

# SUPPLY CHAIN MANAGEMENT OF FRUITS AND VEGETABLES, QUALITY ASPECTS AND PROSPECTIVE DEVELOPMENT THROUGH EFFECTIVE BUSINESS PROCESSES.

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# COMPARISON AND HARD FACTS

FACTS	HUNGARY (2008)*	PAKISTAN (2008)**
Production (M tons)	2.90	12.60
Processing level/ Value addition (%)	80-85	12-13
Annual loss (%)	3-4	30-35
F&V Pack Houses	400	210
Employment (%) of Whole Food Processing Industry	4.5	16

Sources: \*Agriculture Statistics of Hungary  
\*\* Agriculture Statistics of Pakistan

# Supply Chain Management

Management of  
the entire value-added chain  
from the supplier  
to the manufacturer right through  
to the retailer and  
the final customer.

# General SCM Process

INFORMATION

## SUPPLIERS

- Materials
- Parts
- Sub-assemblies
- Services

## PRODUCERS

- Finished goods
- Services

## DISTRIBUTORS

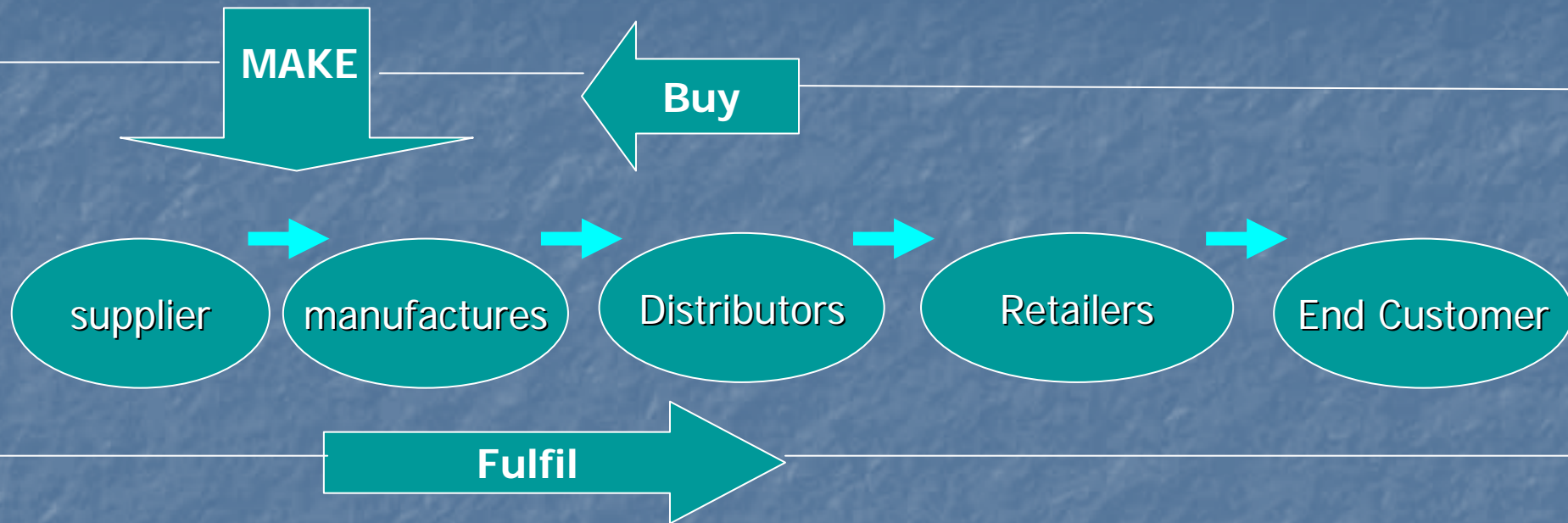
- Delivery
- Packaging and then Delivering

## CUSTOMERS

- Total Satisfaction with
- Quality
  - Price
  - Delivery
  - Service

CASH

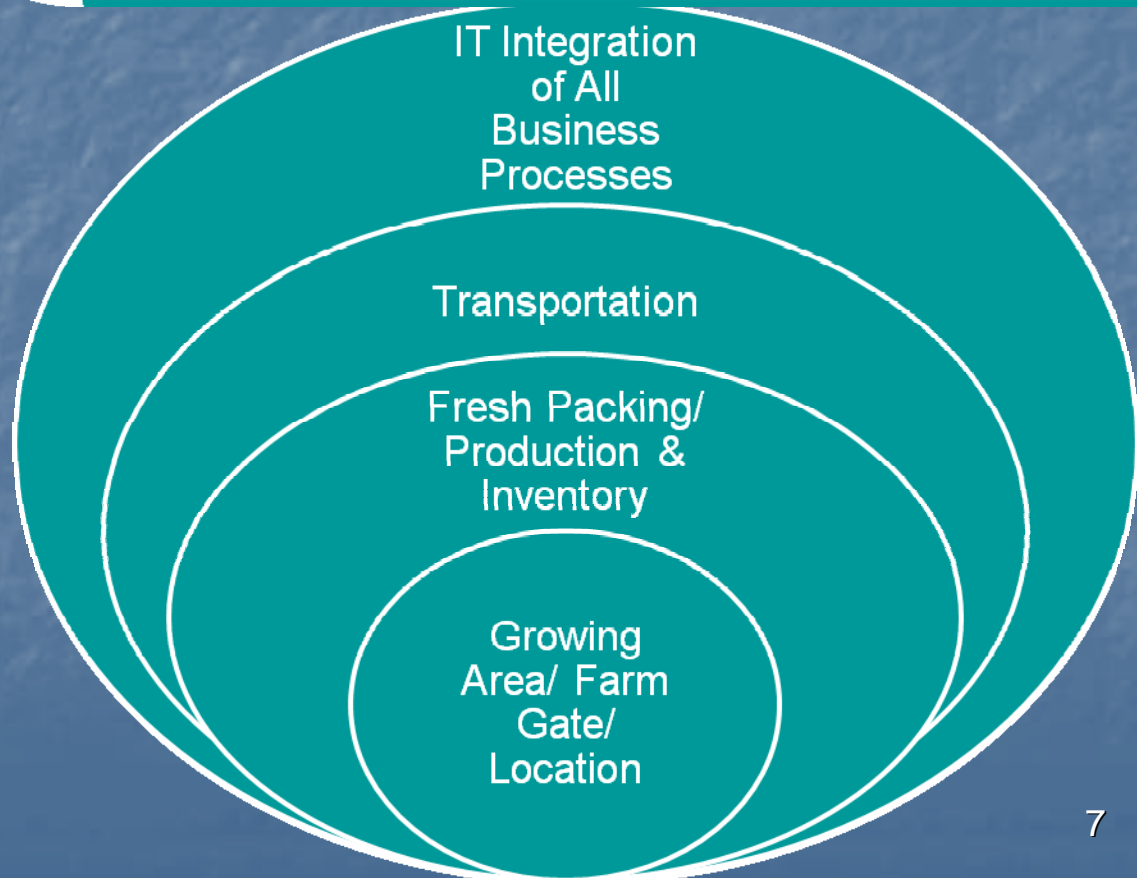
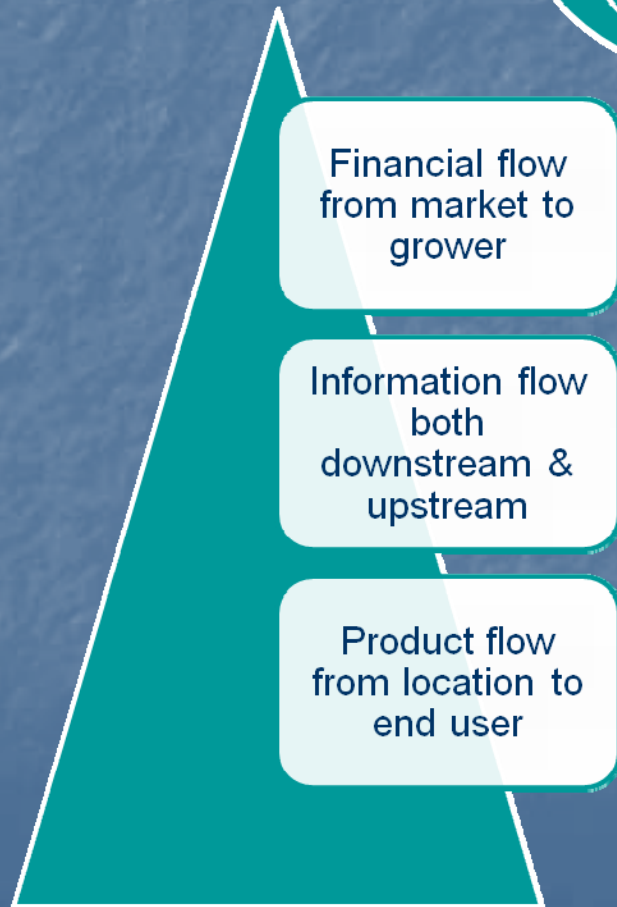
# Key Activities of General Supply Chain Management



- **Buy** : Purchasing of goods and services required to make your products
- **Make**: Producing your finished products
- **Fulfil** : Ensuring your customer receives your product

# Practical Flow and Outcome of SCM of F & V

Reduce	<ul style="list-style-type: none"><li>•Inventory</li><li>•Lead time</li><li>•Returns</li></ul>
Traceability to help	<ul style="list-style-type: none"><li>•Avoid health risk</li><li>•Provide accurate info for trace back</li></ul>
Increase in	<ul style="list-style-type: none"><li>•Transaction</li><li>•Sales</li></ul>



# Problem of Study

Inefficient application and implementation of SC system of fruits and vegetables to its soul due to the lack of detailed research study regarding:

- i. the development and standardization of specific methodology to collect information of each business process and
- ii. the problems encountered throughout the whole chain.



# Objectives of the Study

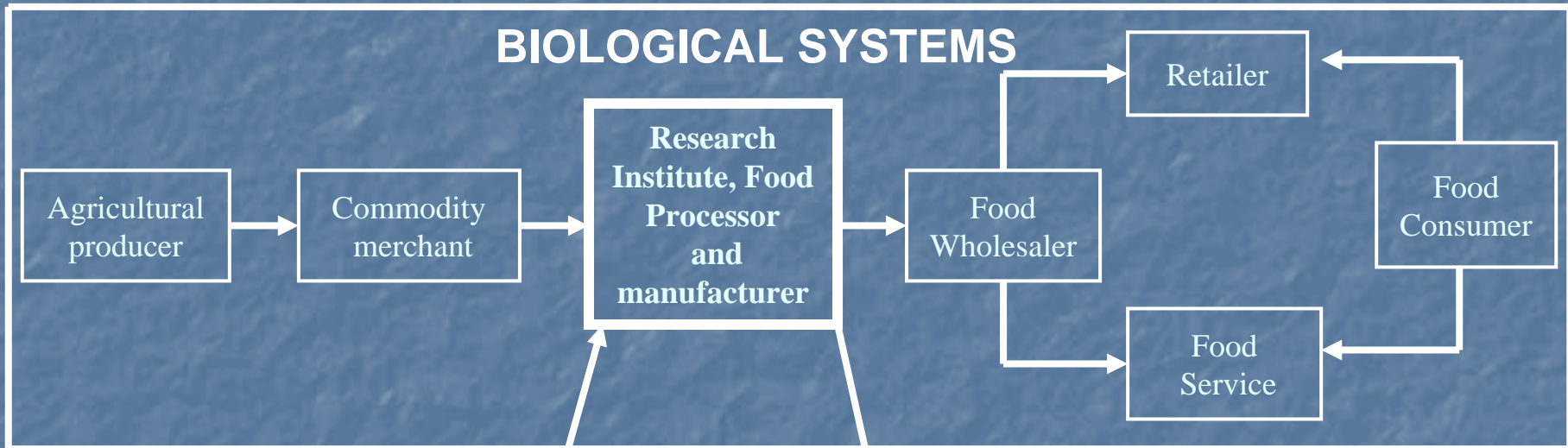
1. To develop new standardized methodology of collecting information regarding the various business processes
2. To chalk out the system-oriented gaps present in the form of AS-IS and TO-BE Approaches.
3. To re-design and propose required business processes in order to develop an effective SCM system for this industry.

