



# Need Assessment of Traceability System for Vegetable Value Chain

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## **List of Abbreviations**

AC	Agricultural Cooperatives
ADB	Asian Development Bank
AgVC	Agriculture Value Chain
AIMS	Accelerating Inclusive Markets for Smallholders
ASPIRE	Agriculture Services Program for Innovation, Resilience and Extension project
CASDP	Cambodia Agricultural Sector Diversification Project
CHAIN II	Cambodia Horticulture Advancing Income and Nutrition 2
CPS	Center of Policy Studies
DoA	District Agriculture Officer
FAO	Food and Agriculture Organization of the United Nations
ha	Hectare
HARVEST 2	Helping Address Rural Vulnerability and Ecosystem Stability 2
ICCO	Interchurch Organization for Development Cooperation
IFAD	International Fund for Agricultural Development of the United Nations
INGO	International None-Governmental Organization
ISO	International Organization for Standardization
MAFF	Ministry of Agriculture, Forestry, and Fisheries
MT	Metric Tons
PDAFF	Provincial Department of Agriculture, Forestry, and Fisheries
PO	Producer Organization
QR Code	Quick Read Code
RGC	Royal Government of Cambodia
SAAMBAT	Sustainable Assets for Agriculture Markets, Business and Trade
SMEs	Small and Medium Enterprises
SNV	Netherlands Development Organization
TSSD2	Tonle Sap Poverty Reduction and Smallholder Development Project 2
USAID	United States Agency for International Development

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## 1. Introduction

Sub-Component 2.2 of the SAAMBAT project implemented by its counterpart Techo Startup Center (TSC), oversees the Digital Technology and Enterprise for Rural Value Chain. SC 2.2 has a mandate to develop a Khmer Agriculture Suite (KAS) core platform, 5 key satellite applications, provide challenge fund to Agri-tech startups, provide digital literacy to value chains actors, develop partnership with private sectors and conduct research. KAS core platform will enable relevant stakeholders currently operating/implementing agriculture activities in Cambodia to voluntarily share their data to the platform. These data will be captured for analysis and to serve the basis of any innovative applications.

To support this platform, 5 key applications will be developed. Among the 5 applications, traceability system is one of the potential applications to be developed. This application is vital to track and trace agricultural products at any value chain stages, improve product quality control, reduce incident of food poisoning risk, authenticate ethical credential, country of origin, produce provenance, and ultimately build consumer trust and satisfaction. Moreover, this system is so much needed for the export compliances. The study will be conducted in 2 stages: first one will be conducted with some of the key actors of vegetable value chain and the second study will be conducted for export crops such as mango, pepper, cashew nut, banana, and longan value chains.

The study is intended to understand different agriculture value chain actors' (AgVC) perception in applying the vegetable traceability system. Qualitative method combining with snowball sampling is used to conduct the study with vegetable value chain actors and the parties involved in this chain. The findings of the study will enable the design of the functionalities and the portal of different actors.

## 2. Objectives of Study

This study seeks (1) to understand the need of the traceability system amongst AgVC actors of vegetable, (2) to identify which AgVC actors having interest to operate this system, and (3) to confirm whether traceability system is needed for vegetable value chain.

## 3. Scope of Study

Having a reliable traceability system was discussed amongst the Royal Government of Cambodia, private sector, and development partners funded project including ASPIRE-vegetables, AMRU RICE-rice, and HARVEST 2-fruit & vegetables. This study specifically focuses on the traceability system for vegetable value chain and at the next stage will repeat with export crops such as rice, pepper, cashew nut, mango, longan etc. The study was conducted in some of the biggest vegetable producing provinces such as Kandal, Kampot, Kampong Cham, Kampong Speu, Kampong Chhnang and Battambang.

## 4. Limitations

Due to limited resources and time constraint, only 6 provinces and limited number of AgVC actors were selected for this study. The study did not conduct the interviews with farmers as the objectives stated above aiming to identify the needs of traceability system. The study seeks to get opinions from

the Provincial Department of Agriculture, Forestry, and Fisheries (PDAFF) directors, wholesalers or collectors, agriculture cooperatives (AC) or Producer Organization (PO), and some retail shops.

## 5. Literature Review

In 2017, an average Cambodian people consume vegetable of 83.02 grams per day which is equal to 30.3 kg per capita per annum (FAO, 2019). This means that Cambodia is required to produce approximately 489,000 MT of vegetable per year to meet the consumer demand. Moving away from vegetable consumption, by looking at the outbreak of the foodborne disease has threatened the public health particularly the spinach outbreak in 2006, peanut butter and peanut paste in 2008 in the United States. Several patients were hospitalized. This resulted in economic loss (Jianrong, Z. & Tejas, B., 2014). In Cambodia, a total of 134 outbreak of foodborne illnesses occurred from 2014 to 2019 were reported. This resulted in 5,825 cases of illnesses where 5,598 were hospitalized and 81 were dead (The Mekong Institute, 2019). Therefore, it is significant to have an effective product tracing system which in turn provides consumer health protection. The benefits of the system would be clearly visible to the public especially during food poisoning investigation period to determine the source of the foodborne disease (Jennifer, Mc. *et al.*, 2010). In addition, the management team could freeze the production line and recall back the contaminated products before it reaches out to end-consumer in case the incidence occurred.

