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## APPENDIX

### Appendix 1

#### CRFS indicator framework

Value chain Process areas	Indicators
Production	<p><b>I1:</b> Availability of local products labels</p> <p><b>I2:</b> Number of urban agriculture producers</p> <p><b>I3:</b> Number of farms in the city region for different food products</p> <p><b>I4:</b> Share of food coming from the city region versus imported</p>
Transport/storage/process	<p><b>I5:</b> Number, type and geographic spread distribution points in the city region</p> <p><b>I6:</b> Number of food wholesale and distribution business</p>
Processing	<p><b>I7:</b> Carbon foot prints city region food processing and manufacturing</p> <p><b>I8:</b> Diversity in food retail and catering in the city region</p> <p><b>I9:</b> Type of food categories/volumes of city region produced/processed food procured</p>
Price	<p><b>I10:</b> Consumer food price for different food products across different types of outlets in the city</p> <p><b>I11:</b> Source of food products that are sold wholesale or distributed in the city</p> <p><b>I12:</b> Price difference between farm gate and the retailer</p>

Source: (Fernando S., 2016a);(RUAF, 2015);(FAO, 2014)

## Appendix 2

<i>Objective</i>	<i>Main Research Question</i>	<i>Sub Research Questions</i>	<i>Indicators/ factors</i>	<i>Data Gathering Technique</i>	<i>Represented Question in the questionnaire</i>
<b>Objective One: To explain the current situation of various food value chains in the main food consumption categories in Colombo city region</b>	What are the main food value chains exist in the Colombo city region?	RQ1) What is food value chain & What are the models of food value chain?	(i).Stylised value chain mapping with horizontal and vertical elements (ii).Food and nutrition system: Subsystem and stages (iii).Traditional supply chain (iv).Hub and spoke model (v).Value chain model/ Porter’s value chain	Refer literature on value chain model and food value chain	Literature Review
		RQ2) What are the main food consumption categories in Colombo city region?	(i) Food expenditure in Colombo city region (ii).Food consumption in Colombo city region (iii). Food item categorization (iv). Selection of representative food category for the further analysis (Fruits & Vegetable)	Refer reports on agriculture economies /census and statistics/ Household consumer survey	Secondary data Analysis
		RQ3) What is the Fruits and vegetable value chain structure and dynamics in Colombo city region?	(i). F &V value chain structure (Actors/Processes) (ii).F & V distribution flow	-Semi-structured and in-depth interviews -Personal Observation -Focused –group discussion	Primary data Analysis /Discussion