# FOOD SYSTEM

INPUT AND FACILITATING  
INDUSTRIES



BIOLOGICAL SYSTEMS



Imports



Regulatory  
Institutions

Exports

# Safe Food System/ SCM



Food System

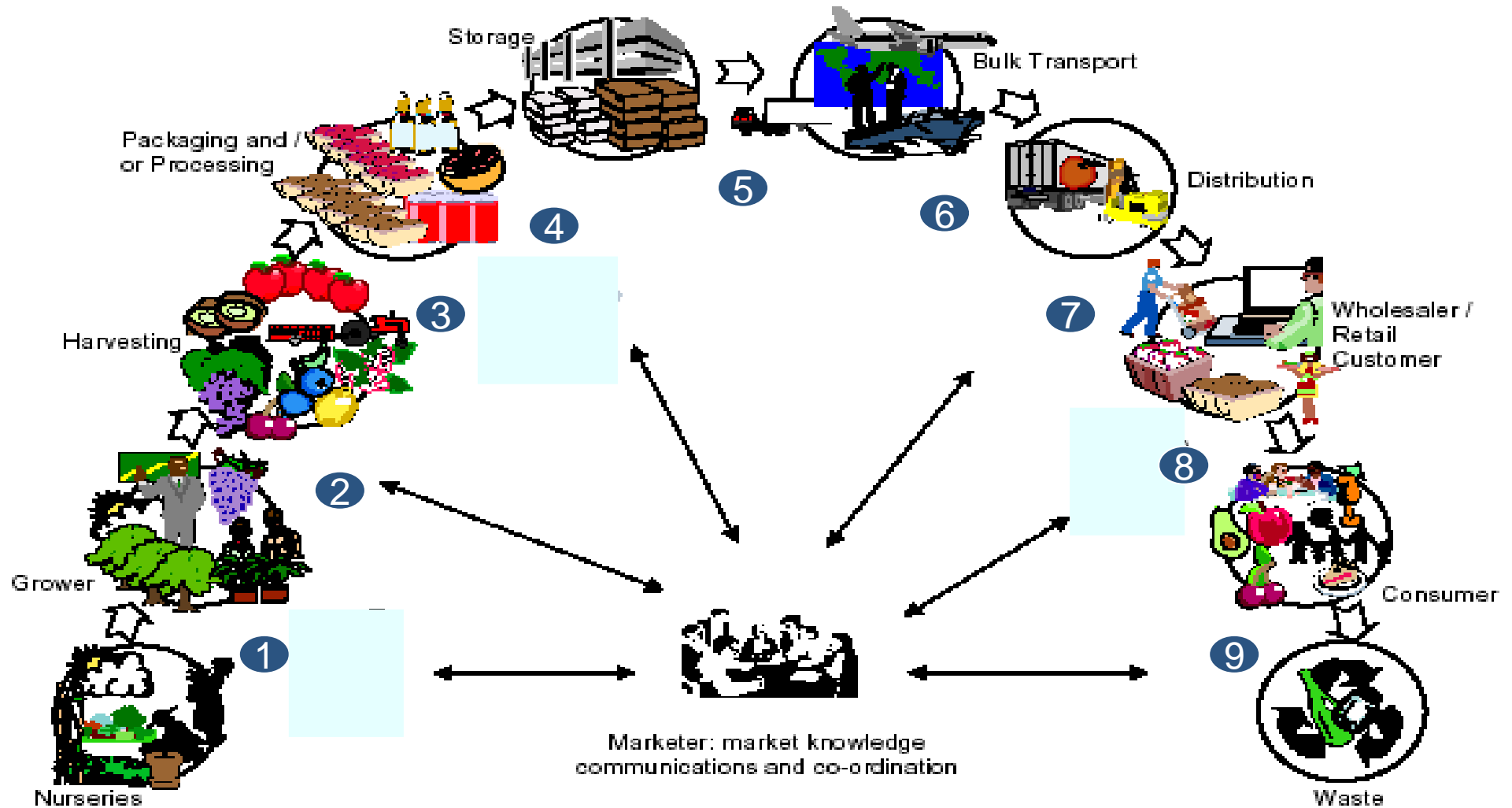
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Quality Assurance

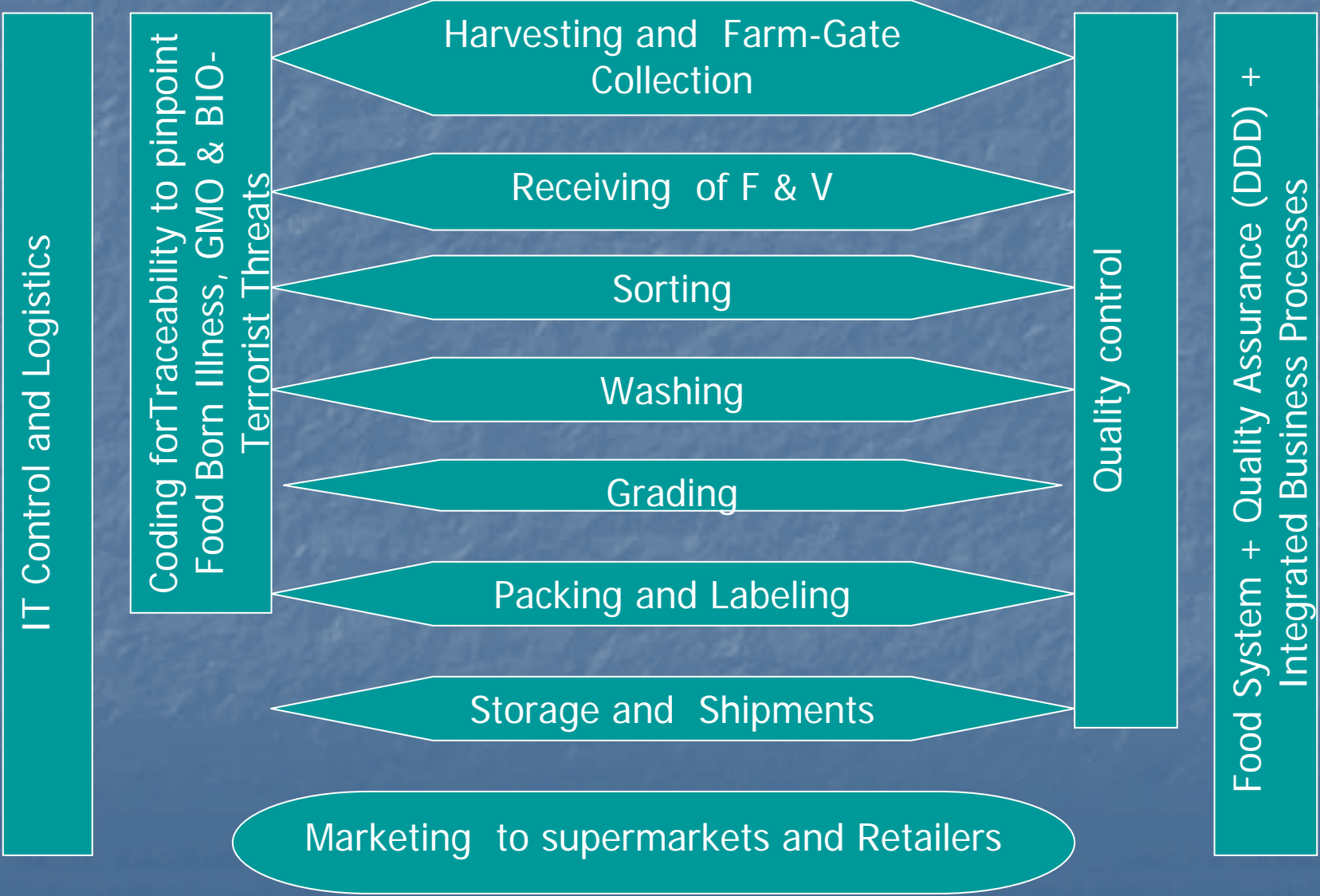
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Integrated Business  
Processes

# General Orchard to Market Chain Activities



# FLOW CHART - SCM OF FRUITS AND VEGETABLES



Step 1:  
Development of New  
Standardized Methodology  
by Using  
Mind Mapping  
Technique