### ➤ Vegetable Production in Selected Economic Poles

Vegetable production in selected provinces was consolidated and compiled as illustrated in Table 1 (Men, S. 2018).

**Table 1:** Vegetable production areas and average yield in selected biggest producing provinces

Province	Production areas (ha)	Harvested areas (ha)	Yield (MT)	Average yield per ha (MT)
Kandal	8,936	8,292	61,111	7.37
Kampot	1,373	1,373	6,297	4.59
Kampong Cham	10,630	10,566	128,958	12.20
Kampong Speu	1,653	1,653	5,968	3.61
Kampong Chhnang	6,876	6,876	93,970	13.67
Battambang	2,156	2,106	38,521	18.29

Source: Men, S. (2018). Consolidated crop data in 2018. MAFF's Department of Statistics and Planning.

Amongst the 6 chosen provinces, Kampong Cham is the biggest province that contains the cultivated areas of 10,630 ha follows by Kandal and Kampong Chhnang province with production areas of 8,936 ha and 6,876 ha respectively. The smallest cultivated area provinces are Kampong Speu and Kampot that accounts for 1,653 ha and 1,373 ha respectively. In term of production volume, Kampong Cham produces the highest productivity accompanies by Kampong Chhnang, Kandal, Battambang, Kampot, and Kampong Speu with an amount of 128,958 MT; 93,970 MT; 61,111 MT; 38,521 MT; 6,297 MT; and 5,968 MT respectively. Although Battambang is the third smallest cultivated area province, its

average production is the highest follows by Kampong Chhnang and Kampong Cham province with the average productivity of 18.29 MT/ha, 13.67 MT/ha, and 12.20 MT/ha respectively.

Vegetables market survey conducted by the Centre for Policy Studies in 2019 shown that local capacity for vegetable production could only be supplied approximately 45% to the market during the wet season and 70% in the peak period of the production in dry season. The survey also reported that about 552 MT or 52% of the total daily market demand were imported from overseas (CPS, 2019).

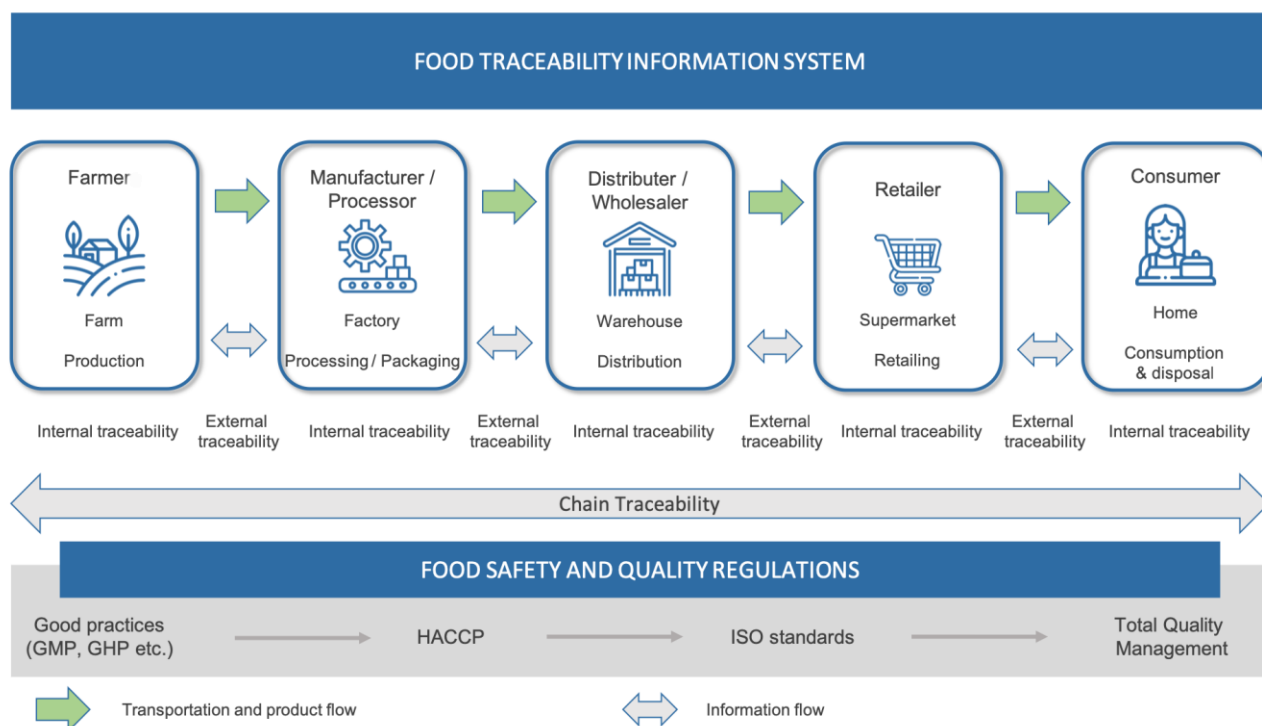
A recent survey in 2020 by SNV, implementing the Cambodia Horticulture Advancing Income and Nutrition II (CHAIN II) project found that a daily demand in the 4 targeted provinces in the north-east and south-east of the country were 53.6 tons of vegetables. The production in those provinces could supply approximately 92% of the local demand. The remaining 6% were imported and about 2% were produced from unknown sources (Hem, M. & Nimol, V., 2020)

