	42	3	1	1
Women	74	14	3	10

Source: Provincial Department of Tourism. Statistics of Restaurants, June 2023

3.2 Sustainable Consumption and Production Roadmap

Summary Key Principles related to Agricultural Sector

1) *Sustainable production: promote climate-smart agriculture through providing agricultural extension service, supporting climate resilient crops, supporting of resilient seed imports, and prevent overuse of chemical fertilizers and pesticides, and promote organic agriculture.*
2) *Sustainable Distribution: promote environmental labelling (e.g echo label), recyclability of plastic products, sustainable business models for minimising waste in the packaging of food and beverages, and reduce emissions in the transportation of products.*
3) *Sustainable Consumption: focuses on waste prevention, recycling, and management. This included effective collection for treatments of recyclable materials and strengthen the implementation of the 4Rs policy (Refuse, Reduce, Reuse, and Recycle).*

The Cambodia's Roadmap For Sustainable Consumption and Production 2022-2035 was developed by the the General Directorate of Policy and Strategy of the Ministry of Environment for the purpose of strengthening the sustainability of Cambodia's consumption and production systems through 5 strategic pillars.

A) **Sustainable production** covers on sustainable industry, sustainable primary production (fishing, agriculture, forestry), sustainable natural resources extraction and production (minerals, oil, sand), sustainable building design (construction and housing), sustainable tourism and services, and sustainable business initiatives. To ensure sustainable agricultural production, the strategy focuses on following mechanisms:

- the establishment of policy framework for Non-Timber Forest Products (NTFPs) that promotes enterprise development, value addition, tax incentives, product quality, production systems and investment and financing, delivering benefits to communities.
- Expand agricultural extension services and regulatory incentives for climate-smart agriculture, supporting climate-resilient crops and diversification, resilient agricultural infrastructure and enable importing of resilient seed varieties.
- Prevent the overuse of chemical fertilizers and pesticides in agriculture, which reduce soil and water quality, through awareness raising, capacity development and regulation enforcement. In addition, promote organic agriculture and recognize local indigenous knowledge as an alternative practice.
- Develop incentives (levy or subsidies) and a certification system to promote sustainable forest products and forest management, including soft wood industry, charcoal, and firewood, to provide consumer information on the sustainability of forest products and help finance community-based natural resources management (e.g., community forestry and community protected areas).

B) Sustainable Distribution covers Environmental labelling and product certification, Sustainable packaging, Trade incentives, and Sustainable product transport and logistics.

- Environmental labelling and product certification focuses on (i) the promotion of international eco-labelling programs for the tourism services and products in Cambodia (e.g., Green Globe Certification, ASEAN Green Hotel Award) an (ii) support the small- to medium-enterprises (SMEs) to obtain certification through the eco-labelling program and promote the program amongst SMEs, especially to women-led SMEs.
- Sustainable packaging focuses on (i) the development of the Implement extended producer responsibility (EPR) schemes and plastic production standards to increase the recyclability of plastic products, (ii) establish incentives (levy or subsidies) and regulations to control for the production, importing and sales to minimize the use of single-use plastic products, (iii) promote production of single-use plastic alternatives, and (iv) develop and promote sustainable business models for minimising waste in the packaging of food and beverages.
- Trade incentives focuses on (i) the establishment of the imported tariff exemptions for equipment and technology used for energy efficiency that meets the standard requirement, (ii) establishment of imported tariffs exemptions for equipment and technology used wastewater treatment and solid waste recycling that meets the

standard requirement, (iii) harmonize eco-labelling standards and certification schemes with international frameworks and trading partners (especially within ASEAN), and (iv) design incentives for Special Economic Zones to implement sustainable practices, including reducing waste and pollution output, and increasing resource efficiency (water and energy consumption).

- Sustainable product transport and logistics focuses on (i) the establishment of vehicle emissions standards for pollutants (NOx, CO, SOx, and PM) and fuel quality standards, (ii) strengthen import control of harmful chemicals, supporting the implementation of the Rotterdam Convention, using the list of chemical substance banned from international use under the Zero Discharge of Hazardous Chemical (ZDHC) Programme,(iii) improve the road, rail and port facility infrastructure in Cambodia to enable efficient transportation of products and reduce emissions, (iv) strengthen green and climate resilient infrastructure, especially road networks susceptible to flooding and landslide, and (v) expand the use of smart technology to support traffic management and reduce traffic congestion.

C) Sustainable Consumption covers waste prevention, recycling, and management, sustainable energy consumption, sustainable water consumption, sustainable personal transport, and sustainable cities and neighbourhoods.

- waste prevention, recycling, and management focuses on (i) the enforcement of waste separation and effective collection for treatments of recyclable materials (e.g., plastic, paper, softwood, metals etc.) through effective partnerships between subnational authorities and waste service providers, (ii) strengthen support to subnational (communes, municipalities, and district and provincial) authorities in implementation of the 4Rs policy (Refuse, Reduce, Reuse, and Recycle), including through knowledge sharing and networks between sub-national authorities, (iii) improve organic waste management and organics recycling at source from households, businesses, marketplaces, and agriculture, through the introduction of incentives, and support improvements to the waste collection system through effective partnerships between subnational authorities and waste service providers, and (iv) support and promote the development of guidelines and any regulations to manage waste from hospital or related to COVID-19.
- Sustainable energy consumption focuses on (i) the establishment of regulations to promote energy efficiency and sustainable energy development, (ii) develop standards and a labelling program for energy efficient electrical appliances and equipment, including testing and certification procedures, (iii) conduct energy efficiency audits across

all government services and properties and establish energy management plans for each Ministry, and finalise the National Energy Efficiency Policy and implement its measures, including education and awareness raising on energy efficiency for the public, residential and commercial sectors.

- Sustainable water consumption focuses on (i) Develop national regulations on wastewater tariff settings to support the sustainable financing of sanitation infrastructure, (ii) Promote public-private investment in decentralized wastewater treatment infrastructure, and safe wastewater recycling for landscape irrigation, in new urban developments and schools, (iii) improve drainage and natural filtration in flood prone areas through green infrastructure that uses natural hydrological systems, (iv) strengthen water treatment and water quality monitoring against national water quality standards, especially amongst small water enterprises,(v) promote the reduction of potable water demand by wastewater recycling, using local sources and utilizing rainwater, (vi) implement all measures identified in Cambodia's National Biodiversity Strategy and Action Plan (2016) under "Theme 7: Sustainable Water Resources", and (vii) trengthen monitoring, reporting and enforcement of water pollution control regulations, including effluent standards in both industrial and residential areas.
- Sustainable personal transport focuses on (i) the enable pedestrian and bicycle mobility through sidewalks and cycling infrastructure, and enforcement of parking regulations, (ii) provide fiscal and regulatory incentives (levies/ subsidies) and infrastructure to shift to low/no- emissions vehicles, including electric motorbikes and cars, and study options for phasing out old vehicles, (iii) increase public and private investment in urban public transport improvement programs (railway, rapid bus transit, ferries), and (iv) promote multimodal mobility through car/motorbike sharing, public bike systems and other micro-mobility modes of transport.
- Sustainable cities and neighbourhoods focuses on (i) promote concepts such as smart, sustainable, liveable, and resilient cities in Master Plans on Land Use and Plans on Land Use at Municipal, Provincial, District, Khan, and Commune levels, (ii) Support mixed land-use, qualified urban density, green/ blue infrastructure, and material recycling within neighborhoods, (iii) enforce existing regulations that require the provision of green spaces and tree planting within built up (construction) areas, and (iv) promote participatory and inclusive planning processes for neighborhood, with full public consultation in the preparation of the Master Plans on Land Use and Plans on Land Use.

D) Sustainable Investment covers national funding for sustainable consumption and production, incentives for socially responsible investment, Sustainable public procurement, and Innovative financing for sustainable technology.

- national funding for sustainable consumption and production focuses on (i) the establishment of the Cambodian Institution for Green Financing with support from the Green Climate Fund to support SCP projects, (ii) mainstream the priorities of SCP into the national budget, (iii) mobilize technical and financial support from development partners, including multilateral organisations and bilateral partners, to support the implementation of the SCP Roadmap, and (iv) mobilize technical and financial support from the private sector, including international investors and Chambers of Commerce, to support the implementation of the SCP Roadmap.
- Incentives for socially responsible investment focuses on (i) expand sustainable financing programs for conservation (e.g., REDD+, payments for ecosystem services, community-based ecotourism, environmental certification, and trust funds for conservation outcomes), (ii) Design guidelines for socially responsible investment in Cambodia, (iii) Develop new programs that provide preferential loans and subsidies for SMEs to invest in clean technology and sustainable production practices, especially women-led SMEs, and (iv) promote the implementation of the Cambodian Sustainable Finance Principles by the banking sector in Cambodia.
- Sustainable public procurement focuses on (i) setting up a sustainable / green procurement standard, under the National Council for Sustainable Development and Ministry of Economy and Finance, (ii) design environmental criteria and performance requirements for priority products and services to be procured by the government, in alignment with action ('environmental labelling and product certification'), (iii) integrate sustainable / green procurement standards into the public procurement system under the Ministry of Economy and Finance (including the amendment of public procurement law), and (iv) provide technical guidance to Ministries and agencies in implementing the sustainable / green procurement standards and implement monitoring and reporting on the standards.
- Innovative financing for sustainable technology focuses on (i) expand financial leasing programs that support SMEs, especially women-led SMEs, to upgrade technology and equipment for sustainability, (ii) establish a revolving fund to address SME access to finance and remove barriers for investments in energy efficiency and other technology improvements for sustainability.

E) Values for sustainability covers education for sustainability, Defining and measuring sustainability, Gender and socially inclusive sustainability, Gender and socially inclusive sustainability, and Advancing knowledge and communications.

- education for sustainability focuses on (i) expand the eco-schools' programme to all schools in Cambodia, ensuring equitable participation by girls and boys, (ii) promote sustainability leadership in businesses and workplaces through champions, certification, awards, and recognition, and promoting women's leadership in sustainability, (iii) expand vocational training opportunities in sustainability businesses (e.g., waste recycling, energy efficiency, green buildings), ensuring equitable participation by women and men, (iv) strengthen training of industry units on monitoring, measuring, and reporting of resource use and environmental parameters for compliance monitoring and reporting, (v) encourage youth participation and leadership on SCP actions, especially among female youth, including through information and awareness raising, and (vi) strengthen human resources capacity across the public and private sectors to promote SCP, for example through professional development and vocational training and workshops, particularly on pollution control and waste management for SMEs and MSMEs.
- Defining and measuring sustainability covers (i) expand the targets under C-SDG 12 to include a more comprehensive set of indicators related to SCP and address data gaps by ensuring the monitoring of C-SDGs is adequately funded, (ii) Design a Monitoring, Evaluation, Reporting and Learning Plan, and a data collection system, which includes monitoring and reporting at sub-national levels of government on the implementation of the SCP Roadmap actions. Ensure the collection and analysis of sex-age disaggregated data in tracking the SCP actions and ensure periodic reporting of information to key decision-makers and the public, (iii) establish a scientifically based monitoring program for monitoring the use of Persistent Organic Pollutants (POPs) in Cambodia to track the extent to which POPs are released into the environment, (iv) encourage the private sector to monitor and publish the sustainability of their products and services through product life-cycle analysis and environmental product declarations, and (v) meet twice annually with the SCP Technical Working Group of NCSD to track progress on implementation of SCP actions.
- Gender and socially inclusive sustainability covers (i) ensure all SCP policy measures and programs are socially inclusive and gender responsive, including through undertaking gender analysis in the development of SCP initiatives and providing capacity building throughout the initiatives, (ii) promote women's leadership in businesses and workplaces that promote sustainability in production and consumption, (iii) expand programs that

support job creation opportunities in SCP, especially for the poor and vulnerable and ethnic groups, (iv) integrate monitoring and reporting of gender and social inclusion metrics into the reporting of the SCP-12 at sub-national levels, (v) ensure strong coordination with the Ministry of Women's Affairs along with gender focal points of other relevant ministries to ensure coherence in SCP actions and synergies with ongoing gender-related actions, and (vi) allocate adequate resources for mainstreaming gender equality and social inclusion.

- Advancing knowledge and communications covers (i) Develop and implement a national communications strategy for promotion of SCP, (ii) Deliver public awareness raising campaigns on sustainable lifestyles (for example, on reducing consumption of energy and water and reducing plastic and food waste), (iii) Provide opportunities for knowledge sharing on SCP both within Cambodia (across sectors and provinces) and between Cambodia and other countries, particularly in Southeast Asia, (iv) Increase research and development (R&D) on the SCP system in Cambodia to inform policy/regulatory design through research partnerships between Cambodian universities and Cambodian government agencies, (v) Strengthen science, technology, and innovation across the public and private sectors to support SCP implementation, consistent with Cambodia's Science, Technology and Innovation Roadmap for 2030.

3.3 Overview of wild honey production

3.3.1 Wild honey production in Cambodia

Cambodia has four indigenous honey bee species: Apis dorsata F., Apis cerana F., Apis andreniformis S. and Apis florea F. However, only three species: Apis dorsata F., Apis cerana F., and Apis florea F have been widely spreaded in Cambodia forests and neighboring countries[18]. Wild honey collection is an old tradition the forest dependent communities and have been contributing to improve livelihood of people in the rural communities, especially forest dwellers and indigenous people in Mondulkiri, Preah Vihear, Kratie, Ratanakkiri, Stung Treng and Koh Kong provinces. In addition, wild honey can be used as family's consumption, food and traditional liquor brewing, and remedy for many kinds of illnesses[19]. According to UNDP report for Cambodia, honey production contributed between 15 to 30 percent of households who live near the forested areas, while approximately 31,000 households involved in forest honey collection in 2014. Each household could earn approximately $280 from wild honey production[20].

[18] Eric Guerin & Chhouk Chheang (2021) Rapid assessment of beekeeping Ecosystem at Tonle Sap Biosphere Reserve
[19] Australasian Agribusiness Perspectives 2017, Volume 20, Paper 2 ISSN: 1442-6951
[20] Moeko Saito Jensen and Richard Colin Marshall (2019) Human Development Report 2019: Sustable Natural Resources for All

The market of honey products is relatively small. The national demand of wild honey is approximately 500 tonnes per year, including 55 to 75 tonnes per year for the high-value segment and tourist markets. The market size of wild honey is approximately US$3.2 million per year. Since wild honey is seasonal production (harvesting period from February to May[21]), the limitation of supply is the main challenge in the value chain. In addition, wild honey market was strongly hit by the COVID-19 pandemic. Decreasing tourism and foot traffic affected mainstream of wild honey markets such as food marts, shops and grocery stores[22].

3.3.2 Wild honey production in Mondulkiri province

Mondulkiri wild honey was generally collected by the Bunong ethnic groups from giant honey bee nests in the rainforests of Koh Nhek District, Pichreda District, Orang District, Keo Seima District, and Senmonorom in Mondulkiri province. Before 2004, wild honey was collected for only either household consumption or traditional medicine, so the quality of honey was unstable due to poor hygiene and high moisture. In 2007, honey groups were established under a forest conservation program supported by the World Wildlife Fund and honey collectors from villages around the Phnom Prich Wildlife Sanctuary and the Sre Pok Wildlife Sanctuary were trained in sustainable honey harvesting and honey processing methods, as well as honey quality. In December 2017, 3 honey groups had been established – in Krang Tesh (with 90 members), Srae Y (with 40 members) and Trapaeng Khaerm (with 90 members) –, while a fourth group at Pou Chrey with 26 members was in the process of being registered. In 2021, Mondulkiri wild honey was granted a domestic Protected Geographical Indication by the Ministry of Commerce of Cambodia. Recently, 11 communities in the Mondulkiri province have been recognized as a "geographical honey forestry", nine of which fall under the protected wildlife sanctuary in Sre Pok and Phnom Prich. Mondulkiri wild honey is usually harvested in dry season from January to June, but peak season is from March to April or May. The annual production was between 150 to 200 tonnes per year.

3.3.3 Wild honey marketing in Mondulkiri province

Honey harvesters relied on diversed marketing channels. Honey collectors sold their products to either local traders in their village, traders in Sennonorom or the Mondulkiri Forest Venture (MFV) through honey groups. MFV purchases honey in April and May for an annually negotiated price and conducts quality control and produce traceability. It has defined three quality categories based on water contents (19–20%, 20–21% and 21–22%). The price of honey increased remarkably from

[21] https://www.wipo.int/ipadvantage/en/details.jsp?id=12638#:~:text=Specific%20Characteristics%20of%20the%20Mondulkiri%20Wild%20Honey&text=The%20honey%20is%20collected%20only,of%20forests%20and%20bee%20sanctuaries.

[22] https://ntfp.org/2022/08/community-enterprises-awarded-wild-honey-compliance-certificate/

US$2.50/L in 2005 to US$10–12.50/L in 2017 for honey harvested during the dry season and US$6.25–7.50/L for honey harvested in the wet season[23].

IV Result of Study

4.1 Profile of Respondents

There were 168 respondents interviewed. The majority of interviewed respondents were female (75%), while a quarter (25%) of respondents were male (Figure 3). The ages of the respondents varied between 16 and 73 years old. Young and adult adults (aged between 16 and 39 years old) represented approximately 35%, followed by middle-aged adults (aged between 40 and 49 years old) represented by 26%, and old-aged adults (aged between 50 and 59 years old) represented by 16%, respectively. The minority of respondents (5%) were older than 60 years old (Figure 5). The marital status of the respondents was categorized into marriage (81%), single (11%), widower/winner (5%), divorced (2%), and separated (1%). It was noted that the majority of respondents were educated (Figure 5). The majority of respondents (64%) finished primary and secondary school, followed by university (13%), and high school (12), respectively. Approximately one-ten (10%) of respondents were not educated (Figure 7). Regarding ethnicity, the majority of respondents were Khmer (84%), while approximately 15% were Punong and Vietnamese (1%) (Figure 6).

Figure 3. Gender

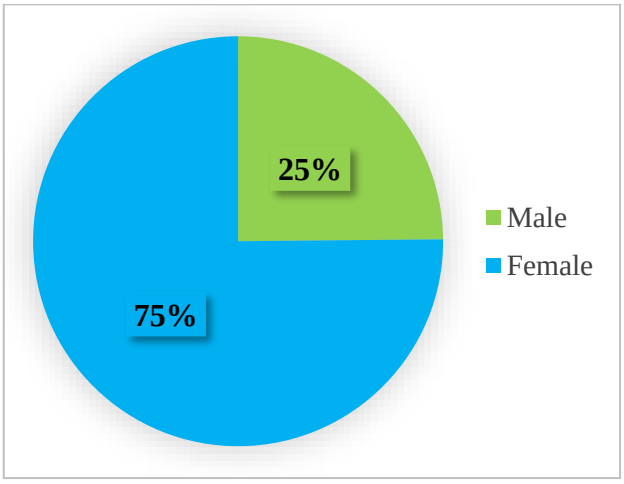


Figure 4. Marital Status

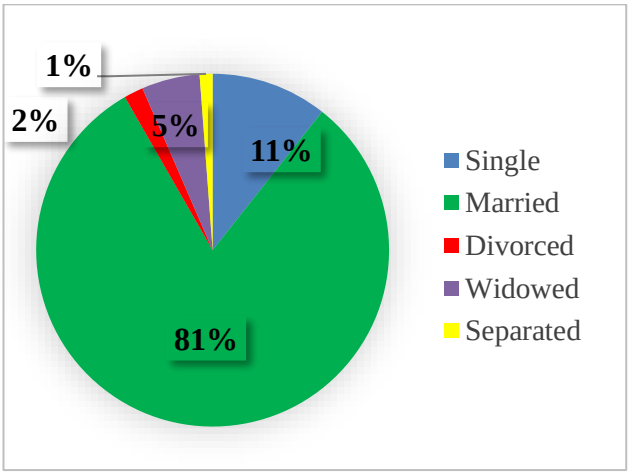
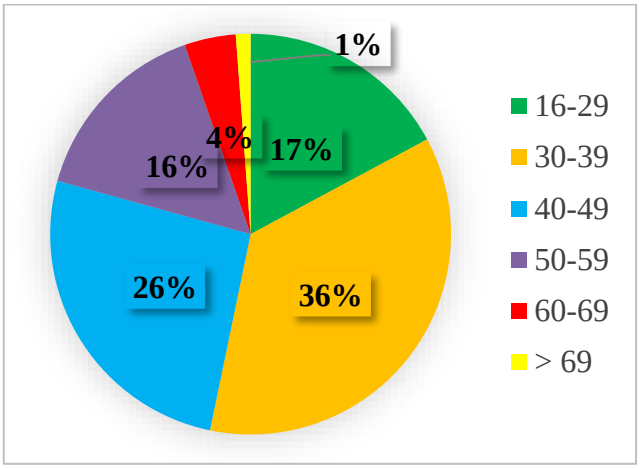


Figure 5. Age distribution

Figure 6. Ethnicity

[23] https://en.wikipedia.org/wiki/Mondulkiri_wild_honey



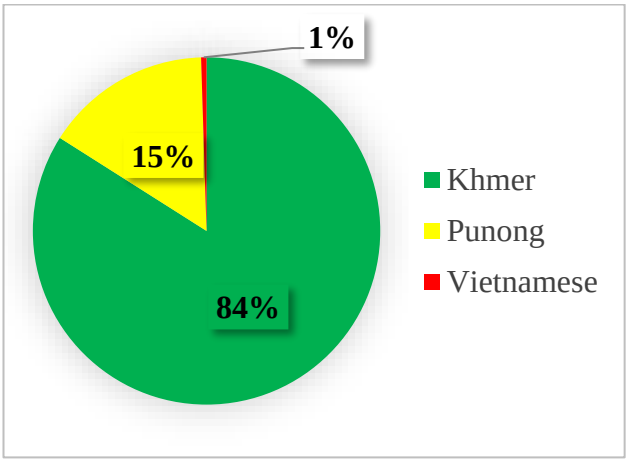
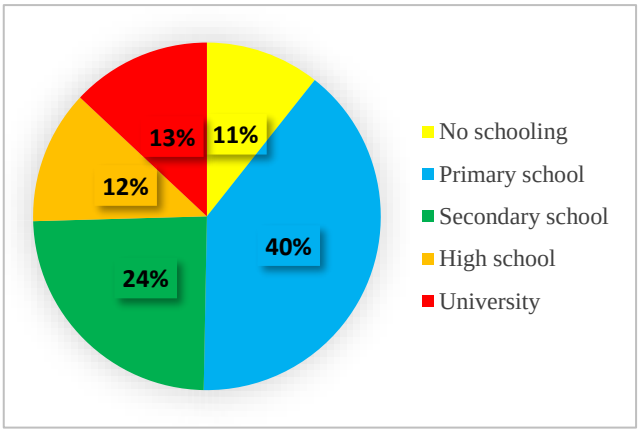


Figure 7. Education



4.3 Vegetable Production

4.3.1 Vegetable supply chain structure in Mondulkiri province

The vegetable supply chain in Mondulkiri province relied on the traditional market structure. There were 8 key actors in the core functions of the vegetable supply chain, including agricultural input suppliers, producers, agricultural cooperatives, collectors, retailers, wholesalers, processors, and consumers (household consumers and restaurants) (Figure 8). In addition, other key actors, including financial institutions, the Mondulkiri Provincial Department of Agriculture, Forestry, and Fisheries (PDAFF), the Royal University of Agriculture, the Provincial Department of Commerce, and NGOs, have been supporting vegetable production in the province. The key roles and responsibilities of the above actors were detailed as follows:

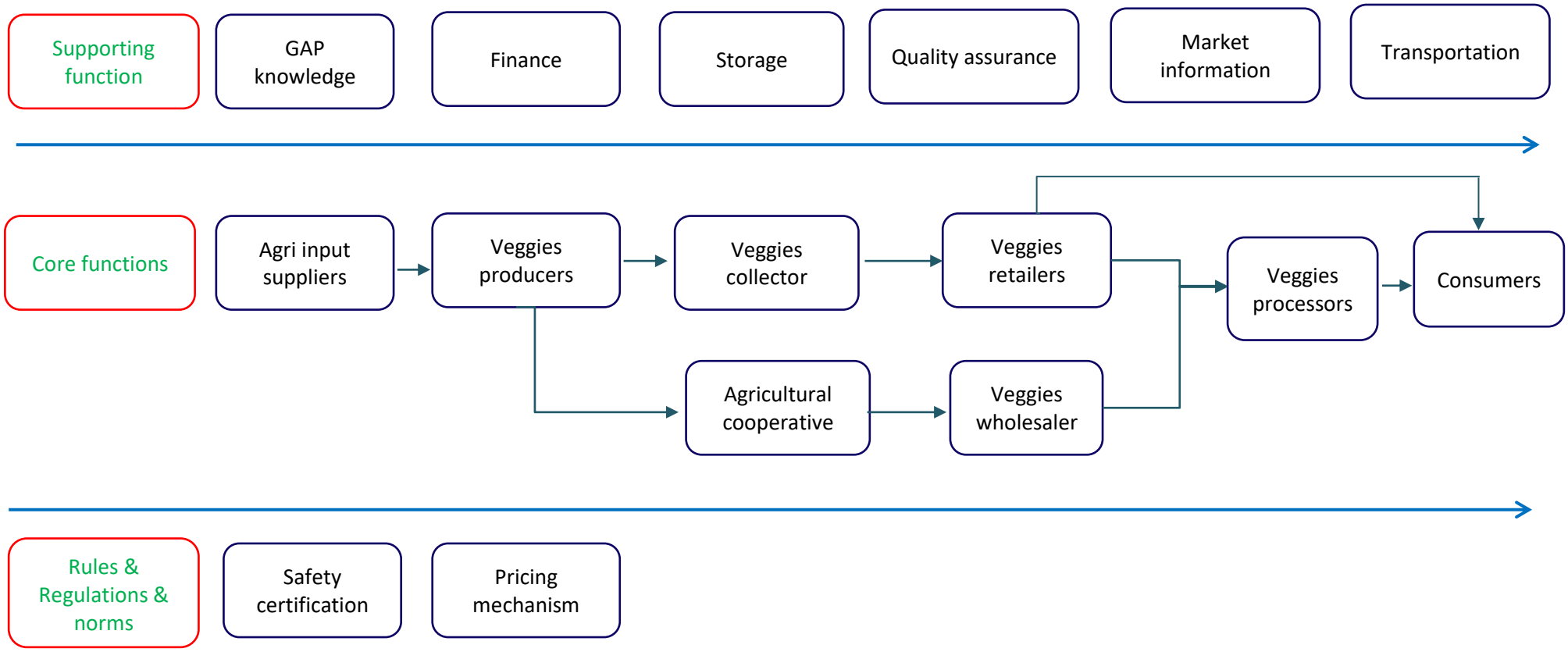
- Agricultural input suppliers: performed two functions. First, they supplied various kinds of fertilizers, pesticides, seeds, and farming tools to farmers in the province. Second, they provided technical assistance to farmers in terms of drip and trellis installation, bed covering, seedling, fertilizer, and pesticide applications. It was observed that animal feces were not commonly sold by input suppliers in the province due to their smell and difficulty controlling the nutrient contents.

- Producer: The majority of surveyed farmers have been growing vegetables for commercial purposes, while a minority of them grow vegetables for household consumption. Interviewed vegetable producers have land sizes ranging from 0.4 hectares to 3.5 hectares. The vegetable farm ranged from 0.1 hectares to 3.5 hectares. Drip, plastic mulch, chemical fertilizer and pesticides, and agricultural tools were accessed in the province, while chicken and bat feces were imported from Kandal and Kampong Speu provinces. Climate change and the fluctuation of vegetable prices were key challenges for farmers in the province.
- Veggie collectors: supported in vegetable marketing. In addition to collecting vegetables from farmers, they provided feedback on market demand and the required vegetable standards to farmers. Market information was also shared with farmers through collectors. Collectors were the main vegetable suppliers to retailers in the province.
- Retailer: accessed vegetables from collectors and sold them to consumers in the province. Some of them also distributed vegetables to wholesalers in Phnom Penh.
- Wholesaler: refers to those who collect vegetables from farmers and collectors and then distribute them to retailers in Mondulkiri and other areas
- Processor: Processors were responsible for processing of raw and intermediate inputs derived from the agricultural sector, including vegetables, to preserving goods for end-user consumption. Since vegetables were commonly sold fresh, most enterprises simply cleaned, graded, and packaged vegetables to prepare them for sale as raw produce at markets or grocery stores.
- Agricultural cooperative: performed as market mediator and technical advisor to farmers. The agricultural cooperative collected and supplied vegetables from its members to vegetable retailers in Siem Reap province and retailers and supermarkets in Phnom Penh city. In addition, the agricultural cooperative provided technical support to its members in terms of vegetable production and supplied contract arrangements.
- Provincial Department of Agriculture, Forestry and Fisheries: The PDAFF is a government entity operating under the Ministry of Agriculture, Forestry, and Fisheries (MAFF), which supports the MAFF with the implementation of agricultural activities in the province. The primary responsibilities of the PDAFF include collaboration with relevant stakeholders to improve agriculture, livestock and aquaculture production and marketing, management of natural resources required for the agricultural sector, management of ACs and cooperative unions; and management of agricultural input suppliers in the province. The Mondulkiri PDAFF has been providing agricultural training and inputs to farmers and agricultural

cooperatives, linking vegetable products to buyers in and outside provinces, and collaborating with local and international organizations to improve vegetable production and marketing in the province. One of the key responsibilities of PDAFF was to inspect and provide CamGap certification to vegetable farmers.

- Provincial Department of Commerce (PDoC): has been implementing projects to improve the vegetable supply chain in the province. PDoC also provided technical training and input to farmers to start up their farms.
- Financial Institution: Agricultural and Rural Development Bank (ARDB) has been providing agricultural loan to commercial vegetable farmers. Other financial institutions also provided loan to both commercial farmers, traders, and input suppliers in the province.
- Storage: vegetables were sold fresh, so storage was conducted by collectors and retailers. PDAFF in collaboration with the CESAIN Center of the Royal University of Agriculture built a packing house where farmers can clean, grade, pack, and store their products before transporting them to market. The center charged 0.25 USD per use for electricity and maintenance.

Figure 8. Vegetable supply chain structure in Mondulkiri province



4.3.1.1 Common vegetables sold in Mondulkiri, Phnom Penh and Kandal market

There were various types of vegetables sold in wet markets in Mondulkiri province. However, only 10 types of vegetables were commonly sold in the province. Cucumber was the most common vegetable in the wet market in the Mondulkiri province, followed by cabbage and carrots (table 5).

Regarding price, cabbage (1.15 USD per kg) stood at the top of the topic price list, followed by choysum (0.90 USD per kg), carrots (0.88 USD per kg), and water green (0.83 USD per kg), respectively. Wax gourd (0.61 USD per kg) is considered the lowest price compared to the above vegetables (table 5).

Table 5 (Q3.2). Common vegetables sold in Mondulkiri province

Name crops	Frequency	Rank	*Price/kg (USD)*
cucumber	29	1	0.62
cabbage	27	2	1.15
carrots	27	2	0.88
wax gourd	26	3	0.61
eggplant	19	4	0.75
radish	17	5	0.77
water green	17	5	0.83
sponge gourd	16	6	0.68
choysum	16	6	0.90
pumkin	15	7	0.64

There were a variety of vegetables sold in wet markets and retail shops in Phnom Penh city and Kandal province. However, only 10 types of vegetables were frequently sold in these markets. Radish and carrots were the most frequently sold vegetables in Phnom Penh and Kandal provinces, while potato and tomato fell in the second and third ranks of frequently sold vegetables in Phnom Penh and Kandal provinces, respectively (table 6).

Regarding the marketing value, lettuce has the highest price (1.74 USD per kg), followed by Curly Wrap Bok Choy (1.53 USD per kg), cabbage (1.17 USD per kg), and tomato (1.08 USD per kg), respectively. Cucumber (0.74 USD per kg) stood at the lowest price compared to the above crops (table 6).

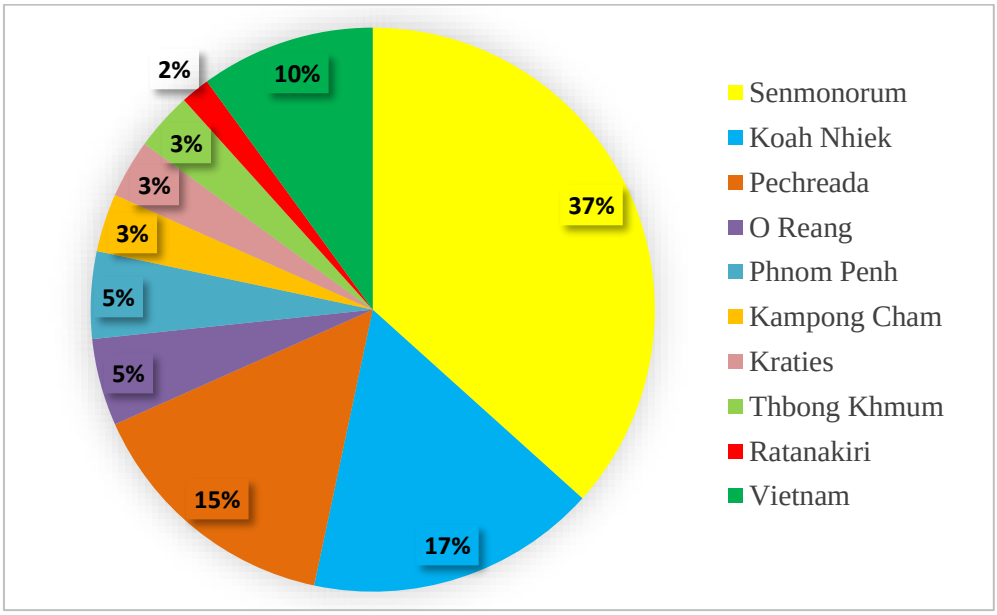
Table 6 (Q3.2). Common vegetables sold in Phnom Penh and Kandal province

Name crop	*Frequency*	*Rank*	*Price/kg (USD)*
radish	61	1	0.83
Carrots	60	1	0.88
potato	51	2	0.92
tomato	41	3	1.08
lettuce	44	4	1.74
Curly Wrap Bok Choy	38	5	1.53
onion	38	5	0.81
cucumber	37	6	0.74
cabbage	33	7	1.17
eggplant	30	8	0.90

4.3.1.2 Source of retailed vegetables in Mondulkiri, Phnom Penh and Kandal

There were 30 vegetable retailers and distributors interviewed in Mondulkir province. The interviewed retailers and distributors procured vegetables from 10 locations. Senmonorum was the main source of vegetables supplied in Mondulkiri province, followed by Kaoh Nhiek and Pechreada district, reported by 37%, 17%, and 15%, respectively. Approximately 10% of vegetables were procured from Vietnam, while other supplied sources (O Reang, Phnom Penh, Kampong Cham, Kratie, Thbong Khmum, and Ratanakiri) accounted for 21% of the supplied vegetables (Figure 9).

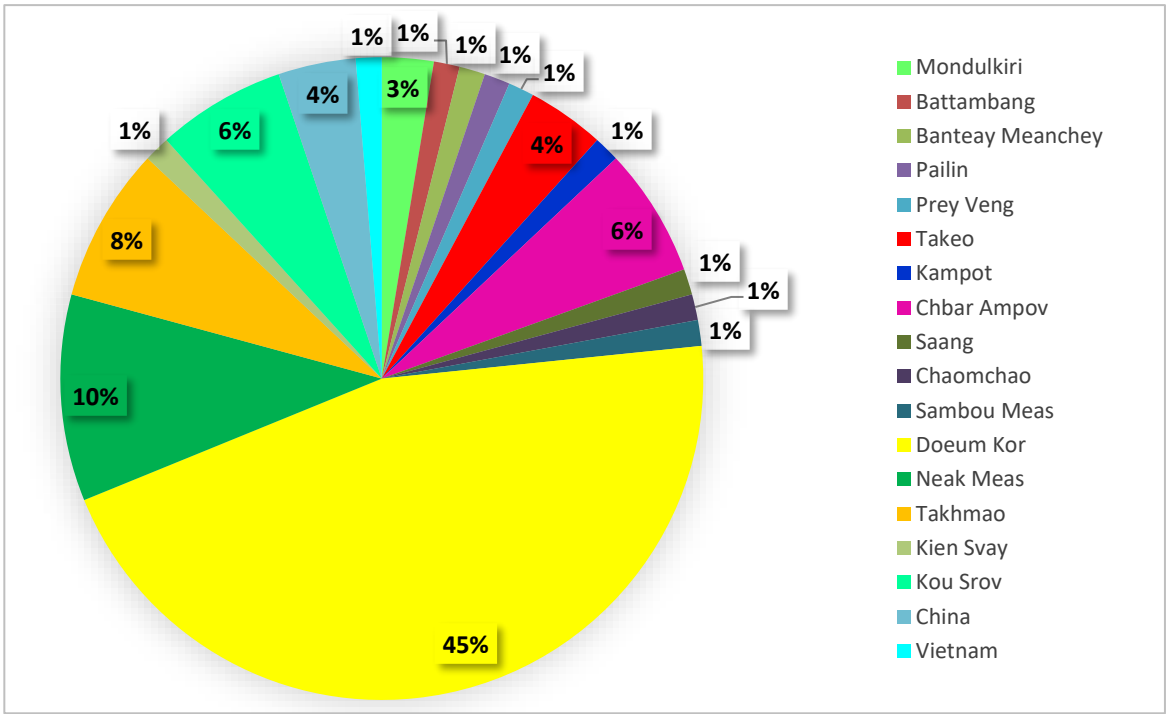
Figure 9 (Q3.3). Source of vegetables supply in Mondulkiri province



There were 68 vegetable retailers (4 safe vegetable retailers) were interviewed. The safe vegetable retailers commonly procure vegetables from nine provinces (Mondulkiri, Battambang, Kandal, Pursat, Kampong Cham, Kampong Chhnag, Takeo, and Kampong Thom). Three provinces (Mondulkiri, Battambang, and Kandal) were the main source of safe vegetables for retail shops in Phnom Penh city.

The results of interviews with retailers in 10 markets (Doeum Kor, Neakmeas, O Reussey, Tuol Tumpong, Steung Meanchey, Beoeung Keng Kang, Chamkar Daung, Takhmao, Thmey, and Chbar Ampov) showed that Doem Kor, Neak Meas, and Takhmao markets were the primary sources of conventional vegetables in Phnom Penh and Kandal, accounting for 45%, 10%, and 8%, respectively. Other supplied sources (Mondulkiri, Battambang, Banteay Meanchey, Pailin, Prey Veng, Takeo, Kampot, Chbar Ampov, Saang, Chaomchao, Sambou Meas, Kien Svay, Kou Srov) accounted for 34% of the supplied vegetables. Approximately 2% of interviewees procured vegetables directly from Vietnam and China (Figure 10).

Figure 10 (Q3.3). Source of vegetables supply in Phnom Penh and Kandal



4.3.1.3 Vegetable suppliers in Mondulkiri, Phnom Penh and Kandal

There are four types of suppliers who have been distributing vegetables in Mondulkiri, Phnom Penh, and Kandal. Vegetables in wet markets in Mondulkir province were mainly supplied by farmers and distributors, representing 49% and 39%, respectively. Just under one-fifth (9%) of retailed vegetables were supplied by importers, while the least amount (3%) were supplied by clusters and agricultural cooperatives. However, the majority of vegetables in Phnom Penh and Kandal (72%) were supplied by distributors (Figure 11). Farmers and importers supplied similarly at 11% and 10%, respectively. Clusters and agricultural cooperatives seemed to have limited activities in the vegetable supply chain. Approximately 7% of retail vegetables in Phnom Penh and Kandal were supplied by clusters and agricultural cooperatives (Figure 12).