# Purposes/ Uses

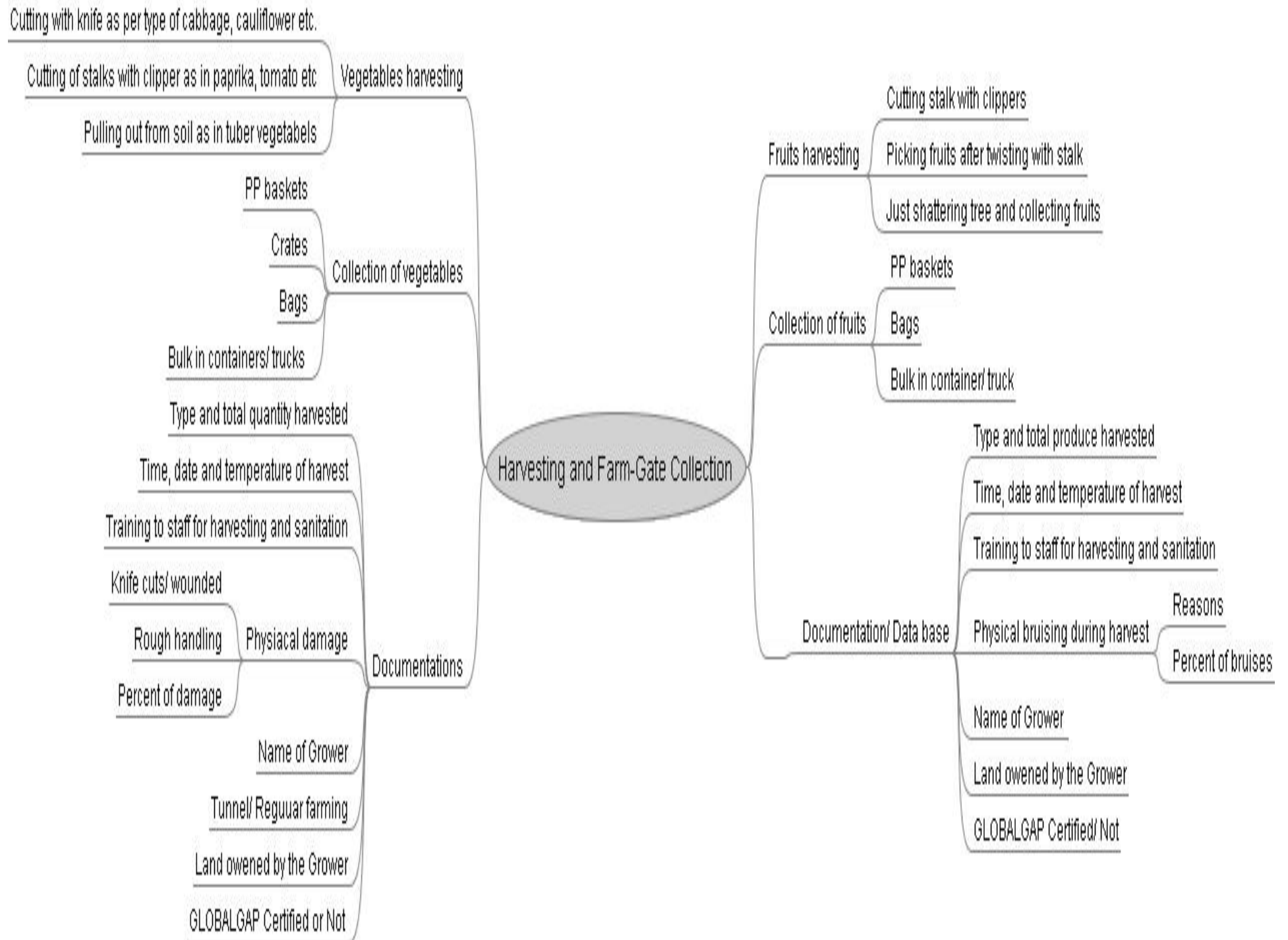
Mind maps can be used for:-

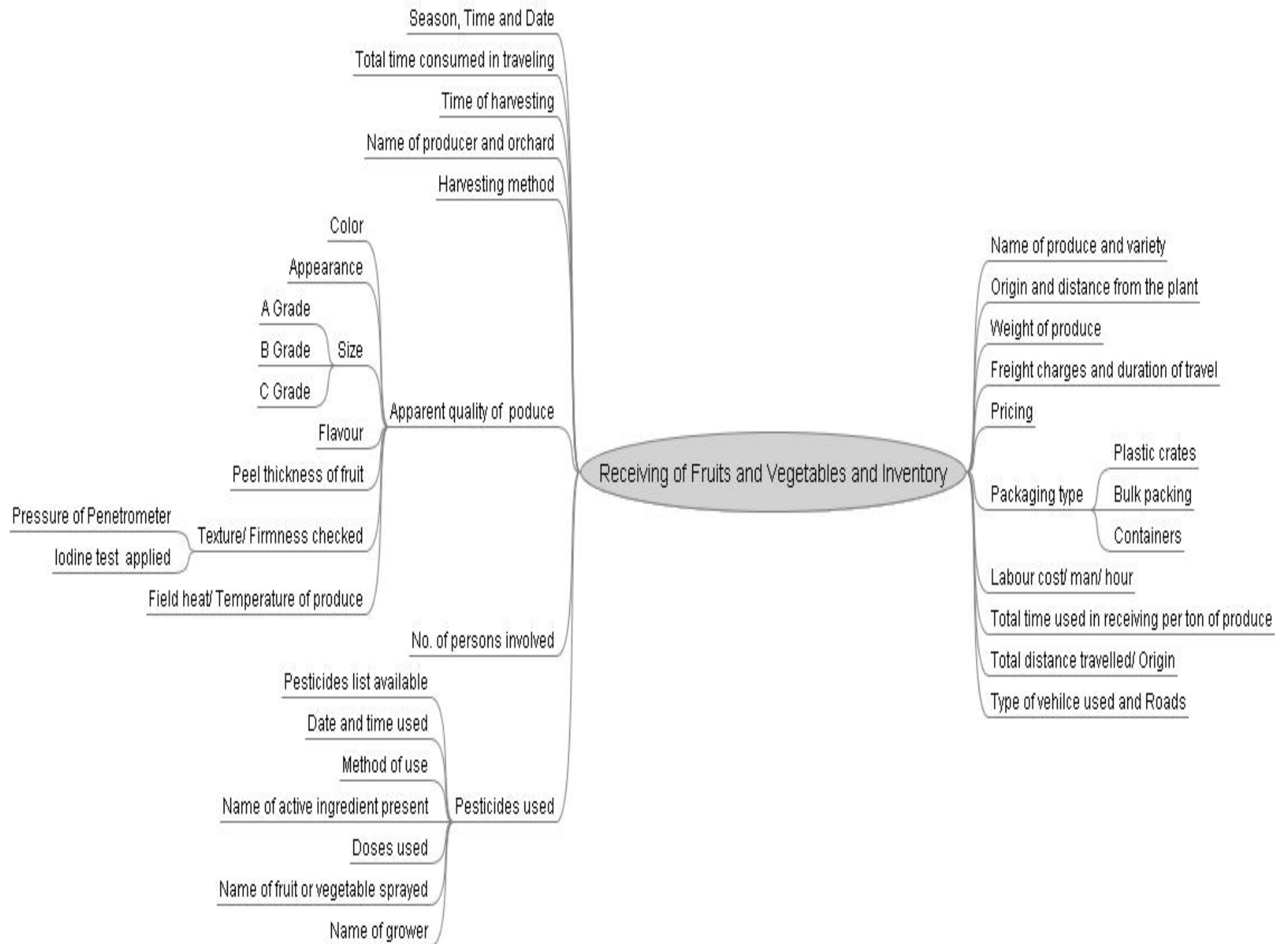
1. Problem Solving
2. Outline / Framework Design
3. Anonymous collaboration.
4. Marriage of words and visuals.
5. Individual expression of creativity.
6. Condensing material into a concise and memorable format.
7. Team building or synergy creating activity.
8. Enhancing work morale.

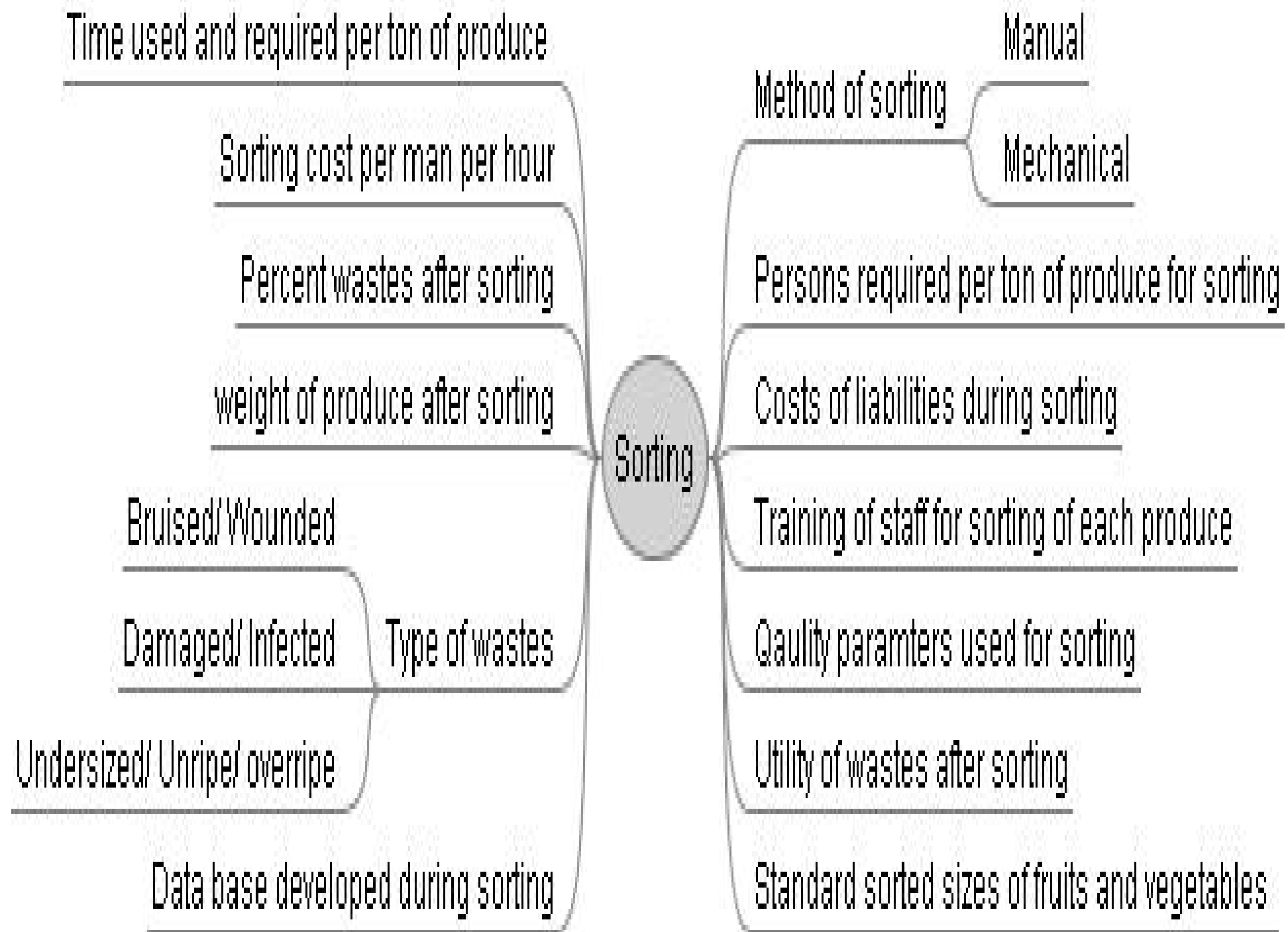
A **mind mapping** is a technique to draw diagram used to represent words, ideas, tasks, or other items linked to and arranged around a central key word or idea.

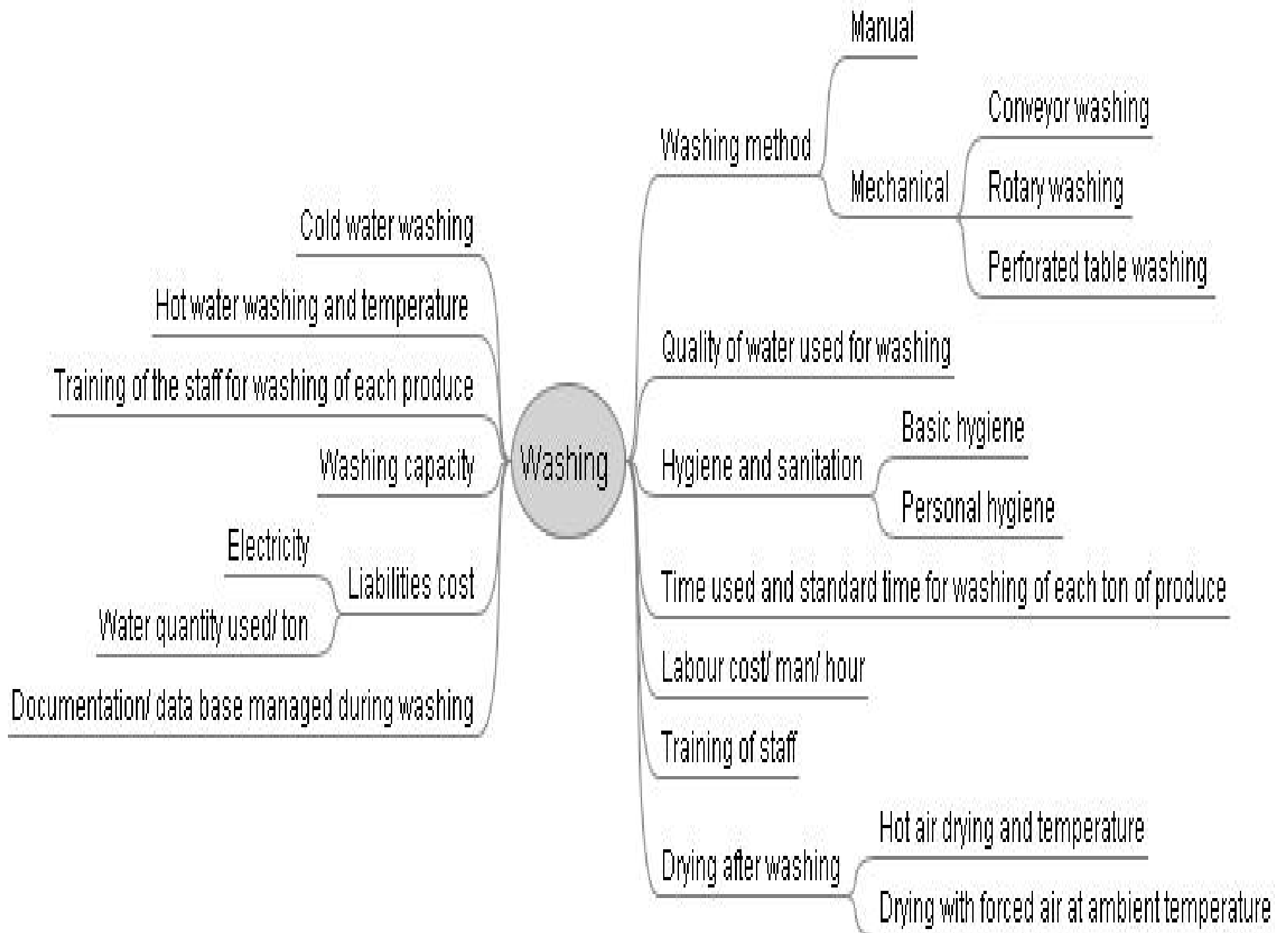
(Wikipedia)