### ➤ Traceability System

To ensure the food safety, technology has been introduced aiming to trace the sources of the agricultural products sold. Traceability system is an effective method to measure food quality and safety. Therefore, the EU, the United States, and several developed countries have introduced laws and regulations to enforce traceability system in the food supply chain to prevent food poisoning incidences (Changxiu, C. *et al.*, 2012). Traceability system is defined as “the ability to discern, identify and follow the movement of a food or substance intended to be or expected to be incorporated into a food, through all stages of production, processing, and distribution” (FAO, 2017). The benefits of the system are “(1) to improve supply chain management, (2) to facilitate traceback for food safety and quality, and (3) to differentiate and market food with subtle or undetectable quality attribute” (Golan, E. *et al.*, 2004).

Traceability system requires all AgVC actors to record and pass those information from one stage/chain to another till the end of the chain or the end-consumer. Farmer/producer will require to perform its internal traceability system by entering data into its digital platform either via phone/tablet or computer. The platform can be stored in cloud server where it will be syncing when the internet is connected. The remaining actors in the value chain will be responsible for entering information into processing, packing and more into the database (*see Figure 1*). The traceability system requires complex activities to perform including good manufacturing practices (GMP), good hygienic practices (GHP), hazard analysis critical control point (HACCP), ISO standards, and total quality management which is compliance with food safety and quality control regulations (Aung, M. M. & Chang, Y., 2014).

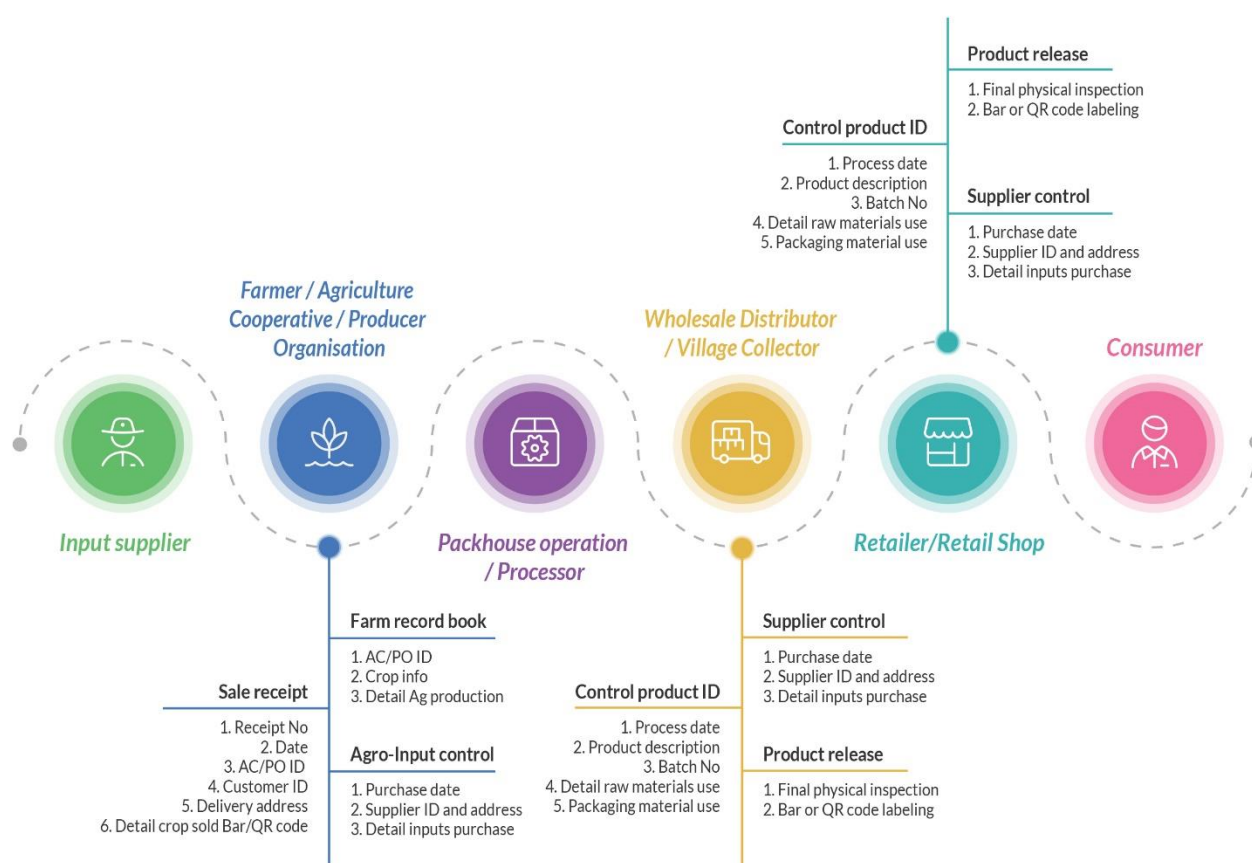




**Figure 1:** Food Traceability Information System

Source: Aung, M. M. & Chang, Y., 2014. Traceability in a food supply chain: Safety and quality perspectives.