Figure 11 (Q3.4). Vegetable suppliers in Mondulkiri province

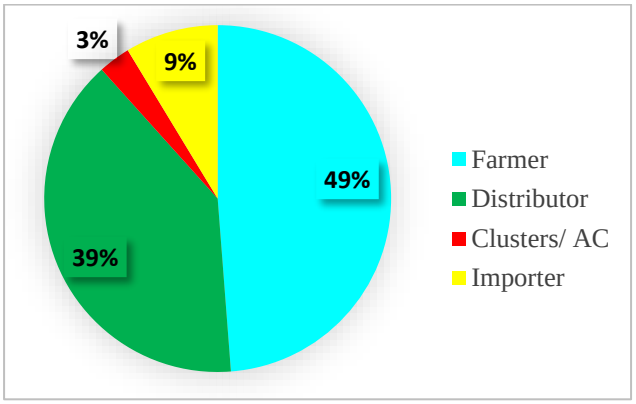
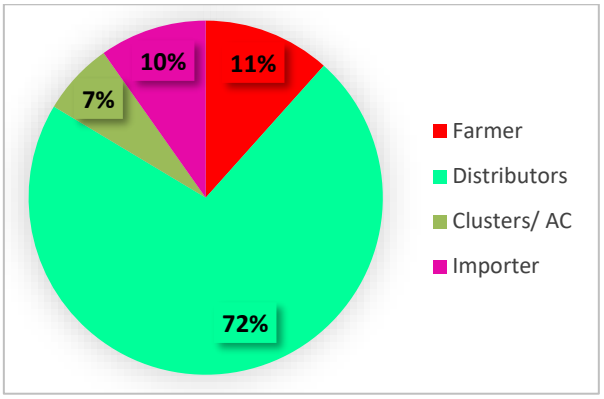


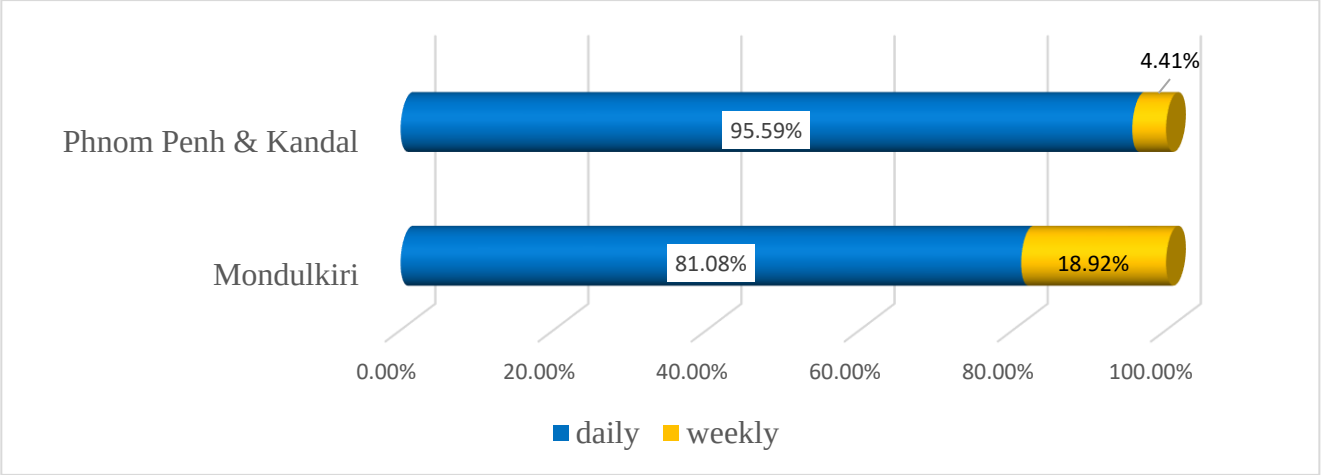
Figure 12 (Q3.4). Vegetable suppliers in Phnom Penh and Kandal



4.3.1.4 Vegetable procurement process in Mondulkiri, Phnom Penh and Kandal

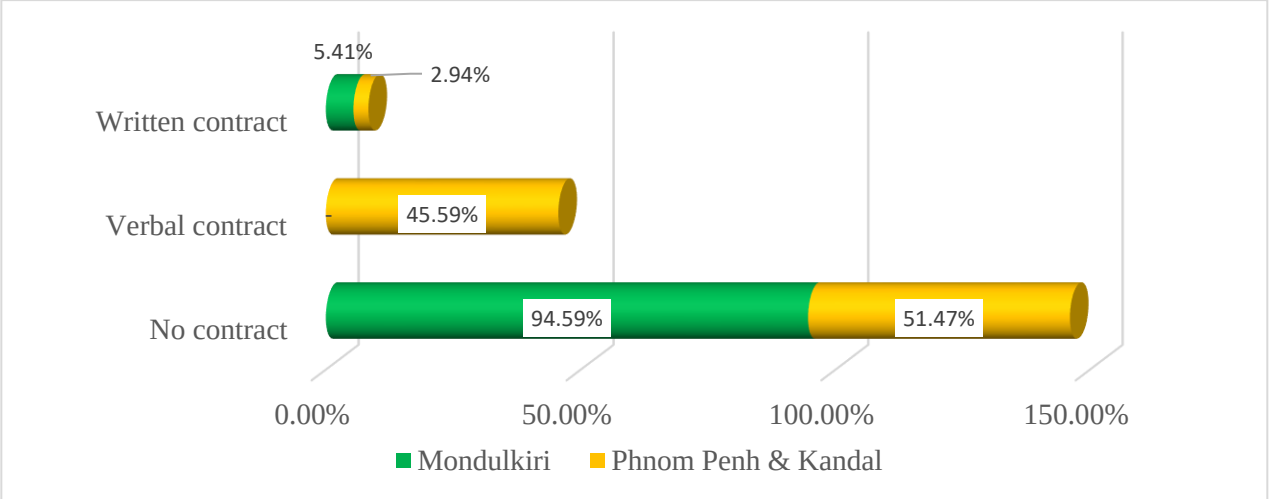
To identify the supply chain arrangement, the procurement practices of vegetable retailers in Mondulkiri province, Phnom Penh city, and Kandal province were assessed. Almost all the retailers interviewed procured vegetables daily, while a minority of them procured vegetables weekly. Approximately 81.08% of retailers in Mondulkiri province procured vegetables daily, while about one-fifth of them (18.92%) procured vegetables weekly. Similarly, approximately 95.59% of interviewed retailers in Phnom Penh city and Kandal province procured vegetables, while the least of them (4.41%) procured vegetables weekly (Figure 13). The reason why most retailers procured vegetables daily was that vegetables were perishable, did not require storage facilities, and did not pose a risk of vegetable losses.

Figure 13 (Q3.7). Vegetable procurement practice by retailers



Regarding the contract arrangement, non-contract and verbal contract agreements were common practices by almost all interviewed retailers. Approximately 94.59% of interviewed retailers in Mondulkiri province procured vegetables without contract, while the least of them (5.41%) procured vegetables with written contact. Similarly, about 97.06% of interviewed retailers in Phnom Penh and Kandal province procured vegetables by verbal and non-contact agreements. It was noted that the fewest retailers (2.94%) procured vegetables with a contract agreement, especially those who procured safe vegetables (Figure 14).

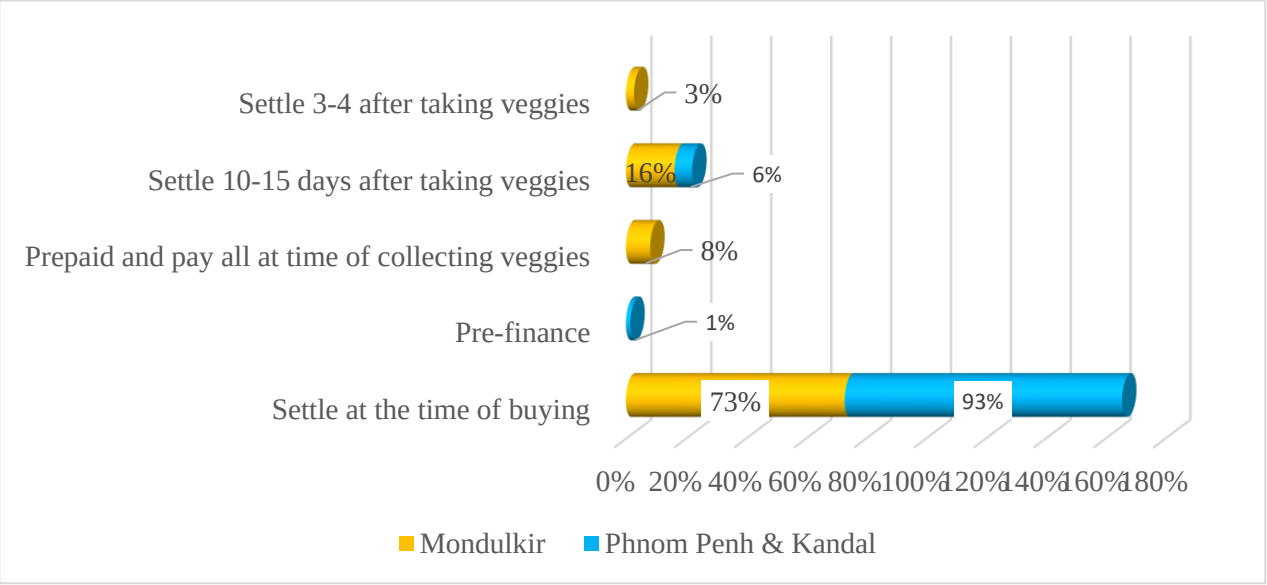
Figure 14 (Q3.8). Supply contract aggreement



The settled period was essential for the vegetable procurement process. Five options (settle at the time of buying, pre-finance, prepaid and pay all at the time of collecting veggies, settle 10-15 days after taking veggies, and settle 3-4 days after taking veggies) were set out to assess the current practice of procured payment transactions. The result of the study showed that the majority of interviewed retailers paid for the quantity of vegetables supplied at the time of buying. Approximately

73% of interviewed retailers in Mondulkiri paid suppliers immediately at the time of buying, while about 16% of them paid the suppliers between 10-15 days after receiving the vegetables, and the very least of them (11%) provided prepaid and paid all at the time of buying and settlement after receiving vegetables for 3–4 days. Similarly, approximately 93% of interviewed retailers in Phnom Penh and Kandal province paid suppliers at the time of buying, while about 7% of them provided pre-finance and paid suppliers after taking vegetables for 3 to 4 days (figure 15).

Figure 15 (Q3.9). Settlement practices



4.3.2 Required standards for vegetable production

4.3.2.1 Type of retail vegetable in Mondulkiri, Phnom Penh and Kandal

There were three types of vegetables (organic, safe, and conventional) sold in the wet markets in Mondulkiri and Kandal provinces and Phnom Penh city. Retailers generally sold the three types of vegetables at the same shops by displaying them in the different sections.

Conventional vegetables dominated the retail markets in the three studied areas, at 65% in Mondulkiri province and 61% in Phnom Penh city and Kandal province (Figure 16, 17). The GAP vegetables were similarly represented at 35% in Mondulkiri province and 38% in Phnom Penh city and Kandal province. It was noted that organic vegetables were rarely sold in the studied areas. Approximately 1% of organic vegetables were sold in Phnom Penh markets.

Figure 16 (Q3.5). Type of vegetables sold in markets in Mondulkiri province

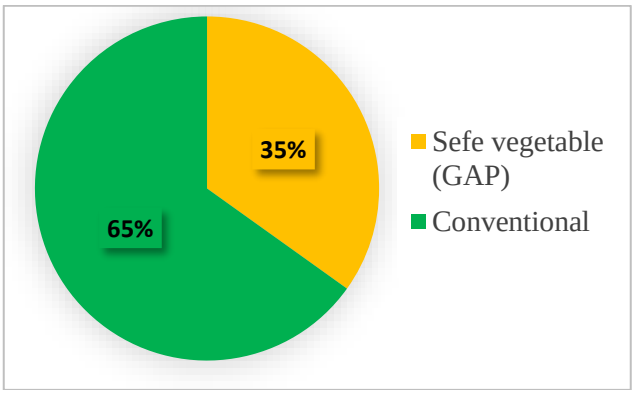
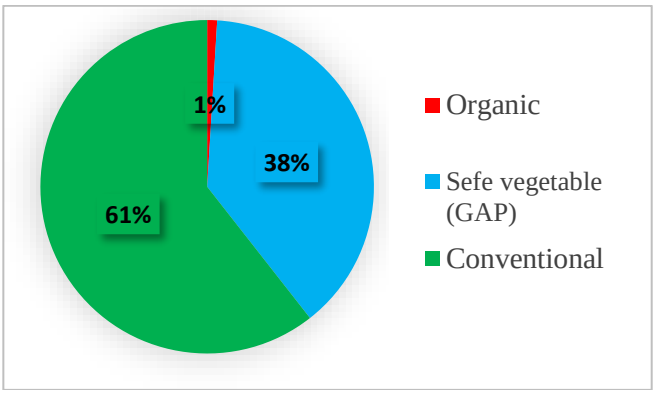


Figure 17 (Q3.5). Type of vegetables sold in markets in Phnom Penh and Kandal province



4.3.2.2 Vegable procuring pactices in Mondulkir, Phnom Penh and Kandal

The grading practices were generally conducted for vegetable procurement in the studied areas. Approximately 70% of retailers in Mondulkiri province graded the vegetables during the procuring process, while about 30% of them did not grade the vegetables (Figure 18). Three vegetable grading techniques (size, color, and freshness) have been practiced by retailers in Mondulkiri province. Vegetable freshness was considered an indicator for buying vegetables by the majority of interviewed retailers (representing 45.6%), while size was the lowest criteria (representing 24.6% of interviewees) for deciding to buy the vegetables (Figure 19). Similarly, the majority of retailers in Phnom Penh and Kandal (72%) graded the vegetables, while approximately 28% of them did not grade the vegetables during the procuring process (Figure 15). Four grading criteria (freshness, color, size, and quality test) were used to grade the vegetables in Phnom Penh and Kandal. Three grading criteria—freshness, color, and size—were considered the primary reasons to buy vegetables, representing 34.5%, 33.8%, and 28.9%, respectively. The quality test (representing 2.8%) was not common practice by retailers in Phnom Penh and Kandal province (Figure 19).

Figure 18 (Q3.6). Vegetable grading practices

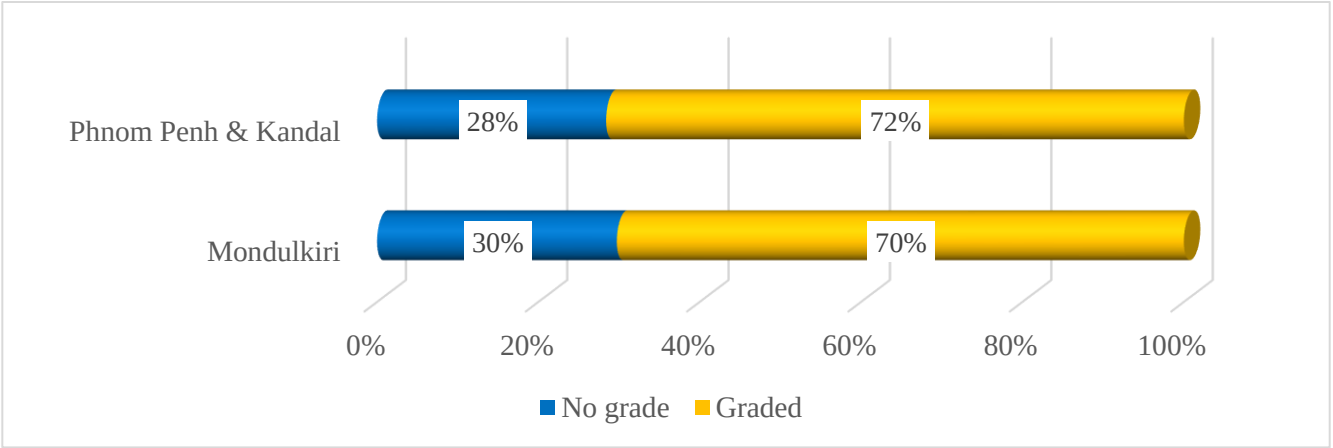
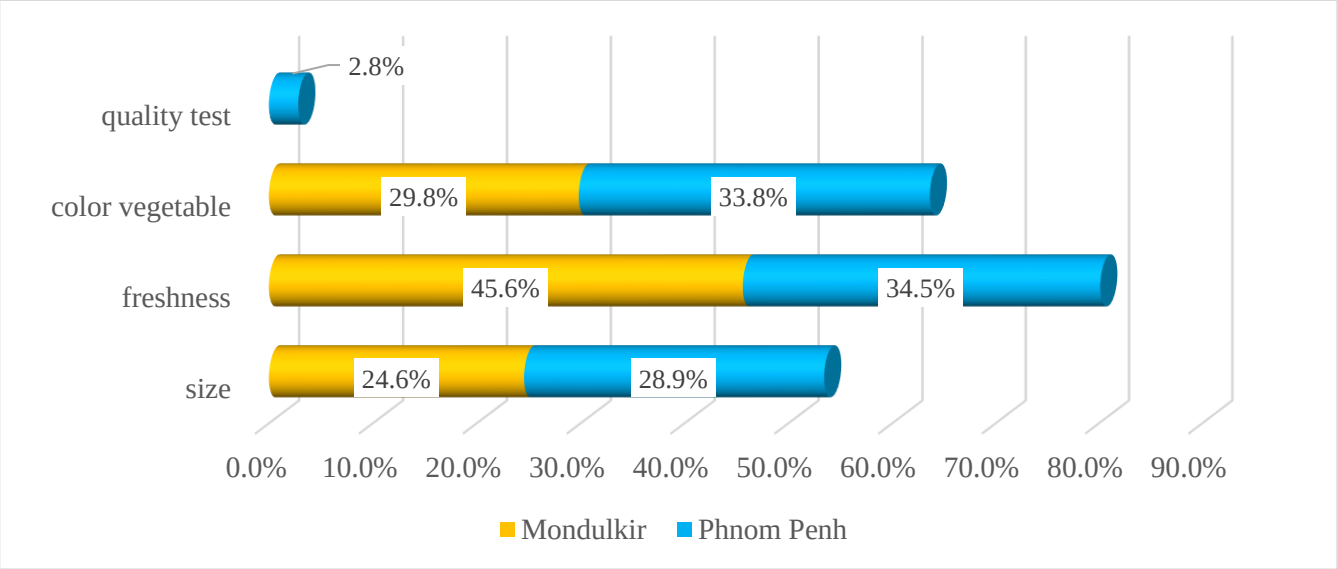


Figure 19 (Q3.6.1). Vegetable grading practices



4.3.2.3 Condition enfluenced retailers to buy vegetable production

The preference of retailers were essential for vegetable supply chain study. Six criteria were set out to measure the influencing conditions for retailers to bu the vegetables in Mondulkiri province, Phnom Penh city, and Kandal province. The result of study showed that product appearance, quality of products, and price were the main conductions influenced retailers in Mondulkiri to buy the vegetables, rating score at 4.6, 4.4, and 4.3, respectively (figure 20). Source of products and safety certification were the least influenced conductions for retailers in Mondulkiri province to buy the vegetable products. These condition matched with preference of retailers in Phnom Penh city and Kandal province. The rating score for product appearance, quality of products, and price were at 4.6, 4.4, and 4.3, respectively. The qualities of supply, safety certification, and source of products were at the medium influence (3.6-3.8) (figure 21).

Figure 20 (Q3.10). Required condition to buy vegetables in Mondulkiri

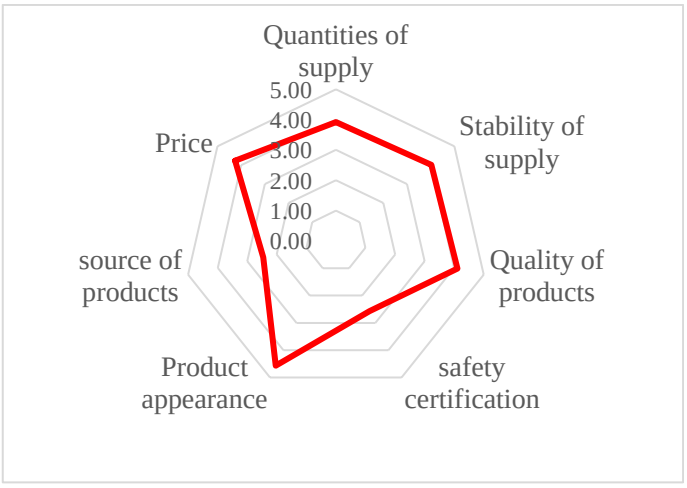
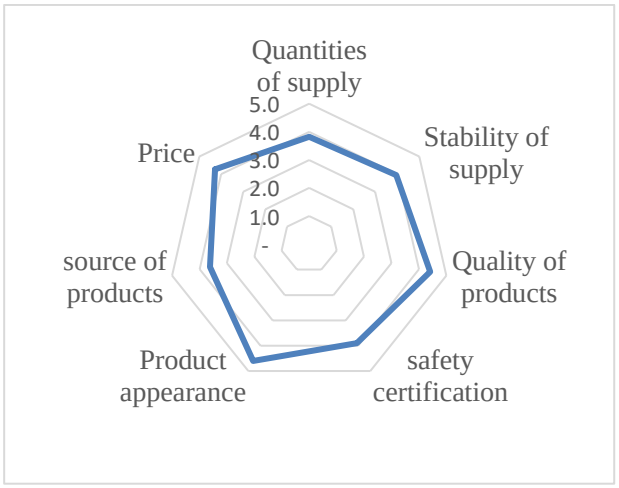


Figure 21 (Q3.10). Required condition to buy vegetables in Phnom Penh and Kandal

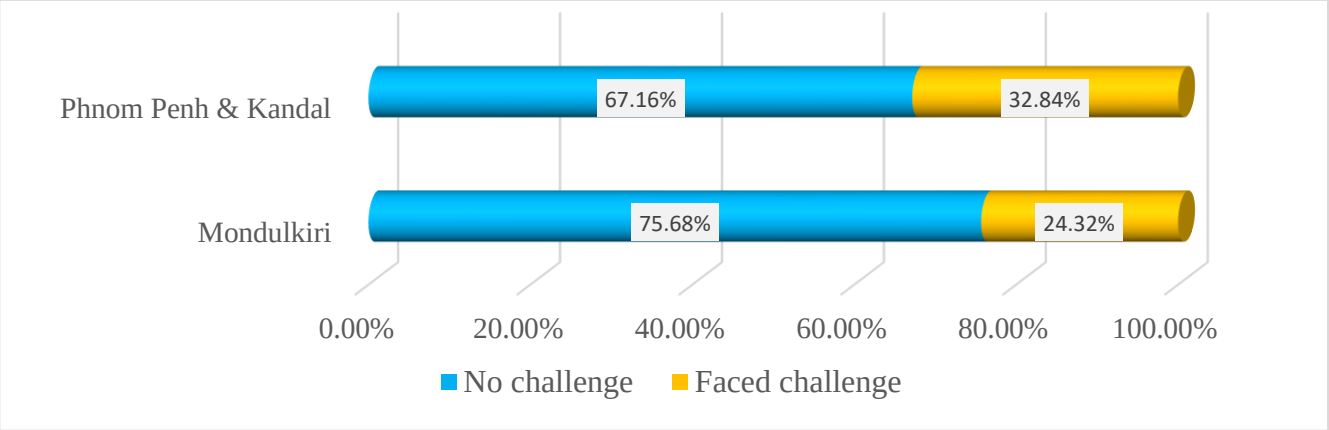


Note: 1. No influence, 2. Low influence, 3. Medium influence, 4. High fluence, 5. Very high influence

4.3.2.4 Key challenges in the vegetable procurement

Identification of challenge is essential for market arrangement. The result of study revealed that majority of retailers in Mondulkiri (75.68%) did not face any challenges in the vegetable procuring process, while approximately one-fourth (24.32%) of them faced some challenges in the vegetable buying process (figure 22).

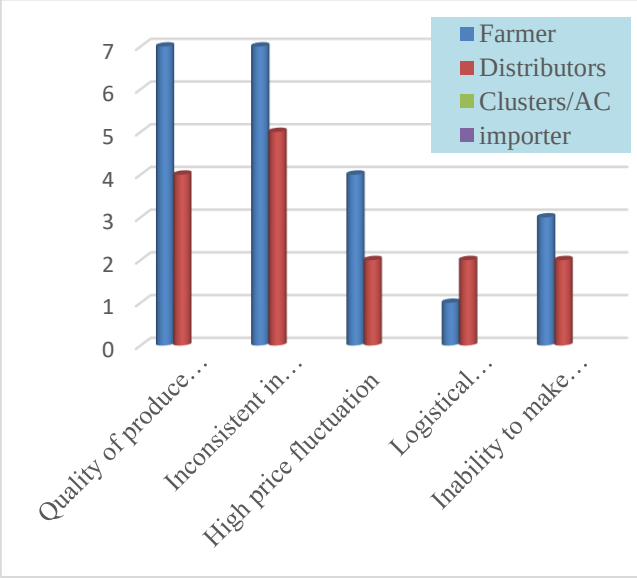
Figure 22 (Q3.11).Challenge of vegetable procurement

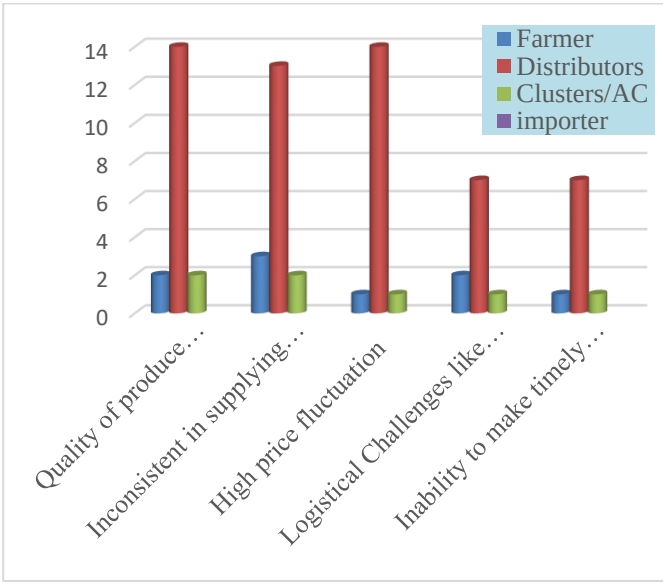


There were five challenges (quality of produce unsatisfactory or inconsistent, inconsistent in supplying quantity, high price fluctuation, logistical Challenges like lack of roads, proper vehicles, etc., and inability to make timely payments to suppliers were faced by retailers in all studied areas. Retailers faced three primary challenges (quality of produce that was unsatisfactory or inconsistent, inconsistency in supplying quantity, and high price fluctuation) when they procured vegetables from farmers and distributors in Mondulkir province (Figure 23). The retailers in Phnom Penh and Kandal faced the same problem when they procured vegetables from distributors (Figure 24).

Figure 23 (Q3.11.1). Key challenges in vegetable procurement in Mondulkiri province

Figure 24 (Q3.11.1).Key challenges in vegetable procurement in Phnom Penh and Kandal province

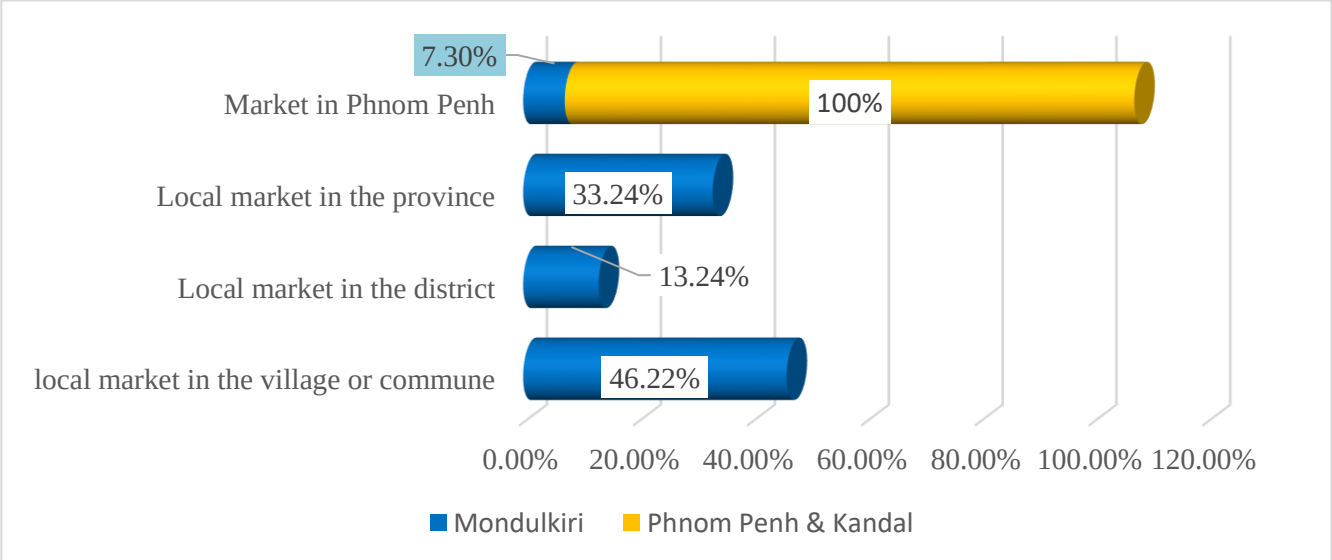




4.3.2.5 Vegetable marketing

There are four vegetable distribution channels that have been practiced by retailers in Mondulkiri province. Almost all the collected vegetables (91%) were sold in Mondulkiri province, while approximately 7.30% were distributed to Phmon Penh city. The majority of collected vegetables were generally sold in local markets in villages or communes in Mondulkiri province, representing 46.22% and 33.24%, respectively. Retailers in Phnom Penh and Kandal province sold all their vegetables in Phnom Penh city (Figure 25).

Figure 25 (Q5.1). Vegetable distributing location



4.3.2.6 Vegetable consumers

The vegetables were sold to seven types of consumers, including end-users, retailers or grocery stores, wholesalers, supermarkets, minimarts, processors, and restaurants. The

majority of vegetables (75%) collected by retailers in Mondulkiri province were sold to end-users, while approximately 25% of the collected vegetables were distributed to other retailers and wholesalers (Figure 26). Similarly, almost all vegetables (88.12%) collected by retailers in Phnom Penh were sold to end-users, while approximately 9% of the collected vegetables were sold to other retailers and grocery stores. Very few vegetables (3%) were distributed to wholesalers in Phnom Penh city (Figure 27).

Figure 26 (Q5.2).Vegetable consumers in Mondulkiri province

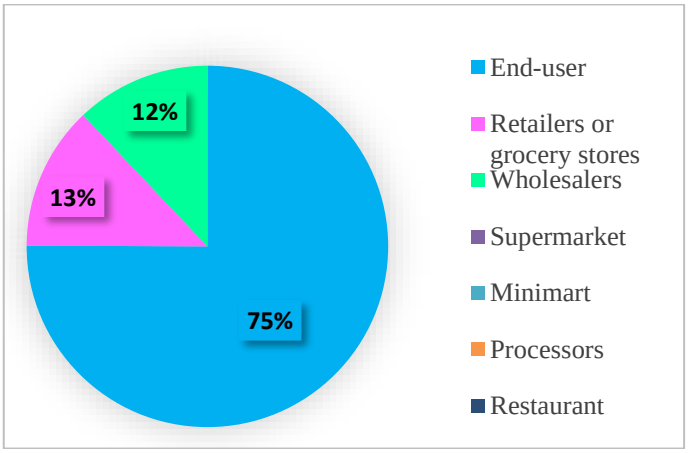
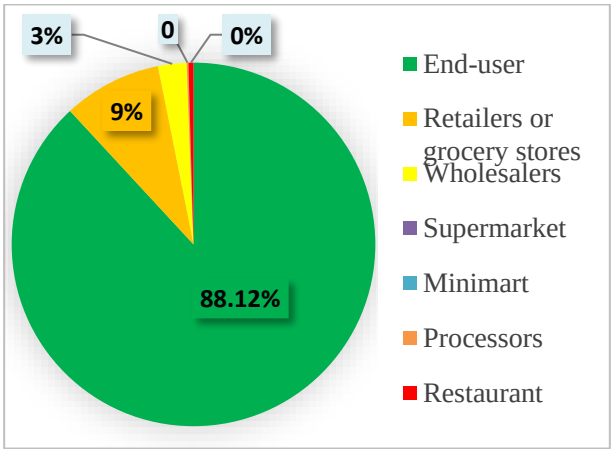


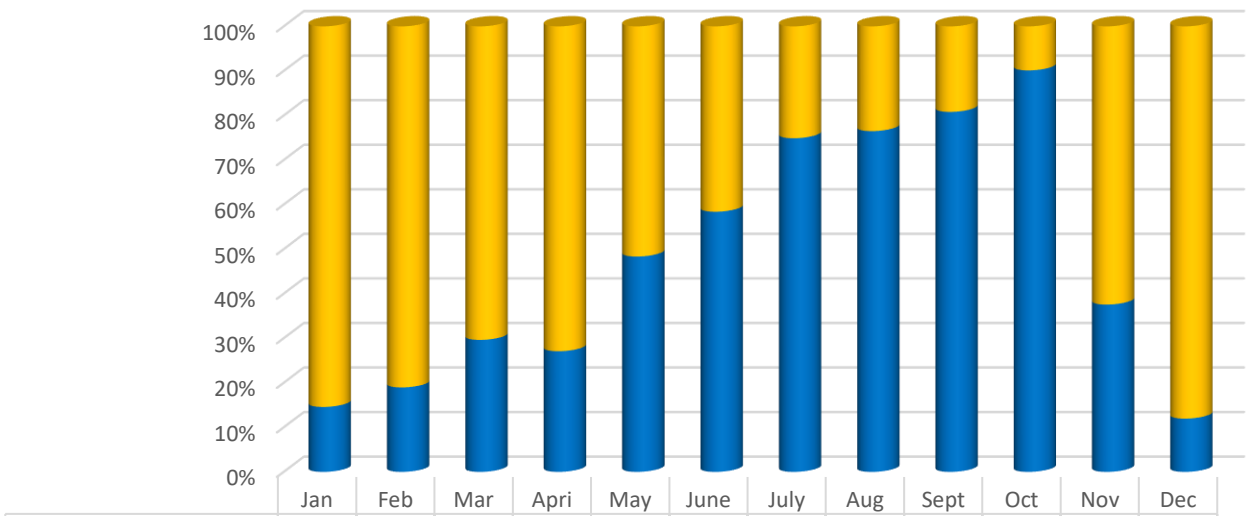
Figure 27 (Q5.2).Vegetable consumers in Phnom Penh and Kandal province



4.3.2.7 Fluctuation of vegetable prices

Vegetables that have been sold in Mondulkiri province were dominated by local products (90%), while about one-ten (10%) were imported mainly from Vietnam, China, and other locations in Cambodia (Figure 12). The price was relatively low during the rainy season (July to October) (figure 28) due to two reasons. First, the majority of vegetable producers were small-scale and relied on seasonal rain for production, so the rainy season was favorable for small-scale vegetable producers since they do not have a water source and irrigating facilities. Second, a high quantity of wild vegetables were harvested during the rainy season, especially from July to October. These vegetables were sold in the local markets, which were situated close to their homes, as confirmed by figure 25. On the contrary, vegetable prices in Phnom Penh and Kandal province dropped remarkably during the dry season from January to April of the year. This can be explained for several reasons: First, retailers in Phnom Penh and Kandal province procured vegetables mostly from distributors (Figure 12), who collected vegetables mostly from commercial farmers. These farmers were relying on the rain for growing vegetables, so the dry season was the preferred condition for vegetable farming. Second, imported vegetables were also high due to the high vegetable season in neighboring countries too.

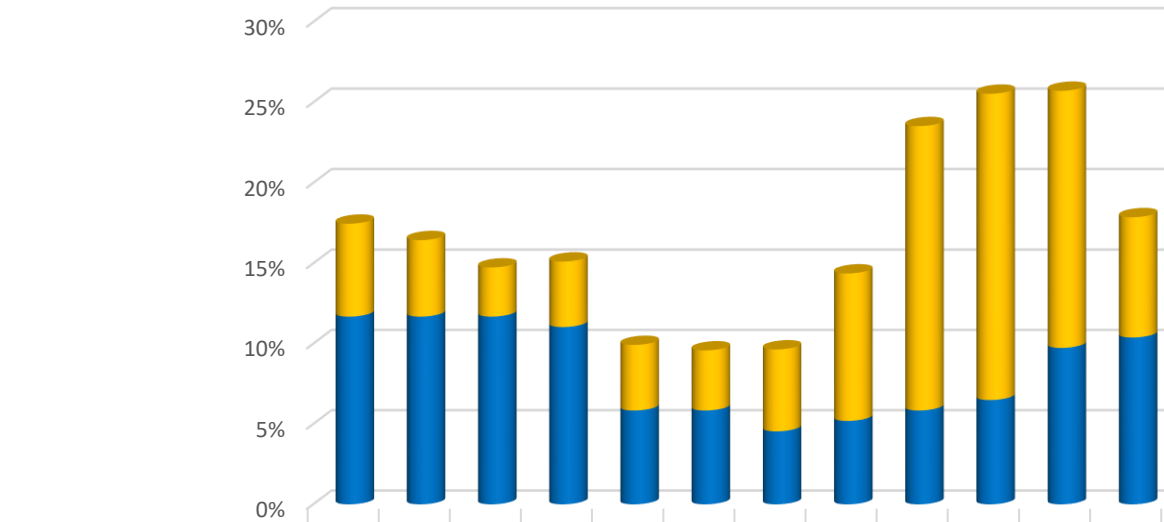
Figure 28 (Q5.3). Low vegetable pricing period



	Jan	Feb	Mar	Apri	May	June	July	Aug	Sept	Oct	Nov	Dec
Phnom Penh and Kandal	19%	14%	8%	9%	9%	8%	6%	6%	4%	2%	4%	16%
Mondulkiri	3%	3%	3%	3%	8%	11%	18%	18%	15%	14%	2%	2%

Vegetable prices were highly volatile during the year. The price of vegetables in Mondulkiri province was high from January to April (Figure 29) due to an undersupply of vegetables. This can be described for two reasons. First, small-scale producers were not able to grow vegetables during the dry season due to the limitations of irrigation systems and growing facilities. Second, the harvest of wild vegetables was limited during the dry season. On the contrary, vegetable prices in Phnom Penh and Kandal province increased notably from September to November during the year because lowland farmers faced difficulty growing vegetables due to heavy rain. In addition, imported vegetables were also low during this period.

Figure 29 (Q5.4). Peak vegetable pricing in Mondulkiri, Phnom Penh and Kandal



	Jan	Feb	Mar	Apri	May	June	July	Aug	Sept	Oct	Nov	Dec
Phnom Penh & Kandal	6%	5%	3%	4%	4%	4%	5%	9%	18%	19%	16%	7%
Mondulkiri	12%	12%	12%	11%	6%	6%	5%	5%	6%	6%	10%	10%

4.3.3 Market linkage arrangement

4.3.3.1 Willingness of retailers to buy vegetables from Mondulkiri province

To identify the way to link vegetable producers and buyers, questions related to the willingness of buyers were asked. As a result, the majority of interviewed retailers (63.24%) were not willing to buy vegetables from Mondulkiri Province (Figure 30) due to four main reasons. First, current selling volume was low, so they were able to procure more vegetables (represented by 29%). Second, they don't know the quality of vegetables from Mondulkri province (represented by 20%). Third, this province is situated far from Phnom Penh city and Kandal province, so it is difficult for them to check the quality of products (represented by 14% of interviewed retailers) (Figure 31).

Figure 30 (Q4.1). Willingness to buy vegetables from Mondulkiri province

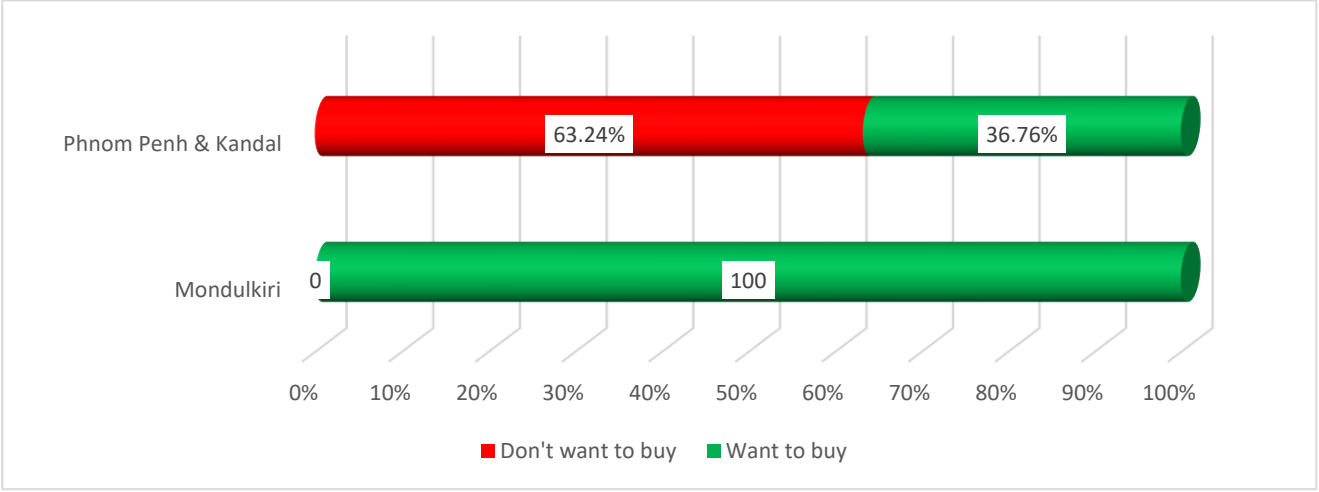
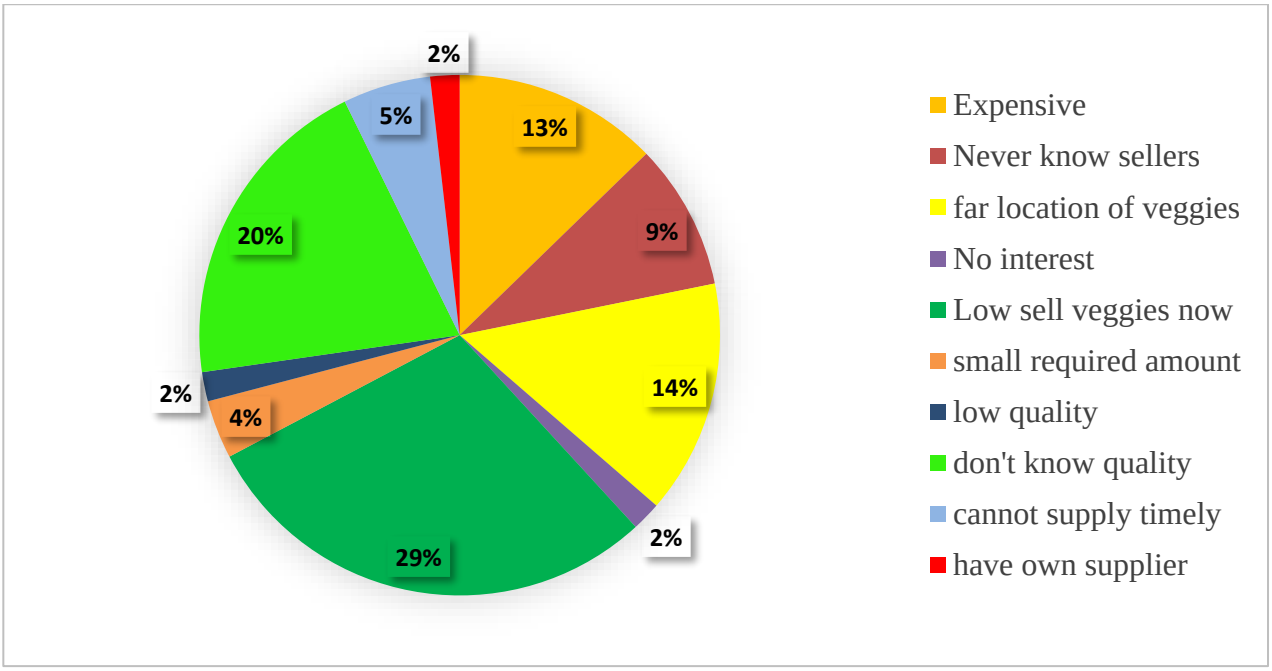


Figure 31 (Q4.4.1). Reasons for rejection to buy vegetables from Mondulkiri province



4.3.3.2 Vegetable supply arrangement

There were six criteria to measure the required supply conditions: enough required production volume; stability of supply; cleaning and packing by farmers; product appearance (e.g., cleanliness, freshness); meeting the required grade; safety certification (Figure 32). There were five conditions (stability of supply; product appearance; required clean, pack, and transport to shop by farmers; enough required volume; and stable price) preferred by the retailers in Mondulkir province, Phnom Penh province, and Kandal province (Figure 32).