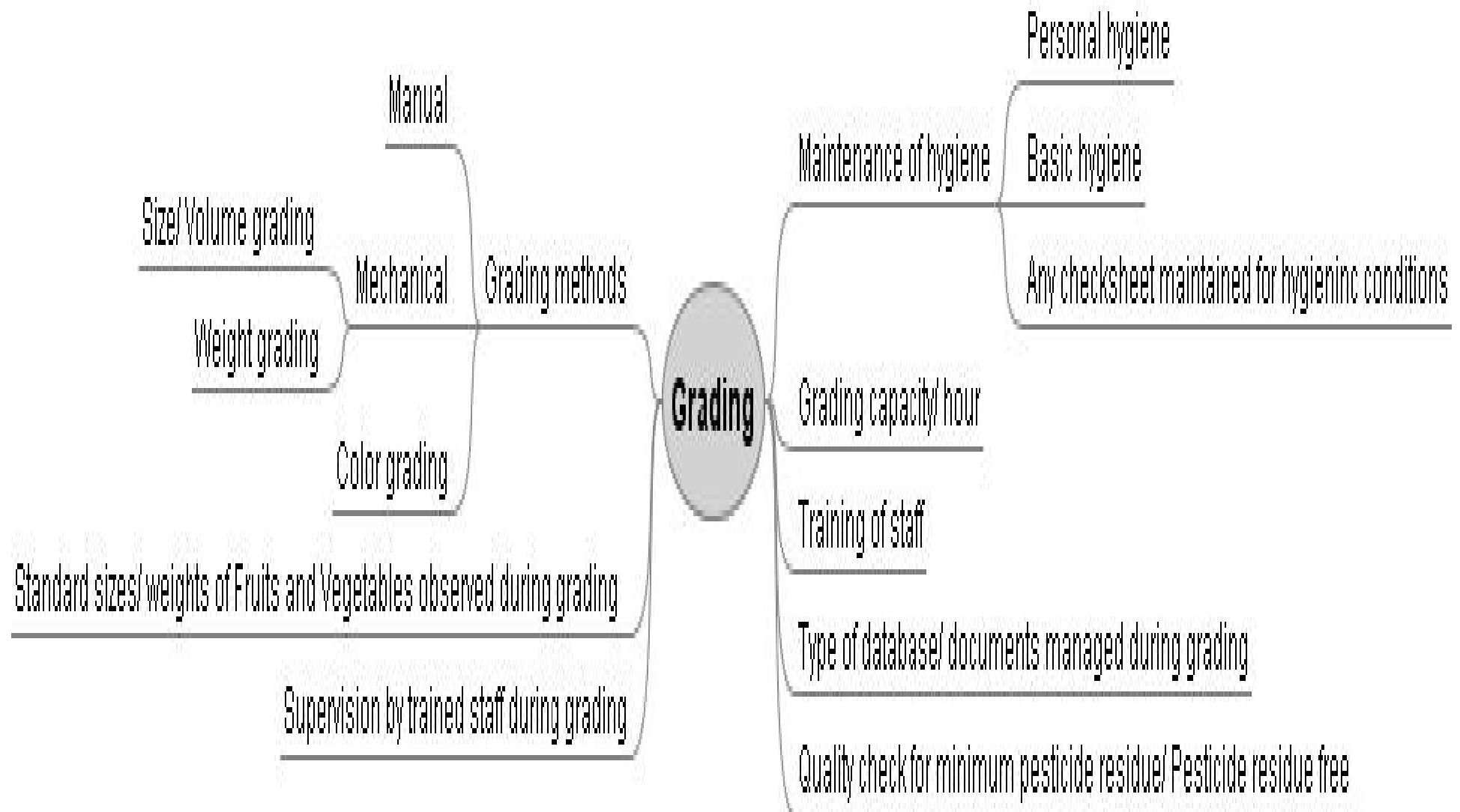


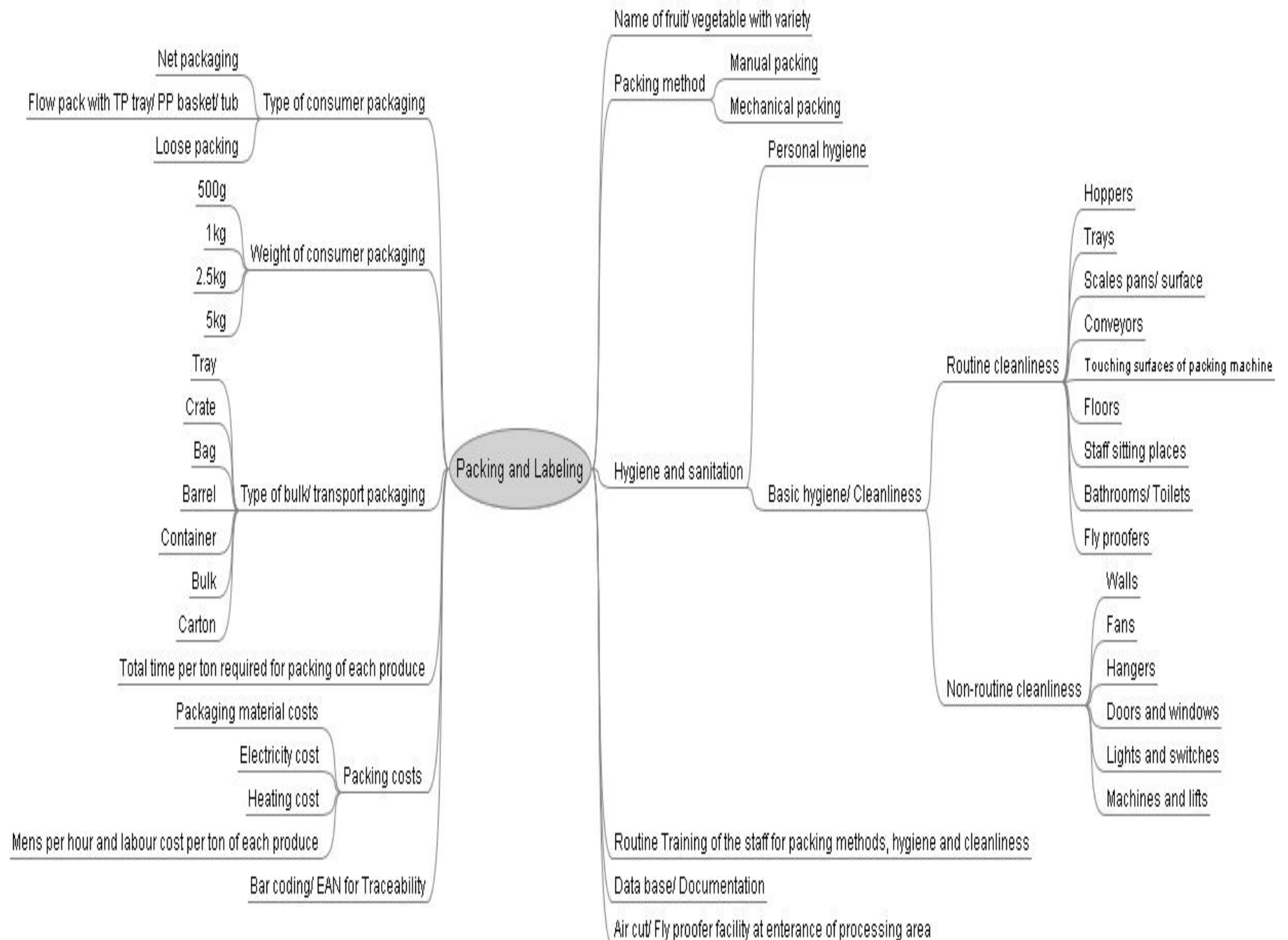




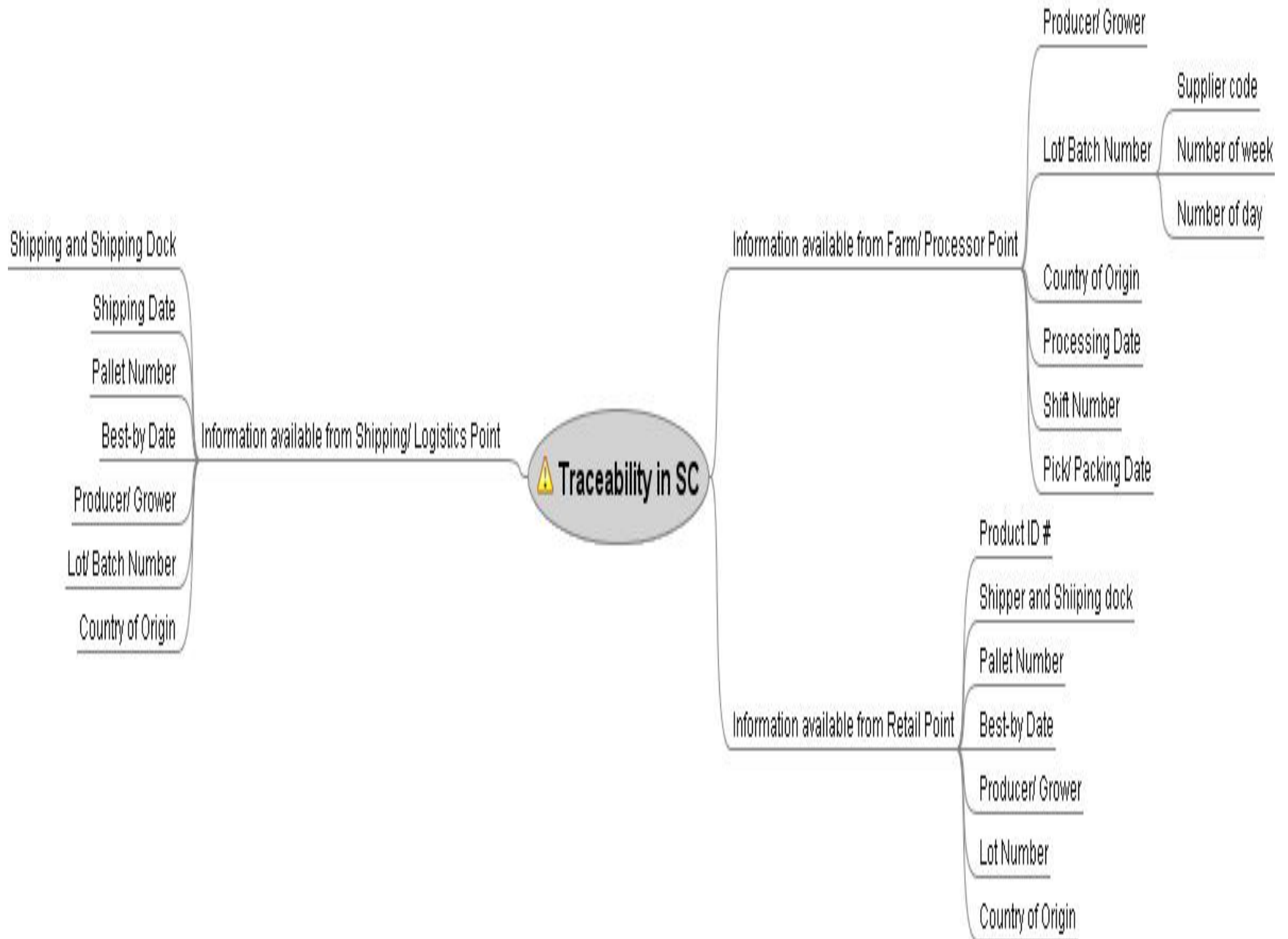
















**⚠ Quality Assurance and SCM**

Quality Control

Physico-chemical Analysis

- Colour
- Flavour
- Size/ Volume/ Weight
- Peel Thickness
- Taste
- Internal pressure of fruits
- Juice yield of fruits
- % Acidity for fruits
- Damage during transportation
- Eggs of fruit fly

Microbiological Examination

- Total Plate Count
- Listeria monocytogenes*
- Salmonella*
- Escherichia coli*
- Fungi

Physical Treatment/ Requirements

- Vapour heat treatment (VHT)
- Hot water treatment
  - Temperature for each produce
  - Time for each produce
- Freezing treatment for citrus fruits
  - Time
  - Temperature
- Quarantine certificate



# Development of New Questionnaire Methodology

## Questionnaire to Study the Supply Chain Management of Fruits and Vegetables

S#	Questions	FruitVeb. Organization/ Supplier of Fruits and Vegetables	Garten Ltd./ Processing Unit/ Processor	Callidatis Kft/ IT Control and Logistics Facilitator
1	What are the mission and objectives of this organization?	X	X	X
2	What are the various varieties of fruits and vegetables being grown in this country?	X		
3	What are the seasons and harvesting times and periods of these horticulture produce?	X		
4	What is the total and individual production of these fruits and vegetables with growing areas in hectares?	X		
5	What is the year wise production for the last five years of this country?	X		
6	What are the farm-gate prices of various fruits and vegetables grown?	X		
7	How much quantity of fruits and vegetables are wasted every year during pre and post harvest management?	X		

8	How much quantity of these fruits and vegetables are being consumed fresh as open and packed form?	X	X	
9	How much percentage of these produce is utilized to develop other value added products like, juices, drinks (both hard and soft), jams, jellies, marmalades, pickles etc. every year?	X		
10	What is the marketing system of fruits and vegetables in this country?	X	X	
11	How many intermediaries play their parts in marketing of these horticultural commodities?	X	X	
12	Fruits and vegetables are perishable in nature. Is there any special logistic facility such as refrigerated containers/ trucks used to bring them from field to market?	X	X	
13	Is there any EU binding being observed for transportation and other logistics activities for export?	X	X	
14	Has any data base been developed for growers, type of produce being grown, the land occupied and also the inputs involved?	X	X	
15	Whether GLOBALGAP practices are being followed and observed by the various growers in this country and does EU has certain bindings in this regard?	X		
16	Do the growers provided with extension services regarding training of GLBALGAP and do they follow these standards?	X	X	

17	Does government provide any incentive to the growers/ farmers to follow the GLOBALGAP standards/ practices and also monitor?	X		
18	Does your organization provide any particular incentive for the small farmers to follow the GLOBALGAP?		X	
19	Did your organization appoint an inspection team to observe continuously, whether the small farmers follow the GLOBALGAP standards?		X	
20	Is there any data base being managed during supply chain regarding origin and type of produce, time and date of harvest, harvesting method, total distance travelled and time spent from farm gate through growers/ orchards, traders, commission agents and to the processors, weight of produce, and apparent quality while receiving fruits and vegetables?	X	X	
21	How the produce is loaded and packed in bulk in the trucks?	X	X	
22	Is there any cool chain system applied during transportation and what temperature range is maintained for each produce, during travelling?	X	X	
23	What is the temperature of refrigeration kept during transportation from farm to processing unit?	X	X	
24	What kinds of fruits and vegetables this organization deals with?		X	
25	Who are your customers? What needs and expectations they share and how you cater them?		X	30

26	Does your organization exporting these fruits and vegetables to EU and Non-EU countries?		X	
27	If answer is yes, then how much quantity per annum of each produce is exported?		X	
28	Who are the main customers in those countries?		X	
29	Whether this organization conducts production/ market forecasting each year, and if then how it is made?	X	X	
30	How you come up with buyer's specifications and also do they communicate with you regarding their future needs?		X	
31	If yes, then how earlier this planning is made?		X	
32	What is the mean of communication, either, via email, personal visits or by telephone with the supermarkets and other customers?		X	
33	How does this organization pass on the needs and feedbacks of your buyers to the growers?		X	
34	Do you have regular meetings with growers to grow the particular type of fruits and vegetables according to the needs of market?	X	X	
35	If answer is yes, then how earlier and in what months, these meetings are conducted?	X	X	