<p><b>Objective Two: To identify the main issues in vegetable &amp; fruits value chain in Colombo city region</b></p>	<p>What are the main issues in vegetable &amp; fruits value chain in Colombo city region?</p>	<p>RQ4) What are the issues and challenges in the F&amp;V value chain in Colombo city region?</p>	<p>Issues and challenges in Food value chain , (broad categorization)</p> <ul style="list-style-type: none"> <li>-Fragmentation issues</li> <li>-Linkage and integration issues</li> <li>-Infrastructural issues</li> <li>-Storage/Packaging issues</li> <li>-Technological issues</li> <li>-Farmer’s knowledge and awareness issues</li> <li>-Quality and safety issues</li> <li>-Processing issues</li> <li>-Supply chain efficiency issues</li> <li>-Financial issues</li> <li>-Post-harvest losses issues</li> <li>-Transportation issues</li> <li>-Information issues</li> </ul>	<ul style="list-style-type: none"> <li>-Key informants interview (Semi-structured and in-depth interviews)</li> <li>*Farmers</li> <li>*Intermediaries</li> <li>* Retailers/Wholesalers</li> <li>*Consumers</li> <li>-Personal Observation</li> <li>-Focused –group discussion</li> </ul>	<p>Primary data Analysis/Discussion Thematic analysis</p>
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<p><b>Objective Three:</b> To ascertain the impact of issues and problems in F&amp;V value chain on urban food security</p>	<p>How the issues and problems in vegetable &amp; fruits value chain affecting on urban food security</p>	<p>(RQ5) What are the critical issue in F&amp;V value chain?  (RQ6) How these critical issues affecting on urban food security?</p>	<p><b>Stage 1:</b> Identified issues and problems are grouped according to the classification based on thematic analysis result, listed below act as causes. -Input &amp; production related issues -Infrastructure related issues -Public institutional support &amp; policy related issues -Finance related issues -Food market related issues</p> <p><b>Stage 2:</b> Using raw secondary data (Colombo consumer survey 2016), voice of the consumer were identified. voice of the Colombo city region consumers are identified with Colombo consumer survey (2016) and what are critical food security concerns they are facing at the current movement have been ranked based on the survey result and in-depth interview carried out with them. 1-10 (Very critical food security issue =10 &amp; Less critical food security issue=1) scale has been used and rate the Voice of the consumer.</p> <p><b>Stage 3:</b> -Upon completion of the cause and effect matrix experts were ask to rate correlation between causes and effect using 9-0 correlation rating system and Pareto analysis carried out to further validate the findings.</p>	<p>Panel of expert selected for the expert survey include, - Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) 3 - Central environmental authority 1 -Colombo municipal council 1</p>	<p>Thematic Analysis</p> <p>Secondary Data (Colombo Food Consumer Survey 2016)</p> <p>Expert Survey</p>
<p><b>Objective Four:</b> To identify few indicators to show problems related to F&amp;V value chain in Sri Lanka</p>	<p>What are the main indicators that show problems related to F&amp;V value chain in Sri Lanka?</p>	<p>RQ7) What are the main indicators for food value chain management?</p>	<p><b>(i) Production</b> <b>I1:</b> Availability of local products labels <b>I2:</b>Number of urban agriculture producers <b>I3:</b> Number of farms in the city region for different food products <b>I4:</b> Share of food coming from the city region versus imported</p> <p><b>(ii) Transport/storage/process</b> <b>I5:</b>Number, type and geographic spread distribution points in the city region</p>	<p><i>City Region Food System Colombo, Sri Lanka</i> <i>Food for the cities programme-Indicator Framework</i></p>	<p>Literature Review</p> <p>Literature Review</p>

			<p><b>I6:</b> Number of food wholesale and distribution business</p> <p><i>Food for the cities programme-Indicator Framework</i></p>	
			<p><b>(iii) Processing</b></p> <p><b>I7:</b> Carbon foot prints city region food processing and manufacturing</p> <p><b>I8:</b> Diversity in food retail and catering in the city region</p> <p><b>I9:</b> Type of food categories/volumes of city region produced/processed food procured</p> <p><i>City Region Food System Colombo, Sri Lanka</i> <i>Food for the cities programme-Indicator Framework</i></p>	Literature Review
			<p><b>(iv) Price</b></p> <p><b>I10:</b> Consumer food price for different food products across different types of outlets in the city</p> <p><b>I11:</b> Source of food products that are sold wholesale or distributed in the city</p> <p><b>I12:</b> Price difference between farm gate and the retailer</p> <p><i>City Region Food System Colombo, Sri Lanka</i> <i>Food for the cities programme-Indicator Framework</i></p>	Literature Review
		(RQ8) How these indicators are measured in Colombo city region?	<p>Discuss how these indicators can be measured with the Colombo city region using facts and figures. Statistical data need to be used to provide more comprehensive analysis with the support of primary data whenever necessary.</p> <p>Refer reports on agriculture economies /census and statistics/ Household consumer survey</p> <p>-Key informants interview *Farmers *Intermediaries * Retailers/Wholesalers *Consumers -Personal Observation -Focused –group discussion</p>	<p>Secondary Data Analysis</p> <p>Primary Data Analysis/Discussion</p>

<b>Objective Five:</b>  <b>To recommend policies and strategies to overcome issues in F&amp;V value chain to minimize food security related issues in urban areas</b>	What are the policies and strategies applicable to overcoming issues in F&V value chain?	(RQ9) What are the strategies /Policies that can implement to overcoming issues in F&V value chain?	Develop strategic framework with action plan to overcome issues in F&V value chain to minimize food security related issues in urban areas	Refer other country best practices	Literature Review
		(RQ10) How to conceptualize and assess the impact of issues in food value chain on city region food security?	Developing/modifying theoretical framework for assessing food value chain and food security	Findings derived in Expert Survey, key informants interview	Expert opinion Key informants interview & comments
				Author compile	Author compile