Each selected value chain actor has the role and responsibility to document all relevant activities happened in its own stage/chain. For instance, farmer/AC/PO is responsible for recording agricultural farm activities, input supply control logbook, farm-record book, and sales receipts. Wholesale distributor and retailer/retail shop have the same role to document vegetable supplier control, check the product identity, conduct the final inspection, and barcode or QR code labelling before placing the products on the market shelves. Figure 2 summarizes each chosen AgVC actor's responsibility (FAO, 2017).



**Figure 2: Roles of AgVC in operating the traceability system**

Source: Combined by Author which adapted from FAO (2017). Food Traceability Guidance.

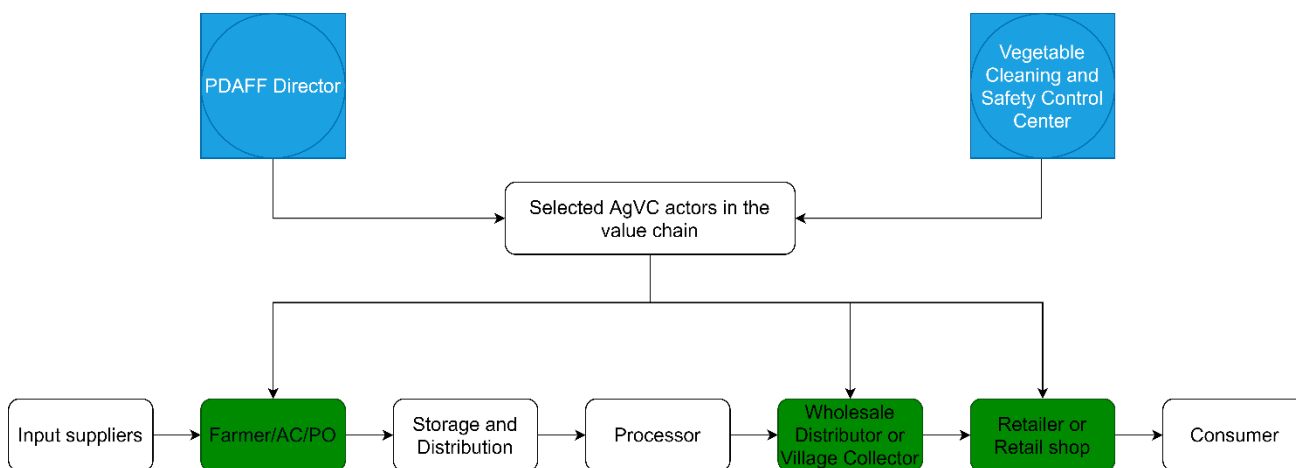
Although there have been several vegetable value chain project interventions implementing by INGOs-SNV, ICCO via World Vegetable, Dan Church Aids, the co-financed projects between RGC and IFAD projects-ASPIRE and AIMS, ADB funded projects-TSSD2 and CASDP, none of them has integrated the traceability system into their implementation plan. A bilateral cooperation project supported by USAID namely HARVEST 2 has assisted SMEs in exporting cashew nut and Pailin longan to overseas markets. A requirement for traceability system is mandatory for the compliances with the export standards. Now the project is in the stage of negotiating with an Indian company to set up the traceability system procedure for these SMEs prior to being legally able to export to intended markets. One of the biggest rice millers, AMRU Rice company, has received technical support from OXFAM financed by the Netherlands Government, to trial out BlocRice platform for the organic rice. BlocRice is developed by a technical team based in the Netherlands using Blockchain technology. AMRU Rice has faced a few challenges to implement the platform and had expressed an interest to look for technical partner to develop a localized platform.

Under SC 2.2 of the SAAMBAT project, the development of the traceability system has been included in the project design. The finding of this study will contribute to conceptualize the traceability system for vegetables and export products.

## 6. Methodology

The study uses purposive and snowball sampling method to capture the perceptions of the intended interviewees. The respondents are selected based on their knowledge of the subject and their several years of experiences as vegetable value chain actors or well-informed about the situation.

Figure 3 shows the value chain actors in the AgVC. Amongst these actors, only 3 actors within the chain, farmer/AC/PO, wholesale distributor or village collector, and retailer or retail shop, and 2 external stakeholders, PDAFF director and a Vegetable Cleaning and Safety Control Centre Staff, were interviewed for their opinions on the adoption of the traceability system.



**Figure 3:** Selected AgVC actors and outsiders of the value chain for an interview

Source: Combined by Author

Farmer/AC/PO is responsible for supplying fresh products to the market as well as recording agricultural production data. These documented information are very critical for vegetable traceability system to exist.

Wholesale distributor should record the detailed information of their own distribution, the sourcing origin of the products, and retailer/retail shop that they supply products to. Additionally, barcode or QR code is commonly used in the traceability system to track and trace back the source of products in the value chain.

Retailer/retail shops were selected because they play significant role in facilitating the free-flow of the final products to the end-consumer. They have direct contact with the end-consumers, and they are in charge of providing the sourcing origin of products to their customers. Their role is to ensure that the barcode or QR code are stucked on the products prior placing them on the shelves.