36	Does this organization certified for any safe food management standard like ISO 22000, HACCP, International Food Standards (IFS) or GLOBALGAP?		X	
37	Whether quality control standards related to appearance, size, color weight and damage of the produce are applied while receiving at these processing units?		X	
38	Pesticides may cause some risk to human health. Whether the list of pesticides used by the farmers and other information regarding the name, date and time of use, name of active ingredient present and doses and also the number of times pesticides used, is compulsory to documented while receiving these each fruit or vegetables?		X	
39	Whether both physico-chemical and microbiological laboratories have been established in your organization?		X	
40	How the hoppers, working tables, weighing balances, conveyor belts and other fruits and vegetables contact surfaces are cleaned and sanitized before and after use?		X	
41	How sorting is done and which method is used while sorting each fruit and vegetable, after receiving?		X	
42	Whether the employees deployed for sorting are trained and educated for methods of sorting, sorting quality standards etc. for each produce?		X	
43	Which method is used for sorting: manual or mechanical?		X	
44	Is there any documentation or data base being managed during sorting process regarding number persons required and cost per hour, weight before and after sorting, time required per ton, liabilities coasts, percent wastes and type of wastes including undersized, unripe, bruised, wounded, contaminated etc. of each fruit and vegetables?		X	



45	As fruits and vegetables are perishable and potential contaminants, so, whether all the wastes packed separate and removed immediately from the work place?		X	
46	How does field heat removed from each produce after receiving, by cold water dip or refrigeration or cold air?		X	
47	Is washing carried out for each fruit and vegetable and if yes, then whether done with normal water or mild dose of any antimicrobial agent is used?		X	
48	Does this antimicrobial agent is permissible and listed in Codex alimentarius and used in the dose as recommended?		X	
49	Which washing method is used, manual or mechanical?		X	
50	What is the length of washing conveyor and time required for washing?		X	
51	Is washing carried out in batch or done continuously and also does it followed by hot air drying?		X	
52	Is washing process being documented for number of men and cost per hour, liabilities cost, time required per ton etc., for each fruit and vegetable?		X	
53	Is hot water dip or vapour heat treatment carried out to unload the microorganisms from the skin/ peel of apple, citrus and other fruits and vegetables?		X	
54	Whether the job description of each level employee has been designed and handed over?		X	
55	Whether the mission statement or quality policy is displayed at various places and also known by each level employee in the organization?		X	
56	Whether all the employees have been trained for personal and basic hygiene?		X	33

57	Are the checklists for personal and basic hygiene being maintained daily before the inception of production for each business process and who is maintaining them, in order to avoid contamination?		X	
58	Is the smoking area separated from work place to avoid contamination?		X	
59	Whether all the employees are checked for personal hygiene before entering the processing or work area in each shift?		X	
60	Is there any air cutter or some particular device installed at the main door to avoid transfer of contamination from out to in the work area?		X	
61	Whether all the employees are trained for receiving, sorting, washing, grading, packing and storage of various varieties of these produce, throughout the process line?		X	
62	Whether the employees are trained after certain stipulated intervals or when training becomes important?		X	
63	Whether the employees are provided with all the necessary tools such as dresses, gloves, caps and shoes for avoiding any health problem and also the cross contamination?		X	
64	How grading of various fruits and vegetables such as apple, berries, strawberry, pear, apricot, peach, plum, potatoes, onion etc. is carried out?		X	
65	What type of grading facility is available in this organization? Sieve, size/ volume, weight or color grader is available?		X	
66	What is the capacity (tones/ type of produce) of this grader/ hour or in 8 hours of shift?		X	
67	Would you please help furnishing with the markets required sizes/ EU countries standards for marketing of these fruits and vegetables?		X	
68	What type of documentation/ data base is maintained during grading?		X	
69	What are the liabilities and men hour cost for each kg of these fruits and vegetables calculated during grading?		X	34

70	What type of packaging materials are being accepted and used in EU countries?		X	
71	What packs and weights are normally demanded by the supermarkets and other mega stores in EU countries, for various produce?		X	
72	Whether the various information mentioned below is printed on the packs to communicate with the users? <ul style="list-style-type: none"> <li>•Name of produce and variety</li> <li>•Weight (g)</li> <li>•Batch/ Lot number</li> <li>•Directions to store and use</li> <li>•Date of packing</li> <li>•Date of expire or use before</li> <li>•Price</li> <li>•Bar Coding/ European Article Number (EAN)</li> </ul>		X	X
73	What type of special information is required by these markets on various packs?		X	
74	How the packaging is done and what type of machine/ model and made of being used?		X	
75	What are the capacities of these packing machines, depending upon the type of produce?		X	
76	Traceability is an important issue now-a-days in food chain system, how it is carried out by this organization and also how the food recalls are handled?		X	X
77	In case of recalls or any health risks involved, what corrective actions are taken in this regard?		X	
78	What documentations are being managed during packing process?		X	
79	What are the liabilities and men hour costs being experienced during packing?		X	35

80	Is there any checklist being maintained during packaging process for both qualitative and quantitative parameters such as: <ul style="list-style-type: none"> <li>•Appearance of produce</li> <li>•Color</li> <li>•Grading size</li> <li>•Weight (g)</li> <li>•Packaging appearance and quality/ Machine efficiency</li> </ul>		X	
81	Food safety and microbiological tests are correlated with each other. Whether each lot is being checked for microbiological tests for Total Plate Count (TPC), <i>E. Coli</i> , <i>Salmonella</i> and <i>Listeria monocytogenes</i> bacteria?		X	
82	How the Controlled Sample from each lot/ batch is maintained? How many days is it kept at ambient temperature, for any change in quality?		X	X
83	Is there any checklist or documentation being maintained during storage regarding the various parameters mentioned below of each produce? <ul style="list-style-type: none"> <li>•Temperature and humidity of storage for each produce</li> <li>•Identification mark and batch number</li> <li>•Size of pallets</li> <li>•Stacking height</li> <li>•Date and time of storing</li> <li>•Distance (in ft) among the pallets</li> <li>•Last In First Out (LIFO) order</li> <li>•Specific type of packaging</li> </ul>		X	
84	How many cold stores are there in this organization and what are their dimensions?		X	
85	What type of refrigeration system is used in cold stores and how much time is consumed to achieve the required temperature?			
86	Whether the storage temperatures and humidity conditions required by each horticultural produce are known by each worker in storage area?		X	36

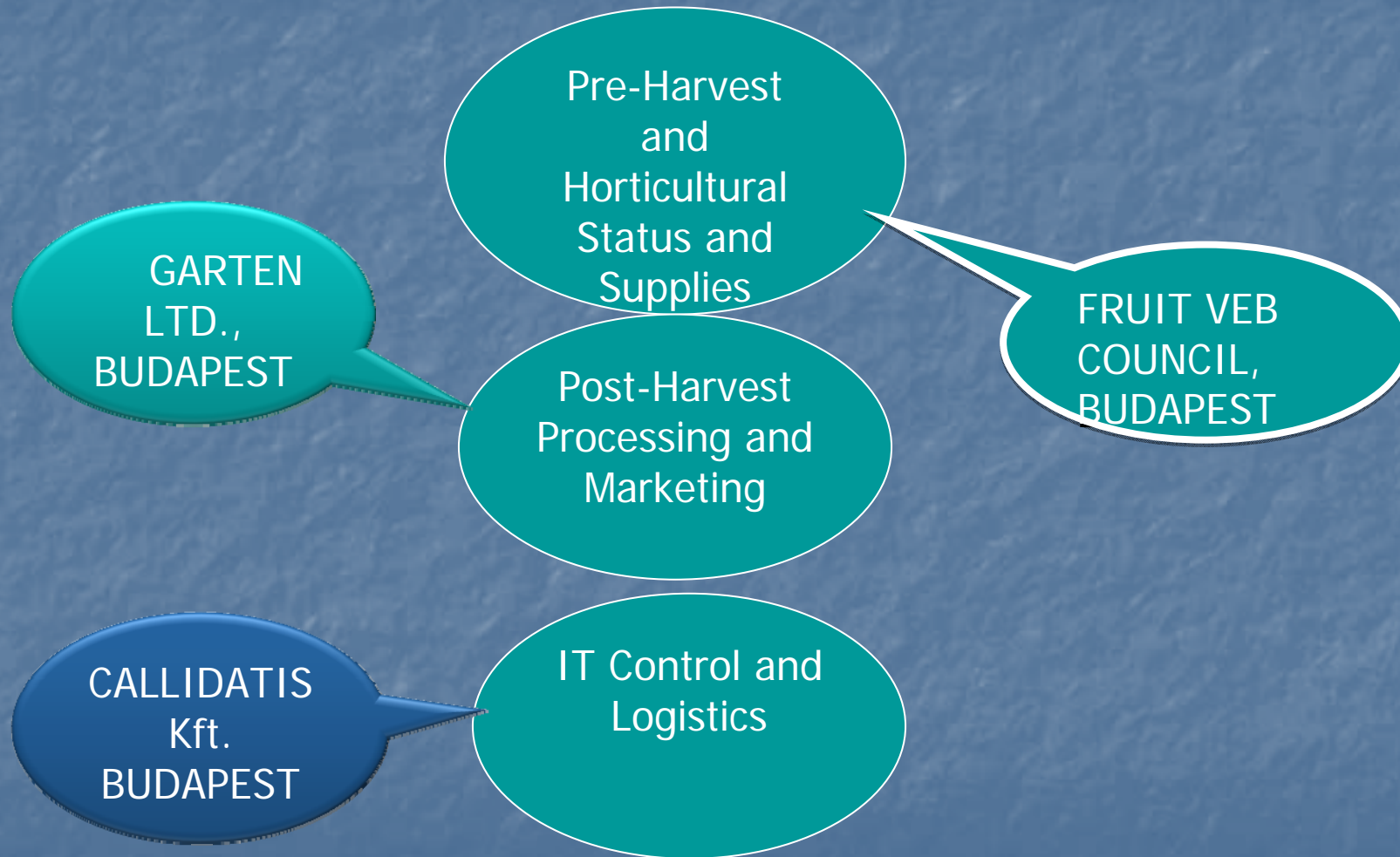
87	Whether the accuracy of thermostats used is checked periodically?		X	
88	What are the storage/ warehouse cost (liabilities and men hour costs) per ton per hour of each produce?		X	X
89	What is the cleanliness schedule of store area/ warehouse?		X	
90	Is trespassing allowed in the store or restricted to personnel working in store area?		X	
91	What about the fork lift being used in processing and store area, is it battery operated?		X	
92	What is the importance of integrated logistics in SCM of fruits and vegetables and how is it managed in this organization?		X	X
93	How this whole supply chain system in this organization is integrated through IT?		X	X
94	How the master data related to company customers, suppliers, items or raw materials, fruits and vegetables and their processing and logistics routing, is managed and integrated in this organization?		X	X
95	How the purchasing and receiving of fruits and vegetables, packaging materials, chemicals used in quality control analysis and for managing basic hygiene are managed and made efficient?		X	X
96	What are the various documents including purchase orders and invoicing carried through from purchasing, selling, stocks and warehouse maintenance through delivery of finished stocks to the customers end in the whole supply chain system?			X
97	What are the ultimate benefits of IT integrated logistics facilities in whole supply chain from farm gate to the supermarkets and retailers and also to the efficient marketing of fruits and vegetables in this country?			X

# Importance of the Questionnaire

- Standardised questionnaire
- 97 questions
- To cover every aspects of SCM in F&V
- For future use of further researches
- Ability to compare results
- Helps to chalk out the gaps
- Pretested through consultations & used in this research

# Step 2: Field Study

# Field Study

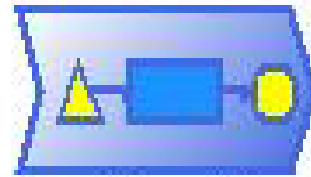




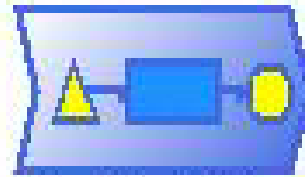
**Step 3:**  
**Development of New Business**  
**Processes by Using**  
**ADONIS Tool**  
**(A Bridging Tool Between**  
**AS-IS and TO-BE Approach)**



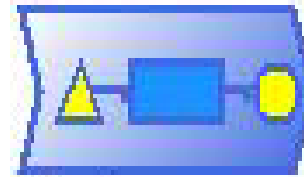
## Core processes



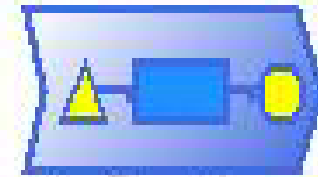
Harvesting and Farm Gate Collection Process



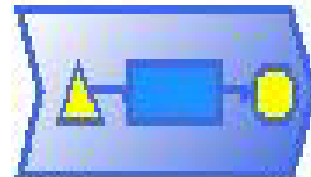
Receiving of fruits and vegetables and inventory



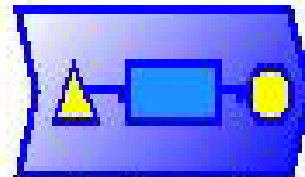
Sorting process



Washing process



Grading process of fruits and vegetables

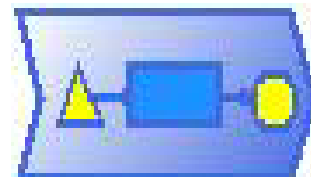


Packing and labeling of fruits and vegetables

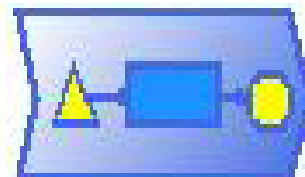


Storage and shipment process

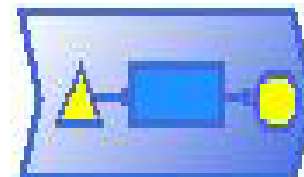
## Supporting processes



Traceability and supply chain process



Quality assurance and SCM



IT integrated logistics

Figure 15: Unit operations of harvesting and farm gate collection process of fruits and vegetables