Regarding the contract arrangement, no contract supply arrangement and farmers arranging product transportation to shop were preferred options for both retailers in Mondulkiri, Phom Penh, and Kandal province. Approximately 45.3% of interviewed retailers in Mondulkir province preferred non-contract supply arrangements and farmer-arranged transportation of products. It was noted that the majority of retailers in Phnom Penh and Kandal (65.5%) choose a non-contract arrangement, and farmers arrange transportation to the shop (Figure 33). The majority of retailers in the studied areas preferred to have an individual contract agreement (Figure 34). Daily supply arrangements were the most preferred for retailers in the studied areas (Figure 35).

Figure 32 (Q4.2). Required supply conditions

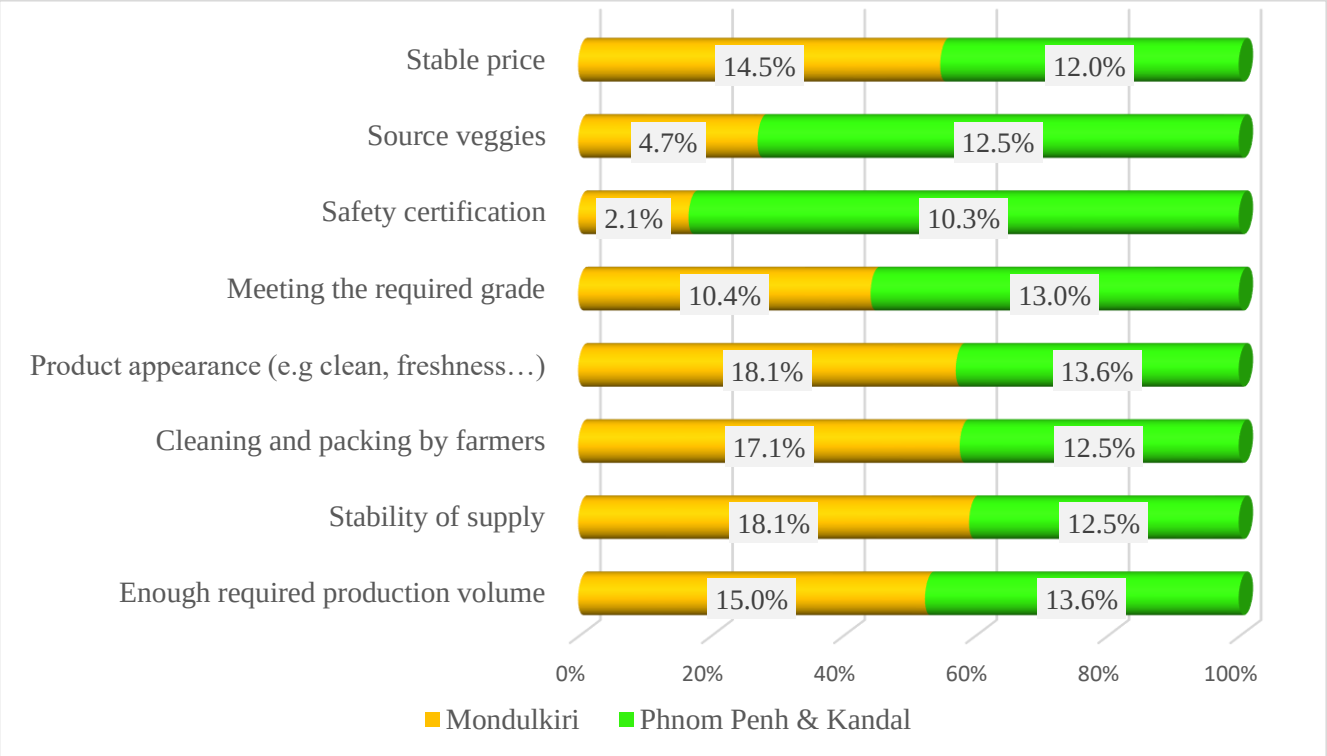


Figure 33 (Q4.3). Required supply contract arrangement

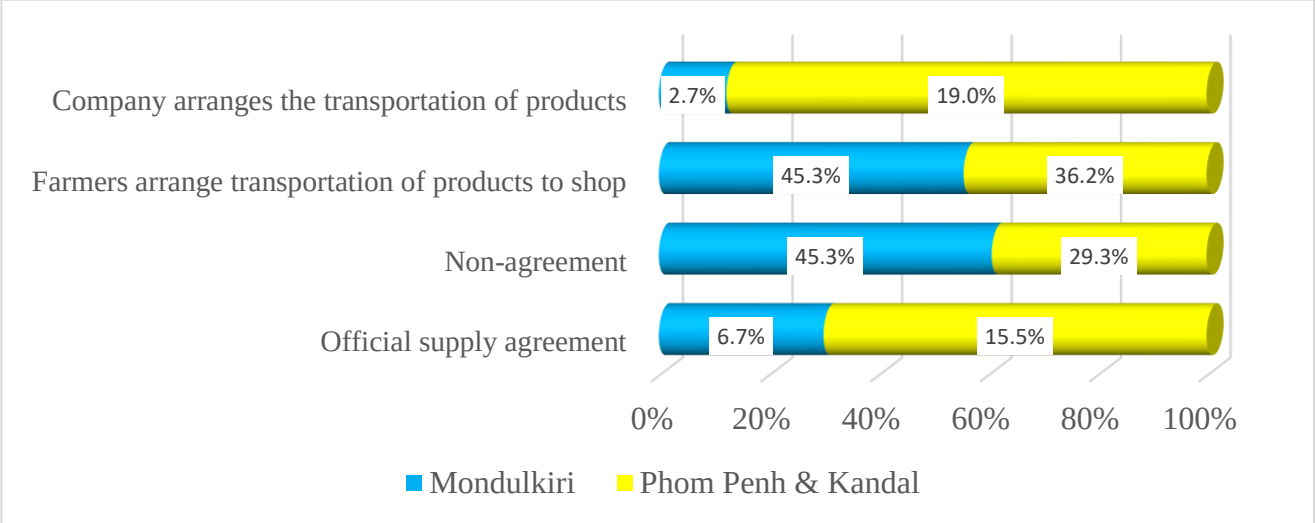


Figure 34 (4.3.1). Specificif contract agreement

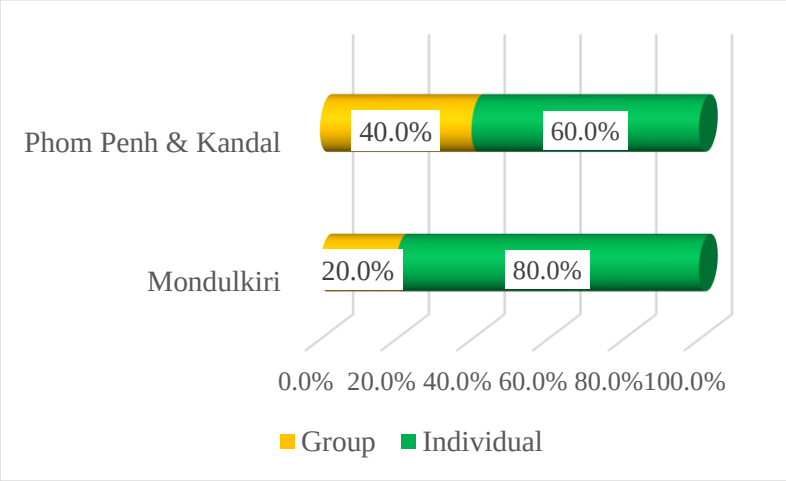
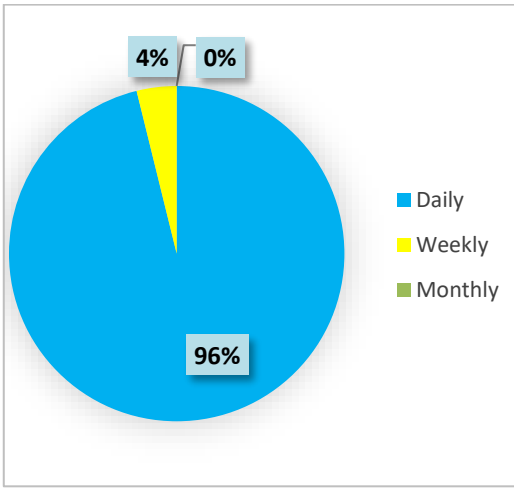


Figure 35 (Q4.4). Required supply arrangement



4.3.3.3 Payment arrangement

There were six options, including market price setting, weekly price settling, monthly price settling, quarterly price setting, semi-annual setting, and year price setting, set out to identify preferred price negations between suppliers and retailers in the studied areas. Almost all interviewed retailers in the studied areas preferred market price setting due to the high fluctuation of vegetable prices during the year. Approximately 94.6% of interviewed retailers in Mondulkiri province preferred market price setting. This figure was similar to the results of the interviews with retailers in Phnom Penh and Kandal province (92%) (Figure 36).

Regarding vegetable payment, the majority of interviewed retailers in the studied areas preferred to settle immediately, representing 83% in Mondulkiri and 81% in Phnom Penh and Kandal

province (Figure 37). Direct cash repayment was the preferred option for the majority of interviewed retailers in the studied areas (Figure 38).

Figure 36 (Q4.5). Preferred price negotation

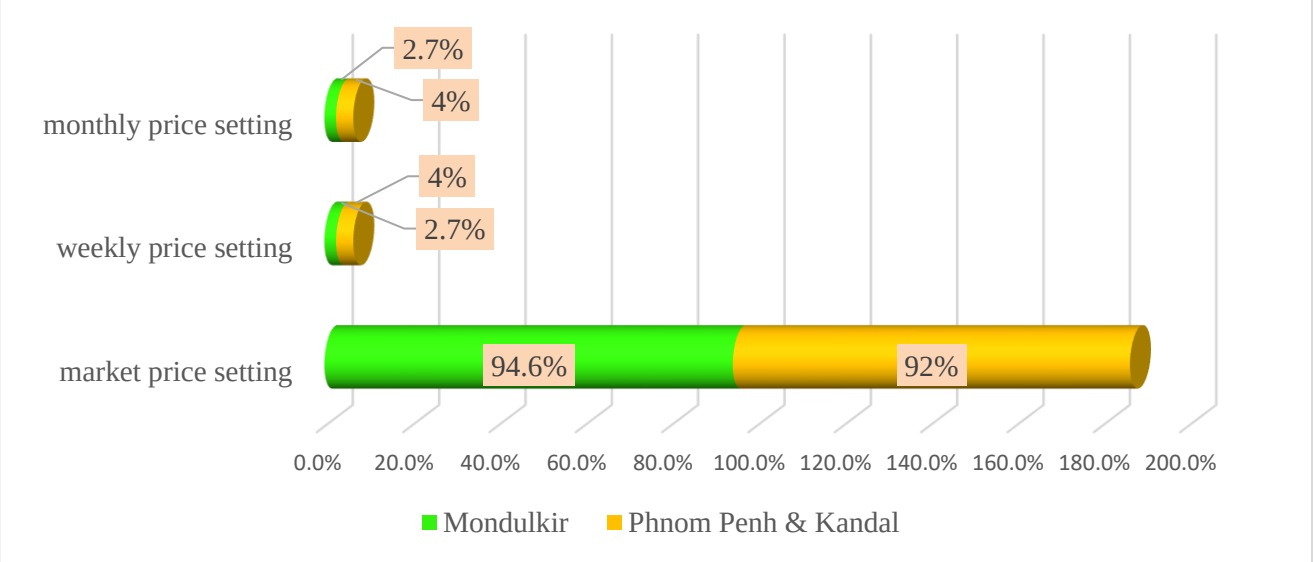


Figure 37 (Q4.6). Required settlement period

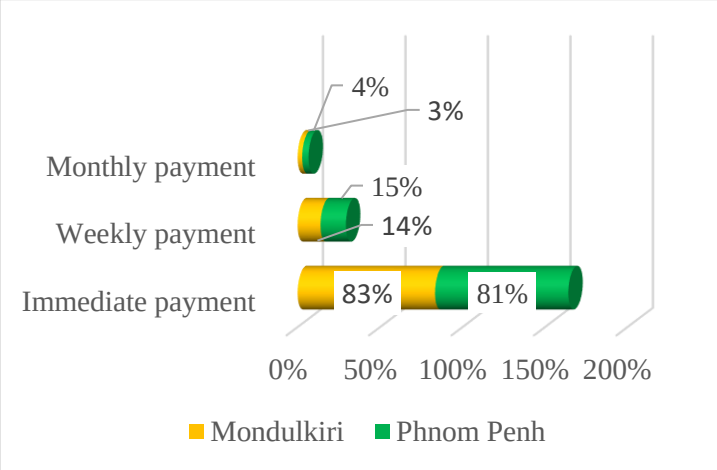
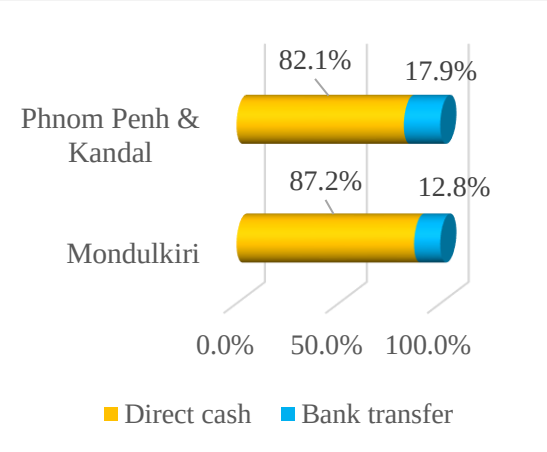


Figure 38 (Q4.6.1). Required method of payment



4.3.4 Roles of women in veggies business operation

The roles of women are essential in the vegetable business operation. The result of the study showed that women have more involvement in the retail vegetable business compared to men. Women represented 60% in Mondulkiri and 68% in Phmon Penh and Kandal provinces (Figure 39).

Regarding the decision on the business start-up, both husband and wife have been involved in the decision-making process for starting up the retail business in Mondulkiri, while the majority of women (71.2%) initiated the vegetable business in Phnom Penh and Kandal province (Figure 40). In terms of business operations, women tended to have more roles in daily business operations in the studied areas. Approximately 75.7% of interviewed retailers in Mondulkiri reported that daily

vegetable buying was decided by the wife, compared to 61.2% of retailers in Phnom Penh and Kandal, who reported that women were the main decision-makers for vegetable buying (Figure 41). Since the vegetable business was small, hiring labor was not an option for retailers. Almost all the retailers interviewed reported that they did not hire labor to support the business. It was represented by 97.3% and 92.6% of the interviewed retailers in Mondulkiri, Phnom Penh, and Kandal provinces (Figure 42). However, if hiring labor was required, husband and wife would be involved in the decision-making process (Figure 43).

Figure 39 (Q6.1). Participation of women in the retail vegetable business

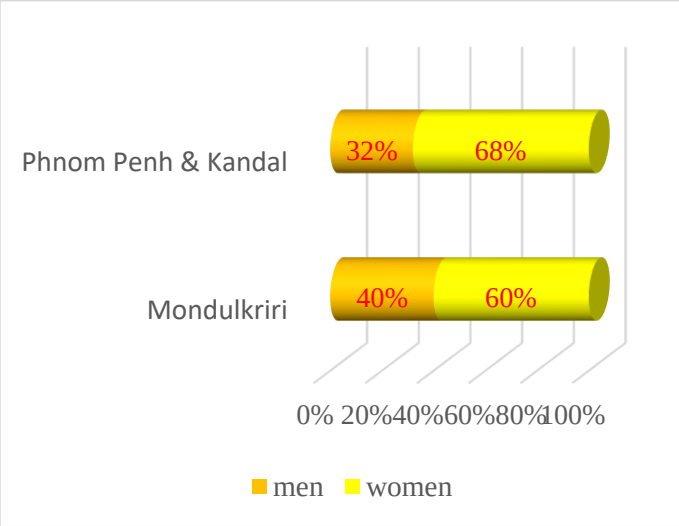


Figure 40 (Q6.2). Decision maker for starting up business

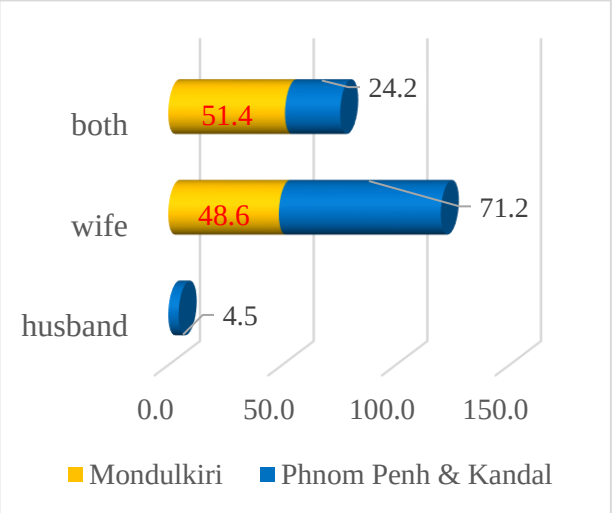


Figure 41 (Q6.3). Main decision maker for daily vegetable buying

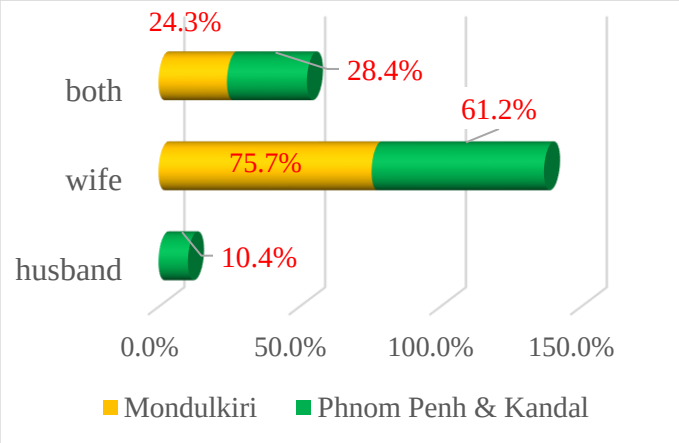


Figure 42 (Q6.4) Labor hiring for supporting business

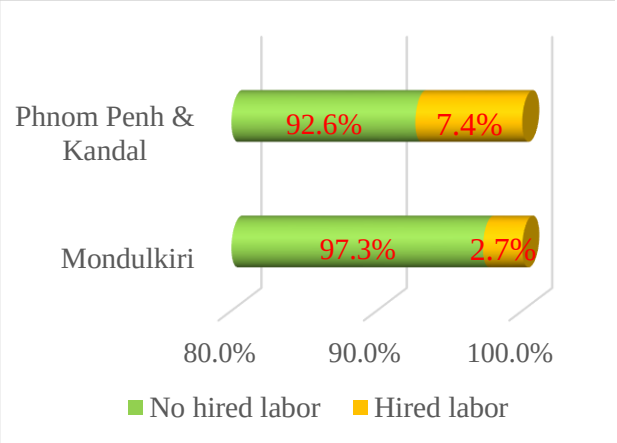
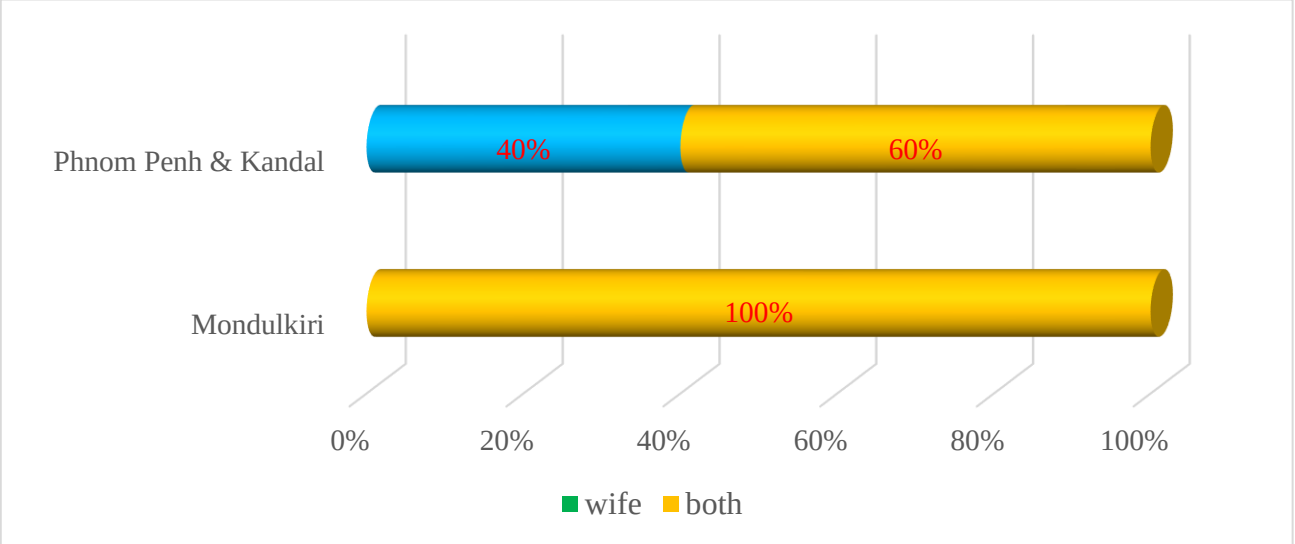


Figure 43 (Q6.4.1). Main decision maker for labor hiring



4.3.5 Vegetable marketing actor practices of SCP

4.3.5.1 Waste manage practices

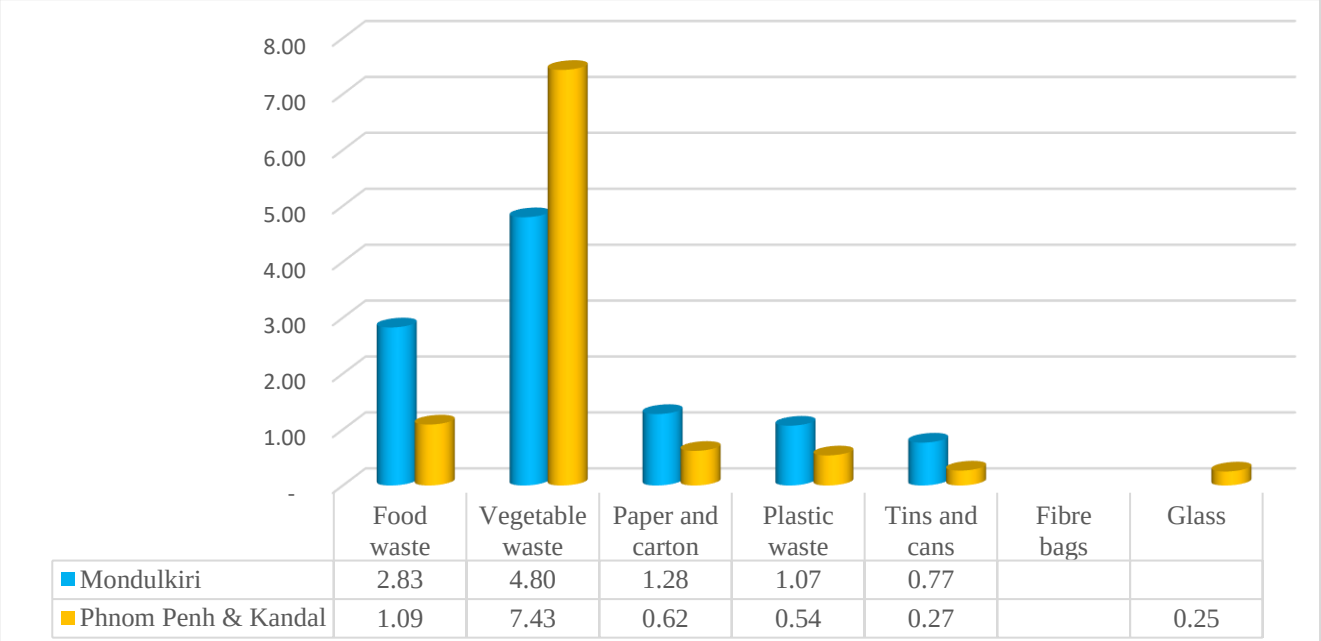
The waste management system was assessed during the study to comprehensively understand the waste management practices of vegetable retailers in the studied areas. Six types of waste were identified in the studied areas. Vegetable and food waste constituted the highest amount of daily waste disposed of. Generally, the average food waste produced by retailers in Mondulkiri province was approximately 2.83kg per day, which was higher than retailers in Phnom Penh and Kandal province (1.09kg per day). On the contrary, vegetable waste (4.80kg) produced by retailers in Mondulkiri province was much lower than that produced by retailers in Phnom Penh and Kandal province (an average of 7.43kg per day) due to the size of the business being bigger in Phnom Penh and Kandal than Mondulkiri province (Figure 44).

In terms of waste classification practices, approximately 54% of interviewed retailers in Mondulkiri province classified their waste; the majority of retailers in Phnom Penh and Kandal (94%) did not classify the waste (Figure 45) due to no separation of public bins based on the type of waste. The common waste classification was separation of food waste, veggie waste, plastic, and cans, represented by 72% of the retailers who practiced waste classification. It was remarked that the minority of interviewed retailers in Mondulkiri province still practiced burning plastic for waste management (Figure 46).

Concerning waste disposal, the majority of interviewed retailers in Mondulkiri province (74.4%) disposed of their waste in personal trash and public bins, compared to 75% of interviewed retailers in Phnom Penh and Kandal province (Figure 47). Waste disposal in the road or street, open space in public or market, and backyards was practiced by a minority of retailers in the studied areas, especially in Mondulkiri province. It was noted that waste recycling was not commonly practiced by the interviewed retailers in the studied areas (Figure 48). Reducing food miles is essential for vegetable

business operations. Two practices to reduce food miles were to offer discounts to customers when buying in bulk and to reduce the single use of food and drink containers (Figure 49).

Figure 44 (Q11.1). Different types of producing waste per day



	Food waste	Vegetable waste	Paper and carton	Plastic waste	Tins and cans	Fibre bags	Glass
Mondulkiri	2.83	4.80	1.28	1.07	0.77		
Phnom Penh & Kandal	1.09	7.43	0.62	0.54	0.27		0.25

Figure 45 (Q11.2). Waste classification practices

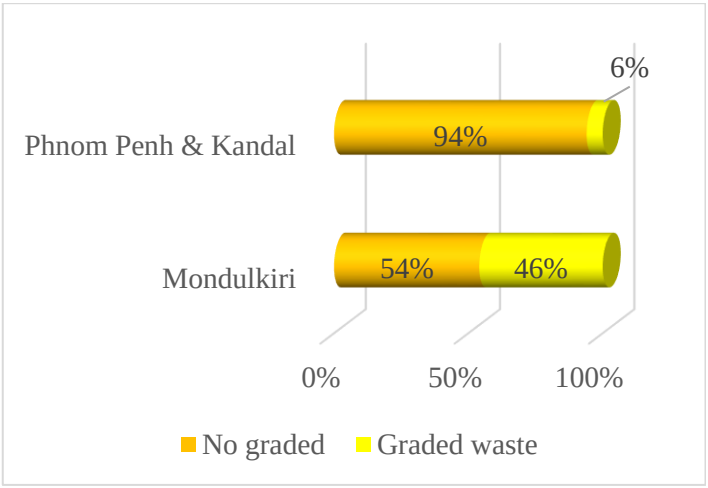


Figure 46 (Q11.3). Method of waste classification

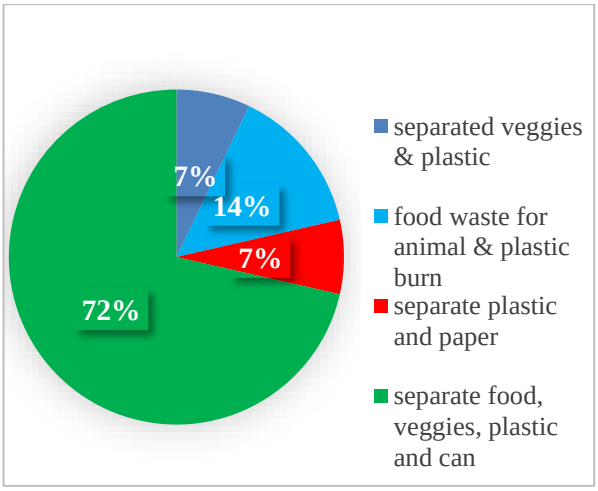


Figure 47 (Q11.4) Location for waste disposal

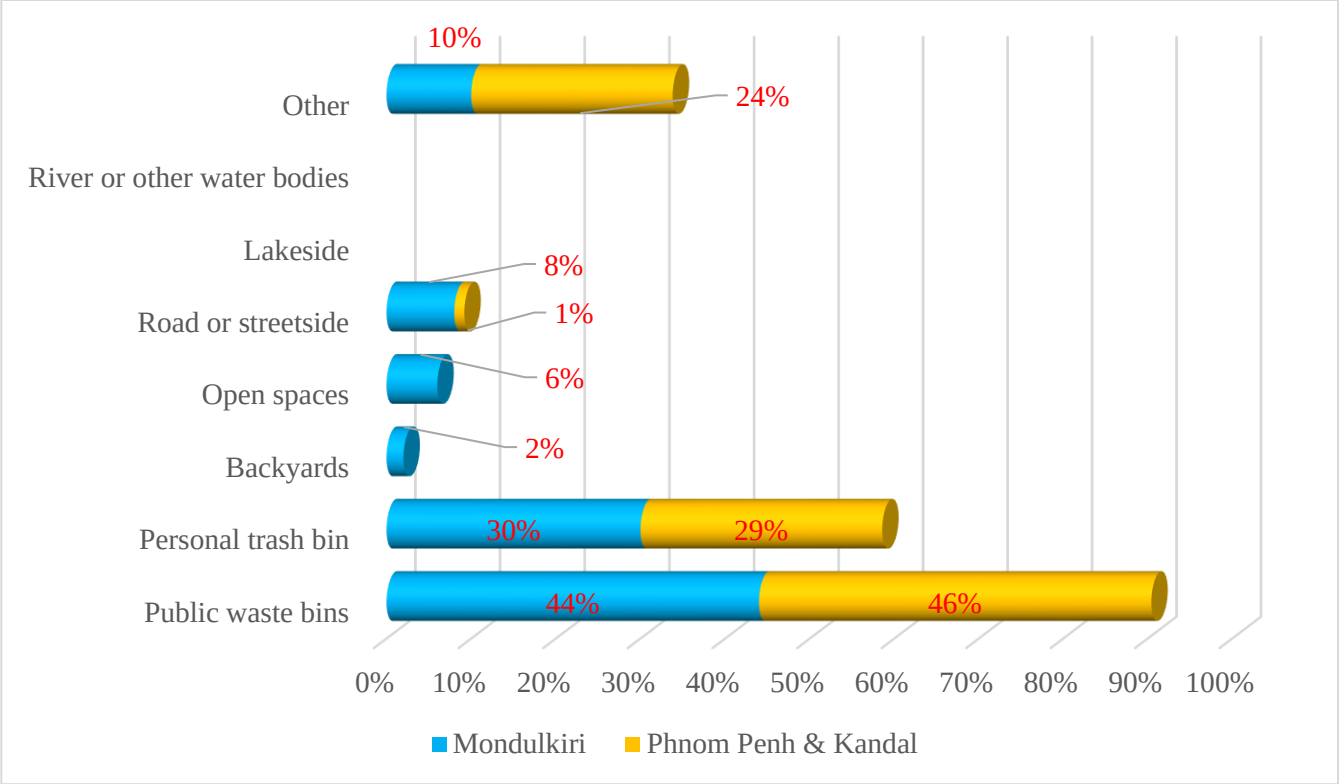


Figure 48 (Q11.5) Practice of waste recycle

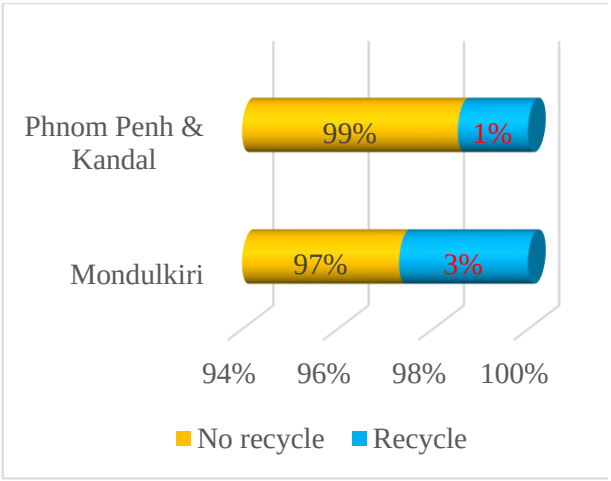
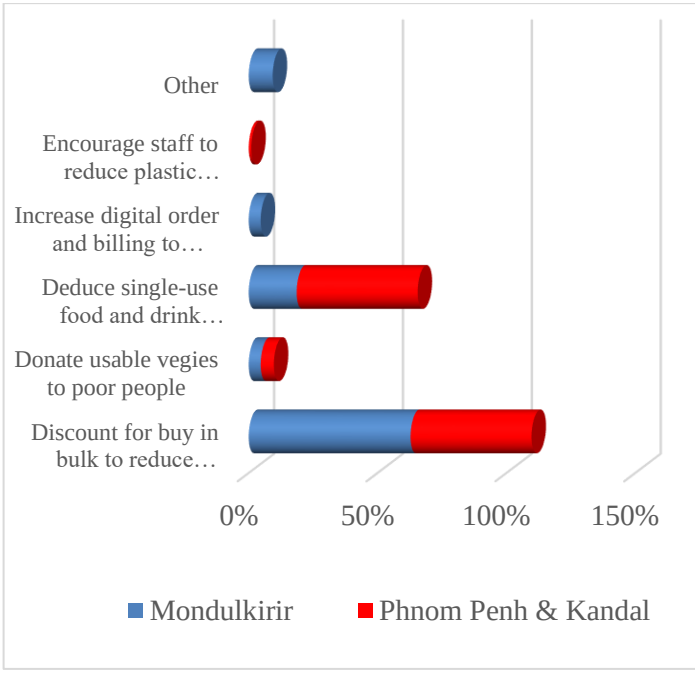


Figure 49 (Q11.6). Waste reduction method



4.3.5.2 Utilization of sustaible packaging and shipping materials

The business causing no harm to the environment is important in the current context. The study found that the majority of interviewed retailers heard about the environmentally friendly packaging. Just over half of the interviewed retailers (54%) in Mondulkiri province heard about

environmentally friendly packaging, compared to 62% of the interviewed retailers in Phnom Penh and Kandal province (Figure 50). Social media (commonly Facebook), governmental institutions, and NGOs were the main sources of environmentally friendly packaging information in the studied areas, rating at 65%, 49%, and 40%, respectively (Figure 51). Almost all interviewed retailers in the studied areas did not use environmentally friendly packaging, while approximately one-ten (9.8%) of interviewed retailers in Phnom Penh and Kandal province used environmentally friendly packaging (Figure 52). Reusable packaging and shipping materials were generally used by a minority of interviewed retailers in Phnom Penh and Kandal province (Figure 53). Three reasons for not using environmentally friendly packaging were: expensive packaging material, difficulty to access, and no requirement from customers (Figure 54).

Figure 50 (10.1) Heard about environmentally friendly packaging

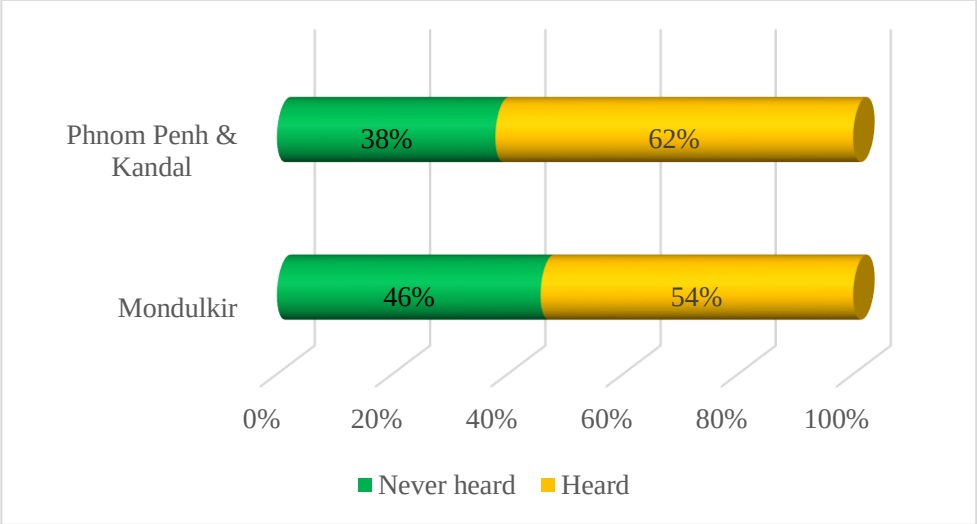


Figure 51 (Q12.2) Where did you hear about environmentally friendly packaging

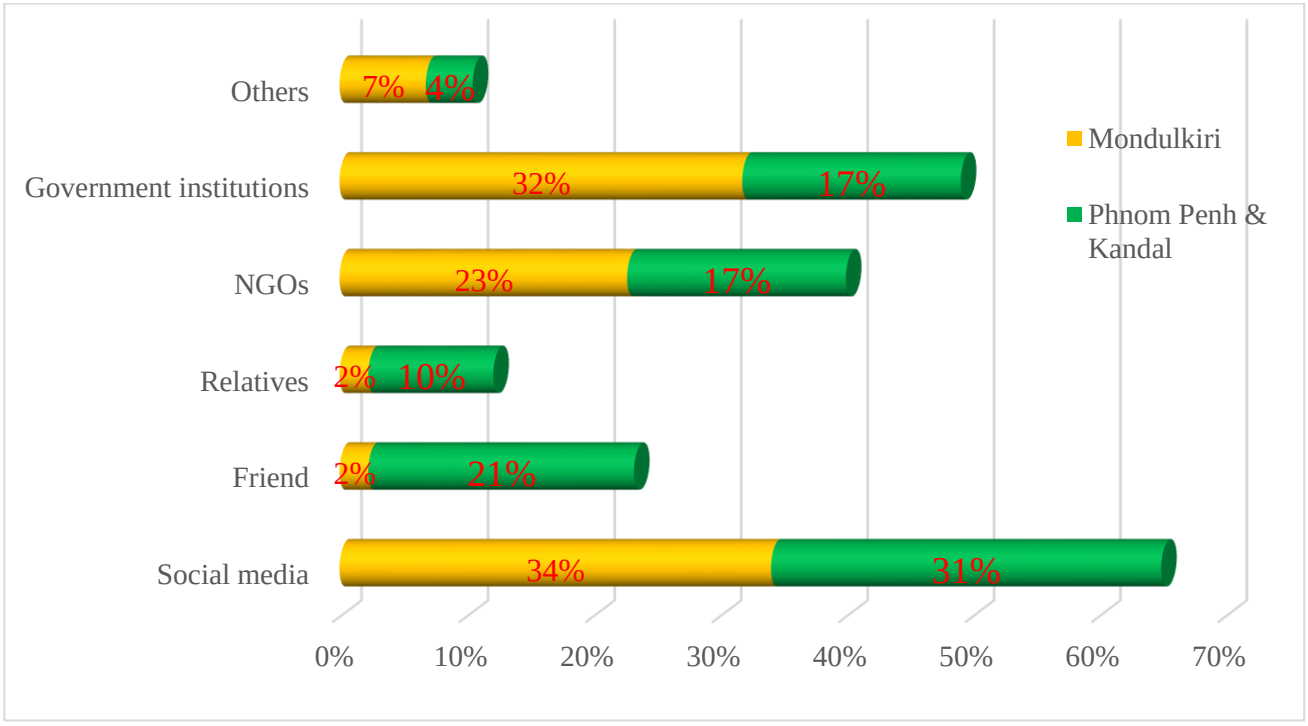


Figure 52 (Q12.3) Used environmental friendly packaging

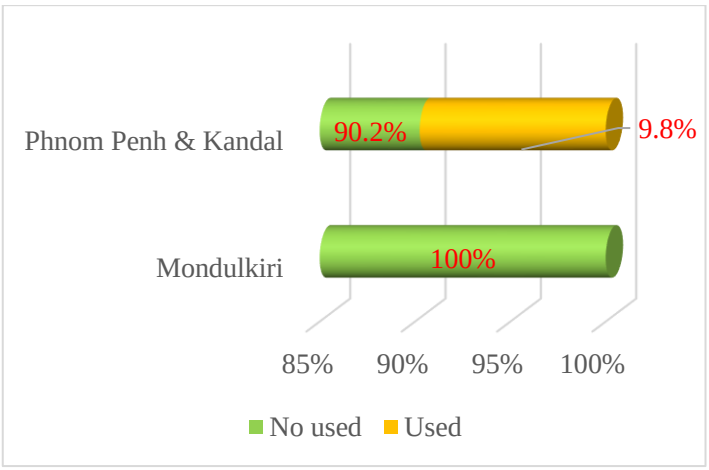


Figure 53 (Q12.4) environementally packaging used

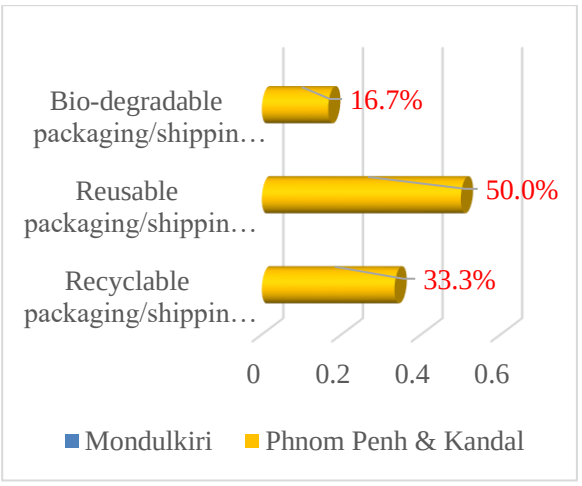
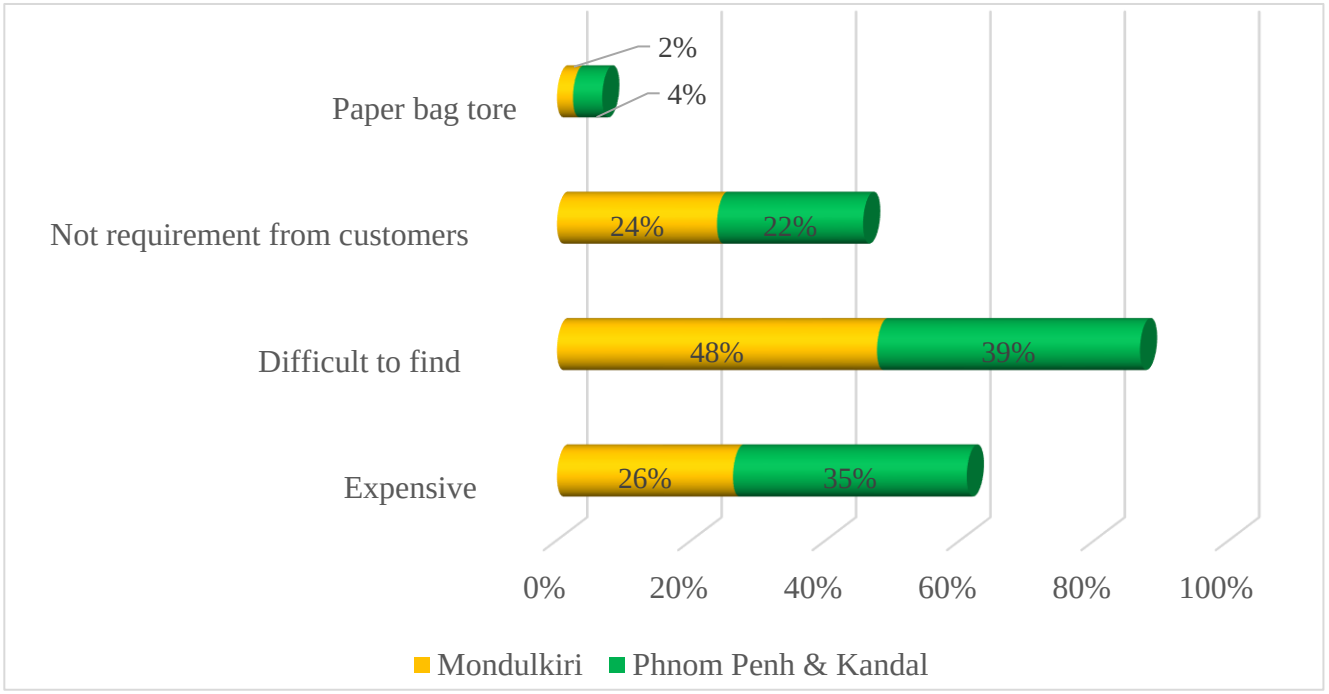


Figure 54 (Q12.5) reason for not environmentally friendly packaging materials



4.3.5.3 Knowledge of vegetable marketing actors on the waste management

The majority of interviewed retailers were aware of the impact of food waste on the environment. The majority of retailers in Mondulkiri province (67%) were aware of the impact of food waste on the environment, compared to 68% of retailers in Phnom Penh and Kandal province (Figure 55). The following-up question was asked to assess the level of awareness. As a result, interviewed retailers knew a little about the impact of food waste on the environment; 56.67% of interviewed retailers in Mondulkiri province know a little about the impact of food waste on the environment compared to 77.07% of retailers in Phnom Penh and Kandal (Figure 56). Concerning the impact of food waste, approximately 66.7% of interviewed retailers in Mondulkiri province rated it from somehow to very concerning. Similary, almost all retailers in Phnom Penh and Kandal (81.3%) rated their concern about the impact of food waste on the environment from somehow to very concern (Figure 57). As they were aware of the impact of food waste on the environment, almost all retailers interviewed in the studied areas were willing to change their behavior towards effective waste management practices.