## **Appendix 3**

### **Appendix 3-1: Interview Transcript**

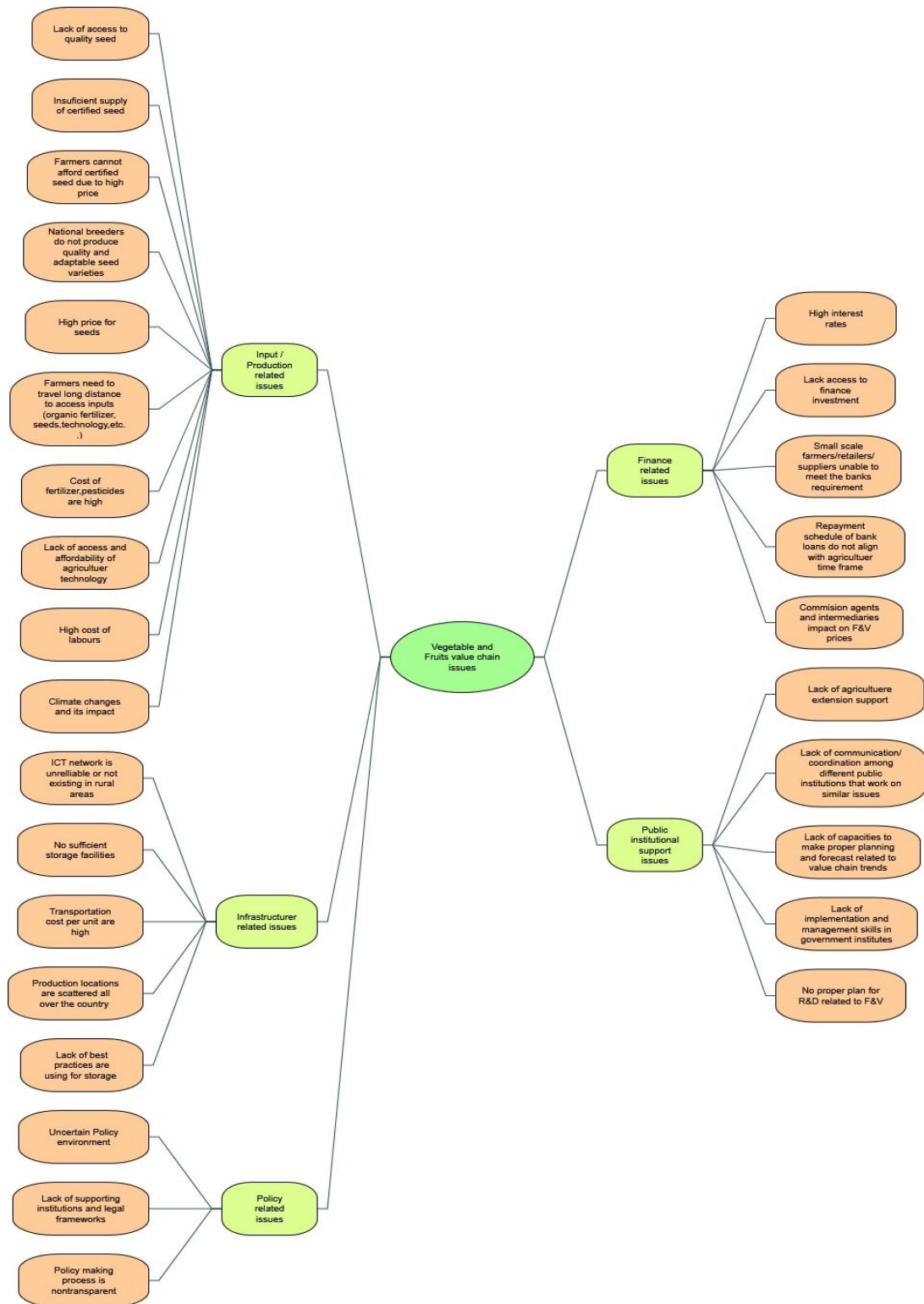
#### **Interview with Embilipitiya Farmer 5: MOV015/MOV016**

(Farmer with big banana plantation) Banana plantation is economically important. Due to the bad weather (dry season) I face some problems in plantation. Banana will effect " Goba hirawime rogaya". Govi jana sewa or other agriculture extension service not providing solution to this issues. In my land i have 2500 plants and out of those I need remove 200-250 plants due to this diseases. It is high for the banana varieties like kolikuttu. If we planted 1000 kolikuttu plant we can remove at least 500 plants due to diseases.