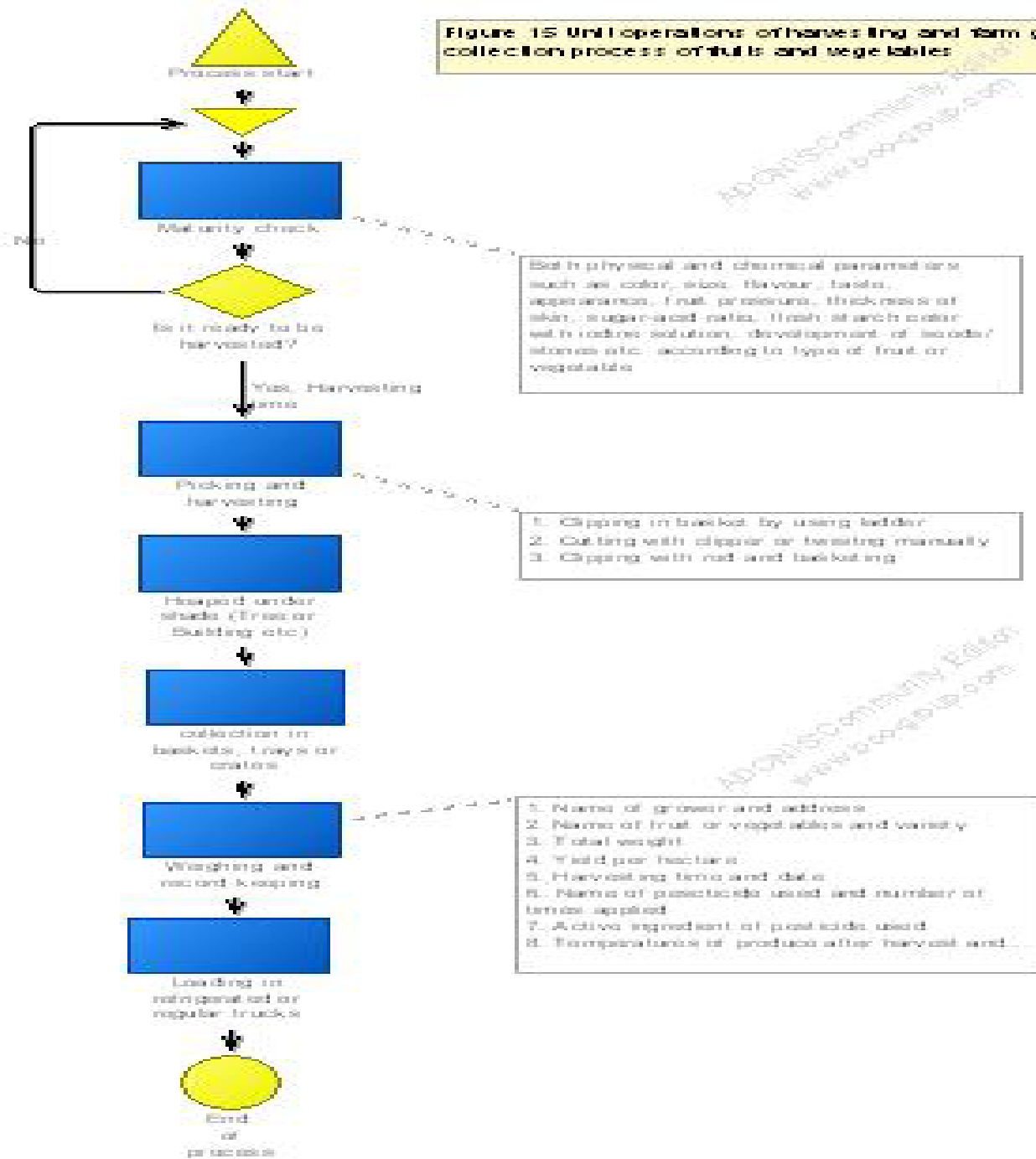
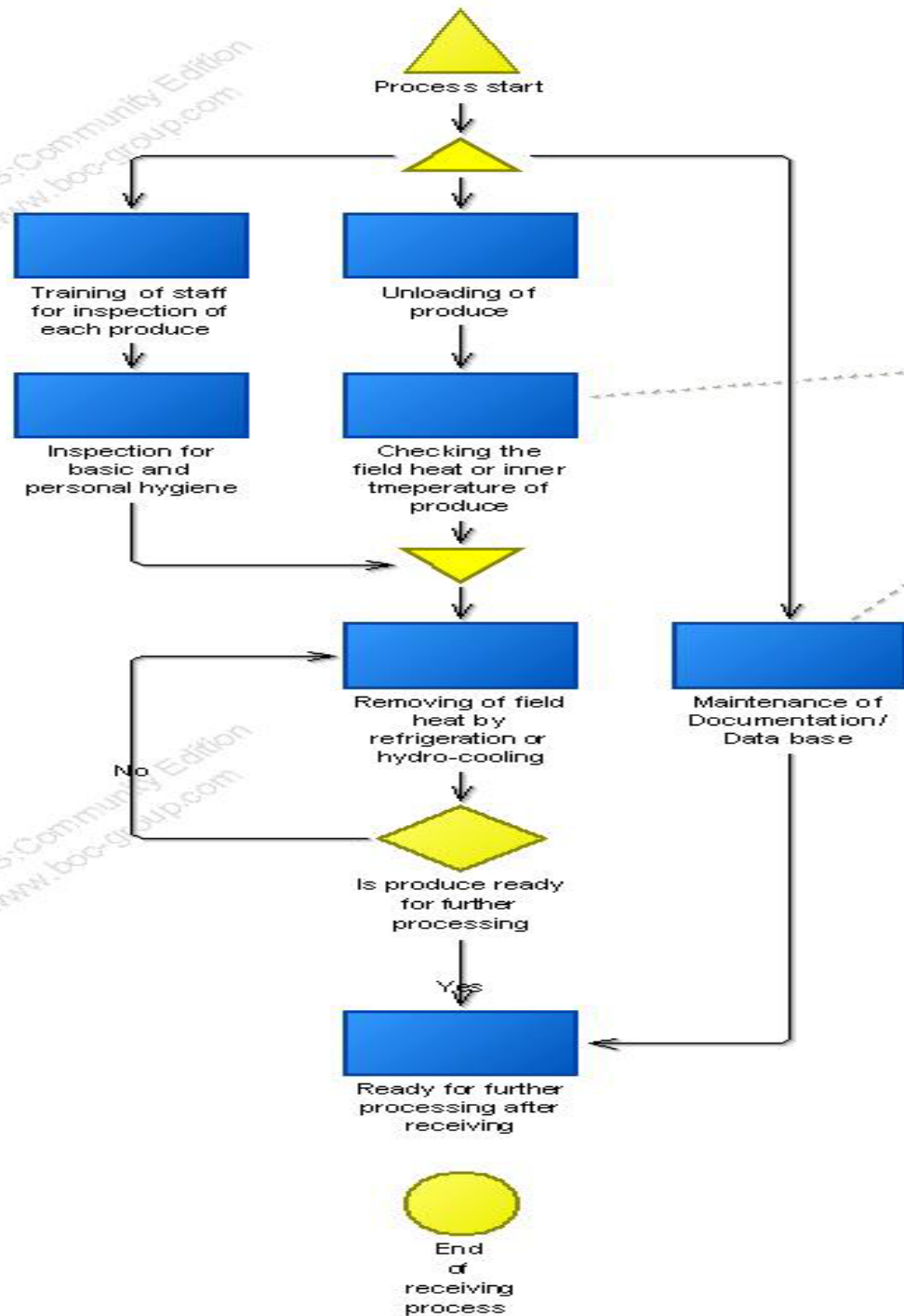


Figure 16 Unit operations of receiving of fruits and vegetables and inventory process



Checking of produce for field heat or temperarue and physical appearance such as color, size, bruises etc

Maintenance of data base as

1. Job card for batch/ lot number, name and type of produce, name of grower and / supplier, shift start time and date, shift supervisor name, total produce received, ..
2. Maintenance of checksheet for personal hygiene routine of staff including daily bath/ shower, teeth brushing, fingernails, uniform or protective clothing, covering of cuts and burns if any with clean waterproof dressing during work, routine health check-up, any worker if infected with flue or cough and sneezing or spitting or with skin, throat or bowl trouble etc .
3. Similarly maintenance of checksheet of basic hygiene including cleaned floor , working tables or areas, working conveyors, surfaces touching produce, weighing scales and other equipments, packing and labeling machines, toilets, etc .
4. Data base of smoking staff and to depute non-smoking staff preferably in all working areas.