Figure 55 (Q13.1) food waste impact on environment

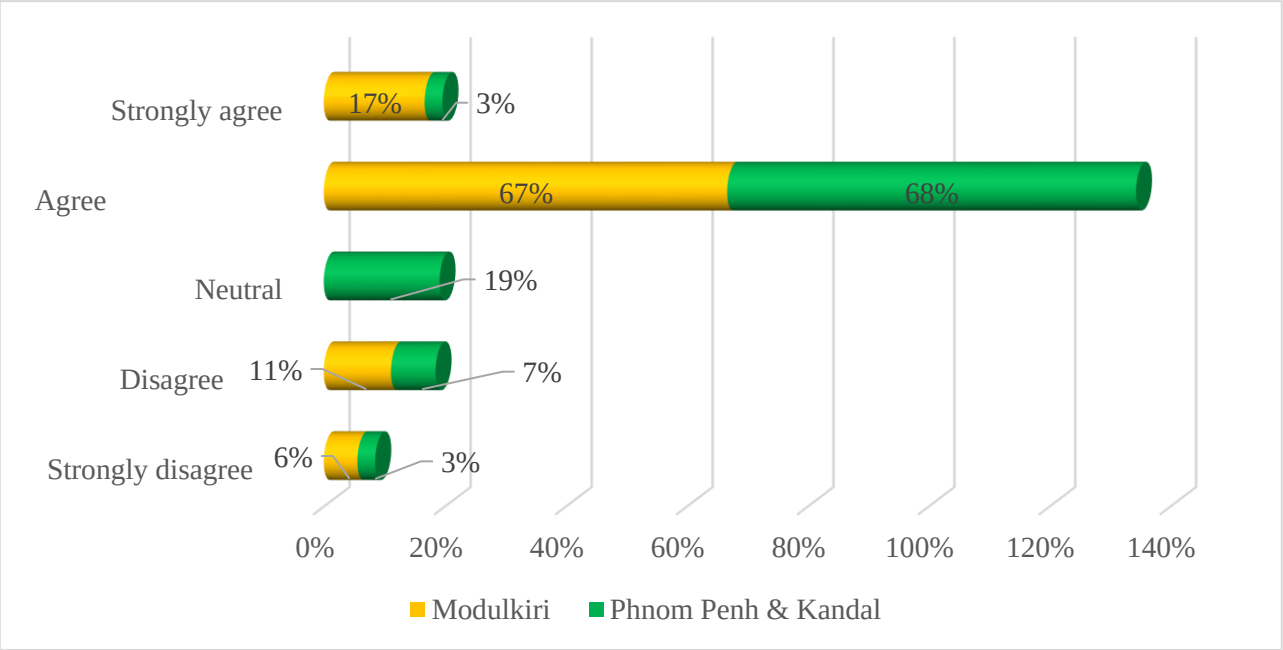


Figure 56 (Q13.2) Awareness of impact of food waste on environment

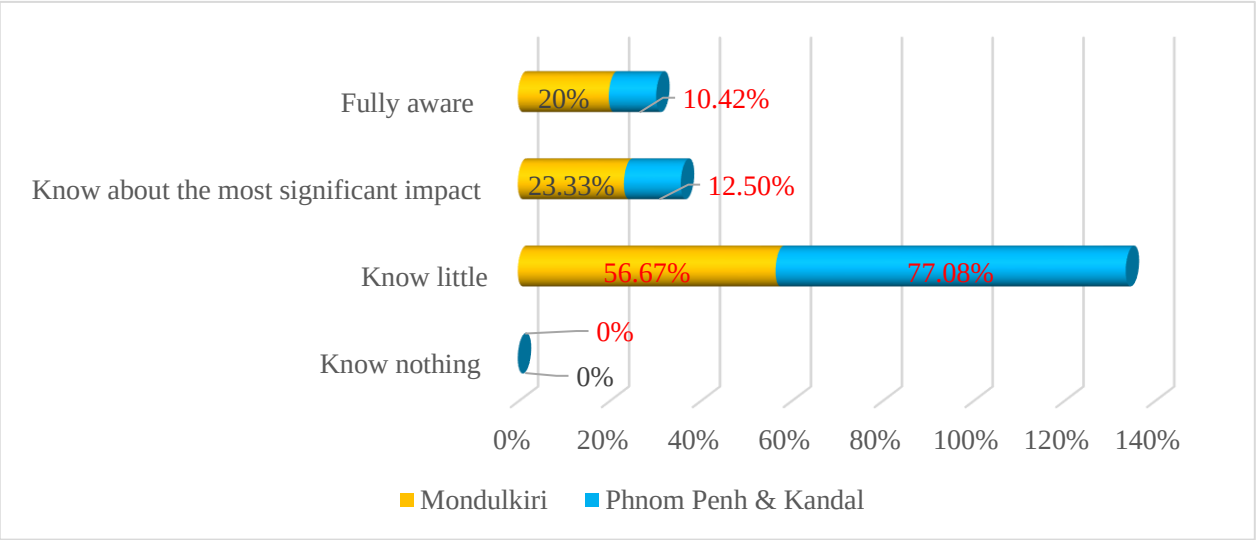


Figure 57 (Q13.3) Level of concern on the impact of food waste on environment

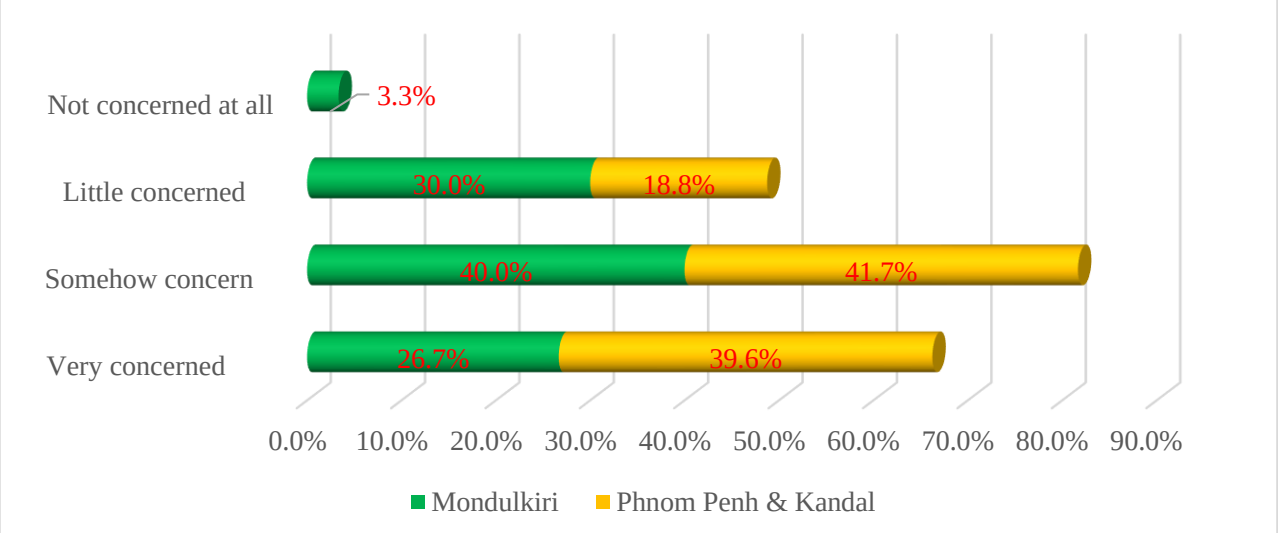
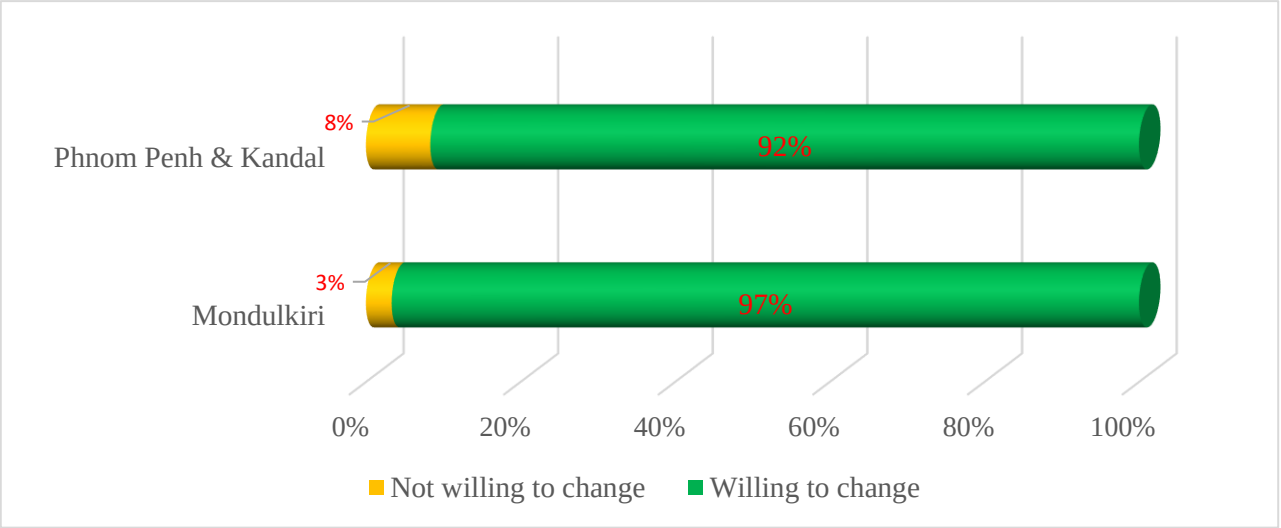


Figure 58 (Q13.4) Willingness to change behaviour towards waste management



The perception of retailers about the impact of plastic waste on the environment was assessed to identify the level concern of retailers about plastic waste. The majority of interviewed retailers in the studied areas were aware of the impact of plastic waste on the environment. Approximately 72.2% and 16.7% of interviewed retailers in Mondulkiri province agree and strongly agree with the statement about the impact of plastic waste on the environment. The retailers in Phmom Penh and Kandal rated similarly at 70.6% and 14.7% on agree and strongly agree (figure 59). Regarding the awareness of the impact of plastic waste on the environment, the majority of retailers in the studied areas knew little about the impact of plastic waste on the environment. Approximately 66% of interviewed retailers in Mondulkiri, Phnom Penh, and Kandal provinces reported that they have limited awareness of the impact of plastic waste on the environment (Figure 60). In relation to the level of concern about the impact of plastic waste on the environment, the interviewed retailers are fairly concerned about the impact of plastic waste on the environment. Approximately 72% and 48% of the interviewed retailers in Mondulkiri province, Phnom Penh province, and Kandal province expressed some concern about the impact of plastic waste on the environment. In addition to this, approximately 41% of the retailers interviewed in Phnom Penh and Kandal expressed great concern about the impact of plastic waste on the environment (Figure 61). As a result, the majority of retailers in the studied areas were willing to change their behaviors toward good plastic management practices. However, approximately 16% and 14% of the interviewed retailers (Figure 62) were not willing to change the practice of plastic utilization for several reasons. First, they have no alternative option to replace the plastic bags. Second, they need plastic bags for packing vegetables for their customers. Third, they found it convenient to use the plastic bags since they have long experience with them. Fourth, paper bags could not carry the wet and heavy vegetables compared to plastic bags.

Plastic bags generally used by retailers in the studied areas. Generally, the retailers in Mondulkiri province, Phnom Penh province, and Kandal province used approximately 73 plastic bags per day, while some of them used up to 250 plastic bags per day (table 7). It was noted that the majority of retailers in the studied areas did not hear any information about sustainable products or green products (Figure 63).

Figure 59 (Q13.5) Perception of retailers on impact of plastic waste on environment

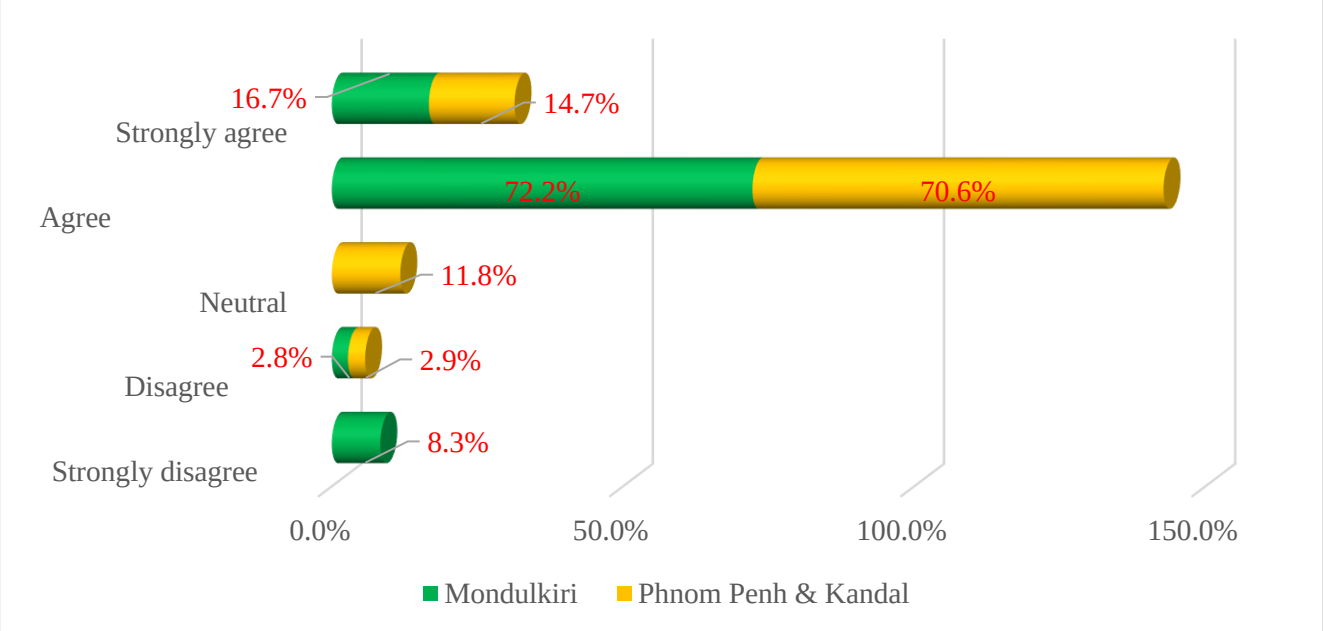


Figure 60 (Q13.6) awareness of impact of plastic waste on environment

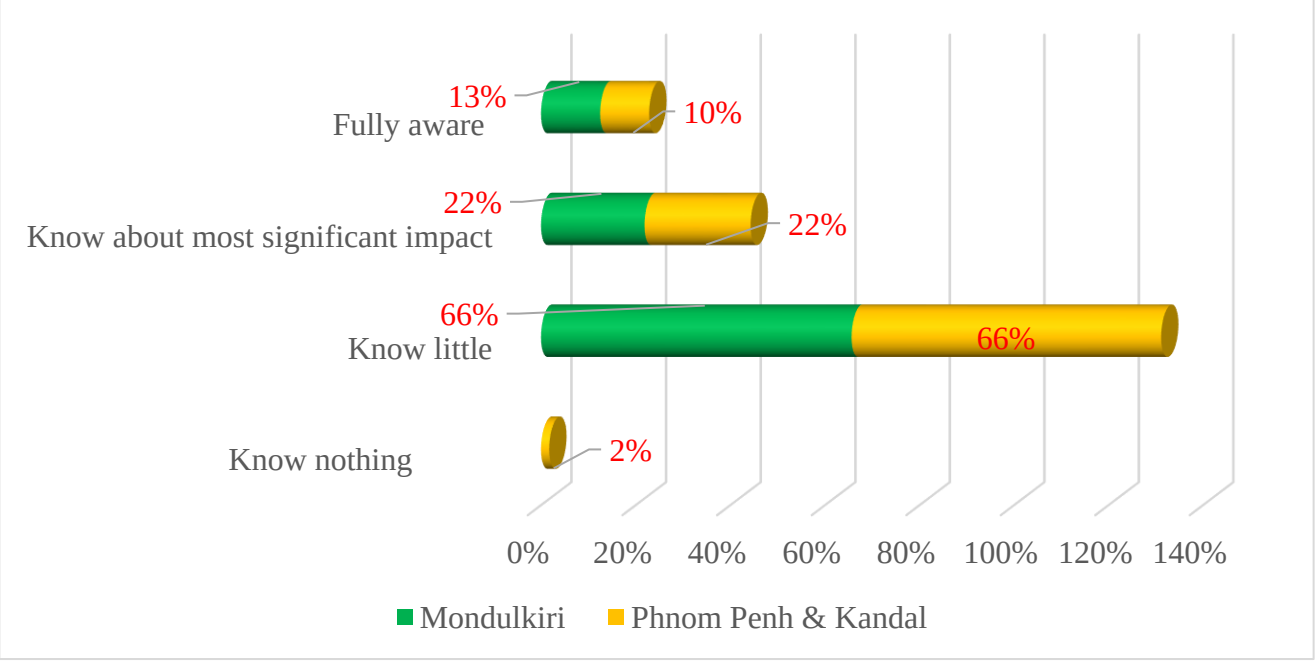


Figure 61 (Q13.7) Concern on the impact of plastic waste on environment

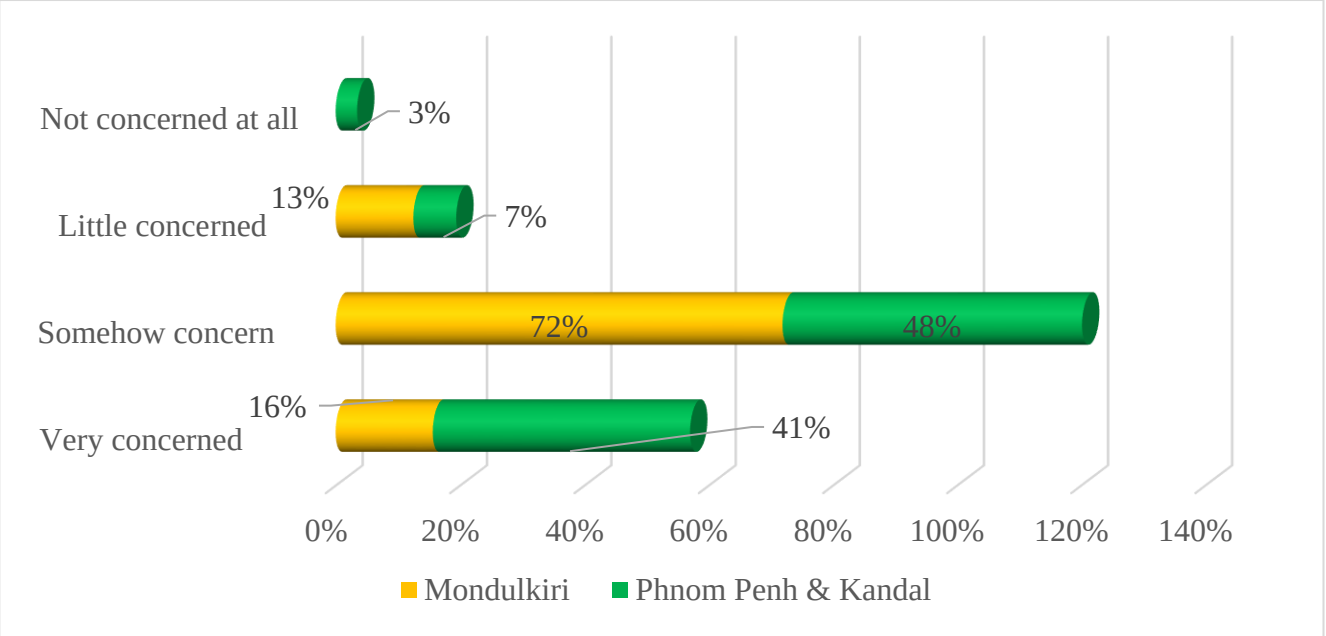


Figure 62 (Q13.8) willingness to change behaviours towards plastic waste management

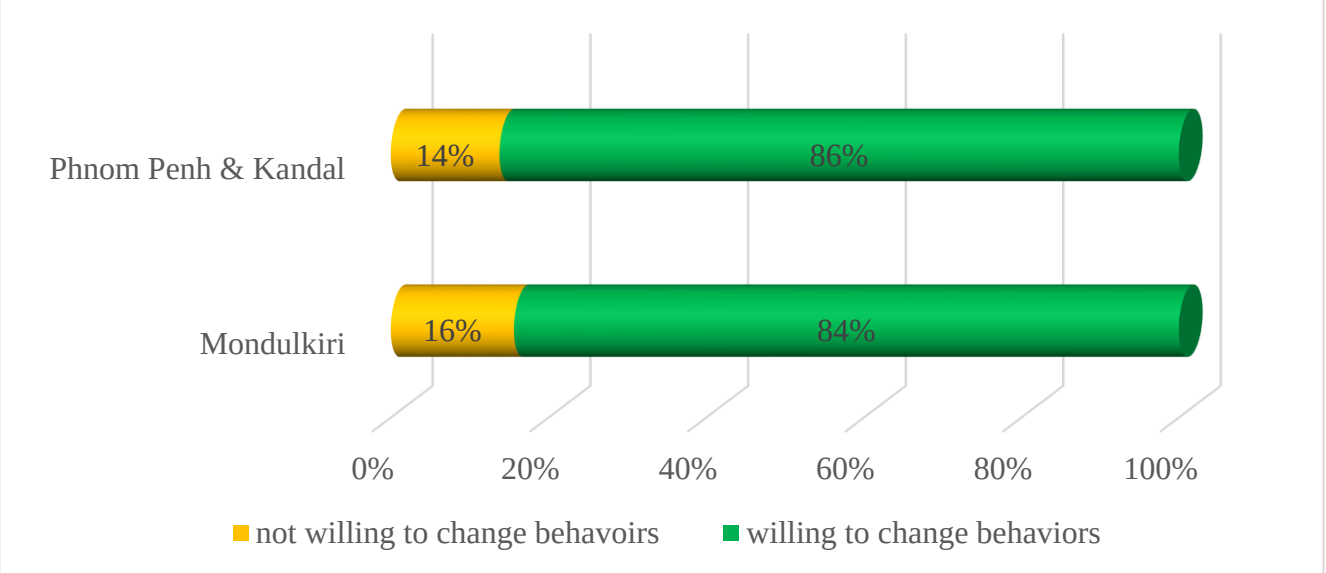
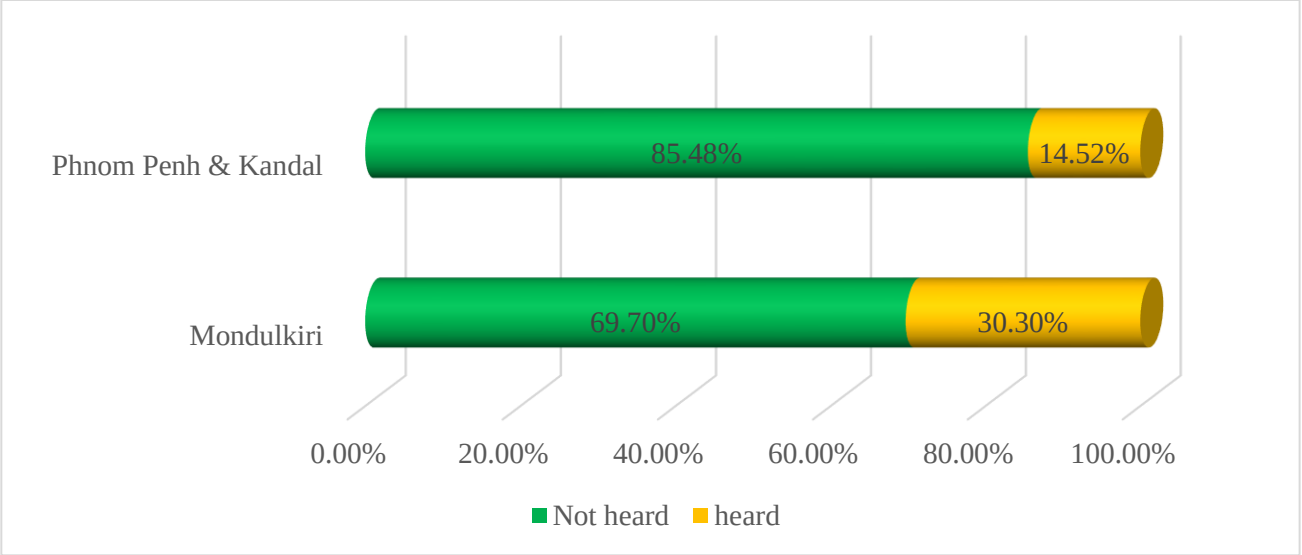


Table 7 (Q13.9) Number of plastic bags used per day

Items	Mondulkiri	Phnom Penh & Kandal
Minimum	4	15
Maximum	250	400
Mean	72	73
Sum	2454	4550

Figure 63 (Q13.10) Heard about sustainable and green products



4.3.5.4 Waste management policies

The result of the study revealed that almost all of the interviewed retailers did not have a plastic-free policy, except for two safe vegetable retailers in Phnom Penh City who addressed that they had a plastic-free policy in place, but the practices were not fully complied with (Figure 64). Almost all of the retailers polled did not have a plan in place to use environmentally friendly packaging. However, approximately 22% of interviewed retailers in Phnom Penh have this strategy (Figure 65). A strategy to reduce transportation emissions was not commonly practiced by retailers in Mondulkiri province; only 8% of the interviewed retailers had this strategy. It was noted that approximately 43% of interviewed retailers have the strategy to reduce transportation emissions (Figure 66).

Figure 64 (Q14.1) Availability of plastic free policy

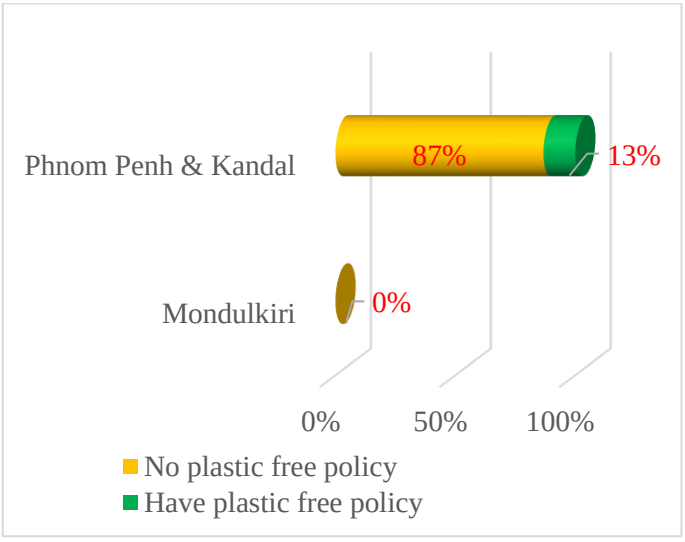


Figure 65 (Q14.2) Availabilty of strategy for the environmental friendly packaging utilization

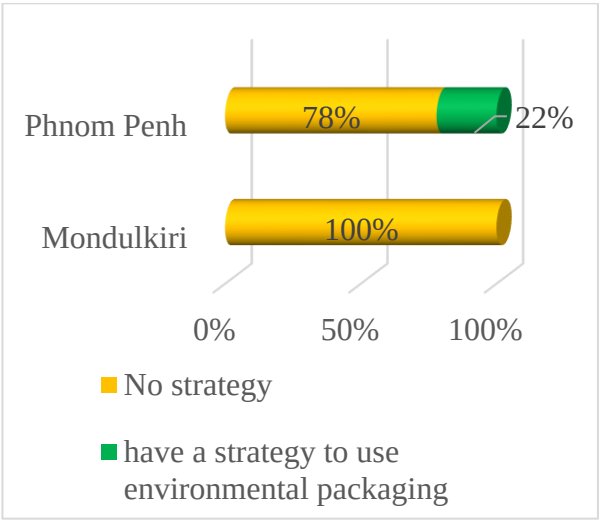
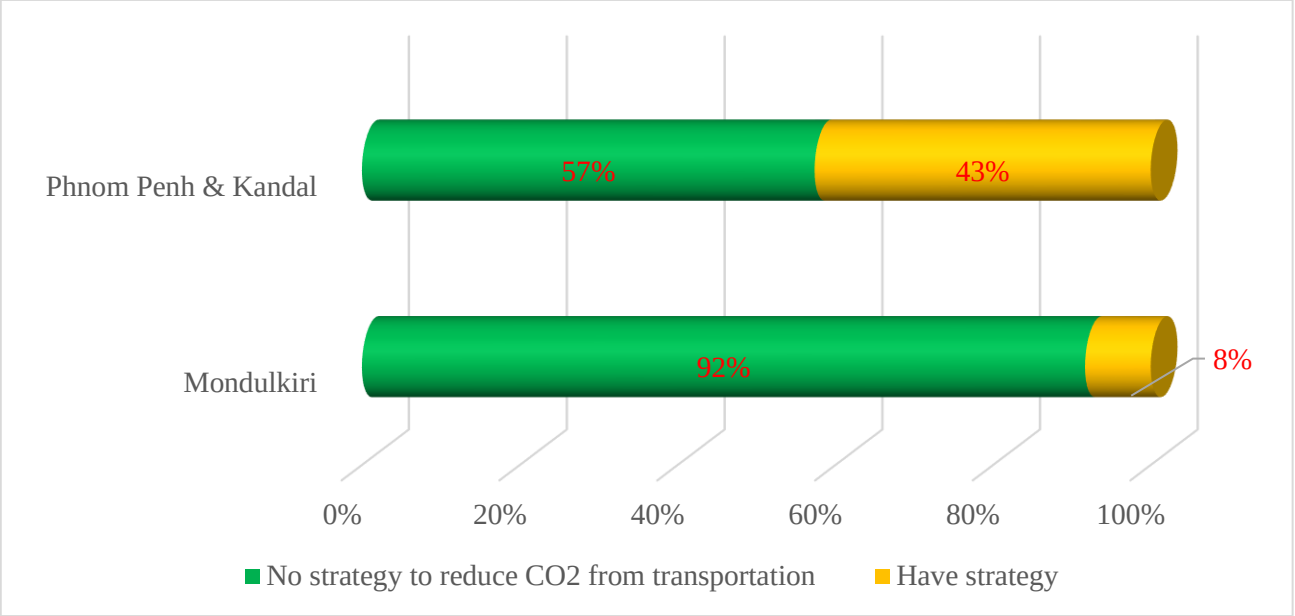


Figure 66 (Q14.3) Have strategy to reduce CO2 from transportation



4.3.5.5 Integration of SCP into retail vegetable business

To understand the perception of retailers toward the integration of SCP into their businesses, various questions were asked. The result of the study showed that half of the interviewed retailers were willing to promote recyclable, compostable, and biodegradable packaging in their businesses (Figure 67). Following-up questions related to the willingness of retailers to promote plastic-free business were asked. As a result, just over half of the interviewed retailers intended to promote plastic-free business (Figure 68) for various reasons. First, they want to reduce the impact of plastic waste on the environment and human health. Second, they want to reduce plastic trash and create a clean environment in the business. On the contrary, about 50% of the retailers interviewed have controversial options for several reasons. First, plastic bags are essential for their business because they need to use them for packing vegetables. Second, they have no alternative choices to replace plastic bags. Some retailers used to use paper bags for packing vegetables, but these bags were torn when they put wet vegetables in them. Third, they find it convenient to use plastic bags since they have lengthy experience using plastic bags.

Regarding the reduction of transportation to reduce CO2 emissions, the majority of retailers in Mondulkiri province (77%) were willing to reduce transportation for not only reducing emissions but also economic benefits. However, the majority of interviewed retailers in Phnom Penh and Kandal province (68%) were not willing to reduce transport since they were required to transport and deliver products to customers (Figure 69). It was identified that increasing the quantity of product

ordering per time was commonly practiced by retailers in the studied areas to reduce emissions and economic benefits (Figure 70).

Further questions were asked to identify the willingness of retailers to reduce food waste. Just under half (47%) of interviewed retailers in Mondulkiri want to discount for customers if they buy in bulk, while the majority of retailers in Phnom Penh and Kandal province (78%) have intended to discount to reduce waste (Figure 71). In addition, they were willing to donate the usable vegetables to customers and other people to reduce waste, as reported by 87% of interviewed retailers (Figure 72). Further, the majority of interviewed retailers in the studied areas were willing to save energy and water, benefiting both the economy and the environment (Figures 73 and 74).