We are not using compost and we don't have facility to buy compost. For the easy use we consider chemical fertilizers. We don't have proper idea for usage of chemical fertilizer and still we didn't get any knowledge and training related to best fertilizer usage. Based on the money availability sometime we use lot of fertilizer and sometimes less amount. As per my opinion fertilizer subsidiary is not good for country and limitation of the subsidiary will reduce the chemical fertilizer usage. And it will impact the increase quality of the product.

Why I'm not using organic: we can't show in the market this product is created only with organic farming. There is no certification for that.so seller try to buy less price and no market for organic product. We have dedicated market for organic product (normal price 100 and organic 200) then we can go for organic farming. Due to the intermediaries and commission agent, we can't get high price. Always seller get the advantage. We don't do any cost benefit analysis. We spend and end of the day we get money for daily operation other than that no planning for cultivation.

## Appendix 3-2: Thematic Analysis: Main themes derived from the F&V chain issues





## Appendix 4

	Estate Sector more than 20 acres			Small sector Less than 40 Perches			Small sector More than 40 Perches			All sectors		
	No of holdings	Ha	%	No of holding (based on	Ha	%	No of holding (based on	Ha	%	No of holding	Ha	%
<b>1. Colombo</b>	<b>124</b>	<b>6295</b>	<b>1.6</b>	<b>23996</b>						<b>27425</b>		
				<b>9</b>	<b>8799</b>	<b>9.1</b>	<b>34162</b>	<b>19402</b>	<b>1.1</b>	<b>5</b>	<b>34496</b>	<b>6.4</b>
2. Gampaha	406	7788	2	33017	1551	16.0	11112	60072	3.5	44171	83377	10.3
				7	7		7			0		
3. Kalutara	334	24204	6.3	15577	7040	7.3	95526	59734	3.5	25163	90978	5.9
				5						5		
4. Kandy	347	29394	7.6	11355	5637	5.8	13831	64084	3.7	25221	99115	5.9
				3			0			0		
5. Matale	271	13005	3.4	28944	1686	1.7	77860	55403	3.2	10707	70094	2.5
										5		
6. Nuwaraeliya	253	61651	16	31108	1157	1.2	85258	26746	1.6	11661	89555	2.7
										9		
7. Galle	244	12396	3.2	11522	5183	5.3	12800	69535	4.0	24347	87114	5.7
				6			4			4		
8. Matara	299	13206	3.4	79233	3755	3.9	10802	65392	3.8	18755	82353	4.4
							0			2		
<b>9. Hambantota</b>	<b>118</b>	<b>4787</b>	<b>1.2</b>	<b>47525</b>	<b>3197</b>	<b>3.3</b>	<b>10534</b>	<b>86541</b>	<b>5.0</b>	<b>15298</b>	<b>94525</b>	<b>3.6</b>
							<b>6</b>			<b>9</b>		
10. Jaffna	10	249	0.1	89379	5123	5.3	43132	21143	1.2	13252	26516	3.1
										1		
12. Mannar	7	2954	0.8	9777	444	0.5	9273	13592	0.8	19057	16990	0.4
13. Vavuniya	6	103	0	12876	812	0.8	26494	25403	1.5	39376	26319	0.9
14. Mullativu	41	978	0.3	6271	490	0.5	22361	23769	1.4	28673	25238	0.7
11. Kilinochchi	180	4125	1.1	5533	482	0.5	22066	25930	1.5	27779	30536	0.6
15. Batticaloa	57	1597	0.4	95269	3973	4.1	35117	42312	2.5	13044	47882	3.0
										3		
16. Ampara	23	2838	0.7	84277	3450	3.6	68983	83125	4.8	15328	89413	3.6
										3		
17. Trincomalee	7	1567	0.4	42161	2063	2.1	34602	34747	2.0	76770	38377	1.8
<b>18. Kurunegala</b>	<b>182</b>		<b>11.</b>	<b>11470</b>			<b>29152</b>	<b>22283</b>		<b>40805</b>	<b>27301</b>	
	<b>8</b>	<b>42612</b>	<b>1</b>	<b>2</b>	<b>7570</b>	<b>7.8</b>	<b>2</b>	<b>0</b>	<b>12.9</b>	<b>2</b>	<b>1</b>	<b>9.5</b>
19. Puttalam	136									18176	10384	
	5	26598	6.9	89678	4448	4.6	90721	72802	4.2	4	8	4.2
20. Anuradhapura	66	3111	0.8	39932	2709	2.8	18520	20949	12.2	22520	21531	5.2
							2	8		0	7	
<b>21. Polonnaruwa</b>	<b>62</b>	<b>9537</b>	<b>2.5</b>	<b>26298</b>	<b>1726</b>	<b>1.8</b>	<b>78747</b>	<b>76187</b>	<b>4.4</b>	<b>10510</b>	<b>87450</b>	<b>2.4</b>
										7		
<b>22. Badulla</b>	<b>196</b>	<b>35941</b>	<b>9.3</b>	<b>56766</b>	<b>2518</b>	<b>2.6</b>	<b>12505</b>	<b>74708</b>	<b>4.3</b>	<b>18201</b>	<b>11316</b>	<b>4.2</b>
							<b>1</b>			<b>3</b>	<b>7</b>	<b>4.2</b>