Figure 17 Unit operations of sorting process of fruits and vegetables

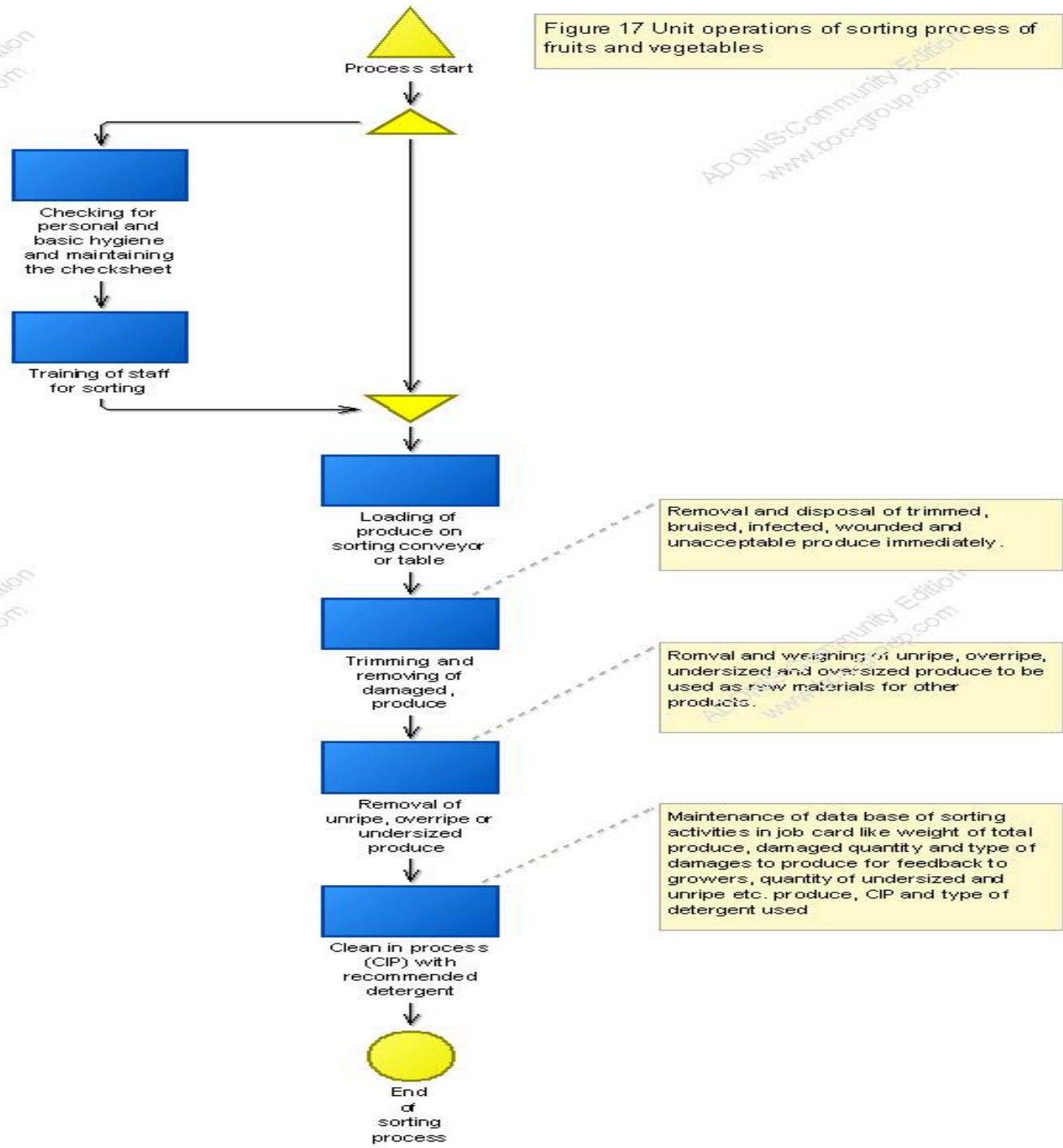


Figure 18 Unit operations of washing process of fruits and vegetables

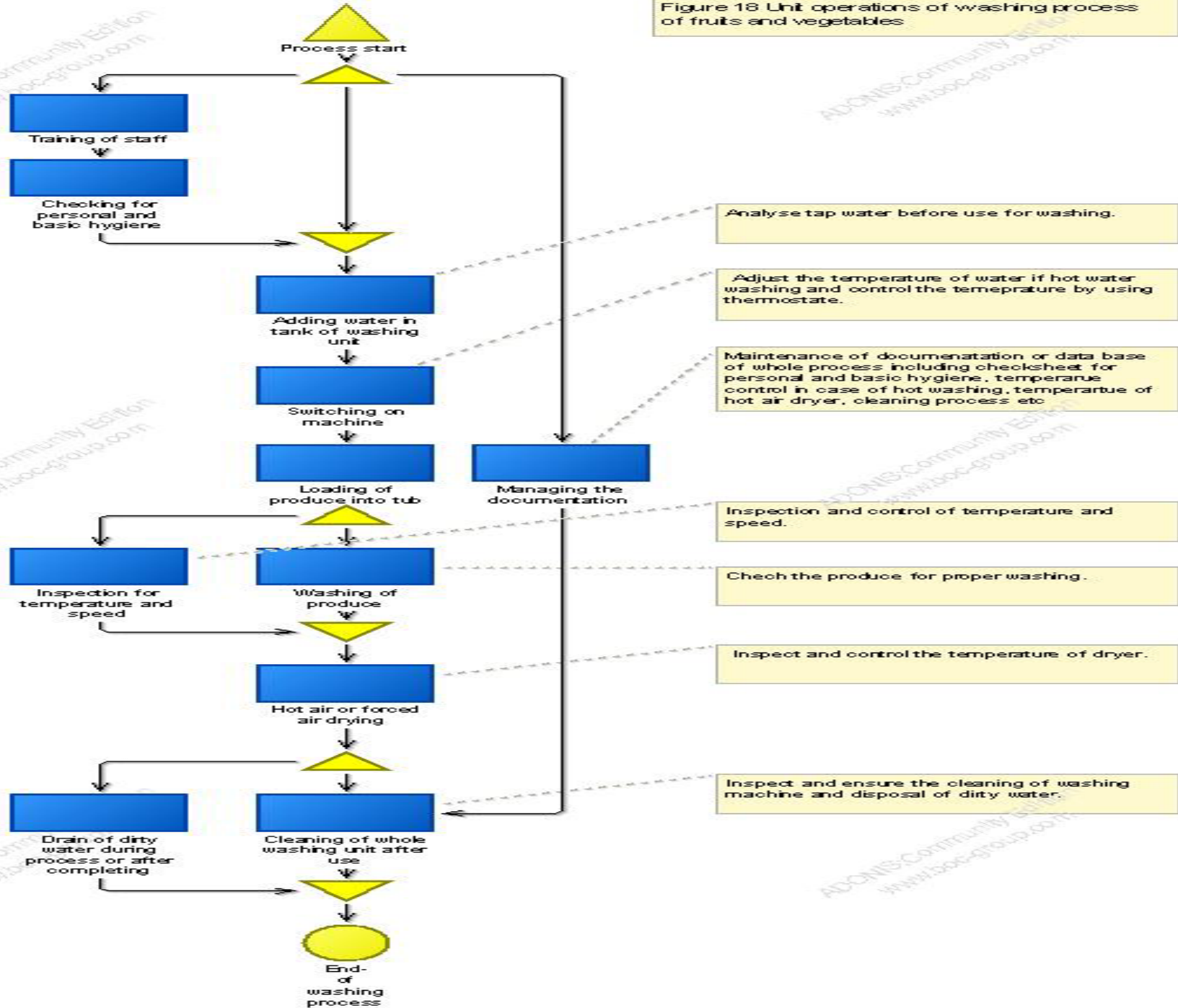


Figure 19 Unit operations of grading process of fruits and vegetables

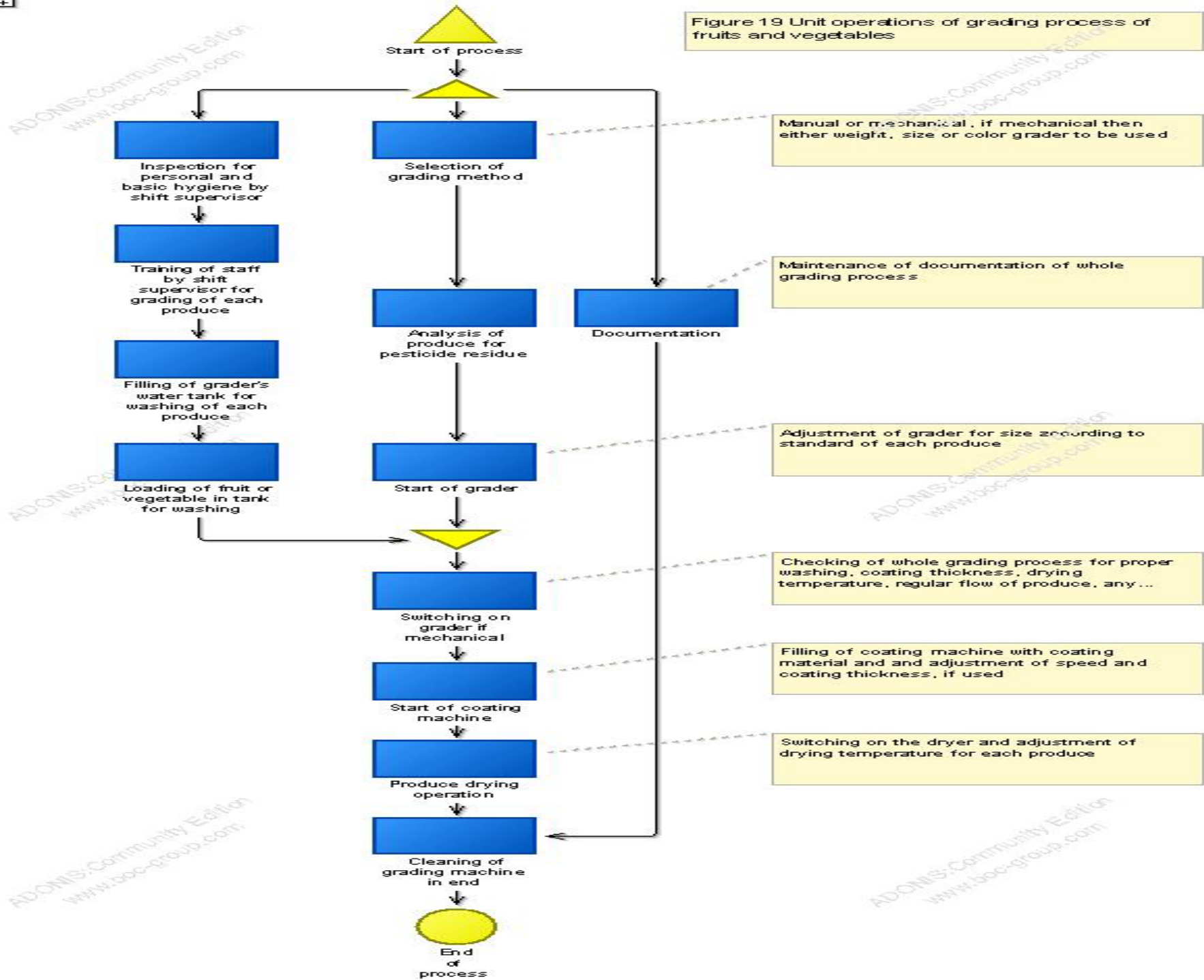


Figure 20 Unit operations of packaging and labeling process of fruits and vegetables

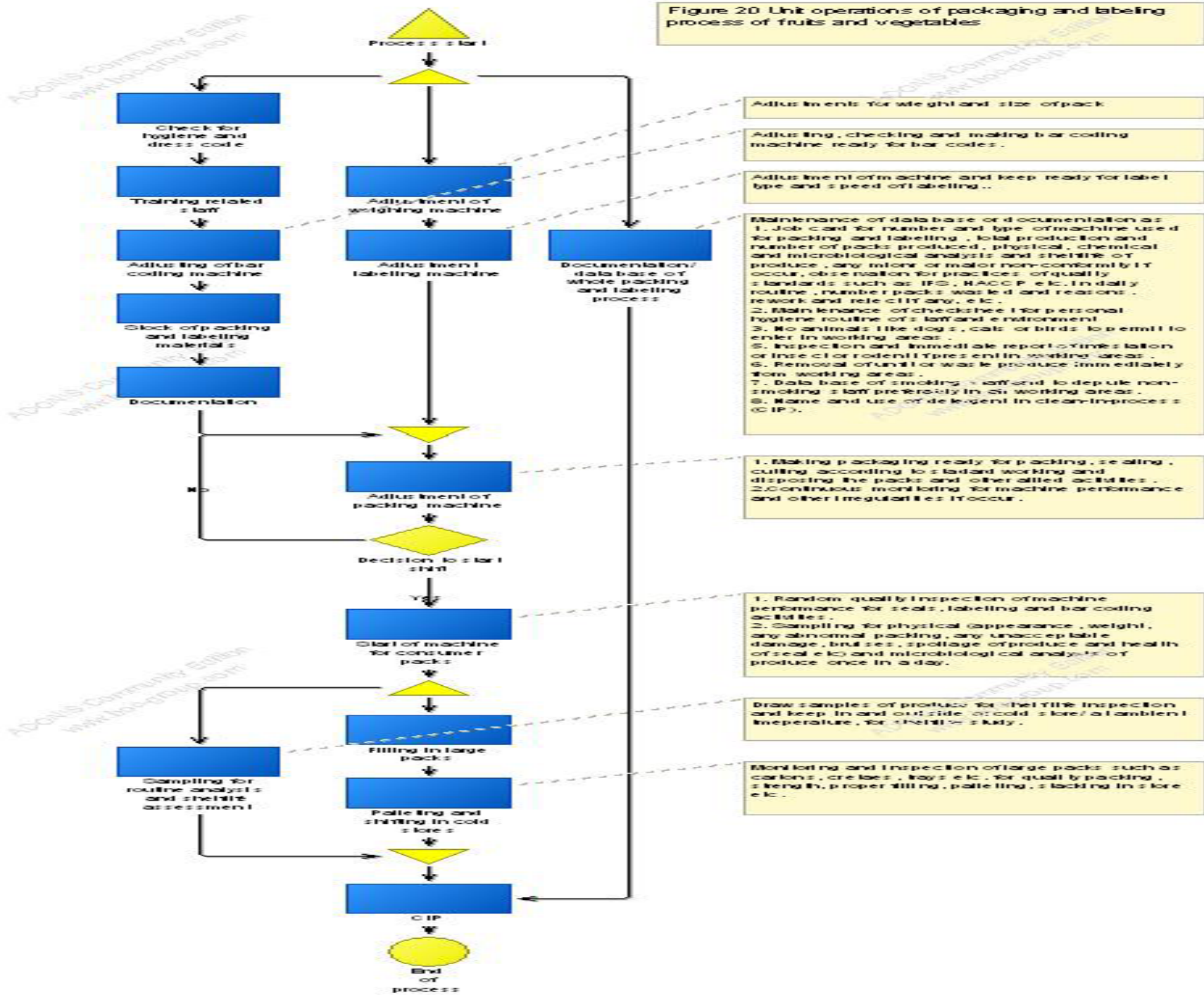




Figure 21 Unit operations of storage and shipment process of freshly packed fruits and vegetables