Figure 67 (Q15.1) willing to promote recyclable/compostable/biodegradable packaging

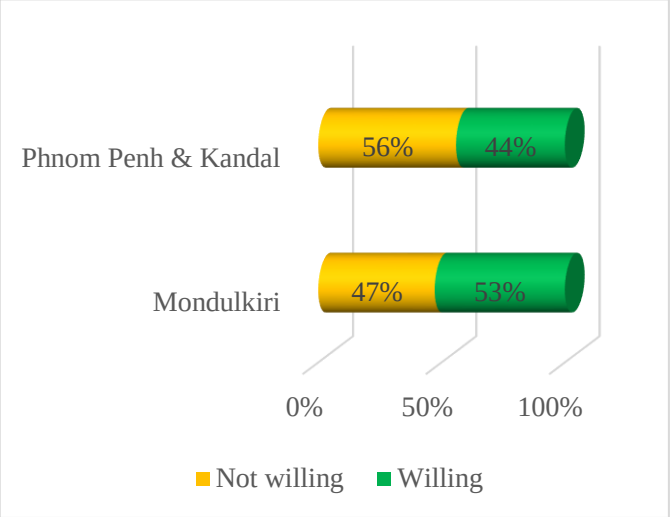


Figure 68 (Q15.2) Willing to promte plastic free into your business

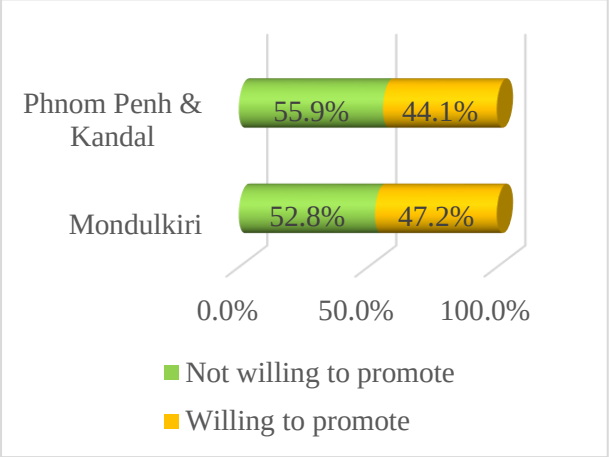


Figure 69 Q13.5 Willingness to reduce transportation emissions

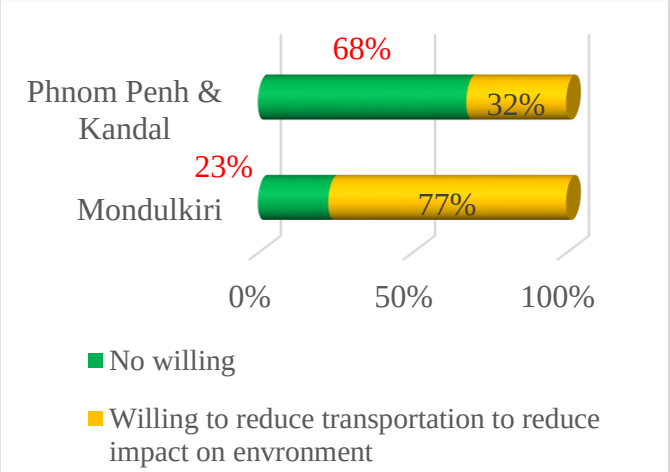


Figure 70 (Q15.4) How to reduce transportation emissions

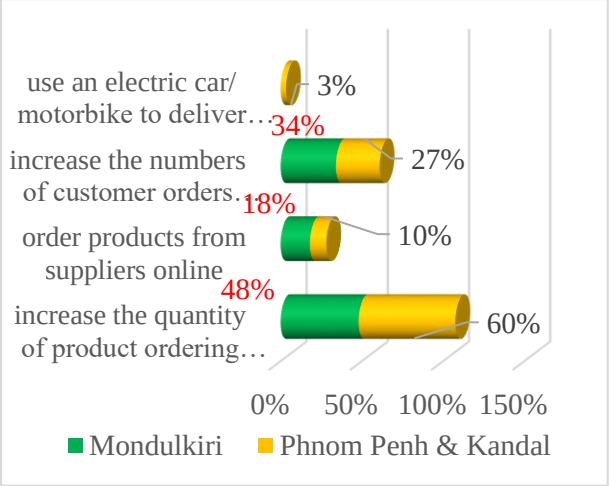


Figure 71 (Q15.5) Want to discount to reduce food waste

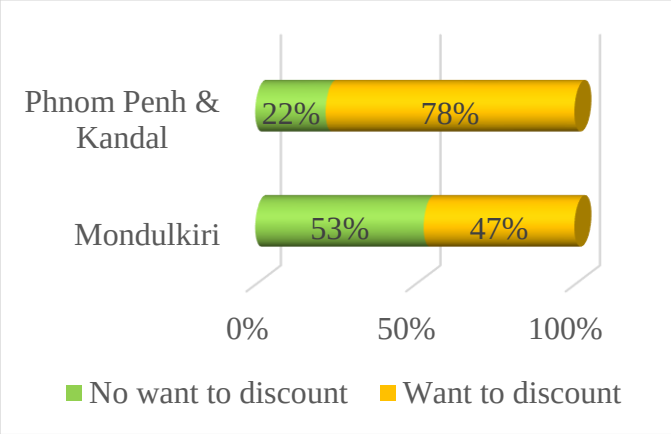


Figure 72 (Q15.6) Willing to donate food to reduce waste

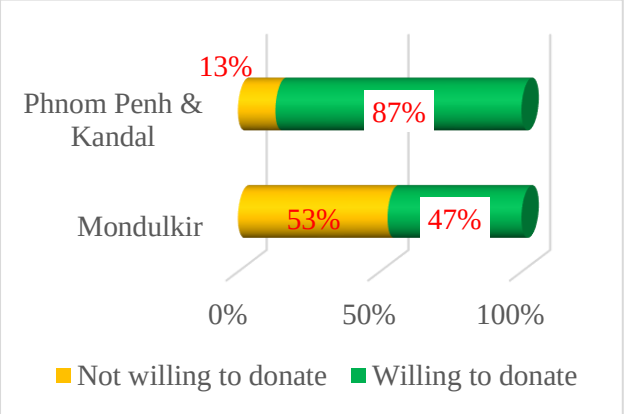


Figure 73 (Q15.7) Willing to save water for your business

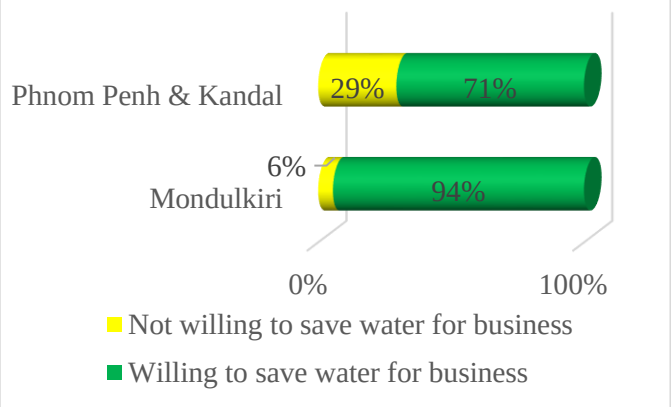
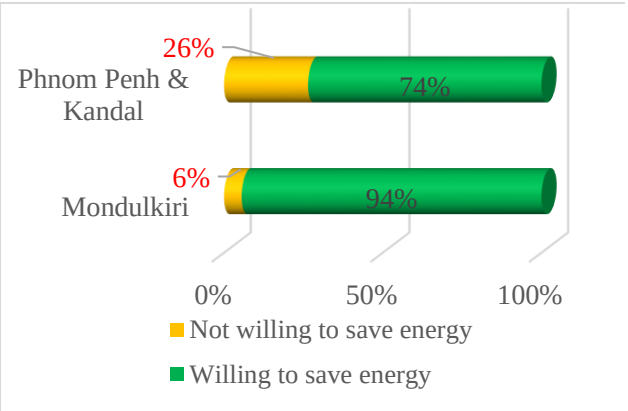


Figure 74 (Q15.8) Willing to save energy for your business



4.4 Wild honey production

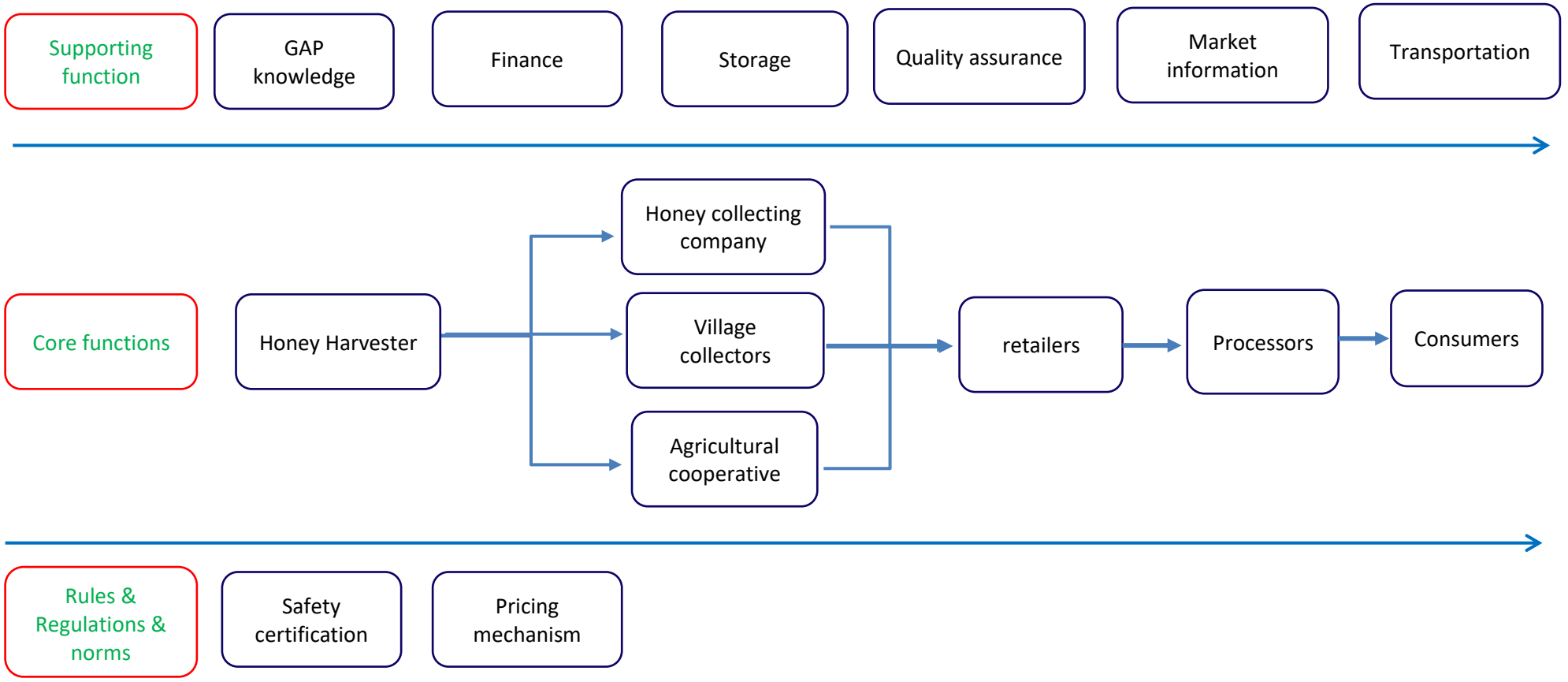
4.4.1 Wild honey supply chain structure

The wild honey production in Mondulkiri province relied on the traditional marketing system, so not many actors participated in the supply chain (Figure 75). The key actors and their roles and responsibilities were detailed as follows:

1. **Wild honey harvester**: the harvester has a main role in collecting honey from the forest and conserving the colony. Since they have lengthy experience and have received various training from NGOs and government institutions, the harvesting techniques have improved.
2. **Village collector**: buy honey from harvesters in the forest and/or village and sell it to customers in the villages, or transport honey to sell in the province.
3. **Distributor/trader**: collect honey from honey harvesters and then retail it to consumers and other retailers in Mondulkiri province, Phnom Penh, and other areas.

4. **Retailers**: small enterprises and companies procured the honey from harvesters, cooperatives, and CPAs for selling to end-users, processors, and other retail shops. The honey price can be added after the processing, bottling, and labeling. This honey is sold for a high price, but the quality of the honey is guaranteed.
5. **Processor**s: wild honey processing was limited. Almost all the collected honey was filtered, packed, and distributed to markets in Mondulkiri, Phnom Penh, and other areas of Cambodia.
6. **Agricultural cooperatives** (ACs) are a market mediator for honey production. ACs have collaborated with NGOs, the government, and the private sector to provide technical training to honey harvesters and also check the quality of honey before supplying it to customers.
7. **Company**: A honey collecting company has collected wild honey from harvesters, filtered it, and then packed it for sale to their customers. During the study, there were three companies operating in the studied areas. First, Forest Venture has been collecting honey from harvesters, ACs, and distributors. Second, Polnet Company has its own group of honey harvesters. They procured the honey, filtered, bottled, sterilized, and then labeled the honey for sale to customers.
8. **NGOs**: several NGOs have been supporting the wild honey supply. However, most of them ended the project, so they have limited activities in the honey supply chain. It was noted that WWF Cambodia has been supporting agricultural cooperatives and CPAs to manage the honey business operation and providing technical and material support to honey harvesters and companies engaged in the honey supply chain.
9. **The Provincial Department of Environment** provided technical training to honey harvesters to ensure the sustainability of honey harvesting.
10. **The Ministry of Commerce** has been providing technical support to the CPA to register Geographical Identification (GI) and providing technical assistance to agricultural cooperatives and harvesters to ensure sustainability in honey harvesting and also promote honey production.
11. **Consumers**: consumers were classified as tourists and end-users in Mondulkiri province. They generally bought the bottled honey.

Figure 75. Wild honey supply chain structure



4.4.1.1 Source of wild honey products

To understand the wild honey supply chain in Mondullkiri province, 16 marketing actors who have lengthy experience (an average of 6 years) in procuring wild honey production in Mondulkiri province were interviewed. The honey collection was generally conducted during the dry season, while some distributors also procured the honey during the rainy season. The quantity of honey collected during the dry season was 300 liters, representing approximately 32% of the interviewed distributors (Figure 76). The quantity of collected honey during the rainy season was 60 liters (Figure 77). The honey was frequently sourced from Pechreada and Kaoh Nhiek districts of Mondulkiri province, representing 44% and 31% of the interviewed honey distributors and retailers, respectively. Approximately 16% of honey distributors procured honey from Preah Vihear, Kampong Cham, and Koh Kong provinces, and Polinet Company, operating in Mondulkiri and Phnom Penh City (Figure 78).

Figure 76 (Q7.2) Quantity of wild honey collected during dry season

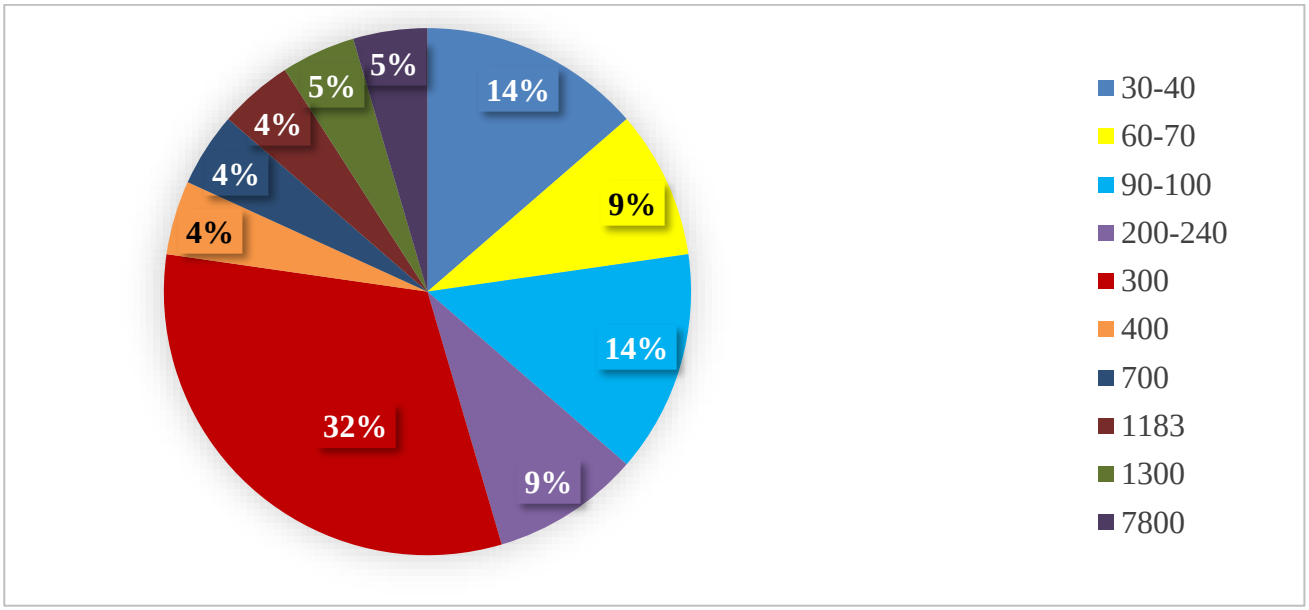


Figure 77 (Q7.21) Quantity of wild honey collected in rainy season

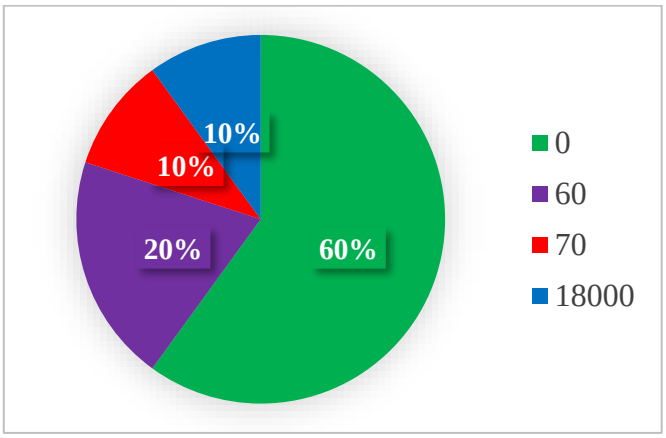
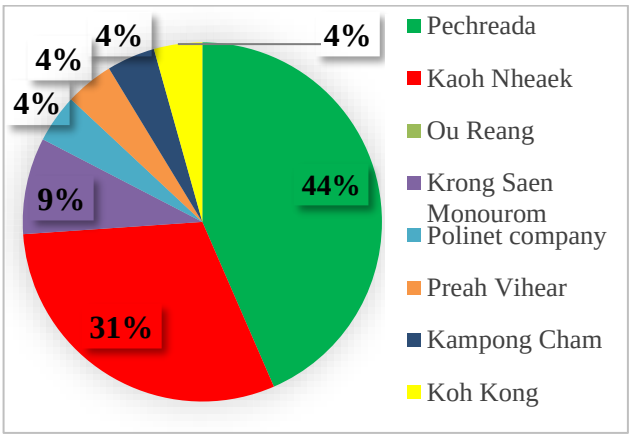


Figure 78 (Q7.3) Souces of wild honey



4.4.1.2 Honey procuring practices

There were six suppliers, including harvesters, distributors, agricultural cooperatives, community protected areas, importers, and polinet companies, that have been distributing honey in Mondulkiri province and Phnom Penh city. However, the honey was mainly procured from harvesters (represented by 82% of interviewed retailers) (Figure 79). The seasonal procurement was generally practiced by interviewed honey distributors and retailers. Approximately 84% of the interviewed distributors and retailers procured honey seasonally (Figure 80) without a contract agreement (representing 92% of interviewees) (Figure 81).

Regarding the payment arrangement, almost all interviewed distributors and retailers paid immediately to suppliers when they took the honey, as reported by 96% of interviewed distributors and retailers (Figure 82).

Figure 79 (Q7.4) suppliers of wild honey

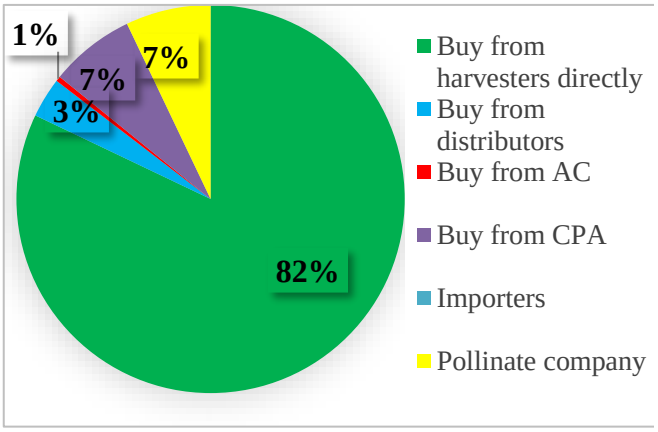


Figure 80 (Q7.5) How often you buy honey

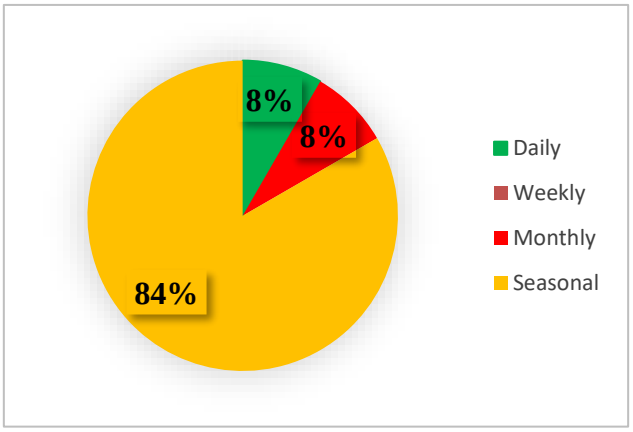


Figure 81 (Q7.7) Contract agreement for wild homey collection

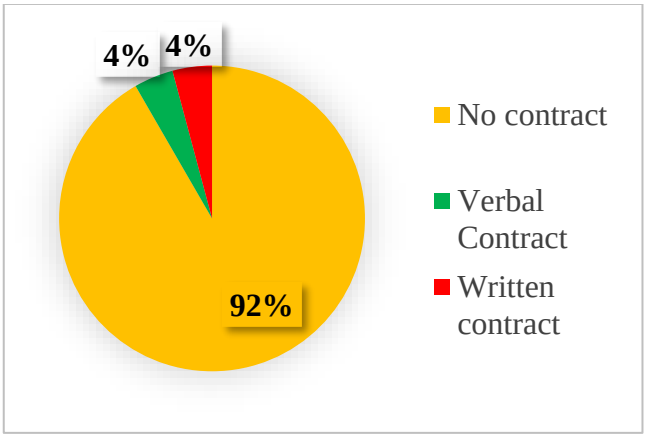
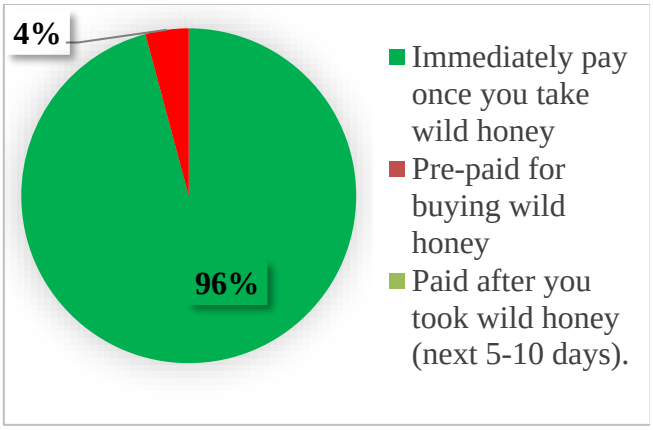


Figure 82 (Q7.9) How to settle supplier



4.4.1.3 Challenges in the honey procurement

It was identified that there were three main challenges faced by approximately 46% of the interviewed distributors and retailers (Figure 83). The quality of produce unsatisfactory or inconsistent, inconsistent in supplying quantity, and high price fluctuation have been hampered the honey retail business. These commonly happened when they procured honey from harvesters (Figure 84).

Figure 83 (Q7.10) Challenges in wild honey procurement

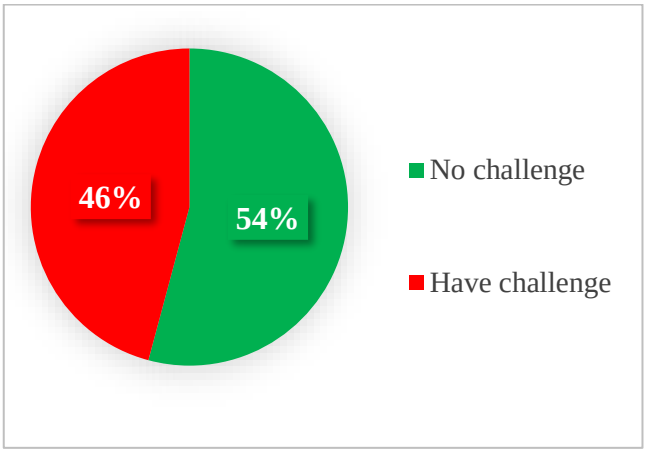
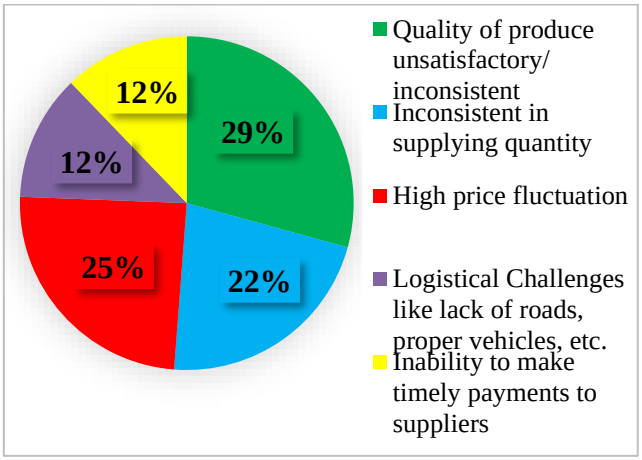


Figure 84 (Q7.10.1) Key challenges in wild honey procurement



4.4.1.4 Wild honey marketing

Wild honey in Mondulkri province was distributed through five channels. More than a half (52%) of harvested honey was distributed to end-consumers and retailers in Phnom Penh city, while just under a half (46%) was sold in local markets in villages, communes, districts, and provinces (Figure 85). Approximately 49% of the collected honey was supplied to end-users, while about 31% was sold to wholesalers in the province and Phnom Penh city. The least amount of honey was sold to processors (Figure 86).

Figure 85 (Q9.1) Distributed channel of wild honey in Mondulkiri province

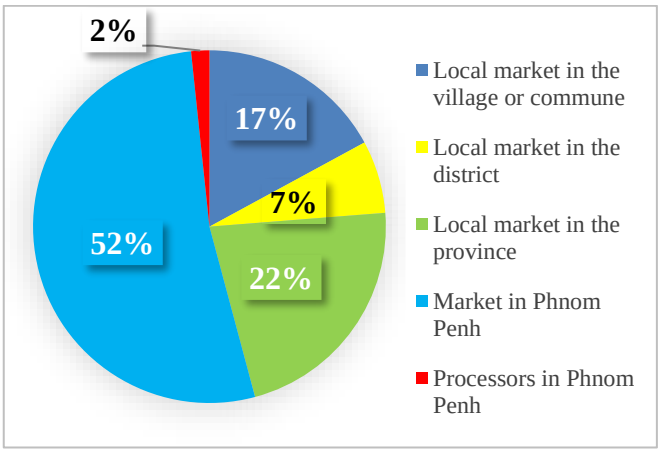
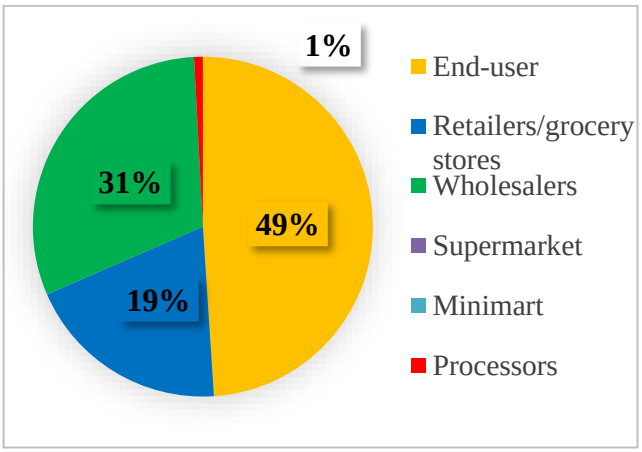


Figure 86 (Q9.2) Consumers of wild honey products



4.4.2 Required standards for wild honey products

The procurement of wild honey in the community was generally not graded. They evaluated the quality of honey with their eyes and used garlic leaves and paper to test the quality. However, agricultural cooperatives and companies that have an agreement with harvesters have a grading system. The quality of honey was graded by the quantity of water contents: first grade (18–20%), second grade (21-22%), and third grade (23-24%). The test machine was used to test the quality of honey at the cooperatives.

Seven conditions (quantities of supply, stability of supply, quality of products, safety certification, product appearance, source of products e.g GI, and price) were set out to assess the conditions influenced the distributors and retailers to buy the honey. It was identified that price, product appearance and quality of products were the most influenced conditions for retailers to buy wild honey in Mondulkiri province, rating from medium (score 3.75) to very high influence (score 4.71), while safety certification and source of products e.g GI were not considered as a main factors to buy the honey (Figure 87).

Figure 87 (Q7.8) Influence condition for retailers to buy

Note: 1. No influence, 2. Low influence, 3. Medium influence, 4. High fluence, 5. Very high influence

4.4.3 Market linkage arrangement of wild honey production

There were six supplied conditions set to assess the preference of the supplied conditions. As a result, price and appearance of the honey were the preferred conditions for procuring the honey, representing 20% and 21% of the interviewed distributors and retailers, respectively (Figure 88). In addition, the majority of them were willing to buy the honey without contract, and harvesters were required to clean and transport products to the buyers, representing 46% and 33% of the interviewed distributors and retailers (Figure 89). On the contrary, a minority of interviewees (16%) were willing to have an official supply agreement with harvesters. It was noted that the majority of interviewees chose the seasonal supply as their first option to procure the honey products (Figure 90).

In terms of marketing, market price setting was the primary option, representing approximately 95% of interviewees, while a minority of them (5%) were willing to have weekly price negotiations (Figure 91). Immediate price settlement was the best option for distributors and retailers (Figure 92), as well as harvesters.

Figure 88 (Q8.2) Required supply conditions

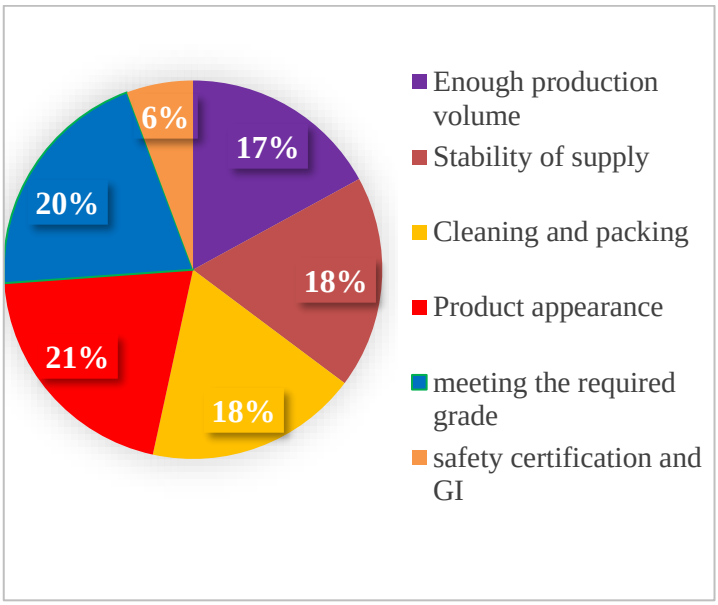


Figure 89 (Q8.3) Required supply arrangement

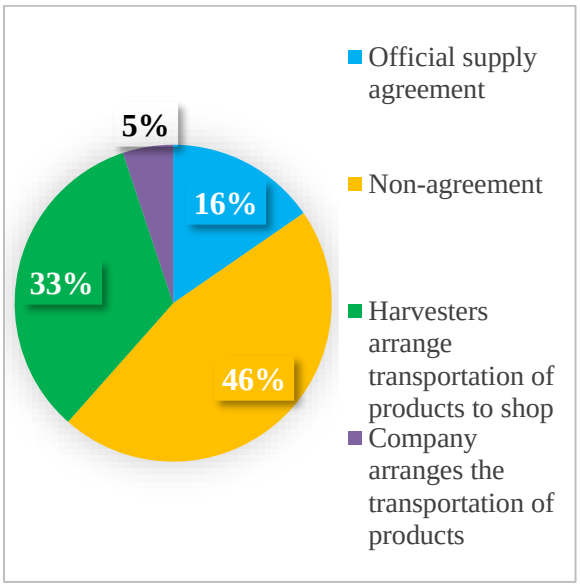
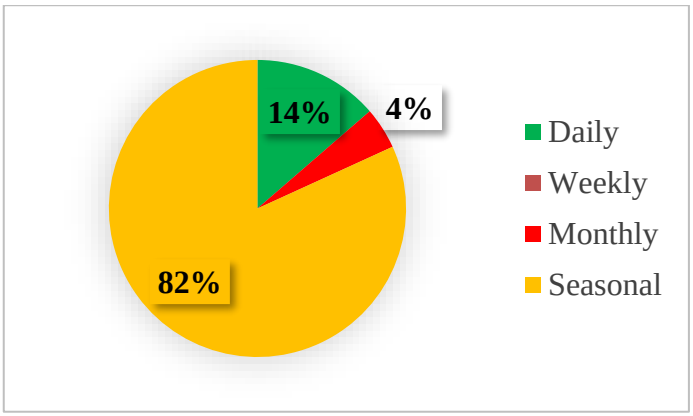


Figure 90 (Q8.4) Required prequent supply

Figure 91 (Q8.5) Preferred price setting



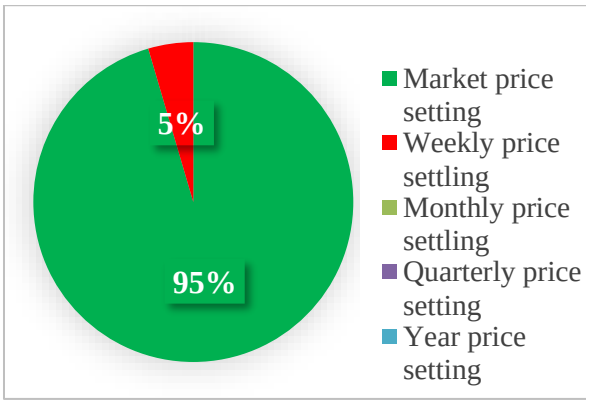
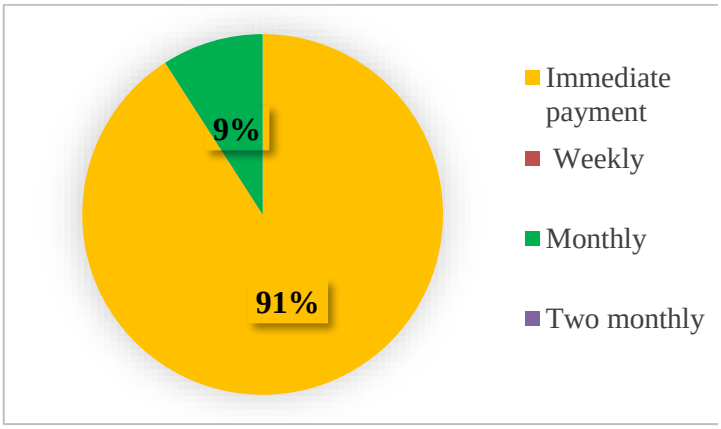


Figure 92 (Q8.6) Required settlement arrangement



4.4.4 Roles of women in honey business operation

The proportion of women is higher than that of men in the wild honey business (Figure 93). Generally, the honey procurement was a small-scale business, with both husband and wife participating.

Regarding the decision to start the business, approximately 44% of the interviewees reported that both husband and wife made the decision jointly, while wife was also an important decision-maker to start the business, rating approximately 35% of interviewees (Figure 94). In terms of daily honey procurement, wife has more function (reported by 39% of interviewees), while approximately 35% of them were decided by both husband and wife (Figure 95). The hiring of labor to support the business was not commonly practiced by interviewees. However, it happened that husband was the main decision-maker reported by 55.6% of interviewees (Figure 97).

Figure 93 (Q10.1) Participation of women in honey retail business

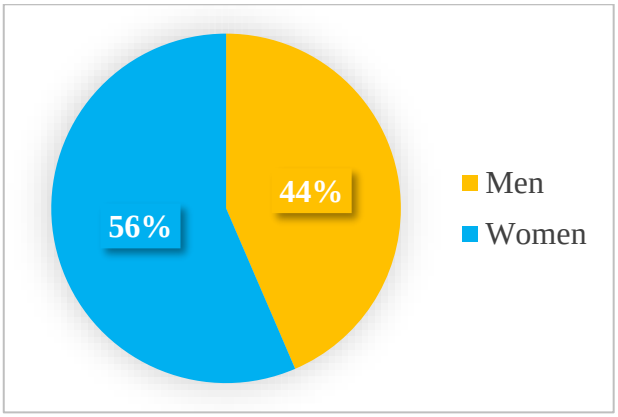


Figure 94 (Q10.2) Main decision maker for starting up business

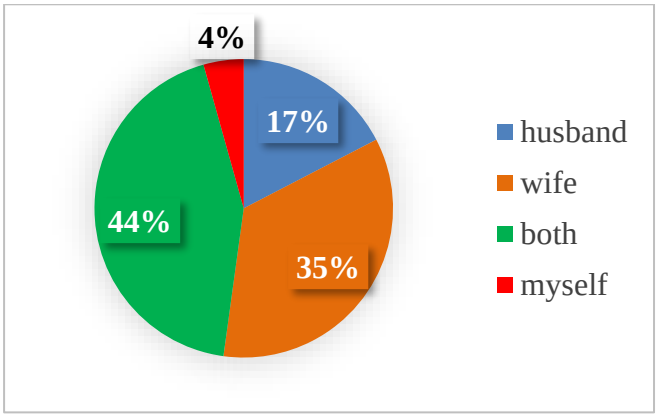


Figure 95 (Q10.3) Main decision maker for daily business operation

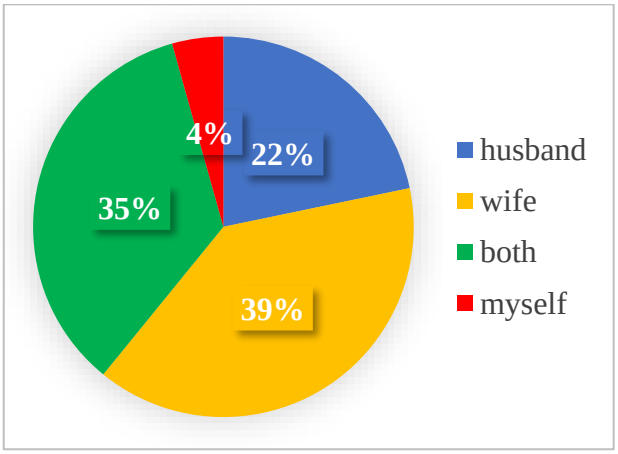


Figure 96 (Q10.4) Hiring labor for supporting business

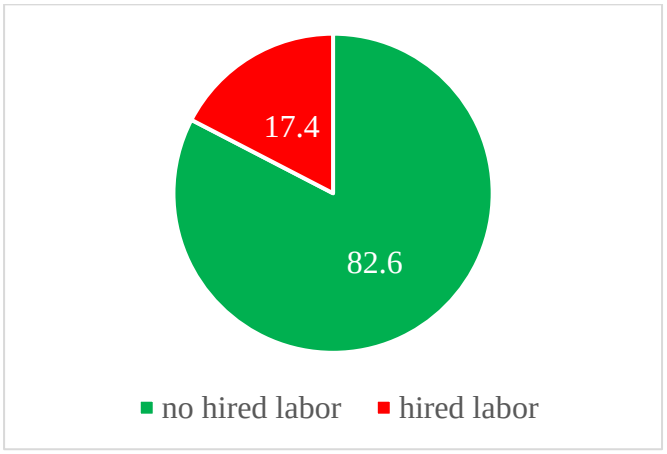
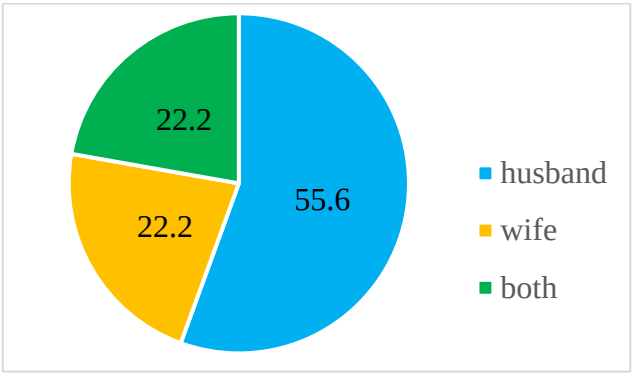


Figure 97 (Q10.4.1) Main decision makers to hire labor for supporting business



4.4.5 Wild honey marketing actors practices of SCP

4.4.5.1 Waste management practices

Waste management is essential for the business in order to attract customers. The questions related to waste management were asked to identify the amount of waste per day. It was identified that the amount of vegetable waste on average was 5.35kg per day, which was the highest amount compared to other waste, while food and paper waste were approximately 1.25kg and 1.33kg per day, respectively (Figure 98). Honey waste was very limited, so it was not included in the result of the study.

The waste was classified and placed in different bins or packaging, as reported by approximately 79% of interviewees (Figure 99). Generally, the interviewees separated the food waste for pig, chicken, and dog feeds, plastic bottles and cans for selling, and plastic bags in the different bins. It was identified that plastic and paper trash burning were still practiced by some of the interviewees in Mondulkiri province.

Regarding waste disposal, interviewees disposed of the waste in five different places. Approximately 41% of interviewees placed the trash in the personal bins, while about 23% of interviewees disposed of the waste in the public bins (Figure 100). Backyards were a convenient place for trash disposal for those who did not have trash bins (representing 15% of interviewees). It was noted that approximately 18% of interviewees practiced plastic burning and burring for waste management.

Waste recycling was not a common practice among interviewees. Approximately 87% of interviewees did not recycle the waste, while approximately 13% of them used the vegetable waste for fertilizing fruit trees such as mango and banana trees (Figure 101). Two common practices identified by the interviewees were discounts for customers who buy in bulk to reduce packaging and reductions in single-use food and drinking containers (Figure 102).