The combination of the records made by farmer/AC/PO, distributor, and retailer are essential to support and make the traceability system exist/possible.

Six PDAFF directors, who are not in the value chain of the AgVC chart but playing a vital role as regulator and supporter, were chosen to get their opinions. They provided invaluable insights of vegetable cultivation data to the study such as the cultivation areas, production volume, and type of vegetables produced in the areas.

Besides PDAFF directors, Kandal Vegetable Cleaning and Safety Control Center staff under the management of Kandal PDAFF, was interviewed too. The center is specialized in checking agro-chemical residues and issue certified chemical-free produce stickers. We seek their advice on vegetable traceability system too.

AgVC actors that were interviewed are PDAFF directors and ASPIRE provincial management advisors, AC, ASPIRE business cluster and AIMS producer organization leaders (PO), wholesale distributors, village collectors, chemical-free/organic retail shops, and a vegetable cleaning and safety control center. A total of 45 interviewees were surveyed which is summarized in table 2:

**Table 2:** List of Interviewed AgVC actors

No	Agriculture Value Chain Actors	Number of interviewees
1	Director of Provincial Department of Agriculture, Forestry, and Fisheries	6
2	Agricultural Cooperatives	10
3	ASPIRE Business Cluster & AIMS Producer Organization Leaders	7
4	Wholesale Distributors	10
5	Village Collectors	9
6	Chemical-free/Organic Retail Shops	2
7	A Vegetable Cleaning and Safety Control Center Staff	1
	<b>Total</b>	<b>45</b>

Three sets of interview questionnaires were developed and used to guide the interviews: List of questionnaires for PDA and DoA (Appendix 1), Questionnaire for Agriculture Cooperative (Appendix 2), and Questionnaire for Village Collector/Distributor (Appendix 3). They are designed using a semi-structured with open-ended questions. This study is not intended to collect quantitative number but rather to get the opinions and perceptions of the subject matter. The finding will be analyzed based on the content analysis method.

## 7. Findings

The primary purpose of this study is to understand the need of vegetable traceability system amongst different AgVC actors. Respondents' experience and feedback added insights to the study. By listening, paper-recording, and analyzing the experience shared by these actors, valuable information are collected and help design vegetable traceability system.

According to the observation through content analysis, vegetable traceability system is not a new concept to some of the respondents. They are well-aware of its benefits and challenges in applying the system.

PDAFF are sharpening their strategy to assist farmers to produce chemical-free products supplying to the local market. Likewise, the 2 retail shops interviewed fully agreed the importance of this system as they are currently supplying chemical-free products to their customers. There is a demand from consumers on the origin and production processes of the products sold in their stores. Currently, all the AC/PO are required to follow strict agricultural production guideline by recording all relevant information, which is part of the traceability, in exchange to a better price offered by the shops. The retail stores which contracted with those AC/PO, from time to time, conducted some random

inspections as part of the quality control. So far, the usage of digital platform to record or track the inputs has not been practiced. After explaining the concept ideas to the 2 unfamiliar actors plus experiences gathered by the other 3 actors, this study could conclude that all AgVC actors perceive that traceability system is important and will add value to chemical-free products. This will benefit to farmers, collectors as well as retailers. However, when asking about making a data record and document the input usage at every step of production, all actors express their feeling that the record is very troublesome and time-consuming for them. Record keeping is challenging but doable.

Even though all the interviewed AgVC actors did agree that vegetable traceability system is very vital, PDAFF in Kampong Cham argued that this system is indeed needed for the export purposes and the supermarkets. It is not suitable for local markets. He added that generally people who reside in the suburb areas of the province or rural areas have lower income and are price sensitive, thus, they tend not to care where the products are sourced from. He also went on to compare 2 products that have the same imperceptible quality and quantity, but the one which have the traceability identity will be higher price than the non-having one. Therefore, it is not plausible for local provincial markets. He observed customers at the weekend market, which organizes by AIMS in collaboration with ASPIRE, are willing to pay higher price for the products as they trust on the quality assurance of the project.

In response to the second objective of the study to identify the right actors to operate the system, there are different perceptions among 7 AgVC actors (table 3). All PDAFF directors recommended that all actors in the value chain need to involve in operating this system at different stages of value chain. Each individual actor has the responsibility to document all of the information that occurs or contains in their stage. However, AC/PO suggested that this role should be responsible for by wholesale distributor/village collector as they are the ones who deal directly with retailer/retail-shop and end-consumer.

**Table 3:** Responses of AgVC actors to operate the traceability system

Respondents	Perception of actors who would have interest in operating the system					
	Input Suppliers	Farmer / Producer / AC / PO	Wholesale Distributor / Village Collector	Retailer / Retail-shop	Consumers	All Actors
PDAFF Director						<b>6</b>
ASPIRE AC			<b>10</b>			
AIMS PO			<b>7</b>			
Wholesale Distributor				<b>10</b>		
Village collector				<b>9</b>		
Retail shop					<b>2</b>	
A vegetable cleaning and safety control center staff					<b>1</b>	

The third objective of the study is to confirm whether the system is needed. The respondents believe that the system would be beneficial to both parties such as: 1. building trust amongst customers, and

2. Offering premium price due to the quality control and assurance. The formation of faith relationship through the system will encourage local consumption of vegetable and will contribute to the “One Village One Product” policy promotes by RGC. All AgVC respondents agreed that the system is much needed to boost local trust on the quality of the fresh products sold in some well-known chemical-free retail shops and supermarkets. If local consumers change their behavior toward getting the products with sourcing traceability, it will contribute to the growth in local production. Farmer/AC/PO will be able to differentiate their produce from the imported ones. Some consumers are ready to pay premium price for the high-quality produce.