23. Moneragala	97	7098	1.8	14108	929	1.0	10360 3	11802 8	6.8	11780 8	12605 5	2.7
24. Ratnapura	614	38950	10. 1	72036	3810	3.9	17039 4	10744 3	6.2	24304 4	15020 2	5.7
25. Kegalle	362	34279	8.9	82828	4476	4.6	10979 6	64674	3.8	19298 6	10342 9	4.5
<b>Sri Lanka</b>	<b>731 7</b>	<b>38526 3</b>	<b>10 0</b>	<b>19834 01</b>	<b>9699 4</b>	<b>100. 0</b>	<b>23006 77</b>	<b>17231 00</b>	<b>100. 0</b>	<b>42913 95</b>	<b>22053 57</b>	<b>100. 0</b>
		<b>17.5</b>			<b>4.4</b>			<b>78.1</b>				

## Appendix 5

### Large residential Markets in Colombo city region



Source: <http://colombo.mc.gov.lk/other-maps.php>

**Appendix 6**  
**Expert Survey: Cause and effect matrix**

Cause and Effect Matrix for city region food security-Expert Survey										
Correlation Rating system 9=High correlation 4=Medium correlation 1=Low correlation 0=No correlation Blank=Not yet determined	Correlation of Input to Output									
	6	9	7	8	6	7	9	8	8	
Main Theme	Output: Food Security Impact									
	Availability			Access		Utilization		Stability		
	Unavailability of different F&V types	Unavailability of healthy/nutritious F&V choice	% of food expenditures to total food expenditures	Lack accessibility of fresh healthy/nutritious F&V choice	Less awareness of organic F&V	Lack of knowledge about quality, and nutrition value of the F&V	Less stability in F&V prices	Lack of Stability of F&V supply		
Importance										
	<b>Input: Potential causes</b>									
	Issues and Problems									
Input & production related issues	1	High cost of fertilizer, pesticides	2	Farmers need to travel long distance to access inputs (eg: organic fertilizer...)	3	Lack of access and insufficient supply of quality seeds	4	High price of certified seeds	5	Lack of access and affordability of agriculture technology
Infrastructure related issues	6	High cost of labor and young generation reluctant to involve in farming	7	Weather pattern changes and inverse impact on F&V cultivation	8	Production locations scattered all over the country & high cost of transportation	9	Lack of storage facilities	10	ICT network is unreliable or not existing in rural areas
Public institutional support & policy related issues	11	Lack of agriculture extension support	12	Lack of communication and coordination among different public institution that work on similar issues	13	Lack of capacities to make proper planning and forecast related to F&V value chain trends	14	Uncertain policy environment and non-transparent policy making	15	Small scale farmers, suppliers and retailers unable to meet the bank requirement when financing activities & high interest rates
Finance related issues	16	Repayment schedule of bank loans do not align with agriculture time frame	17	Food safety concerns in Colombo markets	18	Commission agents and intermediaries impact on F&V price	19	Export market orientation and organic product market consideration is not properly analyze		