Figure 98 (Q11.1) Quantity of waste produced per day

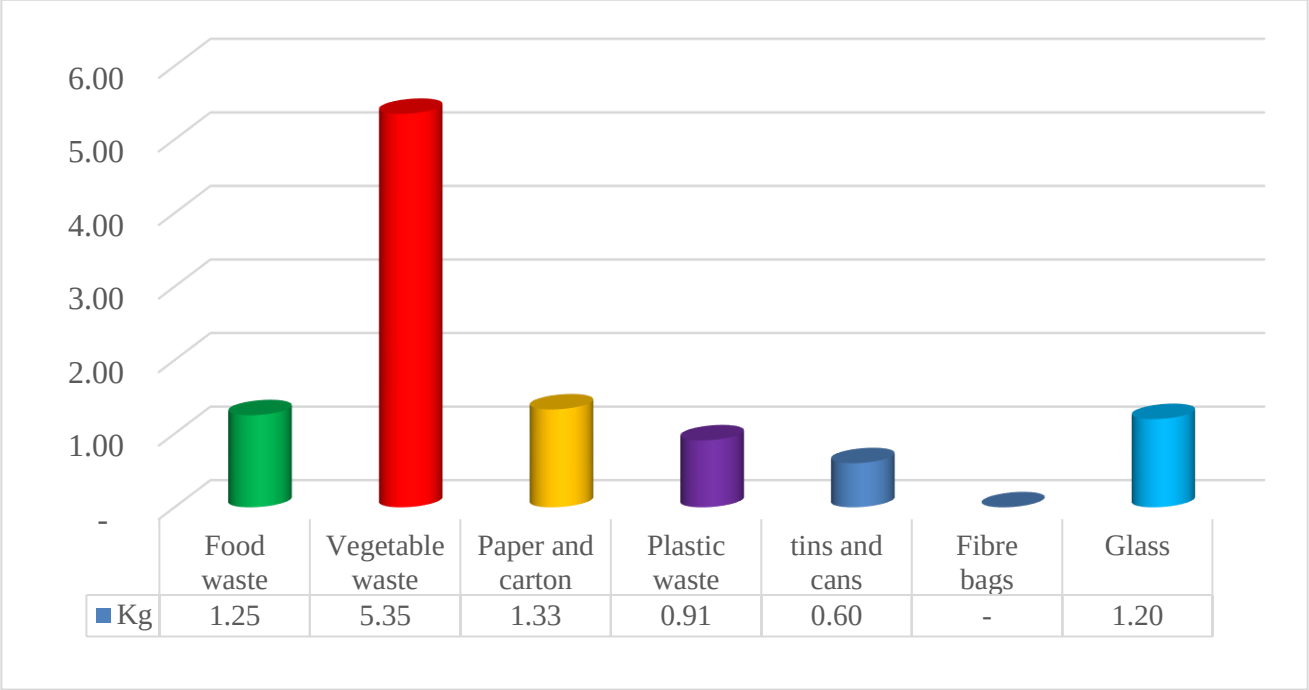


Figure 99 (Q11.2) Waste grading practices

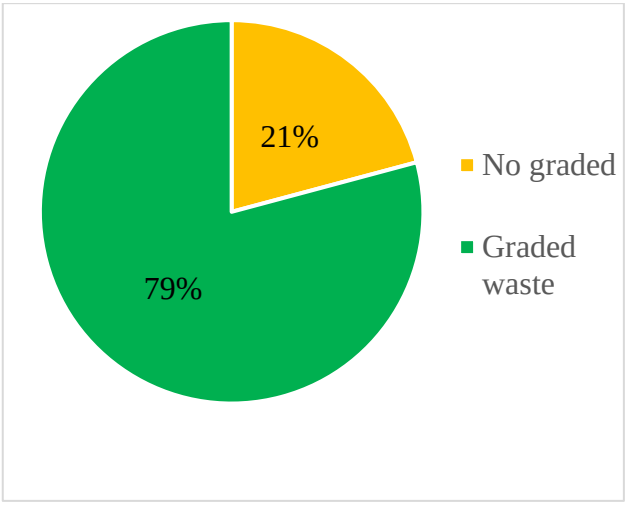


Figure 101 (Q11.5) Waste recycle

Figure 100 (Q11.4) Waste disposal place

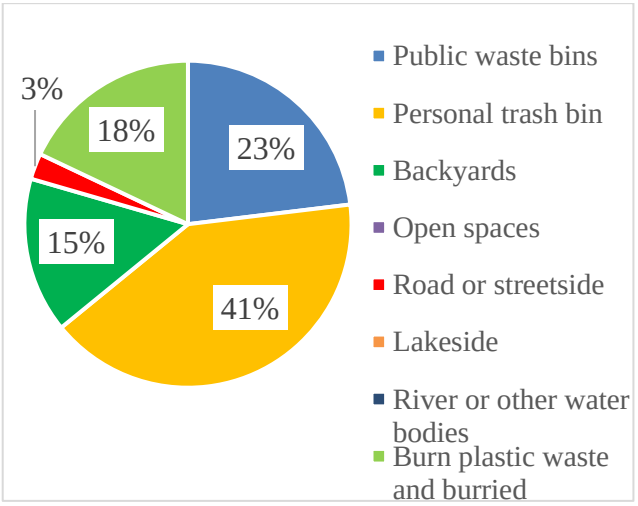
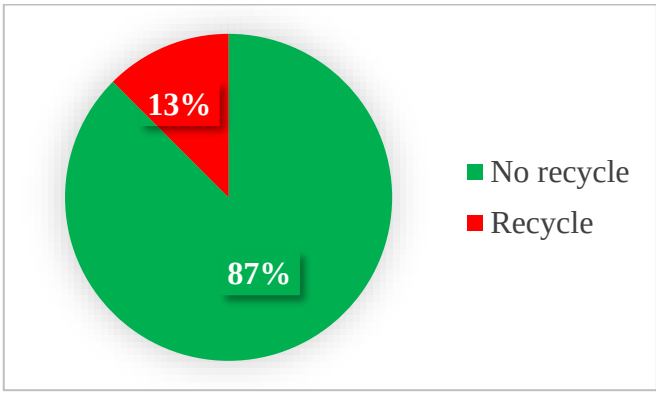
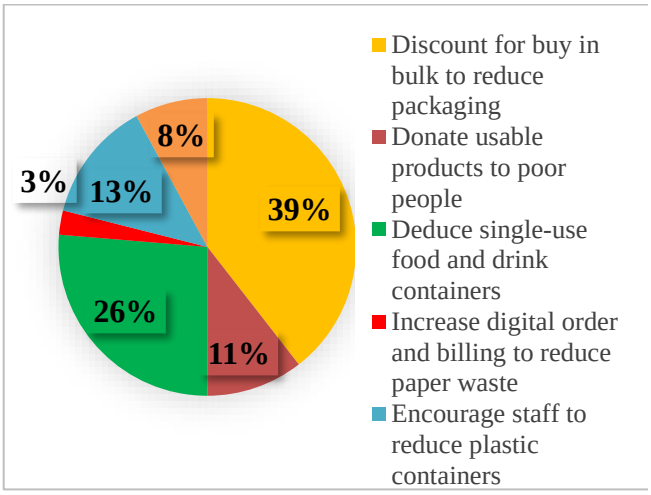


Figure 102 (Q11.6) Common practices for waste reduction





4.4.5.2 Sustainable packaging/shipping materials

The result of the study revealed that the majority of interviewees (83%) heard about environmental-friendly packing (Figure 103). Most of them received information from three main sources. Social media, particularly Facebook, accounted for 31% of those who learned about the environmental packaging, followed by governmental institutions (29%), and non-governmental organizations (29%) (Figure 104). However, the majority of interviewees (66.7%) did not use the environmental packaging (Figure 105) due to three reasons: difficult to find the packaging materials was the primary reason (representing 45%), not required from customers (representing 32%), and expensive (representing 23%) reported by those who did not use the environmental packaging (Figure 107). Three types of environmental packaging materials were used for packaging the honey. Reusable and biodegradable packaging and shipping materials were commonly used by the minority of interviewees in Mondulkiri provinces (Figure 106).

Figure 103 (Q12.1) Have you ever heard about environmental friendly packaging

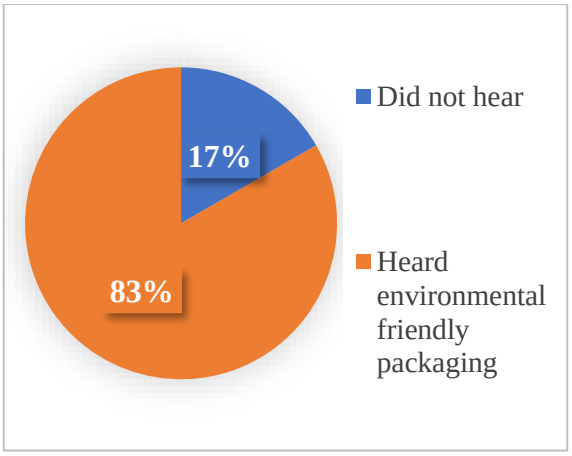


Figure 104 (Q12.2) Where did you hear about environmentally friendly packaging

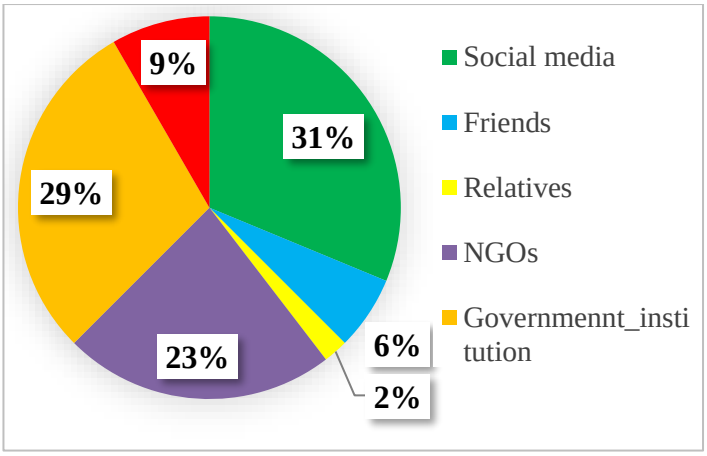


Figure 105 (Q12.3) Did you use environmental friendly packaging

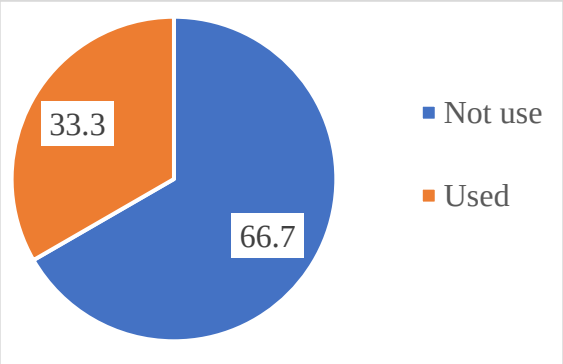


Figure 106 (Q12.4) Type of environmental friendly packaging used

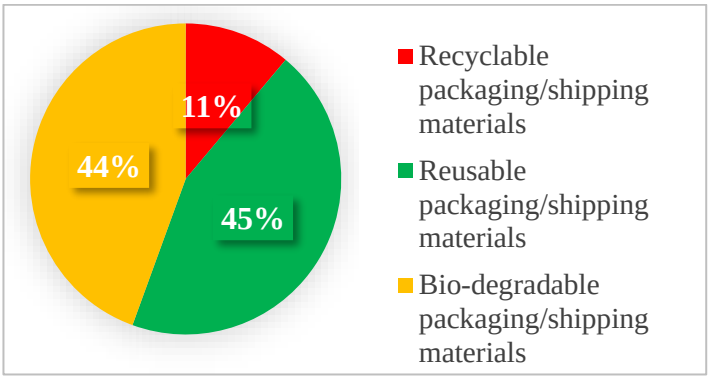
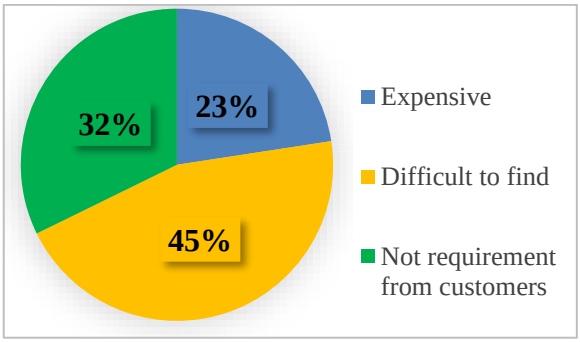


Figure 107 (Q12.5) Why don't use environmental friendly packaging



4.4.5.3 Knowledge of waste management

Various questions were asked to identify the knowledge and perceptions of wild honey distributors and retailers on waste management. The majority of interviewees agreed that food waste has an impact on the environment, with ratings of agree (67%) and strongly agree (25%), respectively (Figure 108). The majority of them were fully aware of the significant impacts of food waste on the environment (Figure 109). Therefore, the majority of them (56%) feel very concerned about the impact of food waste (Figure 110) and are willing to change their behaviors towards good waste management practices, according to the majority of interviewees (96%) (Figure 111).

In terms of plastic waste management, more than half of the interviewees (58%) strongly disagree with the statement that plastic waste has an impact on the environment because the plastic used in their businesses is not much, while approximately 42% of the interviewees agreed that plastic waste has an impact on the environment (Figure 112) and the majority of them are aware of some impact of plastic waste on the environment (Figure 113). Almost all interviewees who are aware of the impact of plastic waste on the environment feel concerned about the impact of plastic waste (Figure 114) and are willing to change behaviors on how to manage plastic waste (Figure 115). Generally, the plastic bags used in the honey business is an average 56 bags per day.

Figure 108 (Q13.1) Food waste have adverse impact on environment

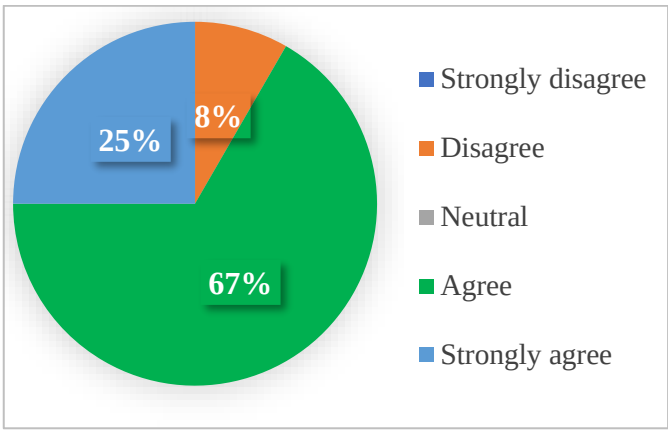


Figure 109 (Q13.2) How much are you aware of the adverse impact of food waste on the environment?

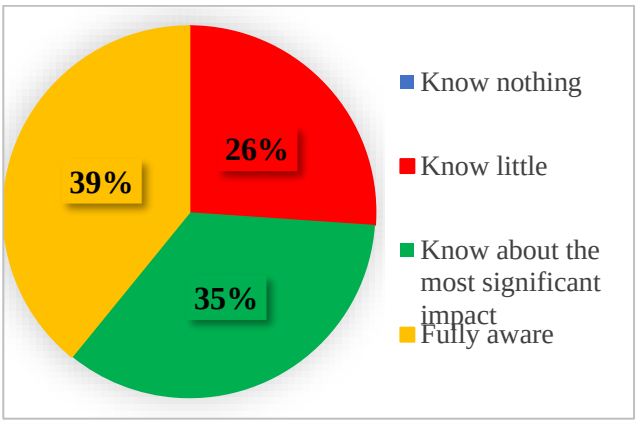
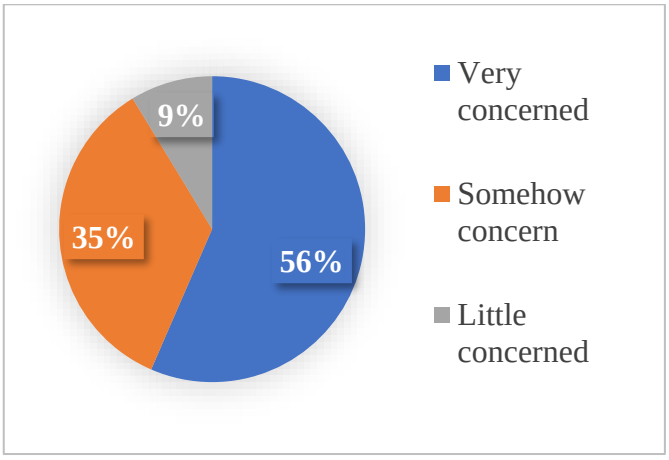


Figure 110 (13.3) Concerned about the impact of food waste on the environment

Figure 111 (Q13.4) Willingness to change behaviors towards food waste management practices



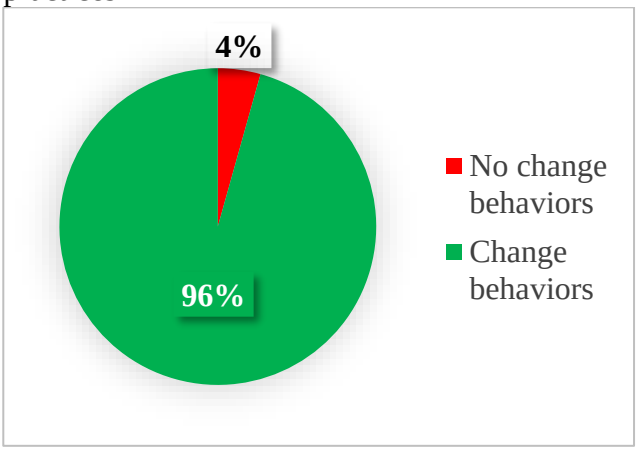
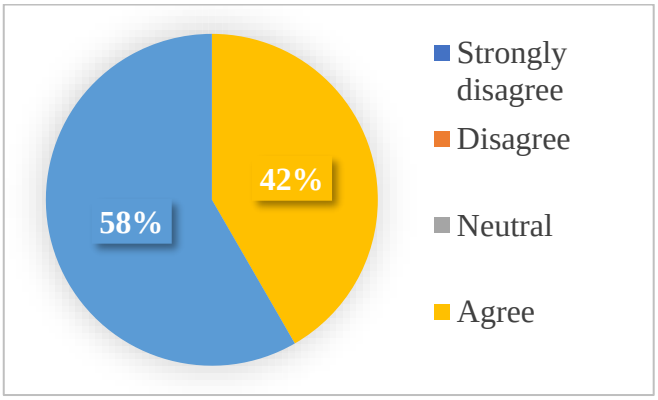


Figure 112 (Q13.5) Plastic waste from food packaging affects the environment and climate change

Figure 113 (Q13.6) How much are you aware of the adverse impact of plastic bags on the environment?



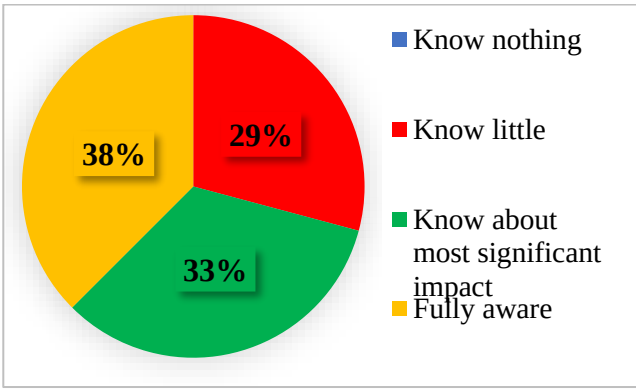


Figure 114 (Q13.7) How much are you concerned about the impact of plastic bags on the environment

Figure 115 (Q13.8) Change behaviors to plastic practices

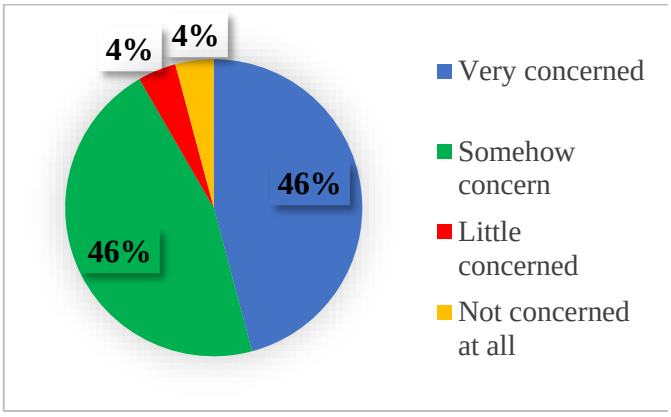


Figure 116 (Q13.9) How many plastic bags you use for your business a day?

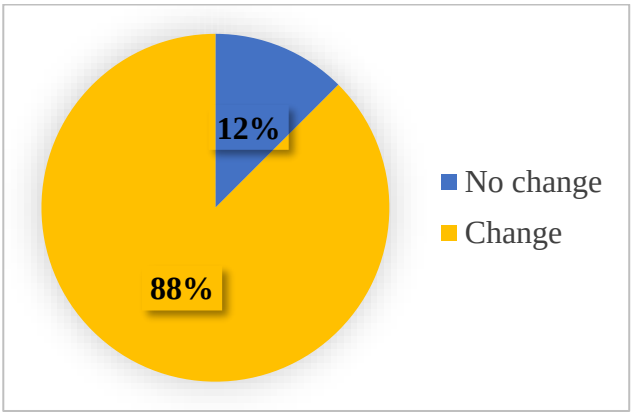
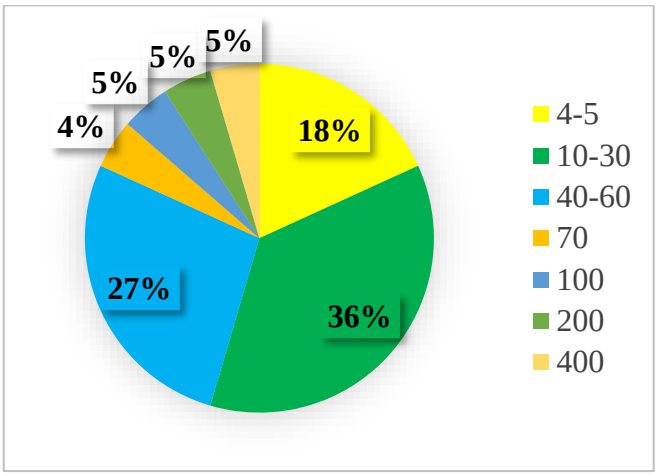
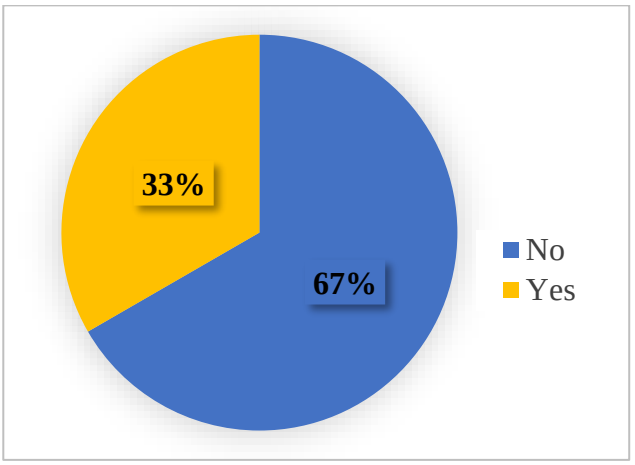


Figure 117 Q13.10) Have you heard the term sustainable products/green products before?





4.4.5.4 Waste Management Policy

The plastic-free policy, strategy to use recyclable, compostable, and bio-degradable packaging, and strategy to reduce food miles were not commonly used for the wild honey business (Figures 118, 119, and 120).

Figure 118 (Q14.1) Do you have plastic-free policy?

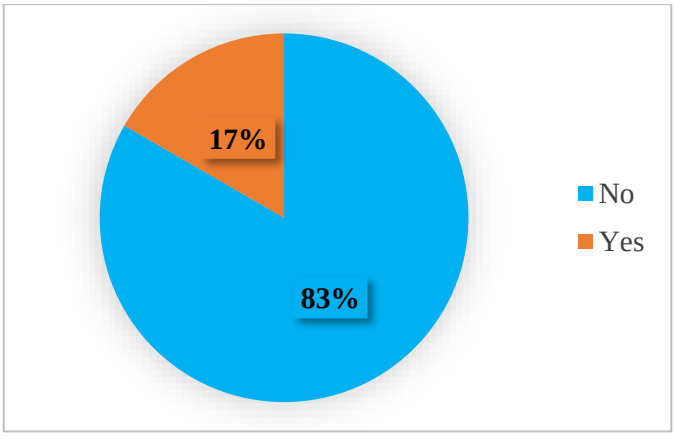


Figure 119 (Q14.2) Do you have a strategy to use recyclable/compostable/biodegradable packaging?

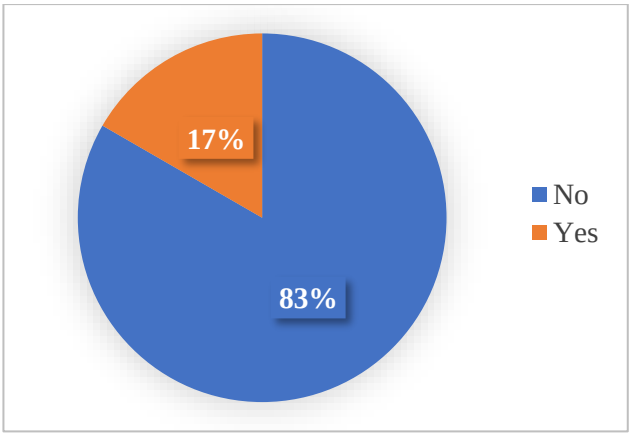
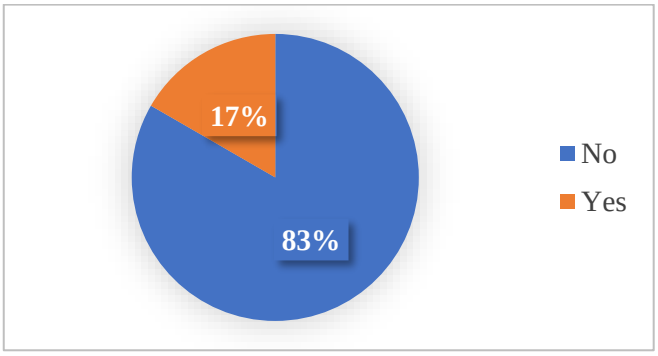


Figure 120 (Q14.3) Do you have a strategy to reduce CO2 transport emissions? (''Food miles'' reduce long-distance transportation)



4.4.6 Interest of wild honey marketing actors in promoting SCP into their business

4.4.6.1 Integration of SCP into Business

The questions related to the perceptions of interviewees on the integration of SCP into their business governance were asked. The result showed that almost all interviewees were willing to promote recyclable, compostable, and biodegradable packaging and a plastic-free policy in their businesses (Figures 121, 122). In addition, they were willing to reduce transportation for economic benefits for the business, as reported by the majority of interviewees (67%) (Figure 123). Two common practices to reduce transportation emissions were to increase the quantity of product ordering per time and increase the numbers of customer orders per delivery, representing 38% and 36% of interviewees, respectively (Figure 126). Following-up questions were asked to assess the willingness of interviewees to reduce waste. As a result, the majority of interviewees want to reduce waste by giving discounts to customers, donate usable food to poor people (Figures 125, 126), and also save water and energy for economic and environmental purposes.

Figure 121 (Q15.1) Are you willing to promote recyclable/compostable/biodegradable packaging?

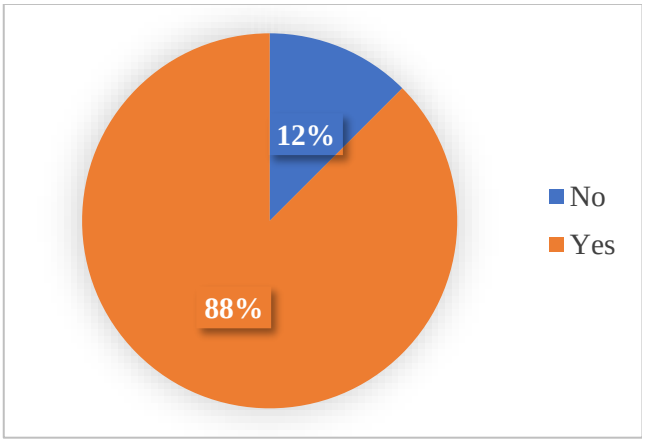


Figure 122 (15.2) Are you willing to promote plastic-free into your business?

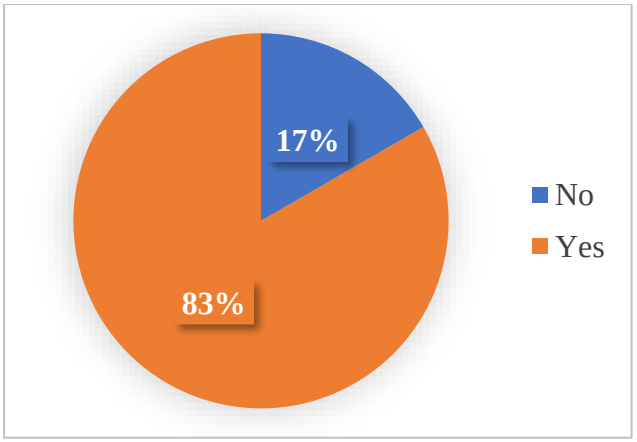


Figure 123 (Q15.3) Are you willing to reduce mean transportation for your product distribution?

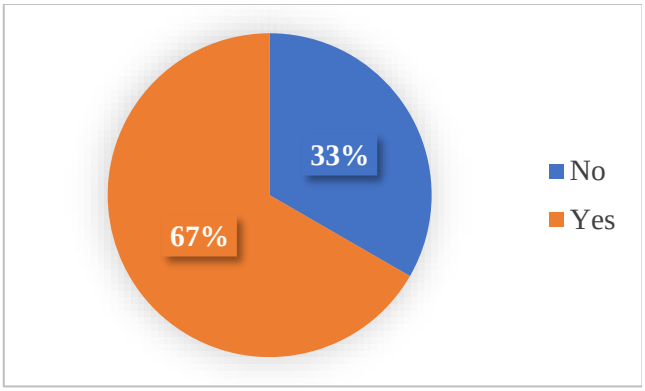


Figure 124 (Q15.4) How do you reduce long transportation of products to reduce food miles?

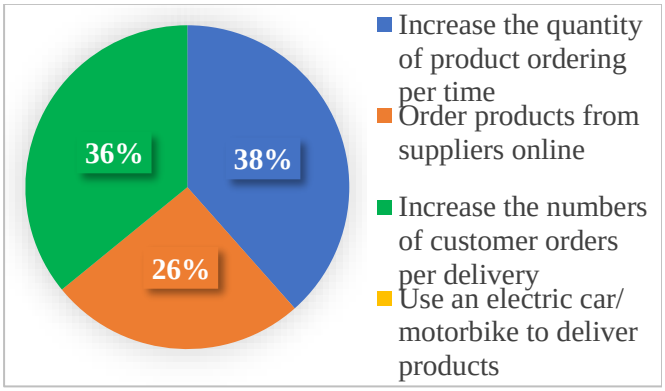


Figure 125 (Q15.5) Are you willing or planning to discount to reduce food waste?

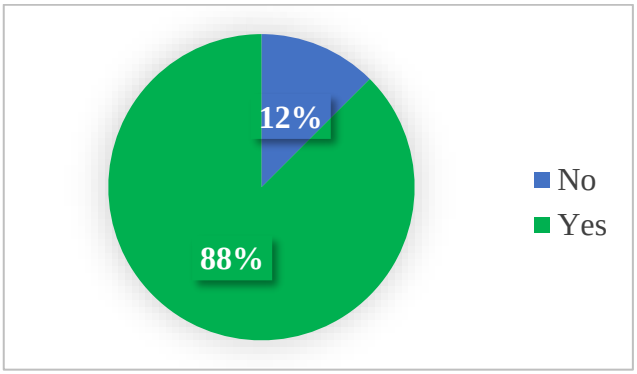
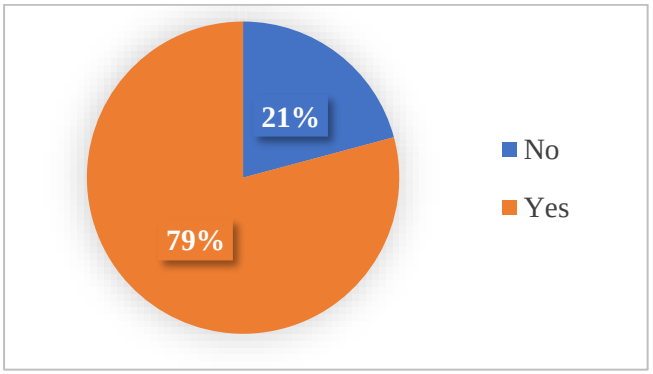


Figure 126 (Q15.6) Are you willing or planning to donate food to reduce food waste?



4.5 Vegetable and wild honey processor's business operations

4.5.1 Vegetable processing

1. **Supply arrangement**: since the number of vegetable processors was very limited in Cambodia, the research team interviewed one processor in Phnom Penh city. This processor focused mainly on the packaging of the vegetable, weighing approximately 4000 kg per year. Raw products for processing were procured from Koh Kong, Battambang, Takeo, Kampong Som, Kandal, Kampong Speu, Mondulkiri, Prey Veng, Kampong Cham, Kampong Chhnang, Pailin, Pursat, Kampot, Kratie, Steung Treng, and Preah Vihear provinces. The majority of products (58%) were procured from agricultural cooperatives and clusters with supply contracts, while the least amount (2%) was bought from farmers with a contract. Approximately 40% of vegetables were supplied by own farm. The company procures vegetables every three days. The settlement was conducted within 10–15 days after supplying vegetables.

2. **Key challenges**: there were four main challenges faced in vegetable procurement. The quality of produce is unsatisfactory and inconsistent, inconsistent in supplying quantity, high price fluctuation, and difficulty in logistical arrangements for vegetable transportation because raw products are situated far away from Phnom Penh city.

3. **Required supply arrangenement**: for prospective supply arrangements, the company preferred to have a 6-to-21 price set with suppliers to reduce the volatility of pricing.

4. **Honey processing**: this company also processed honey by bottling and labeling it for sale in the shop and retailing it to other retailers in Phnom Penh. Approximately 600 liters of wild honey were procured from Mondulkiri province every year.

5. **Waste management**: since the company was supplied with safe processing vegetables, a clean environment was essential for the business. Waste, vegetables, and plastic were classified and placed in the personal trash bins situated in the company.

6. **Waste management policy**: the company has a plastic-free policy and a strategy to use recyclable, compostable, and biodegradable packaging for managing the business. However, a strategy to reduce CO2 transport emissions did not exist.

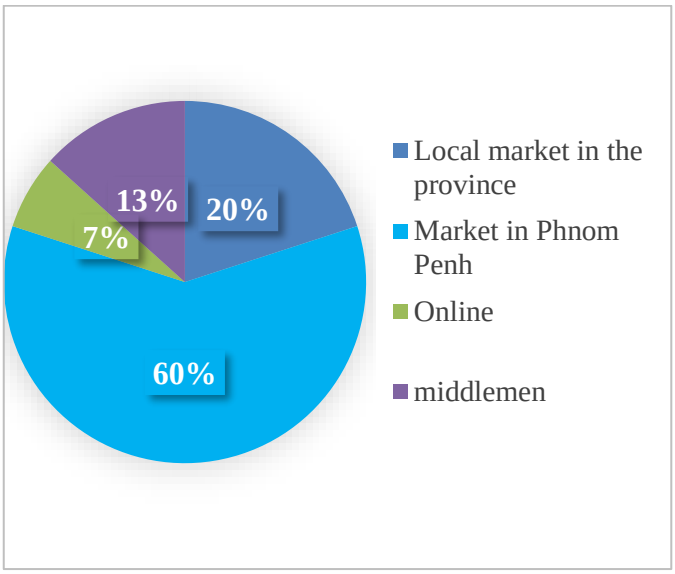
7. **Integration of SCP into business governance**: the company was willing to promote recyclable, compostable, biodegradable, and plastic-free packaging into the business to ensure healthy products were supplied to customers.

4.5.2 Wild honey processing

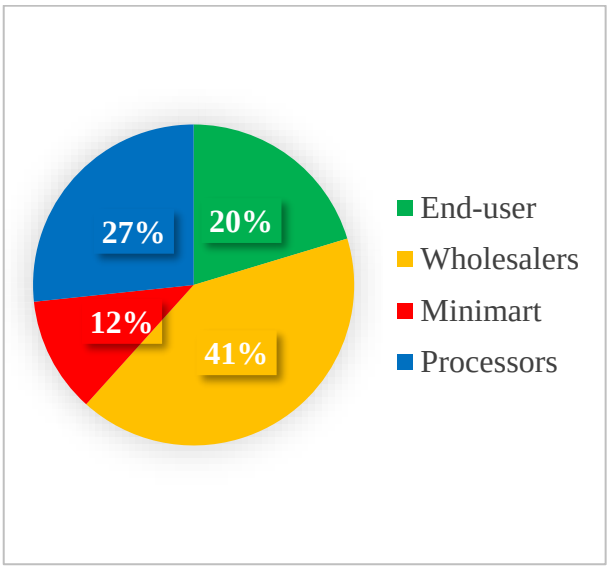
1. Supply arrangement: due to the limited number of wild honey processors, the research team conducted interviews with only three wild honey processors in Mondulkiri and Phnom Penh City (1 in Phnom Penh). The processing method was mainly filtered, cleaned, bottled, and labeled for sale in the market. The total processed products were 5596 liters (3000 liters) produced by the processor in Phnom Penh. All raw honey was procured from honey harvesters in the Pechreada district of Mondulkiri province. Generally, honey was graded by water contents (first grade 18–20%, second grade 21-22%, and third grade 23-24% of water contents). The honey was collected seasonally. The payment was made immediately during the buying process.

The processed products were sold mainly in Phnom Penh city (representing 60%) and in markets in Semonorum town, Mondulkiri province (representing 20%). Wholesalers were the primary customers, consuming approximately 41% of processed products, followed by processors and end-users, representing 27% and 20% of processed products, respectively.

Selling locations



Customers



2. Key challenges: There were three main challenges faced in honey procurement. The quality of produce is unsatisfactory and inconsistent, inconsistent in supplying quantity, and not enough capital for collecting honey have been facing processors, especially those in Pechreada district.

3. Required supply arrangenement: Required supply arrangement: all processors required a supply agreement with honey harvesters with a seasonal price setting period, but the settlement was based on the actual negotiation between processors and suppliers.

4. Waste management: since trash bins were not available, waste classification was not conducted for processors in Pechreada, while honey processors in Phnom Penh classified the waste byseparating food and vegetable waste from pastic and cans.

5. Waste management policy: all interviewed honey processors did not have a plastic-free policy, a strategy to use recyclable, compostable, and biodegradable packaging, or a strategy to reduce CO2 transport emissions.

6. Integration of SCP into business governance: all interviewed processors were willing to promote recyclable, compostable, biodegradable, and plastic-free packaging into the business to ensure healthy products were supplied to customers.

4.6 Vegetable Procuring practices for Restaurants

4.6.1 Vegetable supply chain structure

4.6.1.1 Varieties of vegetables

According to the report, restaurants in Mondul Kiri and Phnom Penh procure a variety of vegetables to meet the nutritional needs and preferences of their customers. However, the study found that only 10 types of vegetables are commonly procured by restaurants. Cabbage and carrots were found to be the most commonly procured vegetables in Mondul Kiri province, followed by water greens, lettuce, cucumber, tomato, broccoli, and yardlong beans, which were procured on a daily basis (Figure 127). In Phnom Penh and Kandal province, the most commonly procured vegetables were cabbage, carrots, lettuce, cucumber, Chinese cabbage, and pakchoi, followed by onion, broccoli, and radish, which were also procured daily by all restaurants (Figure 128).

Figure 127 (Q3.1) Common vegetable variety consumed by restaurant in Mondulkiri province

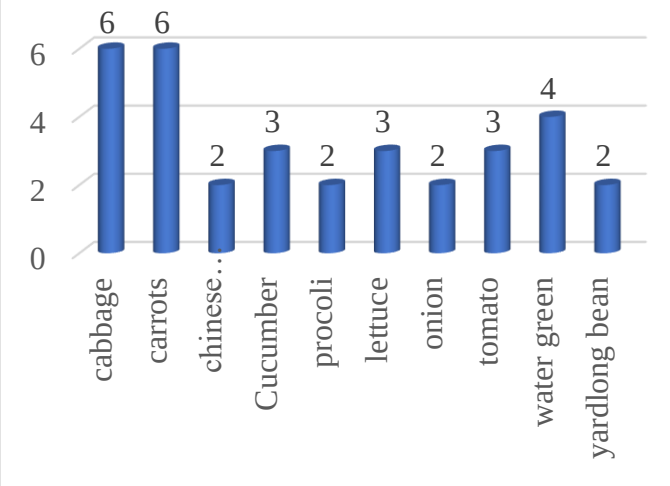
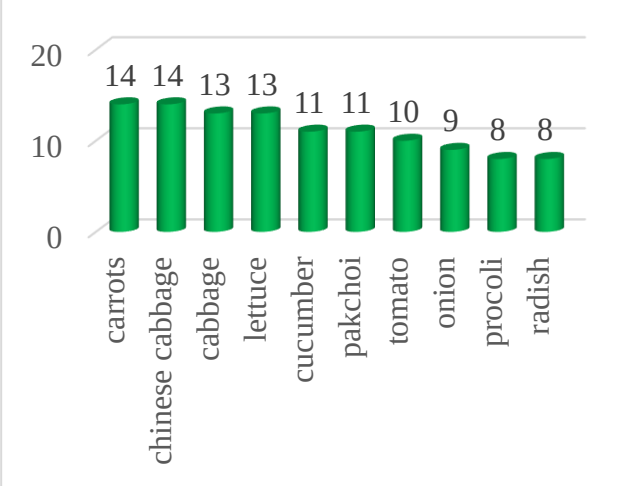


Figure 128 (Q3.1) Common vegetable variety consumed by restaurant in Phnom Penh and Kandal



As per the findings in (Figure 129), each restaurant procures vegetables in varying quantities depending on the scale of services and number of customers they cater to. Cabbage was found to be the most commonly procured vegetable, with each restaurant in Phnom Penh procuring from different production sites to fulfill their daily consumption needs (7 kilograms). This was followed by carrots (6 kilograms), cucumber, onion, broccoli, pak choi, and radish (5 kilograms), and tomato (4 kilograms), and Chinese cabbage (3 kilograms) respectively. Similarly, lettuce, cucumber, Chinese cabbage, and onion were found to be the most commonly procured vegetables by each restaurant in Mondul Kiri (3 kilograms), while cabbage, carrots, tomato, water green, broccoli, and yardlong bean were procured in average quantities (2 kilograms) respectively (Figure 130).

Figure 129 (Q3.1) Quantity of vegetable procured by restaurant in Mondulkiri province

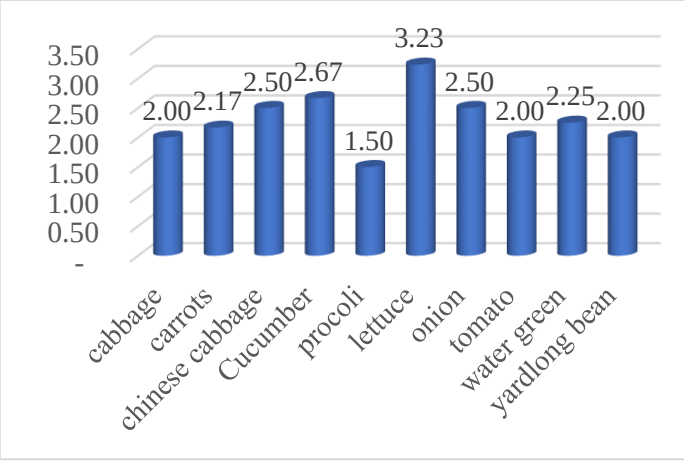
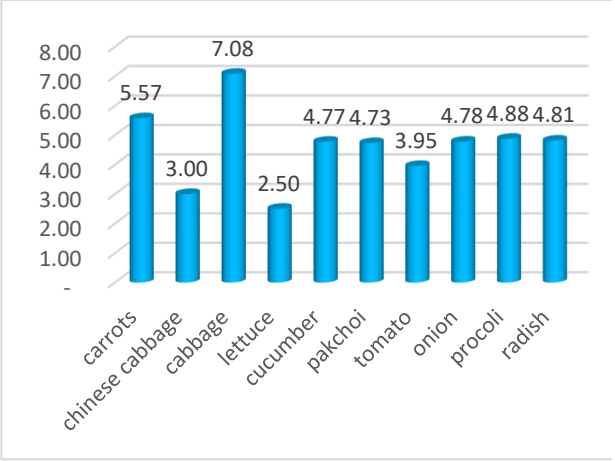


Figure 130 (Q3.1) Quantity of vegetable procured by restaurant in Phom Penh & Kandal



According to the findings, Chinese cabbage was found to be the most expensive vegetable, priced at 1.6 USD per kg, followed by cabbage, lettuce, broccoli, and yardlong beans, all available at 1.5 USD per kg. Carrots, water greens, and onions were priced at 1.1 USD. Tomatoes were priced at 1 USD per kg, and cucumbers were priced at 0.9 USD per kg in Mondul Kri province (Figure 131). The price range of broccoli was recorded to be the highest among all vegetables, at 2.3 USD per kg, followed by tomatoes and lettuce, both priced at 1.1 USD per kg. Cucumber, Chinese cabbage, and pakchoi were priced at 1 USD per kg, cabbage at 0.9 USD per kg, and carrots and onions at 0.8 USD per kg. Radishes were the cheapest among all, priced at 0.7 USD per kg (Figure 132). The data also indicated that the prices of vegetables in Phnom Penh were generally cheaper than in Mondul Kri province, except for broccoli and tomatoes.