## 8. Recommendations and Conclusion

The results show that there is a need of the traceability system amongst AgVC actors despite some contradict perceptions of who should be responsible for operating the system. It concludes that it is necessary to have the system. Despite some challenges in implementing the system, the project will pilot the traceability system for vegetables by working closely with the supporters of ASPIRE’s commune extension workers and AIMS’s social mobilizers. Moreover, under the assistance of the service provider in digital outreach activities of the SAAMBAT project, the piloting project would be able to overcome farmer/producer’s reluctant habits to recording their agricultural production data. It is hoped that this would, in turn, trigger a market demand-driven mechanism from better-off end-consumer of the traceability system for vegetables. It is recommended to repeat the same study for export commodity crops such as rice, mango, pepper, cashew nut etc. It is likely the need for such system is high due to the demand from the importing countries and to fulfill the export compliance standards requirement.

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## Appendix 1: List of questions for PDAFF

1. Name: \_\_\_\_\_
2. Position: \_\_\_\_\_
3. Location: District \_\_\_\_\_ Province \_\_\_\_\_
4. How many vegetable households in your district/province?
  - # of vegetable HH in district \_\_\_\_\_
  - # of vegetable HH in province \_\_\_\_\_
5. Please list the most grown vegetable in your areas and average production capacity per month including crop calendar (which vegetable grown in which month?)

#	Name of crop	Avg. production per month (kg)	Production month
a			
b			
c			
d			
e			
f			
g			

6. What are the main vegetables cultivating in your district/province?
  - ☐ a. Leafy
  - ☐ b. Root/bulb
  - ☐ c. Flower
  - ☐ d. Fruit
  - ☐ e. Spices
7. Are these vegetables for:
  - ☐ a. A local market supply
  - ☐ b. Domestic supply
  - ☐ c. Oversea export
8. Are those products sufficiently supplied to your local market?
  - ☐ a. Yes
  - ☐ b. No
9. If no, where do those vegetables import from?
  - ☐ a. Other province (\_\_\_\_\_)
  - ☐ b. Phnom Penh (\_\_\_\_\_ market)
  - ☐ c. Oversea-please specify (\_\_\_\_\_)
10. How many kg/tons do they import to your district/province per day/month? \_\_\_\_\_ kg
11. Do you know how many collectors are there in your areas? # \_\_\_\_\_
12. Please provide some names and contacts of collectors.

#	Name of collector	Contact	Location
a			
b			
c			
d			
e			



13. Do you think producers have separated between vegetables based on the standard of chemical-free, organic, chemical, CAMGAP vegetables?
- a. Yes, why? \_\_\_\_\_
- b. No, why not? \_\_\_\_\_
14. Do you think collectors separating the products per different sources i.e. farmer?
- ☐ a. Yes ☐ b. No
15. As per consumer's perspective, do you think they need to know where the products are from, who grow them, and do they spray insecticide?
- c. Yes, why? \_\_\_\_\_
- d. No, why not? \_\_\_\_\_
16. In your opinion to what extend do you think that the traceability system is important?
- ☐ a. Very important ☐ b. Important ☐ c. Not important ☐ d. Other \_\_\_\_\_
17. If there is a need for traceability system, who would be the right actors in the value chain to operate the system? Why? \_\_\_\_\_
18. Do you think that it is mandatory for farmers to record all production data?
- a. If yes, what techniques would you use to encourage farmer to record all Ag production data?
- \_\_\_\_\_
- b. No, why not? \_\_\_\_\_
19. Do you think there should be a traceability system for vegetable in order to prove the authenticity of the products and its provenance (for products safety tracing, building consumer trust, better price tag)?
- a. Yes, why? \_\_\_\_\_
- b. No, why not? \_\_\_\_\_
20. When the traceability system is in-place, would PD AFF invest or co-invest for on this system in the purpose of promoting the application of vegetable traceability system? assist to follow up this practice?
- a. Yes, why? \_\_\_\_\_
- b. No, why not? \_\_\_\_\_
21. Would you assist us to follow up the usage of this system by keeping all data records?
- ☐ a. Yes ☐ b. No

## Appendix 2: Questionnaire for AC & Producer Organization

### A. AC/PO profile

1. Interview Date: \_\_\_\_\_, Location: \_\_\_\_\_
2. Interviewee name: \_\_\_\_\_ Phone number: \_\_\_\_\_
3. Which group do you belong to? ☐ a. AC ☐ b. PO
4. Name of AC/PO: \_\_\_\_\_
5. Date of establishment \_\_\_\_\_
6. Type of buyers (choose only the dominated one answer)  
☐ a. Wholesaler at distribution center ☐ b. Village collector ☐ c. Distributor  
☐ d. retailer-shops or local market ☐ e. End-consumer
7. AC/PO Address: \_\_\_\_\_
8. Number of group members: \_\_\_\_\_ Female: \_\_\_\_\_ % of members below 35 years old: \_\_\_\_\_ %
9. # of villages in this AC/PO: \_\_\_\_\_, Name of villages: \_\_\_\_\_