Figure 131 (Q3.1) Average price of vegetables procured by restaurants in Mondulkiri province

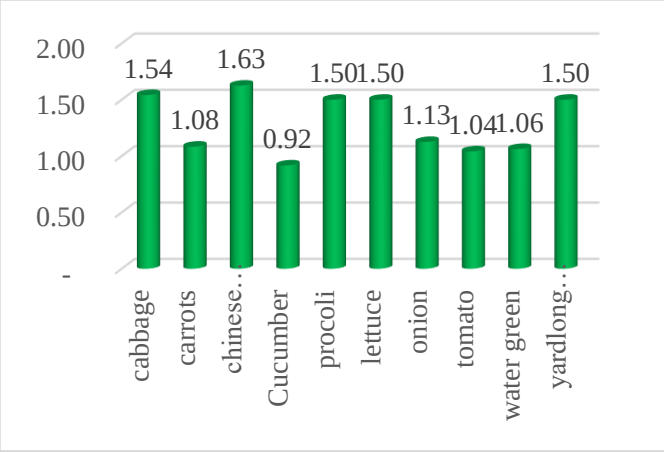
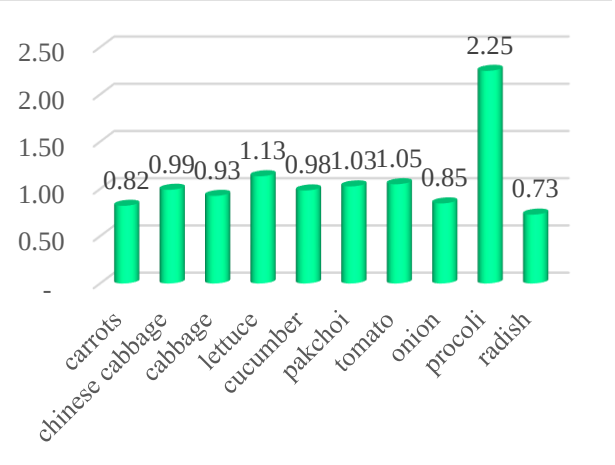


Figure 132 (Q3.1) Average price of vegetables procured by restaurants in Phnom Penh and Kandal



4.6.1.2 Vegetables sourcing

The majority of interviewed restaurants in Mondulkiri sourced vegetables from Mondulkiri province (representing 60%), while approximately 40% of them procured vegetables from Vietnam. Takhmao, Chak Agre Krom, and Doeum Kor markets were the main sourced of vegetables supplying to interviewed restaurants in Phnom Penh city and Kandal province, representing 37%, 30%, and 25%, respectively (Figure 133).

Retailers and distributors were the main source of vegetables for restaurants. Approximately 65% and 33% of vegetables supplied to interviewed restaurants in Mondulkiri province was procured from distributors and retailers. Similary, 56% and 43% of vegetables supplied to interviewed restaurants in Phnom Penh and Kandal procured from retailers and distributors (Figure 134).

Figure 133 (Q3.2).Vegetable sourcing location in Mondulkri and Phnom Penh and Kand province

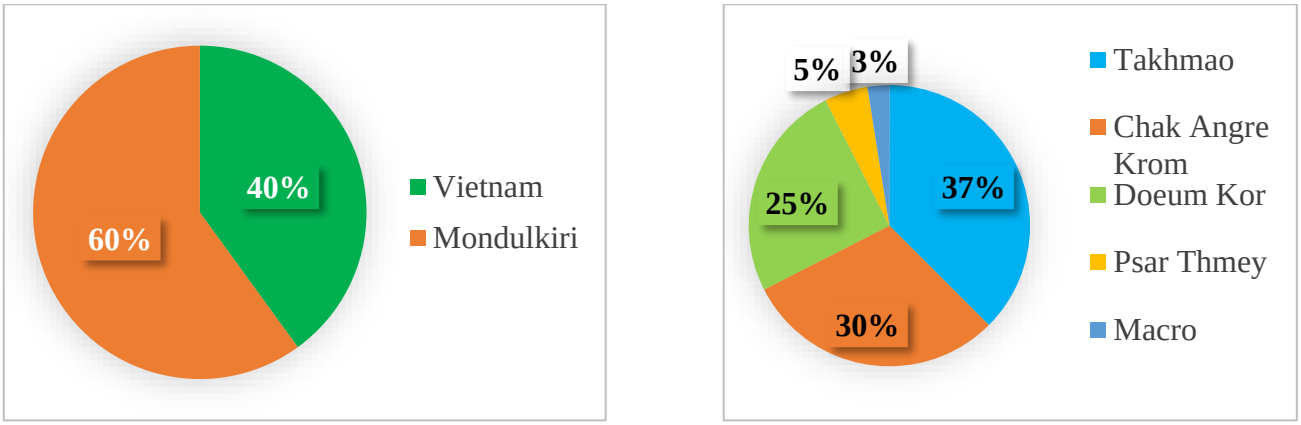
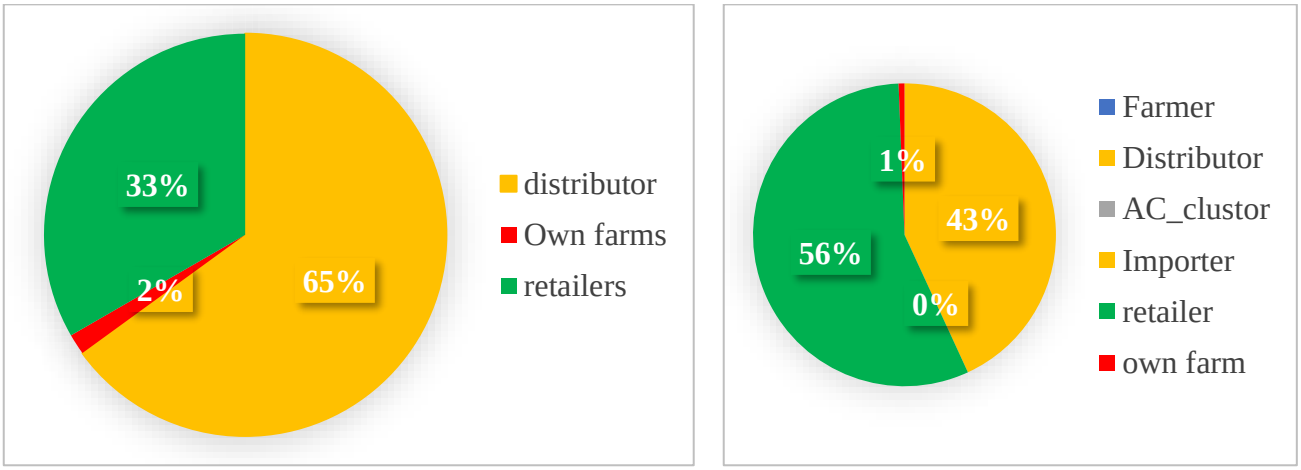


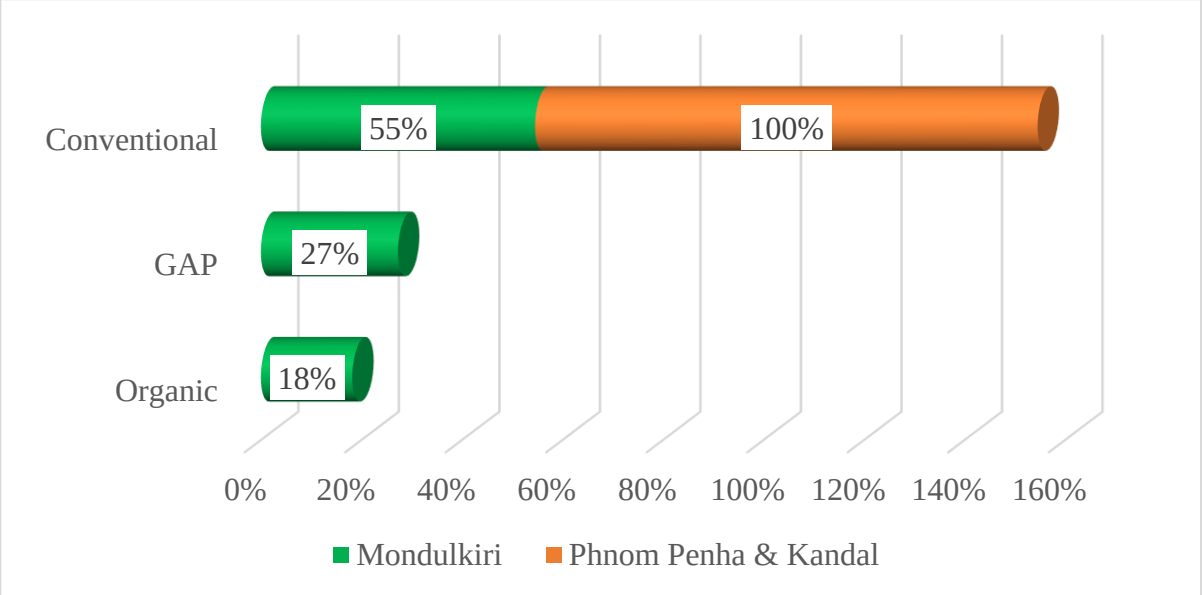
Figure 134 (Q3.4) Source of vegetables by suppliers in Mondulkiri and Phnom Penh and Kandal



4.6.1.3 Required standards for vegetable production

According to the survey, it was discovered that three types were vegetables were procured for restaurants in Mondulkiri province. Conventional vegetables represented approximately 55% of interviewed restaurants, followed by GAP 27%, and organic 18%, respectively. It was remarked that all interviewed restaurants in Phnom Penh city procured only conventional vegetables for the restaurants (Figure 135).

Figure 135 (Q35) Type of procured vetables in Mondulkiri and Phnom and Kandal province



According to the survey, grading practices are important to ensure the quality of vegetables and meet customer preferences. However, the majority of restaurants surveyed (68%) did not apply grading practices themselves, with only 9% (2 restaurants) in Mondul Kiri and 59% (13 restaurants) in Phnom Penh doing so. On the other hand, retailers and distributors had already packaged and supplied the vegetables to these restaurants. Only 32% of the surveyed restaurants applied grading practices, including 18% (4 restaurants) in Mondul Kiri and 14% (3 restaurants) in Phnom Penh.

It was found that seven restaurants have implemented various grading practices, such as assessing color, freshness, size, and taste. Among these practices, color, freshness, and size were considered the most important by all restaurants. However, only one restaurant in Phnom Penh, accounting for 14% of the total, conducted additional checks on the quality of vegetables through tasting.

Figure 136 (Q3.6) Vegetable grading practice

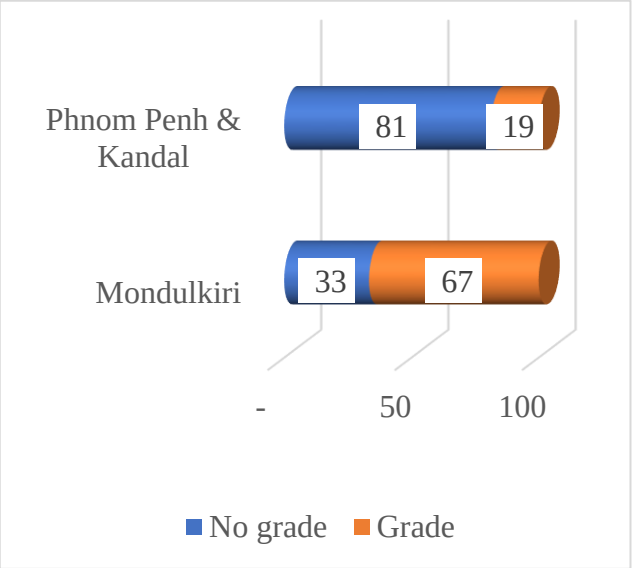
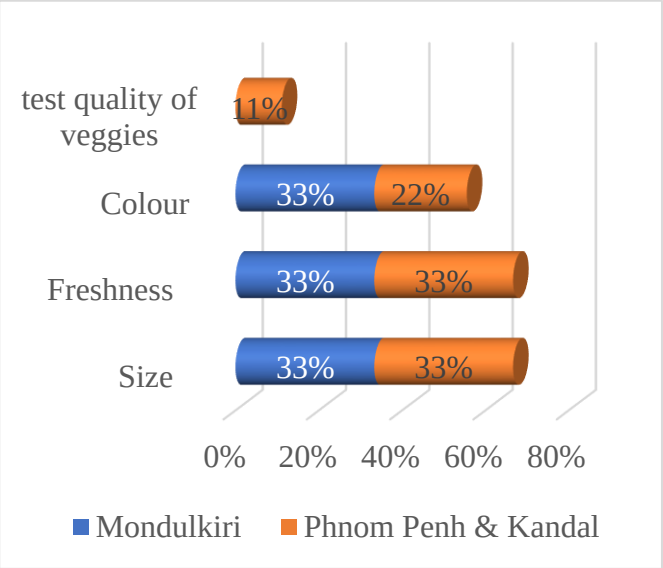


Figure 137 (Q3.6.1) Common grading practices



4.6.1.4 Vegetables supply arrangements

The vegetable contract supply was not common practice by interviewed restaurautans. All interviewed retaurants (100%) in Mondulkiri province procured vegetables without contract. Similary, the majority of interviewed restaurants in Phnom Penh (56%) procured vegetables without any contract, while approximately 44% of them (Figure 138) have a contract supply with mostly distributors due to they require supply timely and regularly to ensure the smooth business operations.

Immediately payment was the common practices by all interviewed restaurants. Total interviewed restauramts in Mondulkiri province paid suppliers directly at the time of buying vs 69% of interviewed restaurants. It was not approximately one-third (31%) of interviewed restaurants, especially elite restaurants settled the suppliers 30days after taking vegetables by bank transfer (Figure 139).

Five rating scale questions (no influence, low influence, medium influence, high fluence, and very high influence) were asked to identify the conditions influenced restaurants to vegetables (Figure 140). As a result, quality of products, product appearance, and price were three main conditions considered by restaurants in the studied areas to buy vegetables, rating score from high to very high.

Figure 138 (Q3.8) Vegetable procurement arrangement

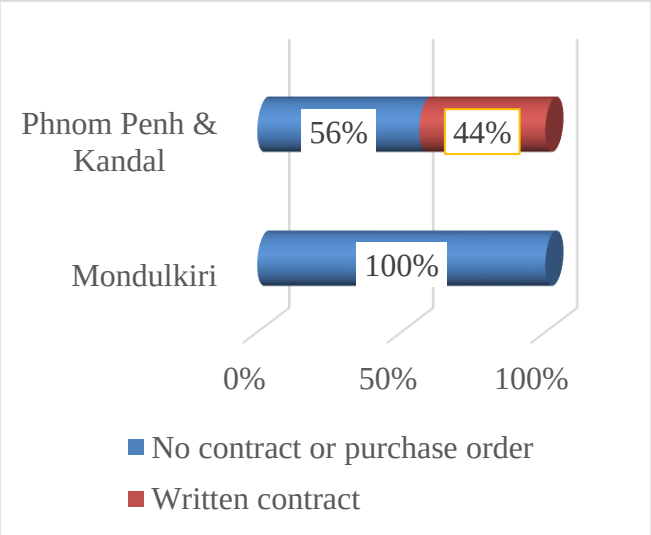


Figure 139 (Q3.9) Settlement practices

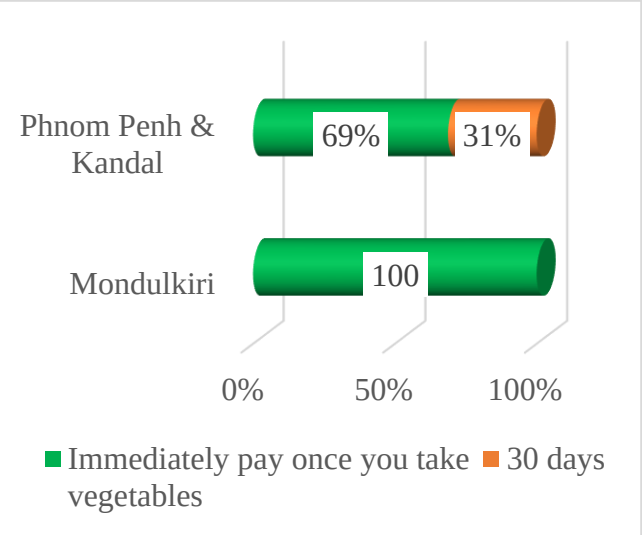
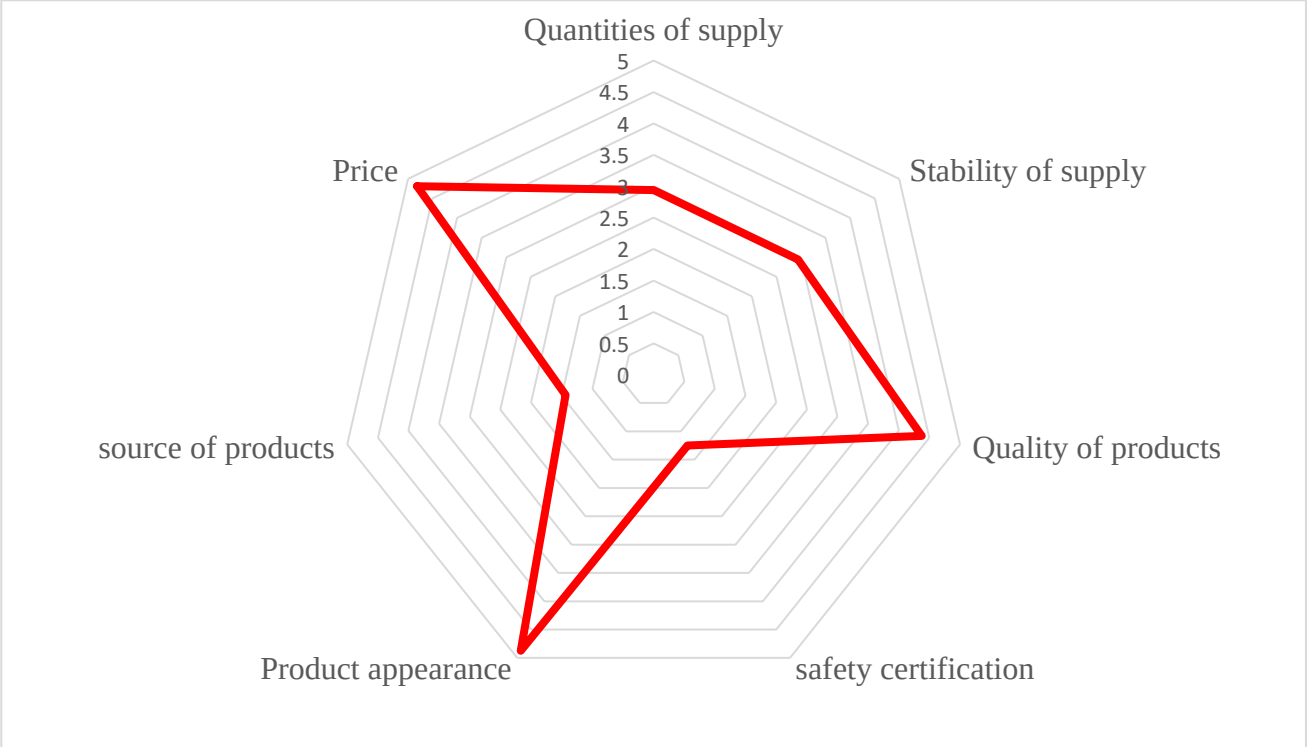


Figure 140 (Q3.10) Condition influenced restaurants to buy vegetables



Note: 1. No influence, 2. Low influence, 3. Medium influence, 4. High fluence, 5. Very high influence

4.6.1.5 Challenges in the vegetable procurement by restaurants

The majority of restaurants in Mondulkiri provice faced challenges in the vegetables procurement (67%), while the minority of interviewed restaurants in Phnom Penh and Kandal province (13%) faced the challenges in the vegetables buying (Figure 141). Four main challenges (quality produce unsatisfactory, inconsistent supply, high price fluctuation, and logistical

challenges) were common issues for restaurants in Mondulkiri province when they procured vegetables from farmers and distributors. It was noted that two challenges (quality produce unsatisfactory and inconsistent supply) have been faced restaurants in Phnom Penh and Kandal province when they procured vegetables from distributors (Figure 142).

Figure 141 (Q3.11) Challenges of restaurants in the vegetable procurement

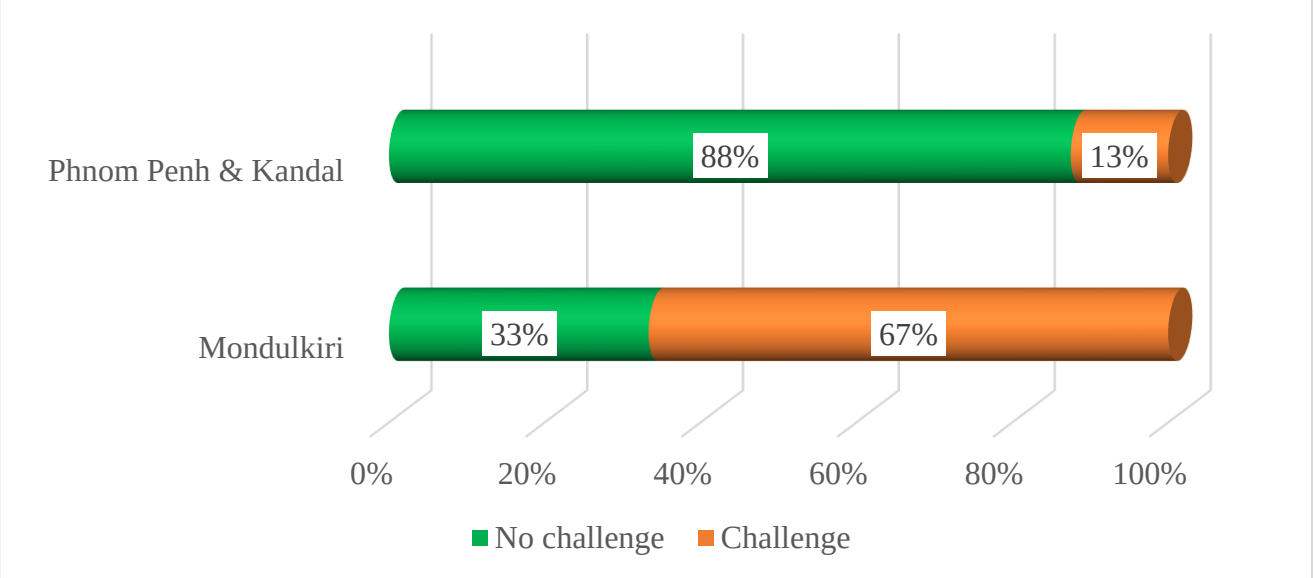
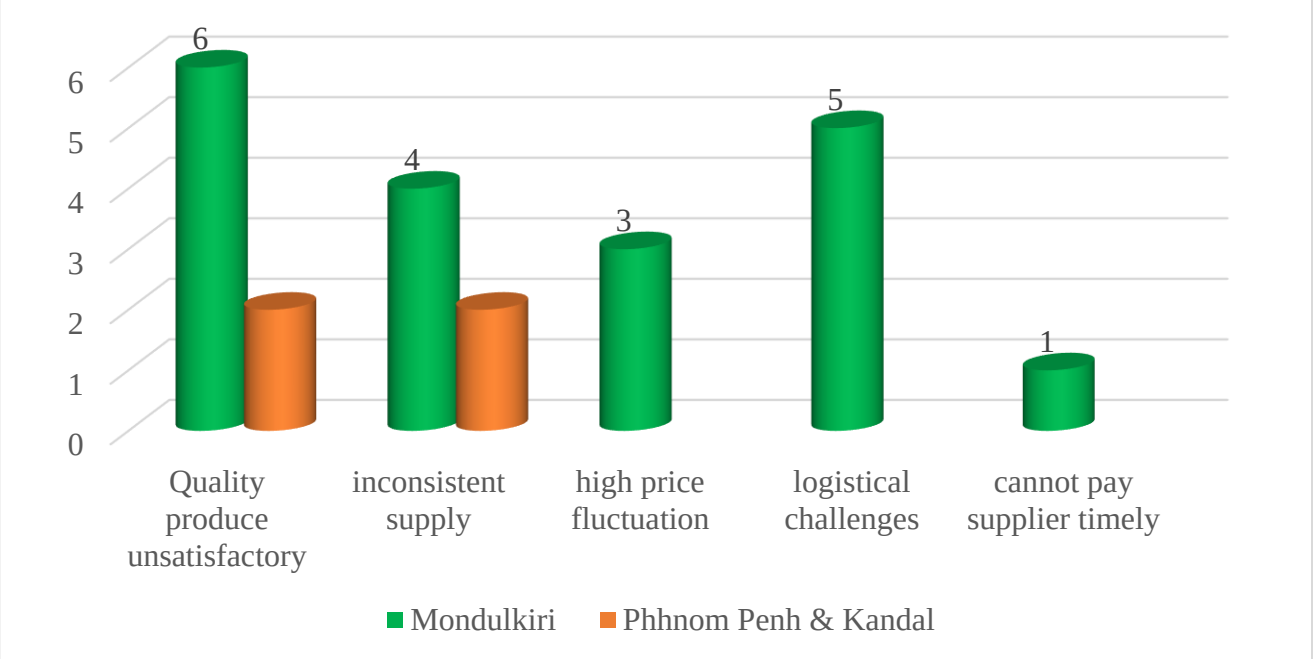


Figure 142 (Q3.11.1) Key challenges in the vegetable procurement



4.6.1.6 Market linkage arrangement of restaurant

The result of surey showed that almost all interviewed restauarants in Phnom Penh and Kandal province (Figure 143) showed interest in procuring vegetables from Mondul Kiri province. However, minority of restaurants (9%) in Phnom Penh showed reluctance to procure vegetables from Mondul Kiri province citing reasons such as the distance between the production sites and their business, and availability of cheaper vegetables nearby their business (Dankor).

Generally, restaurant in Mondulkiri and Phnom Penh and Kandal procured vegetables based on the certain conditions. Five main conditions (Enough required production volume, Stability of supply, Cleaning and packing by farmers, Product appearance and meeting the required grade) were the most preferred supply conditions by restaurants in Mondulkiri province. Similary, five were conditions (Enough required production volume, Stability of supply, Cleaning and packing by farmers, Product appearance and stable price) were the preferred conditions for restaurants in Phnom Penh and Kandal province (Figure 144).

Regarding the supply contract, approximately 71% of interviewed restaurants in the studied areas preferred to have official supply agreement with suppliers, while 29% of them were not willing to have the contract, especially small restaurants in studied areas. Suppliers were required to arrange supply logistics to the restaurants.All interviewed restaurants (100%) in the studied areas required daily vegetable supply since they serve food for thre meal times. In terms of price setting, all interviewed restaurants (100%) in Mondulkiri province required market price setting for supply agreement. On contrary, almost interviewed restaurants in Phnom Penh and Kandal province were willing to procure marketing price setting (representing 43%) and monthly price setting (representing 43%) for the supply agreement (Figure 145).

The payment condition is essential for supply agreement. Result of study showed that all interviewed restaurants (100%) in Mondulkiri province preferred to pay suppliers immediately during supply with cash. However, the majority of interviewed restaurants (72%) in Phnom Penh and Kandal province preferred monthly settlement for supply (Figure 146) and bank transfer was required mode of payment, representing by 92.9% of interviewed restaurants (Figure 147).

Figure 143 (Q4.1) Willingess to buy vegetables from Mondulkiri province

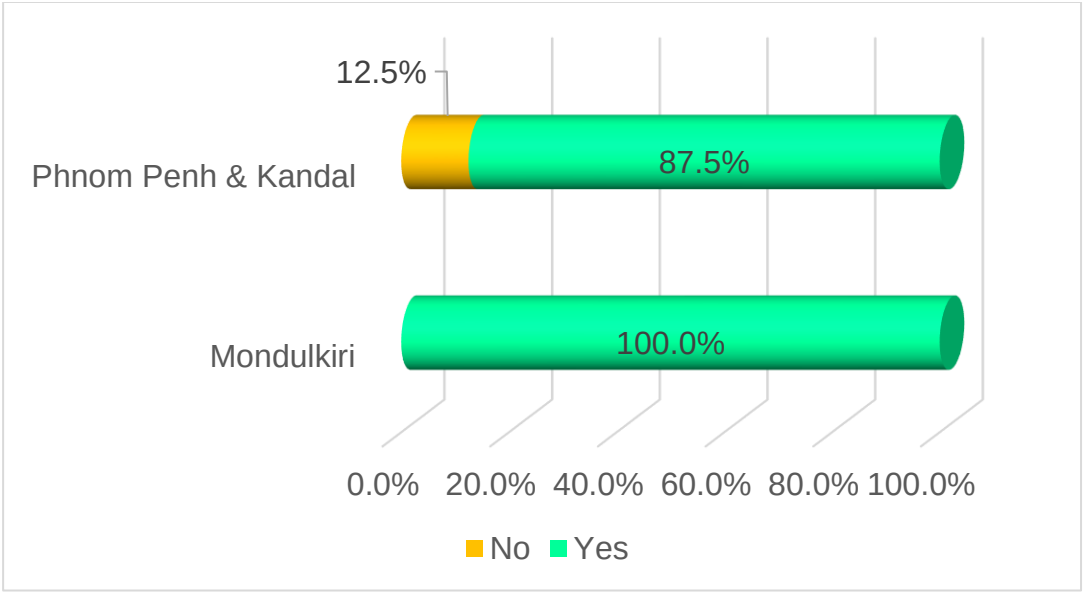


Figure 144 (Q4.2) Required vegetable supplying conditions

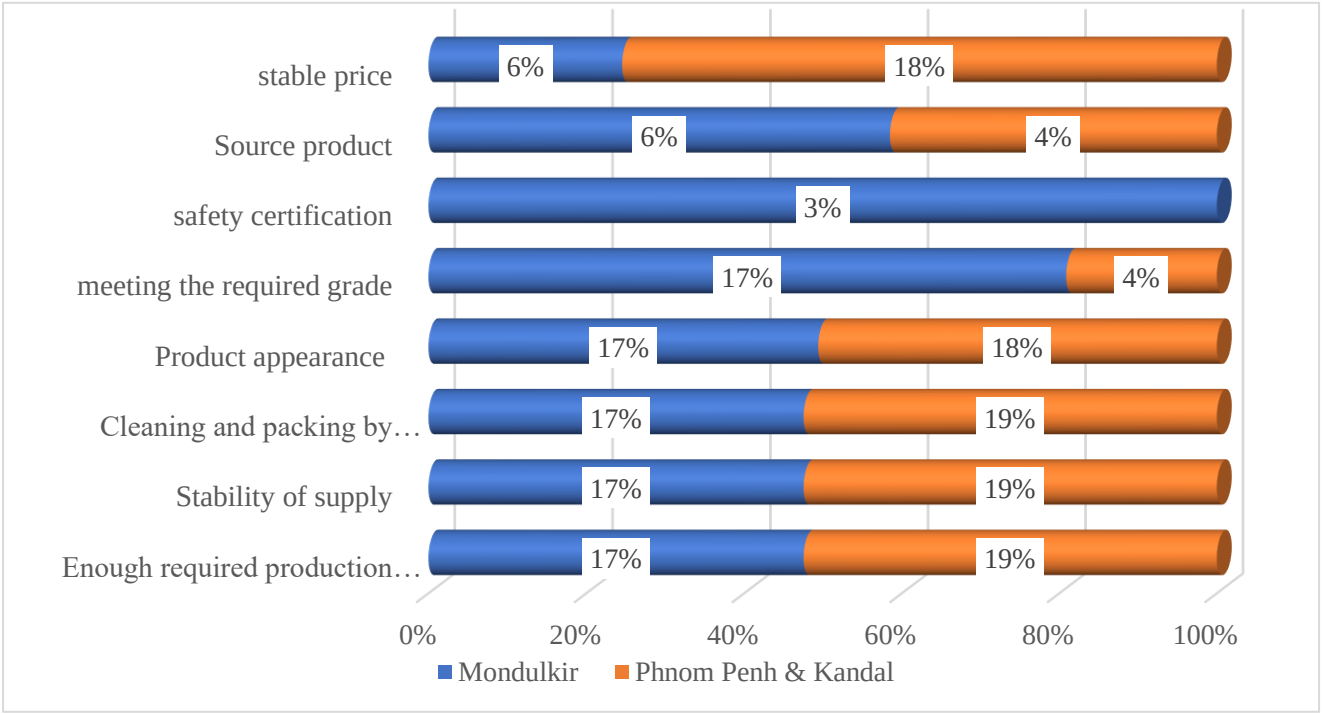


Figure 145 (Q4.3) Required supply agreement

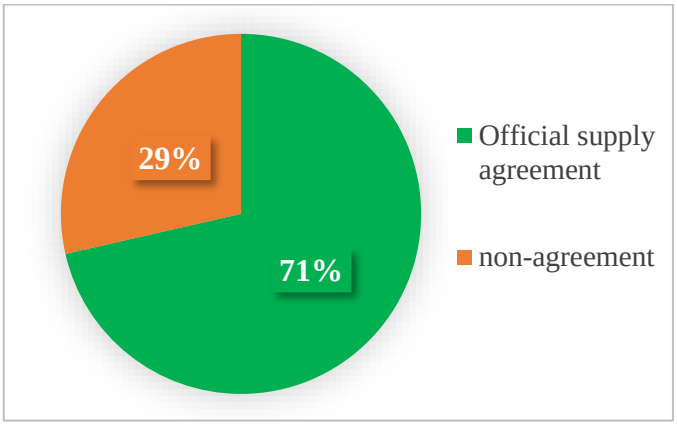


Figure 146 (Q4.5) Required market price setting

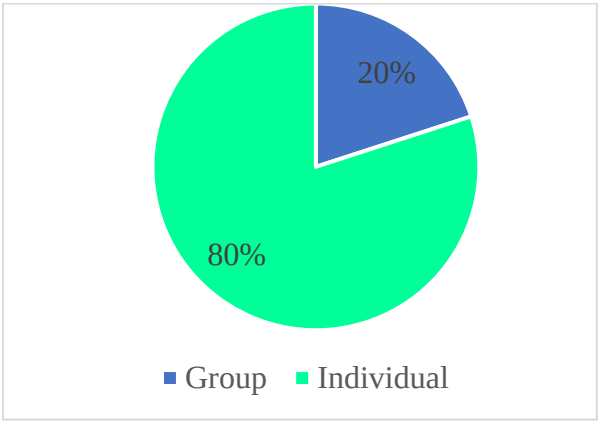
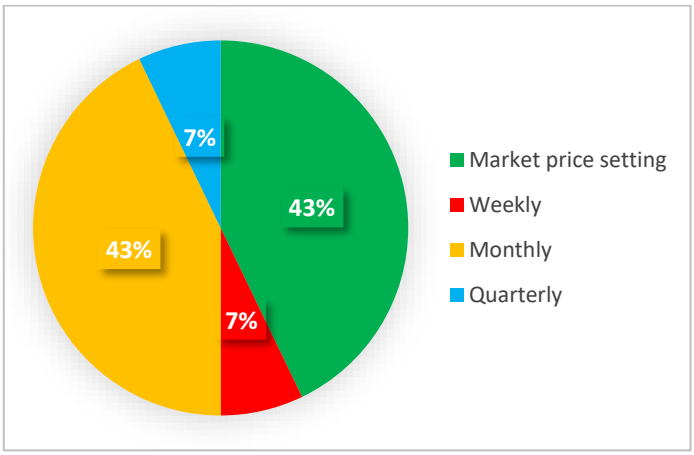
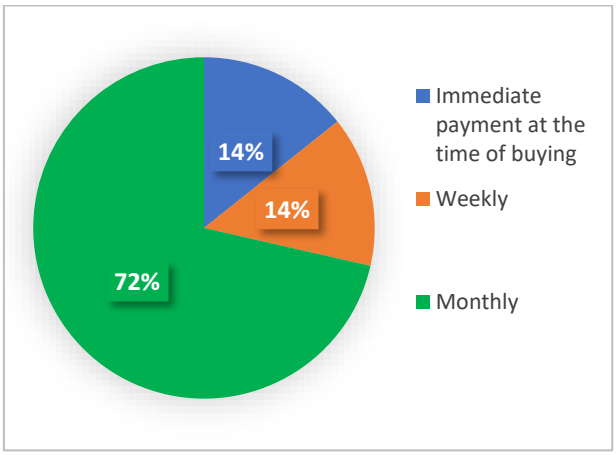


Figure 147 (Q4.6) Required settlement period





4.6.1.6 Roles of women in veggies business operation

The result of the survey showed that all women-owned restaurants were involved in the decision-making process to start up their business (Figure 148). Interestingly, approximately 33% of the restaurants interviewed in Mondulkiri province have been independently managed by wives, while the majority of them were jointly managed by husband and wife. Almost all restaurants interviewed in Phnom Penh and Kandal province were managed by both husband and wife (Figure 149). All restaurants hired labor to support the business, while only 1 or 5% have not hired any labor to support the business (Figure 150). It was also found that 33% of women-owned restaurants in Mondulkiri province made independent decisions to hire labor, while 67% of them made joint decisions with their husbands to hire labor to help their businesses (Figure 151).

Figure 148 (Q8.1) women involved in the restaurant business

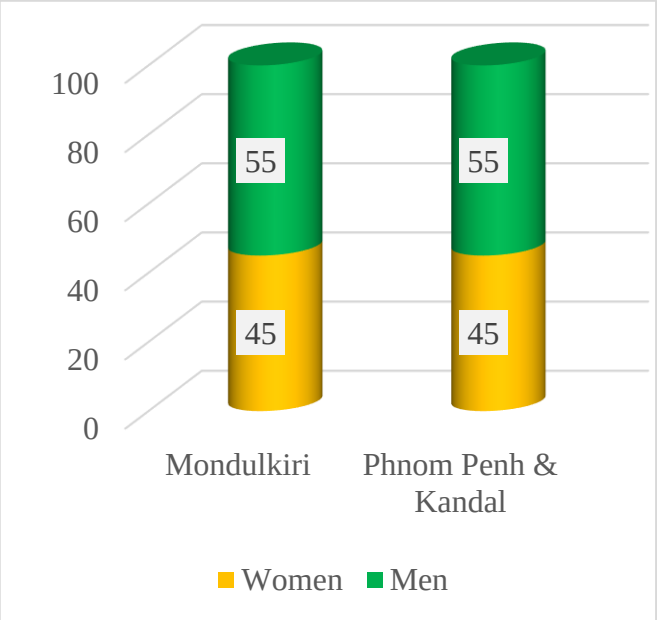


Figure 149 (Q8.3) main decision maker in the daily business operation

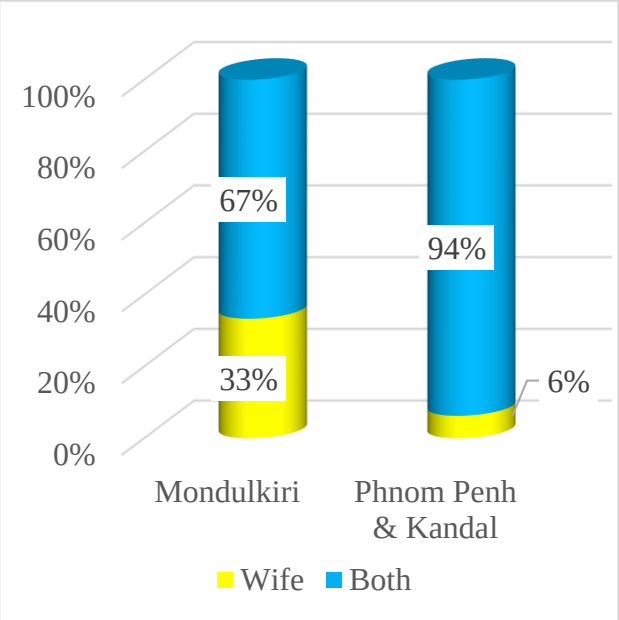


Figure 150 (Q8.4) Did you hire labor?

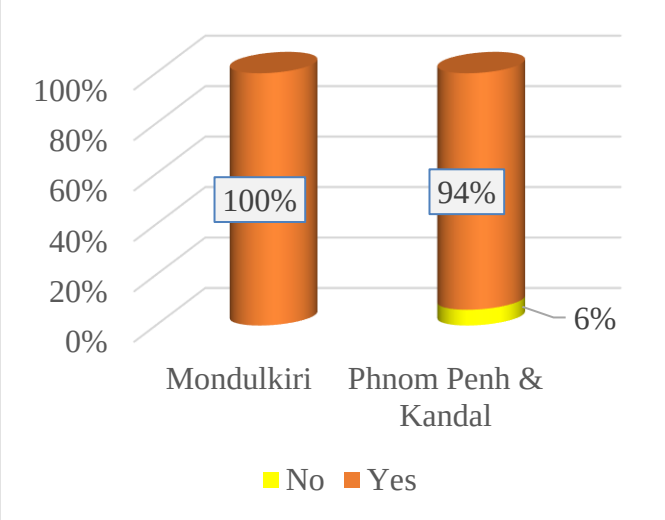
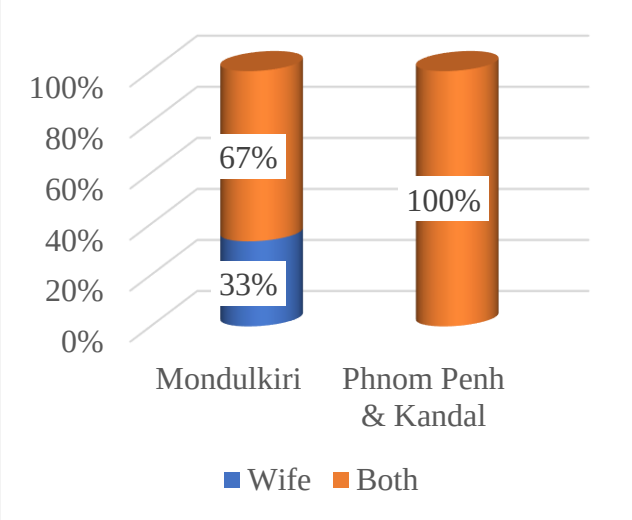


Figure 151 (Q8.4.1) who is the main decision maker in hiring labor



4.6.1.7 Restaurant Vegetable marketing actors practices of SCP

4.6.1.7.1 Waste Management practices

The study revealed that on average, each restaurant in Phnom Penh generates 40.1 kg of food waste per day, along with 9.7 kg of vegetable waste, 5 kg of tins and cans, 2.8 kg of paper and carton, 2 kg of plastic waste, and 1 kg of glass waste. In contrast, restaurants in Mondul Kiri produce a significantly lower amount of waste, with an average of 8.2 kg of food waste per day, along with 3 kg of vegetable waste, 2 kg of glass waste, 1.6 kg of tins and cans, 1.5 kg of plastic waste, 1 kg of paper and carton, and fiber bags (Figure 152).

It was observed that almost restaurants interviewed practices waste classification, while minority of them did not practice waste classification. The total interviewed restaurants in Mondulkiri province classified their waste. Likewise, 81% of interviewed restaurants in Phnom Penh and Kandal province classified the waste. On contrary, approximately 19% of interviewed restaurants in Phnom Penh and Kandal province did not classified the waste (Figure 153).

Regarding waste disposal, personal and public trash bin were the common disposed place practised by interviewed restaurants. The majority of interviewed restaurants (83%) disposed waste in public and personal trash bins, while 100% of interviewed restaurants in Phnom Penh and Kandal province disposed waste in the personal trash bins (Figure 154).

Figure 152 (Q9.1) Waste produced by restaurants per day

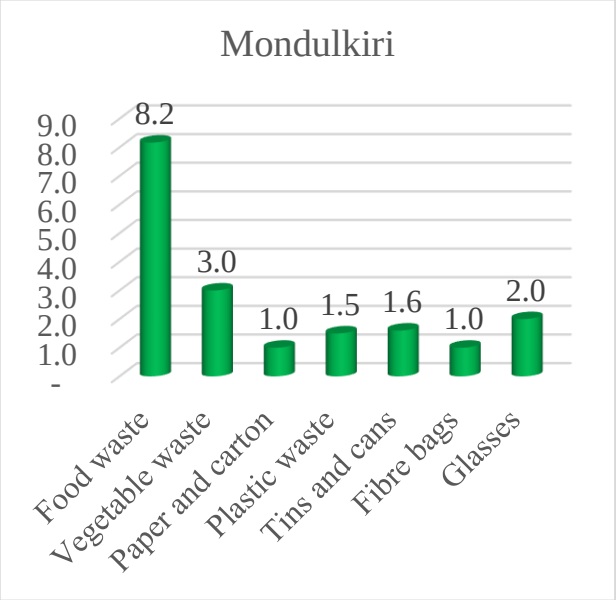


Figure 153 (Q9.2) Practice on waste classification

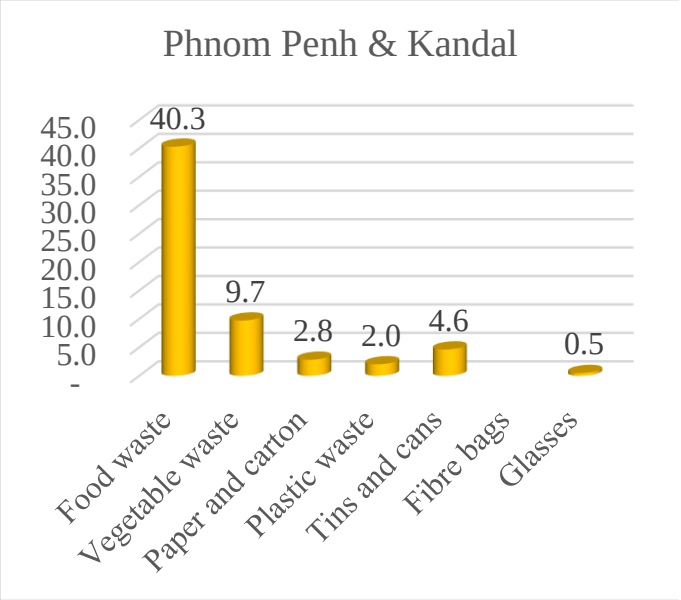
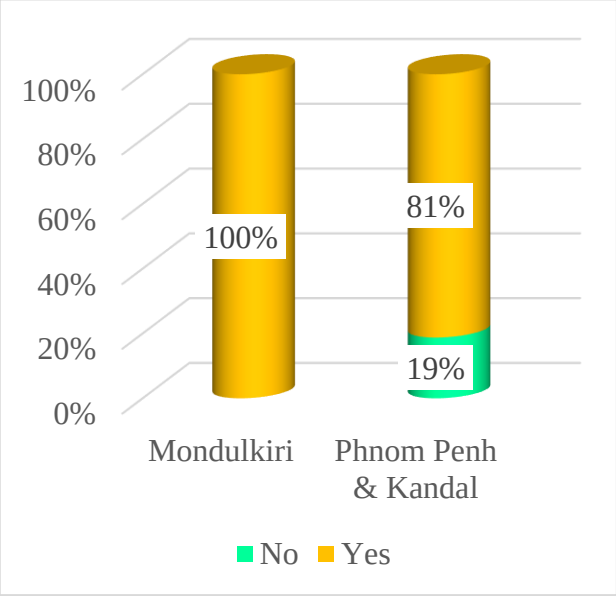
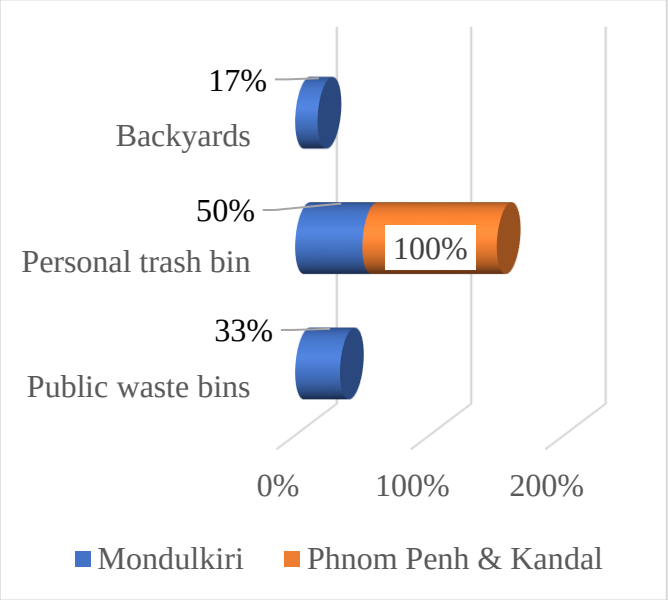


Figure 154 (Q9.3) Waste disposal place



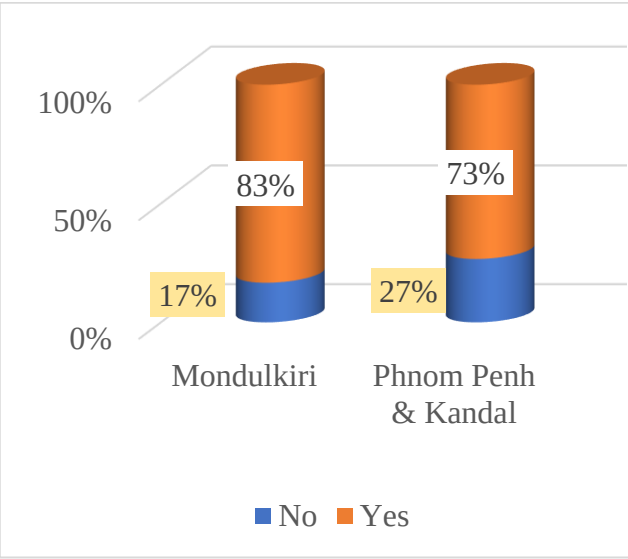


4.6.1.7.2 Sustainable packaging/shipping materials

The study found that a large majority of interviewees in Mondulkiri and Phnom Penh and Kandal province aware of the the concept of environmental-friendly packaging, representing 83% and 73% respectively (Figure 155). Social media (Facebook), the governmental institutions, and NGOs were source of information on the environmentally packaging (Figure 156). However, utilization of environmentally packaging were not commonly practiced by restaurants in Mondulkiri province, while the majority of interviewees in Phnom Penh and Kandal province used the bio-degradable packaging (Figure 157).

Figure 155 (Q10.2) Did you use any of these packaging materials?

Figure 156 (Q10.1.1) Source of information on the environmentally friendly packaaging



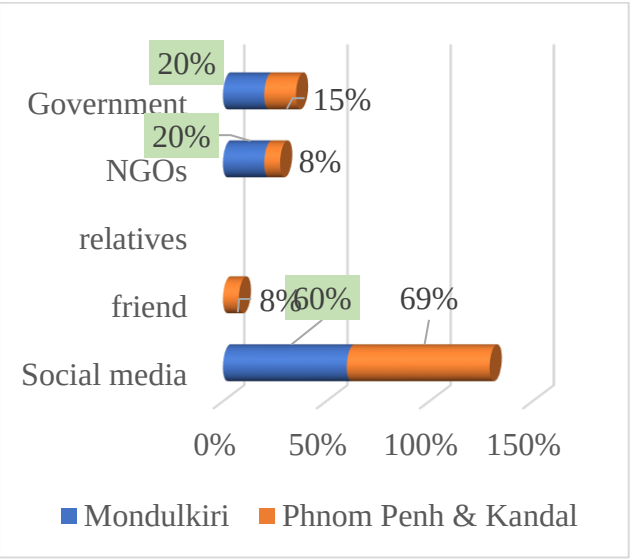


Figure 157 (Q10.2) Did you use any of these packaging materials?

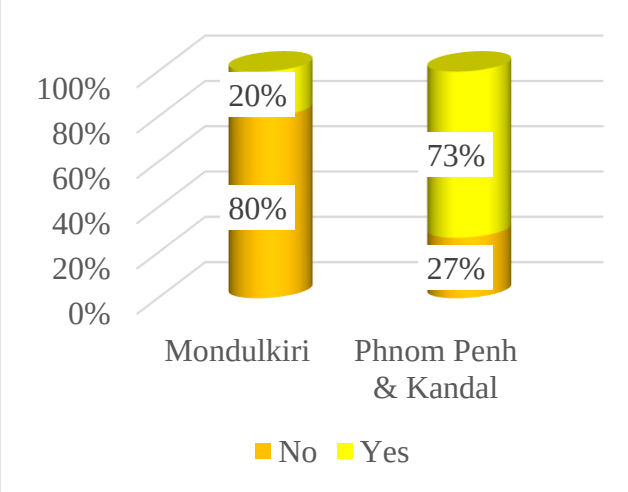
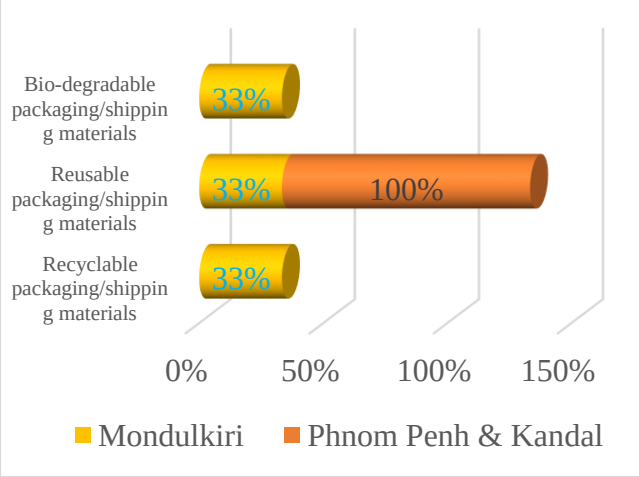


Figure 158 (Q10.3) type of environmentally packaging



4.6.1.7.3 Knowledge of waste management

The study conducted interviews to gauge the understanding and views of restaurants on waste management. A majority of the interviewed restaurants in Mondulkiri province (83%) agreed or strongly agreed with the statement that food waste has a negative impact on the environment (Figure 159). The study also found that most of the respondents (94%) were aware of the negative effects of food waste on the environment. In terms of concern towards waste management, 74% of interviewees in Mondulkiri province were worried about the impact of food waste on the environment (Figure 161). They knew only the specific impact of food waste on the environment (Figure 162). Furthermore, 100% of the respondents were willing to change their behavior toward good waste management practices.

Figure 159 (Q11.2) awareness on the impact of food waste on environment

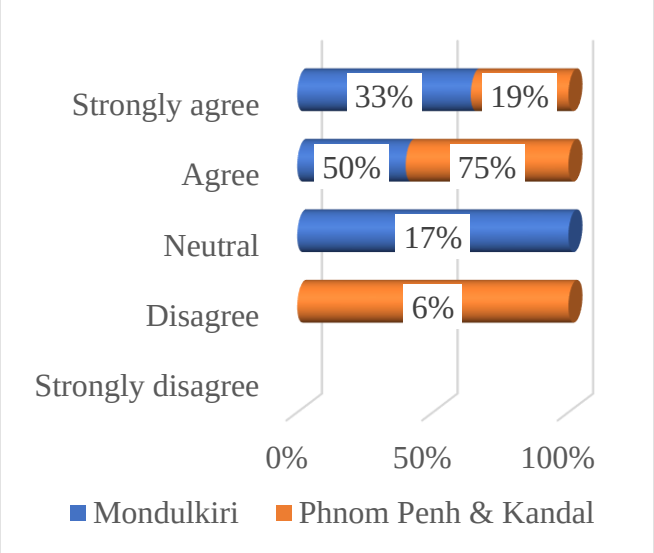


Figure 160 (Q11.1) Impact of food waste on environment

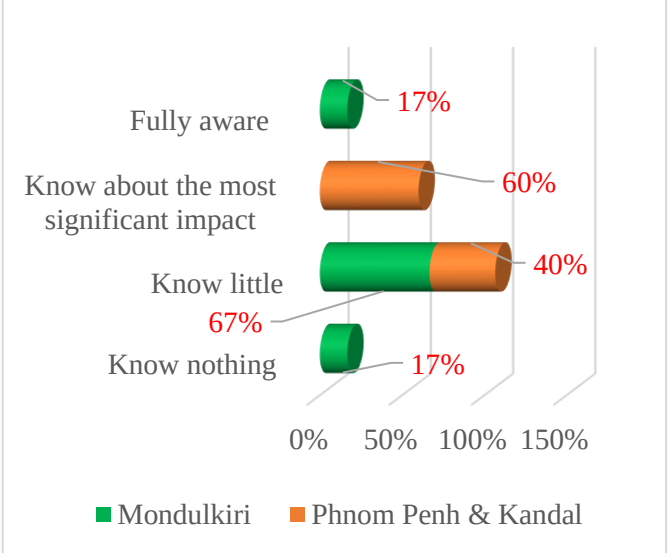
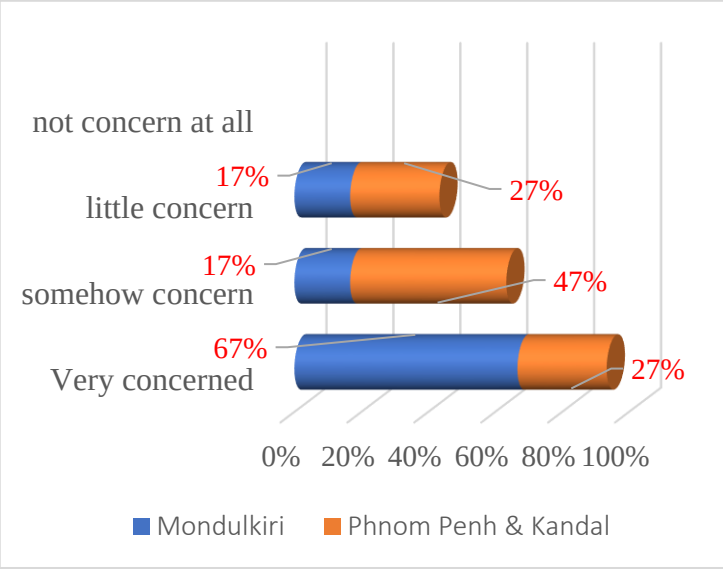


Figure 161 (Q11.3) concern of beneficiary in pack of food waste on environment



With regards to plastic waste management, 100% of the respondents strongly agreed and agreed with the statement that plastic waste has an impact on the environment (Figure 162), as the plastic they use in their businesses is much. The study also found that a majority of the respondents were aware of the negative effects of plastic waste on the environment.

Almost all interviewees recognized the impact of plastic waste on the environment and expressed concern about it. All interviewed restaurants in Mondulkiri province expressed very concern (representing 67%) and somehow concern (representing 33%). Similary, the majority of restaurants in Phnom Penh and Kandal province (62%) rated very concerned or somehow concerned (Figure 164) and willing to change behaviors on plastic waste management (Figure 165). The average number of plastic bags used in each restaurant was 40 bags per day.

Figure 162 (Q11.5) Awareness of impact of plastic waste on environment

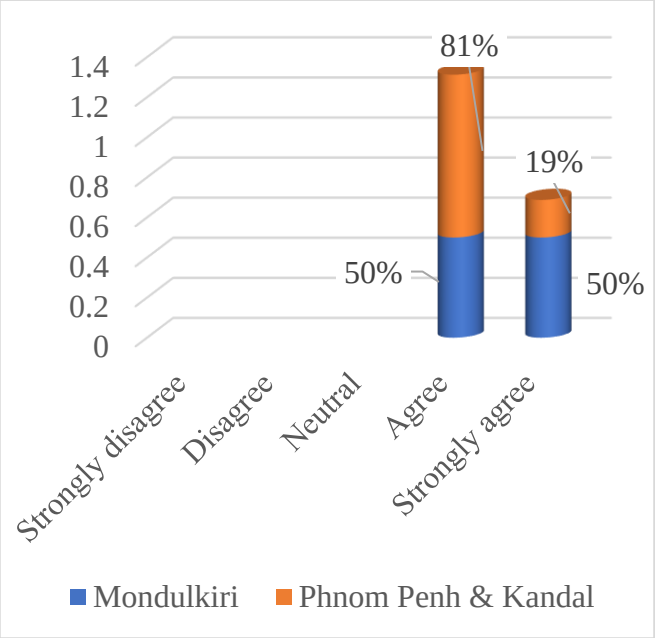


Figure 163 (Q11.6) level of knowing impact of plastic on environment

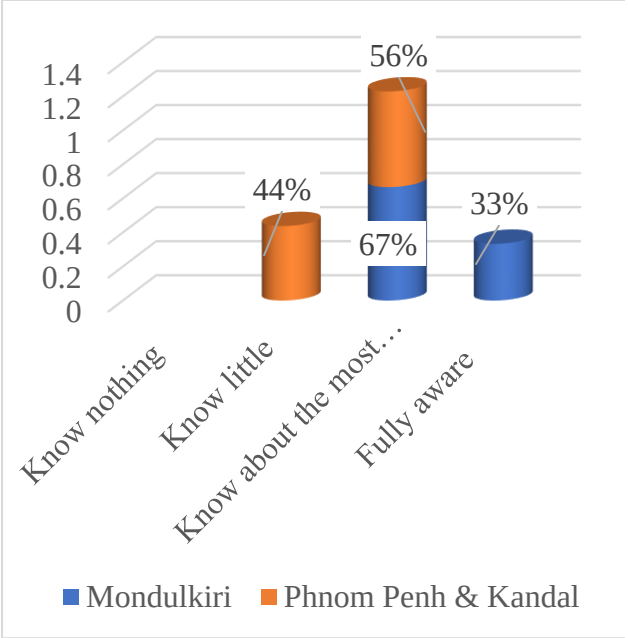


Figure 164 (Q11.7) Concern of impact of plastic waste on environment

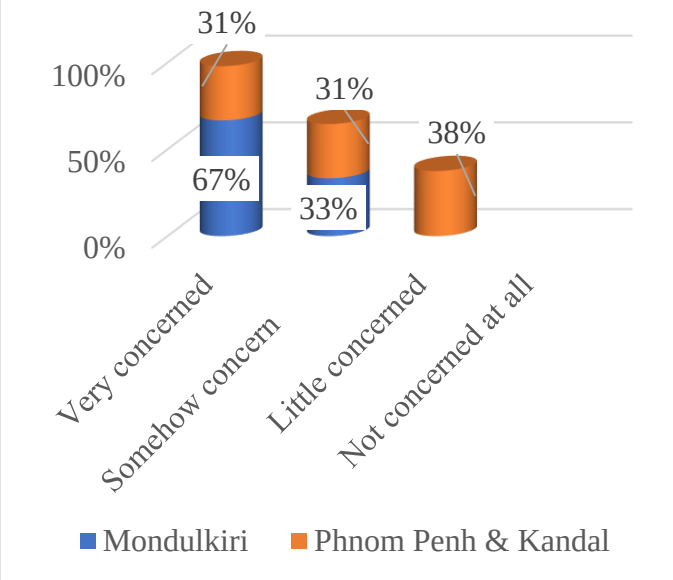
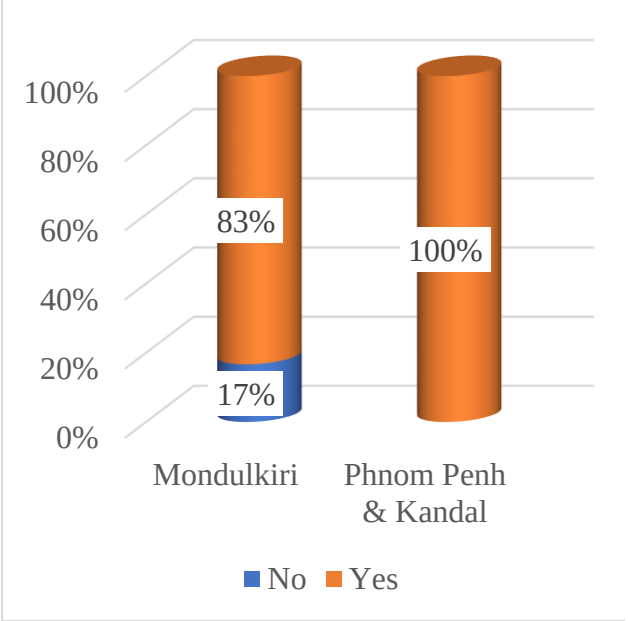


Figure 165 (Q11.8) willingness to change behaviors on the plastic management practices



4.6.1.7.4 Waste Management Policy in restaurants

In the current scenario, it is crucial for restaurants to take steps towards reducing plastic waste. One way to achieve this is by developing guidelines, policies, and strategies that promote the use of recyclable, compostable, or biodegradable packaging materials. Additionally, implementing a plastic-free policy and taking measures to reduce CO2 transport emissions can also contribute to this cause.

Unfortunately, it is disappointing to note that most restaurants do not have such policies or guidelines in place.

4.6.1.7.5 Interest of restaurants in promoting SCP into their business

Based on the study, it was found that all respondents were willing to save water and energy in theirand Kandal were willing to promote the use of recyclable, compostable, or biodegradable packaging, representing 83% and 94%, respectively (Figure 166). They also wanted to promote plastic-free business and were willing to reduce the cost of transportation for environmental and economic benefits (Figures 167, 168). Regarding discounts for customers who buy in bulk, the majority of restaurants in Mondulkiri province (67%) were willing to discount, while the majority of restaurants in Phnom Penh and Kandal province were not willing to discount to reduce waste (Figure 169). Further, approximately 50% of the restaurants interviewed in Mondulkiri province were willing to donate usable food to the poor in order to reduce food waste. However, the majority of restaurants in Phnom Penh and Kandal province (87.50%) were not willing to donate the usable food because they believed that a mess in front of restaurants could happen while poor people came to take the food (Figure 170). business operations. Additionally, almost all interviewed restaurants in Mondulkiri, Phnom Penh,

Figure 166 (Q13.1) Are you willing to promote recyclable/compostable/biodegradable packaging?

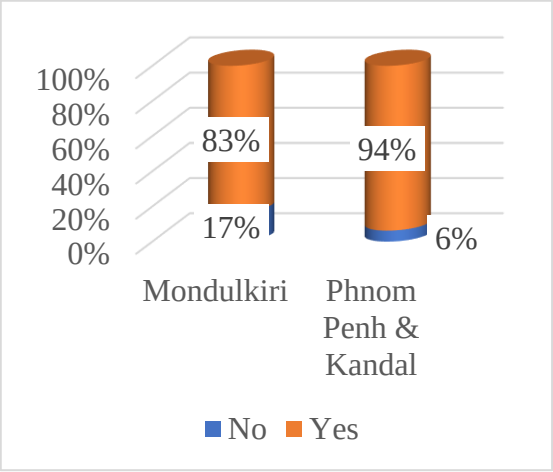


Figure 167 (Q13.2) Are you willing to promote plastic-free into your business?

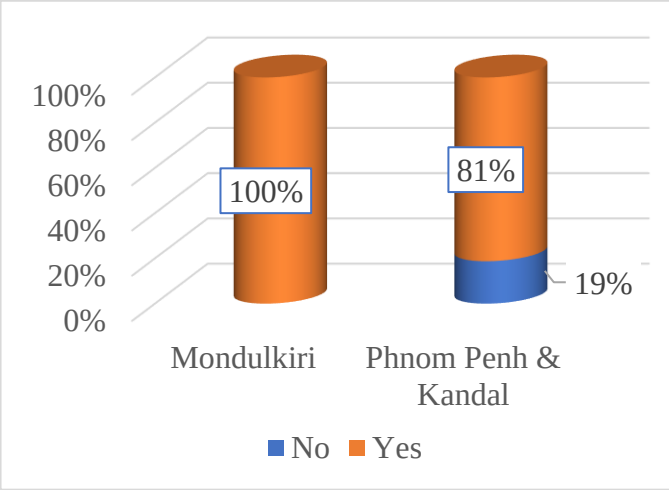
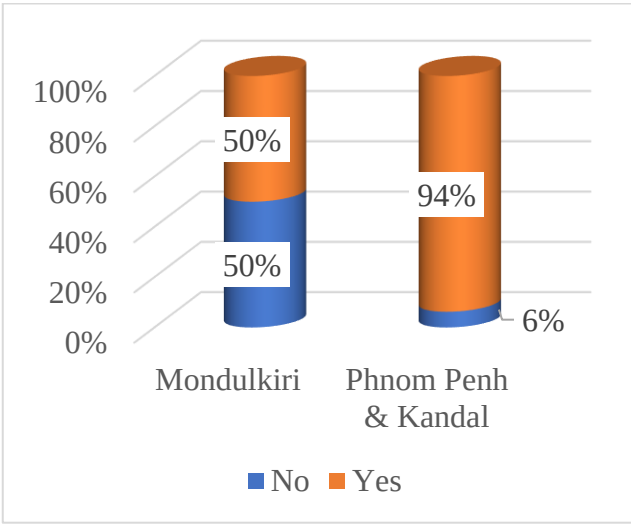


Figure 168 (Q13.3) Are you willing to reduce mean transportation for your product distribution to reduce CO2 emission?

Figure 169 (Q13.5) Are you willing to discount reducing food waste?



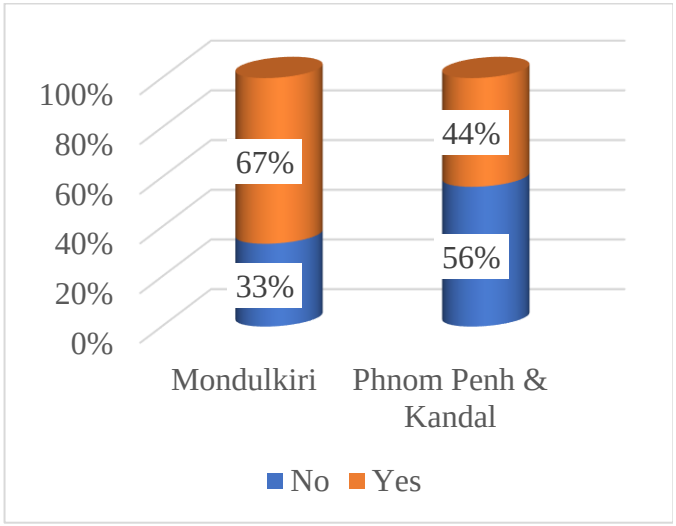
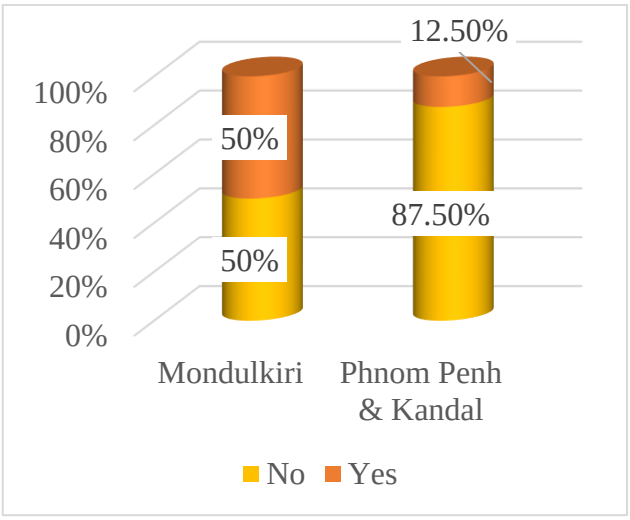


Figure 170 (Q13.6) Are you willing to donate reducing food waste?



V Conclusion and Recommendation

5.1 Conclusion

5.1.1 Vegetable supply chain

Procurement practices: the vegetable supply chain in Mondulkiri province relies on the traditional marketing system, where not many actors have been involved in the chain. Practically, retailers procure vegetables from three main locations (Senmonorum, Koah Nhiek, and Pechreada) in Mondulkiri province, and approximately 10% of vegetables are imported from Vietnam, while retailers in Phnom Penh procure vegetables mainly from Doem Kor market. Daily procurements without contracts are practiced by almost all retailers in Mondulkiri, Phnom Penh, and Kandal province. Product appearance, quality of products, and price are influencing factors for retailers to buy the vegetables, while source of products is not considered a main factor in buying vegetables. There are three challenges (quality of products unsatisfactory or inconsistent, inconsistent in supplying quantity, and high price fluctuation) that vegetable retailers in the studied areas have been facing.

Required supply arrangement: The majority of interview retailers in Phnom Penh are not willing to buy vegetables from Mondulkiri province due to three reasons. First, the current selling volume was low, so they were able to procure more vegetables. Second, they don't know the quality of vegetables from Mondulkri province. Third, this province is situated far from Phnom Penh city and Kandal province, so it is difficult for them to check the quality of products. However, those willing to buy vegetables from Mondulkiri province require five conditions: stability of supply; product appearance; required clean, pack, and transport to shop by farmers; enough required volume; and stable price. In addition, they prefer no supply agreement, and farmers bring vegetables to their shops. Regarding price, they require market price setting with immediate payment by cash.

Role of women in vegetable supply chain: women has more involvement in the vegetables business compared to men. They have iniated the business and manage daily business operation, and labor hiring.

Waste management practices: The waste classification is not commonly practiced by retailers in the studied areas. However, the minority of interviewed retailers classified the waste by separating food waste, veggie waste, plastic, and cans. Plastic burning is practiced by a minority of retailers in Mondulkiri province. The waste is commonly disposed of in personal and public trash bins. However, a minority of retailers disposed of waste on the road or street, in open spaces in public places or markets, and in backyards, especially in Mondulkiri province. Waste recycling is not commonly practiced by retailers in the studied areas. The majority of retailers heard about environmentally friendly

packaging through Facebook, the government, and NGOs. However, almost of them did not use these packaging due to difficulty to access them, expensive, and not required from customers.

Knowledge of retailers on waste management: The majority of interviewed retailers are aware of the impact of food and plastic waste on the environment. However, their knowledge is limited. Majority of retailers concern about food and plastic waste on the environment. In addition, they are willing to change their behavior toward waste management practices. On the contrary, approximately one-fifth (20%) of interviewed retailers are not willing to change their current practices because plastic bags are essential for their business and are convenient to use.

Waste management policies: almost all of the interviewed retailers did not have a plastic-free policy, a strategy for the environmentally friendly packaging utilization, and strategy to reduce transportation emissions.

Integration of SCP into retail vegetable business: the majority of retailers are willing to promote recyclable, compostable, and biodegradable packaging packaging and plastic-free policy in their businesses. In addition, they are willing to reduce transportation for not only emissions but also economic benefits. However, some retailers in Phnom Penh and Kandal province are not willing to reduce transportation practices because they are required to transport and deliver products to customers. In terms of water and energy reduction, they are willing to save energy and water, benefiting both the economy and the environment.

5.1.2 Wild honey supply chain

Procurement practices: the wild honey market system is very traditional. The honey is generally procured from Pechreada and Kaoh Nhiek districts (84%) during the dry season. However, about 16% of the honey sold in Mondulkiri is procured from Preah Vihear, Kampong Cham, and Koh Kong provinces. Honey is commonly procured from honey harvesters. No-contract procurement and immediate payment terms in cash are common practices in Mondulkiri province. Therefore, the quality of produce has been unsatisfactory or inconsistent, inconsistent in supplying quantity, and retailers have been facing high price fluctuations. Approximately 52% of collected honey is sold in Phnom Penh, while 46% is sold in Mondulkiri province, and 2% is sold to processors in Phnom Penh. Honey grading is rarely practiced by distributors.

Required supply arrangement: no-contract supply, harvesters delivered products to buyers, and market price setting are preferred conditions for distributors and retailers.

Role of women in wild honey supply chain: women has more involvement in the honey business compared to men. However, the business started by joint decision by husband and wife. The women have more role in managing daily business activities. When it come to hire labor, husband is the main decision makers for labor hiring.

Waste management practices: food and plastic waste are disposed of in personal and public bins. However, trash burning is practiced by distributors and retailers in Mondulkiri province.

Knowledge of retailers on waste management: The majority of honey distributors hear about environmental-friendly packaging from Facebook, government institutions, and NGOs. However, they did not use these materials because they were difficult to find, expensive, and not required by customers. In addition, they are aware of the impact of food and plastic waste on the environment and are willing to change their behavior towards waste management practices.

Waste management policies: almost all of the interviewed distributors did not have a plastic-free policy, a strategy for the environmentally friendly packaging utilization, and strategy to reduce transportation emissions.

Integration of SCP into retail honey business: honey distributors and retailers are willing to promote recyclable, compostable, and biodegradable packaging and a plastic-free policy in their businesses. In addition, they were willing to reduce transportation for economic benefits for the business.

5.1.3 Vegetable procurement by restaurants

Procurement practices: Senmonirum Market and Vietnam are the main sources of vegetable supply for restaurants in Mondulkiri Province, while restaurants in Phnom Penh procure vegetables from different markets in Phnom Penh. Three types of vegetables (organic, GAP, and conventional) are procured by restaurants in Mondulkiri province, while all interviewed restaurants procured conventional products from wet markets and distributors. The grading system is not commonly practiced by restaurants because they set supply criteria in the agreement. No-contract supply for restaurants in Mondulkiri province. However, almost half (44%) of interviewed restaurants in Phnom Penh and Kandal province, especially elite restaurants, procured vegetables with a contract and payment period of 30 days after receiving vegetables. The method of payment is a bank transfer.

Required supply arrangement: five supplying conditions (enough required production volume, stability of supply, cleaning and packing by farmers, product appearance, and meeting the required grade) are required by restaurants to procure vegetables. The majority of restaurants prefer to

have an official supply agreement, while about 29% of small restaurants are not willing to have a supply contract. Daily supply, market price setting, and immediate payment by cash are preferred by the majority of restaurants. However, about 43%, especially elite restaurants, are required to have a supply agreement, monthly price negotiation, and monthly payment terms by bank transfer.

Role of women in the restaurant business operation: women involved in the discussion to start up and manage the business.

Waste management practices: waste classification is commonly practiced by restaurants in the studied areas. Generally, they separated food and vegetable waste, plastic, cans, and glass. However, waste recycling is not practiced by almost all restaurants. The waste is generally disposed of in personal trash bins.

Knowledge of restaurants on waste management: The majority of restaurants (72%) hear about environmental-friendly packing from Facebook, government institutions, and NGOs. However, the majority of restaurants in Mondulkiri (80%) did not use environmentally friendly packaging, while approximately 73% of the restaurants interviewed in Phnom Penh and Kandal province used environmentally friendly packaging, mainly paper bags and paper made from sugar can residue. Almost all restaurants interviewed are aware of the impact of food and plastic waste on the environment and are willing to change their behavior towards waste management practices.

Waste management policies: All interviewed restaurants did not have a plastic-free policy, a strategy for environmentally friendly packaging utilization, or a strategy to reduce transportation emissions.

Integration of SCP into the restaurant business: most restaurants are willing to promote recyclable, compostable, and biodegradable packaging and a plastic-free policy in their businesses. In addition, they were willing to reduce transportation for economic benefits for the business.

5.2 Recommendation and its implication

Based on the results of the study, the following recommendations are proposed:

1. Resilient agricultural technology should be promoted in Mondulkiri province to improve agricultural production, especially during the dry season.

Mondulkri province is dominated by small-scale farmers, so agricultural knowledge and facilities are limited in the studied areas. The price of vegetables is relatively high in the dry season because farmers cannot produce them and wild vegetables are limited. By collaborating with the Provincial Department of Agriculture, Forestry, and Fisheries and the CESAIN Center of the Royal University of Agriculture, farmers can receive both technical and some financial support to improve their production.

2. Contract farming between producers and retailers should be promoted to resolve the price fluctuation during the rainy season.

By strengthening existing agricultural cooperatives and clusters, farmers will have a strong production and marketing system and ensure regular supply to restaurants and retailers both in and outside the province. The cooperative and clusters will have strong negotiation power, so farmers can gain more benefits from being members of cooperatives and clusters.

3. Convert vegetable production in Mondulkiri province into GAP and local certified organic (PGS) for integrating in the Phnom Penh markets

The result of the survey showed that the price of conventional vegetables in Mondulkiri province is higher than vegetables in Phnom Penh and Kandal markets (Figures 129–130), so the conversion of conventional vegetables in Mondulkiri province to GAP and PGS-certified productions can be an option for integrating the vegetables from Mondulkiri province in the Phnom Penh and Kandal markets. The premium price from the certified system can motivate farmers to increase vegetable production.

4. Strengthen the agricultural cooperative and CPA to collect honey products.

The agricultural cooperative and CPA have been playing key roles in wild honey production and marketing. With technical support from NGOs and government institutions, agricultural cooperatives and CPA provided technical assistance to honey harvesters in terms of harvesting technical and quality assurance for the production.

By strengthening collecting through reviewing and contracting honey harvesters, the cooperatives and CPA are able to secure the quantity and quality of honey for supply to retailers and processors in Phnom Penh and other provinces.

5. Honey processing should be promoted in Mondulkiri province

Processing is very limited in Mondulkiri province. Processors are mainly filtered, bottled, and labeled for sale. Processing techniques and capital for business operations are the main challenges for processors in Mondulkiri province. Improving the techniques and provision of financial accessibility can improve the current status of processors.

6. Awareness session on the impact of food and plastic waste on the environment

The food and plastic waste have a strong impact on the environment, as the interviewees are aware of. The practice of waste management is still limited by the majority of interviewees. Since many people have been using Facebook daily, The campaign on the impact of food and plastic waste should be promoted through the Facebook channel. Another medium (TikTok) can be useful to promote campaigns on food and plastic waste management.

7. Waste recycling should be promoted.

Recycling waste is essential to reducing the impact of food and vegetables on the environment. Almost all interviewees in the studied areas did not recycle the waste. In addition, waste classification is not practiced by majority of interviewees. The vegetable waste in Mondulkiri province can be collected to make compost for supply to vegetable producers in the province. An individual compost maker can be an option to operate the business. The technical assistance can be accessed from the CSARO Organization which have lengthy experience in the compost making and waste management in Phnom Penh city and other provinces.

Annexes

1. Questionnaires


Attendant List.docx


FGD_questionnaire for vegies farmers.do


FGD_questionnaires for wild honey harves


Restaurant 03 final.doc


Veggies and wild honey Processor 03 fi


Veggies and wild honey traders 03 final

2. *Sample size calculation*


Sample size calculation.xlsx

3. *Dataset*


001-Restaurant-Mondulkiri.xlsx


Mondulkiri vegetable retailers.xlsx


Data for analysis honey.xlsx


001-Restaurant-Phnom Penh.xlsx


Phnom Penh vegetable retailers.xls

4. *Result of data analysis*


Analysis of veggies retailers.xlsx


Analysis of wild honey.xlsx


Analysis of Restaurants in Mondu

5. *PPT presentation*