### B. Production of vegetable

10. Type of vegetable produce  
☐ a. Leafy ☐ b. Root/bulb ☐ c. Flower ☐ d. Fruit ☐ e. Spices
11. What type of vegetable standard does the AC/PO produce?  
☐ a. Organic ☐ b. Chemical-free ☐ c. CAMGAP ☐ d. Other \_\_\_\_\_
12. Who do they supply to? \_\_\_\_\_
13. Who conduct the inspection and provide certification? \_\_\_\_\_
14. Please list the most grown vegetable in your areas and average production capacity per month including crop calendar (which vegetable grown in which month?)

#	Name of crop	Avg. production per month (kg)	Production month
a			
b			
c			
d			
e			
f			
g			

15. Does the group member record Ag production process?  
☐ a. Yes ☐ b. No. (Continue to Q18)
16. Which of the following info do the AC/PO member record?  
☐ a. Planting date ☐ b. Pesticide application ☐ c. Fertilizer application  
☐ d. Harvesting ☐ e. Selling to \_\_\_\_\_ ☐ f. Quantity ☐ e. All of above
17. what is the purpose of recordings? \_\_\_\_\_
18. Does the AC/PO practice of post-harvest management?

- ☐a. Yes                      ☐b. No. (Continue to Q20)
19. Which of the following post-harvest practices do you apply?
- ☐a. Cleaning              ☐b. Grading              ☐c. Packing              ☐d. Weighing
- ☐f. Transporting              ☐d. Storing              ☐e. All of above
- C. Buyer profile**
20. # of buyers bought: \_\_\_\_\_
- a. Name: \_\_\_\_\_, Contact: \_\_\_\_\_
- b. Name: \_\_\_\_\_, Contact: \_\_\_\_\_
- c. Name: \_\_\_\_\_, Contact: \_\_\_\_\_
21. Where are they from? \_\_\_\_\_
22. Does the buyer record any info from the AC/PO?
- ☐a. Yes                      ☐b. No (Go to Q24)
23. If yes, what are the info recorded?
- ☐a. AC/PO name              ☐b. Location              ☐c. Quantity              ☐d. Products type              ☐f. All of above
24. An offered price is based on which of the following?
- ☐a. Quality              ☐b. Market price              ☐c. a & b              ☐d. Other \_\_\_\_\_
- D. Products traceability info**
25. How do you distinguish between CAMGAP, chemical-free, or chemical vegetables?
- ☐a. Veg appearance              ☐b. Smell              ☐c. a & b              ☐d. Other \_\_\_\_\_
26. To what extend do you think that the traceability system is important?
- ☐ a. Very important              ☐ b. Important              ☐c. Not important              ☐ d. Other \_\_\_\_\_
27. If the traceability system is available, would you be interested in applying it?
- ☐ a. Yes. Why \_\_\_\_\_
- ☐ b. No. Why not? \_\_\_\_\_
28. If you were required to input data into the traceability system, would you do it?
- ☐ a. Yes. Why \_\_\_\_\_
- ☐ b. No. Why not? \_\_\_\_\_
29. Are you willing to invest or co-invest in setting up a system for farmer to input the data?  
(Printing barcode, barcode scanner)
- ☐ a. Yes. Why \_\_\_\_\_
- ☐ b. No. Why not? \_\_\_\_\_
30. What is your technique to encourage all group members to record all Ag production process?
- \_\_\_\_\_
31. Which AgVC actors would be the right person to operate this traceability system and why?
- \_\_\_\_\_
32. Would this system be suitable for vegetable value chain and why?
- \_\_\_\_\_

### Appendix 3: Questionnaire for Village Collector/Distributor

Date: \_\_\_\_\_

Location: \_\_\_\_\_

#### I. Village Collector/Distributor Profile

1. Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_
2. Sex: ☐ a. Male ☐ b. Female Age group: ☐ a. Younger < 35yrs ☐ b. > 35 year
3. Are you a village collector or distributor?  
☐ a. Village Collector ☐ b. Distributor
4. Do you have another job or income?  
☐ a. Yes ☐ b. No  
If Yes, what is it? \_\_\_\_\_

#### II. Information Collection

5. What type of vegetables do you buy?  
☐ a. Chemical-free ☐ b. Organic ☐ c. Chemical ☐ d. CAMGAP ☐ e. Any types  
If the answer is a, b, or/and d then continue to Q2 and if not then move to Q5
6. Do you conduct any organic inspection or certification?  
☐ a. If yes, name the institution \_\_\_\_\_ ☐ b. No
7. How often does the certified institution verify the certification procedure?  
☐ a. Monthly ☐ b. 6 monthly ☐ c. Annually ☐ b. Others \_\_\_\_\_
8. How long will the certification expire and require renewal?  
☐ a. 3 years ☐ b. 5 years ☐ c. Others \_\_\_\_\_
9. How often do you collect vegetable from the farmers?  
☐ a. Daily ☐ b. Weekly ☐ c. Others \_\_\_\_\_
10. Which value chain actors do you purchase veggies from?  
☐ a. Individual farmer ☐ b. PO name \_\_\_\_\_ ☐ c. AC \_\_\_\_\_ ☐ c. Others \_\_\_\_\_
11. How many individual farm, AC, or PO do you collect from? \_\_\_\_\_
12. What types of vegetable do you collect?  
☐ a. Leafy ☐ b. Root/Bulb ☐ c. Flower  
☐ d. Fruit ☐ e. Spices ☐ f. All of above  
In what quantity? \_\_\_\_\_
13. Do you collect on a seasonal basis?  
☐ a. Yes ☐ b. If No. Specify \_\_\_\_\_
14. What information do you record when buying from farmers or AC/PO?  
☐ a. Farmer profile & production dairy ☐ b. Only production dairy ☐ c. Others \_\_\_\_\_
15. Is there any collection center in your area?  
☐ a. Yes ☐ b. No  
If Yes, where is it located? \_\_\_\_\_
16. Do you conduct the quality control/post-harvest handling for collected vegetables?  
☐ a. Yes. Continue to Q13 ☐ b. No. Continue to Q14
17. Which of these practices do you conduct?  
☐ a. Cleaning ☐ a. Grading ☐ c. Packaging/repackaging  
☐ d. Labelling ☐ e. Transporting ☐ f. Storing/cold storage
18. Are you facing any challenges in collection process?  
☐ a. No ☐ b. Yes, specify? \_\_\_\_\_

### III. Distribution Information

19. Where do you sell the products to?  
☐ a. Local market \_\_\_\_\_ ☐ b. Neighboring province \_\_\_\_\_ ☐ c. Other \_\_\_\_\_
20. Who is your customer? (One-step forward process)  
☐ a. End-consumer ☐ b. Retailer ☐ c. Other \_\_\_\_\_
21. If you supply to retail shops, how many of them do you supply to? # of retail shops \_\_\_\_\_
22. How long does it take from collection to distribution?  
☐ a. 7 hours ☐ b. 1 day ☐ c. Other \_\_\_\_\_
23. Do you record any information during distribution process?  
☐ a. Yes ☐ b. No
24. If yes, what are the information do you record?  
☐ a. Supplier shipping address ☐ b. Delivery date ☐ c. Purchase order #  
☐ d. Gross weight ☐ e. Serial number ☐ f. Others \_\_\_\_\_
25. What is your distribution process?  
\_\_\_\_\_
26. How many distribution channels do you have?  
☐ a. Only 1 ☐ b. 3. Who are they? \_\_\_\_\_ ☐ c. Others \_\_\_\_\_
27. Are you able to meet the market demand on a daily basis?  
☐ a. Yes ☐ b. No. Why Not? \_\_\_\_\_
28. Are you facing any challenges in the distribution process?  
☐ a. If yes \_\_\_\_\_ ☐ b. No

### IV. Traceability Information

29. Do you know which products belong to which farmer? (One-step back process)  
☐ a. Yes ☐ b. No  
If Yes, How? \_\_\_\_\_
30. Does any of your retailer/customer wish to know the products origin?  
☐ a. Yes ☐ b. No  
If Yes, what do you think? \_\_\_\_\_
31. Do you incorporate any technology to track the sources of vegetable provenance?  
☐ a. Yes ☐ b. No. Continue to Q5  
If yes, what is that technology?  
☐ a. Barcode ☐ b. QR code ☐ c. RFID ☐ d. Other \_\_\_\_\_
32. Can you distinguish between chemical, chemical-free, or organic vegetables? (Organic Collector)  
☐ a. Yes ☐ b. No  
If Yes, How? \_\_\_\_\_
33. Can you distinguish between chemical vs. chemical-free vegetables?  
☐ a. Yes ☐ b. No  
If Yes, How? \_\_\_\_\_
34. To what extent do you think that the traceability system is important?  
☐ a. Very important ☐ b. Important ☐ c. Not important ☐ d. Other \_\_\_\_\_
35. If the traceability system is available, would you be interested in?  
☐ a. Yes ☐ b. No. Why not? \_\_\_\_\_
36. If you were required to input data into the traceability system, would you do it?

- ☐ a. Yes. Why \_\_\_\_\_ ☐ b. No. Why not? \_\_\_\_\_
37. Are you willing to invest in setting a system for farmer to input the data? (Printing barcode, barcode scanner)
- ☐ a. Yes. Why \_\_\_\_\_ ☐ b. No. Why not? \_\_\_\_\_
38. Which AgVC actors would be the right person to operate this traceability system and why?
- \_\_\_\_\_
39. Would this system be suitable for vegetable value chain and why?
- \_\_\_\_\_



## Appendix 4: Interview Activities

### Interviewing Vegetable Cleaning and Safety Control Center Staff in Kandal Province



### Interviewing AC, AIMS social mobilizer, Wholesale Distributor in Kampot province





Interviewing PDAFF deputy director and ASPIRE provincial management advisor in Kampong Speu



Interviewing AC, PO, Wholesale Distributor, Village collector in Battambang province







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