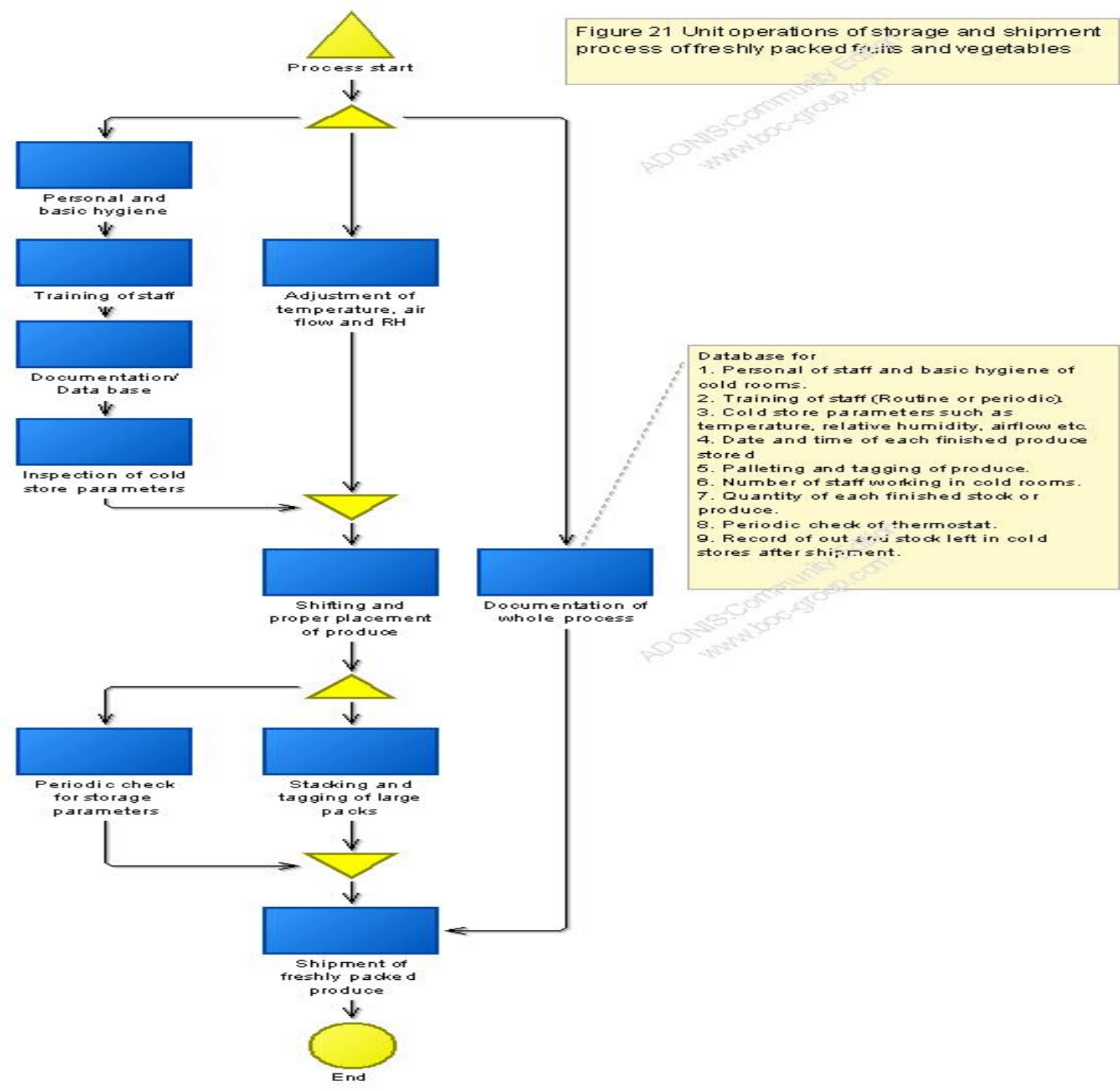


Figure 24 Unit operations of quality assurance process and supply chain management

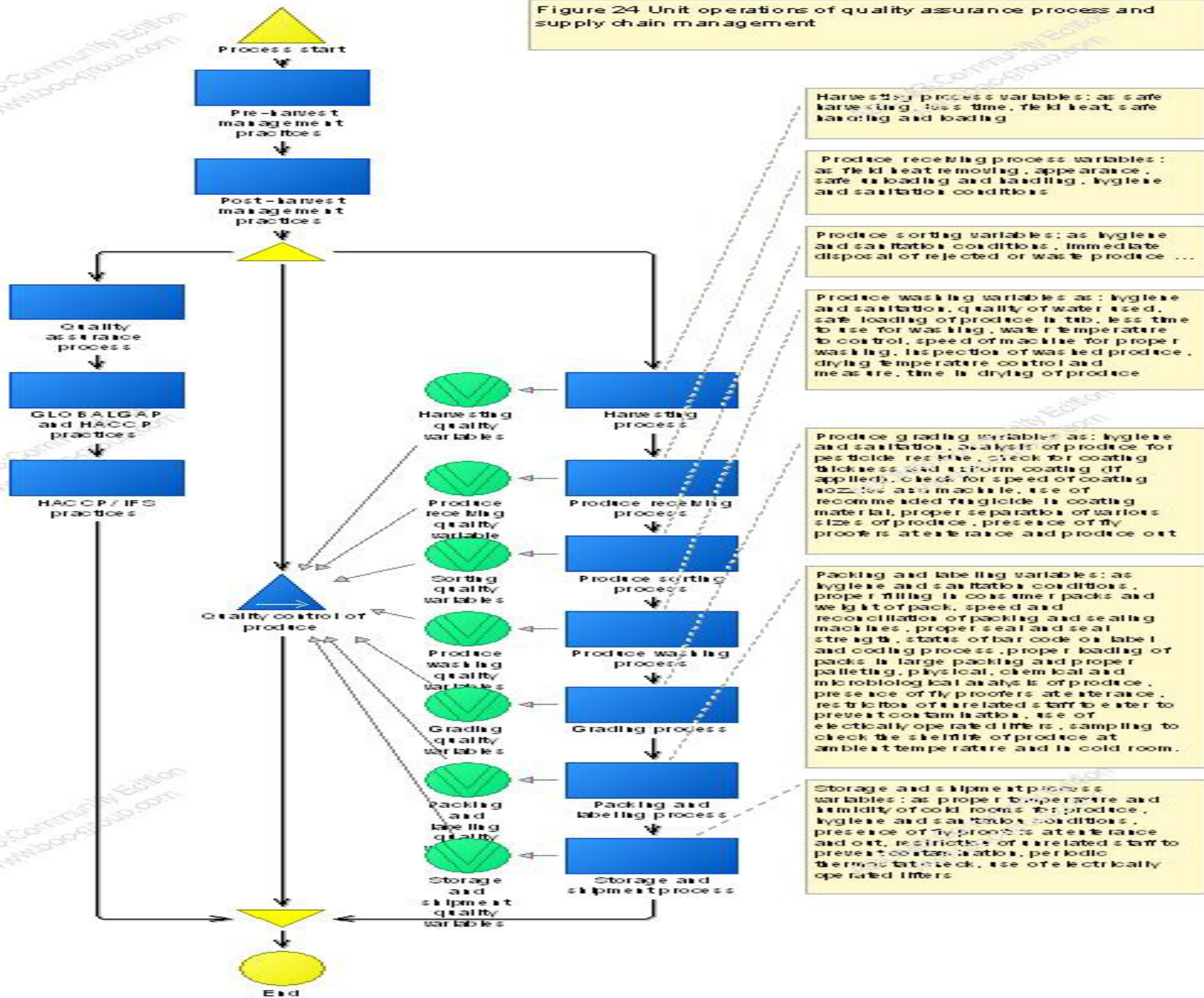
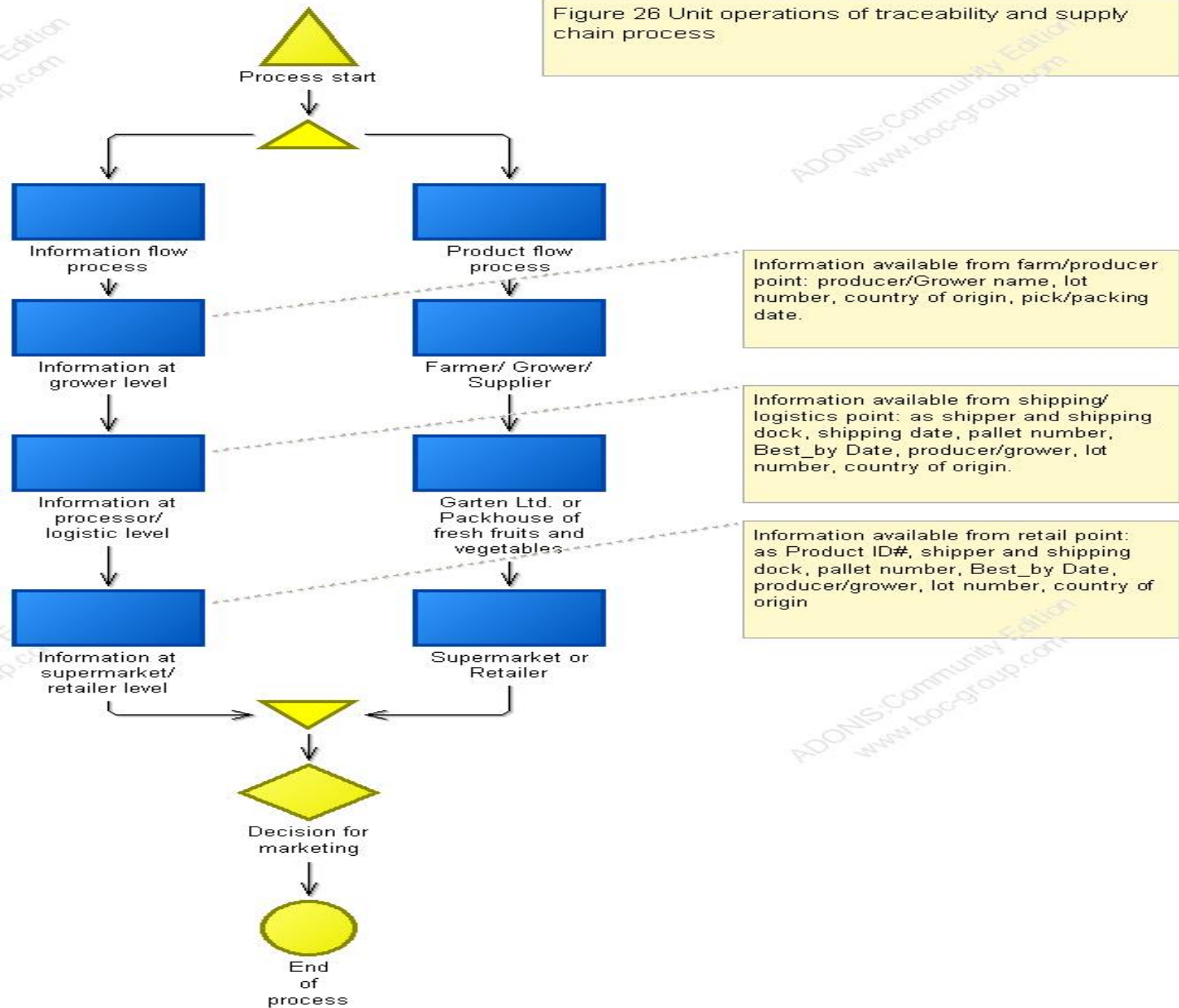


Figure 26 Unit operations of traceability and supply chain process





<b>Information available from farm/producer point</b>	<b>Information available from shipping/ logistics point</b>	<b>Information available from retail point</b>
Producer/ Grower	Shipper & shipping dock	Product ID#
Lot Number	Shipping Date	Shipper & shipping dock
Country of Origin	Pallet Number	Pallet Number
Pick/Packing Date	Best_by Date	Best_by Date
	Producer/Grower	Producer/Grower
	Lot Number	Lot Number
	Country of Origin	Country of Origin <sup>53</sup>





FLATRON W1943SB

FILE anzeigen 2

### Zusammenfassung der Raumerhebungen

Station	O2%	CO2%	T1°C	T2°C	SpO2%	SpO2%	SpO2%
A1			7.2	7.2			92.9
A2			7.2	7.2	74.7	72.9	92.9
A3			1.5	1.8			92.9
B4	1.5	2.7	3.2	1.8			94.4
B5	8.9	1.6	17.4	4.1	4.1		94.4
B6	6.2	2.1	1.7	1.8			94.4
B7	5.0	2.5	11.1	1.8	1.8		94.4
B8	3.3	2.4	2.1	1.6			95.0
B9	5.1	1.5	1.5	1.1	1.1		95.0
B10	5.2	1.8	2.2	1.6			95.0
B11	4.9	2.4	1.6	1.4	1.4		95.0
B12	5.0	2.5	2.1	1.7			95.0
B13	3.3	2.4	1.7	1.7	1.7		95.0
B14	3.3	2.4	1.3	2.1			95.0
B15	5.2	1.5	1.2	2.0	2.0		95.0
B16	5.1	1.3	1.8	1.9			95.0
B17	21.1	0.3	0.5	2.3	2.3		95.0
B18	20.9	0.3	0.5	0.7	0.7		95.0
B19	21.4	0.0	5.0	4.7			95.0
B20	21.4	0.0	4.2	4.2	4.2		95.0
B21	21.4	0.0	4.2	4.2	4.2		95.0
B22	21.4	0.0	4.2	4.2	4.2		95.0
B23	21.4	0.0	4.2	4.2	4.2		95.0
B24	21.4	0.0	4.2	4.2	4.2		95.0
B25	21.4	0.0	4.2	4.2	4.2		95.0
B26	21.4	0.0	4.2	4.2	4.2		95.0
B27	21.4	0.0	4.2	4.2	4.2		95.0
B28	21.4	0.0	4.2	4.2	4.2		95.0
B29	21.4	0.0	4.2	4.2	4.2		95.0
B30	21.4	0.0	4.2	4.2	4.2		95.0
B31	21.4	0.0	4.2	4.2	4.2		95.0
B32	21.4	0.0	4.2	4.2	4.2		95.0
B33	21.4	0.0	4.2	4.2	4.2		95.0
B34	21.4	0.0	4.2	4.2	4.2		95.0
B35	21.4	0.0	4.2	4.2	4.2		95.0
B36	21.4	0.0	4.2	4.2	4.2		95.0
B37	21.4	0.0	4.2	4.2	4.2		95.0
B38	21.4	0.0	4.2	4.2	4.2		95.0
B39	21.4	0.0	4.2	4.2	4.2		95.0
B40	21.4	0.0	4.2	4.2	4.2		95.0
B41	21.4	0.0	4.2	4.2	4.2		95.0
B42	21.4	0.0	4.2	4.2	4.2		95.0
B43	21.4	0.0	4.2	4.2	4.2		95.0
B44	21.4	0.0	4.2	4.2	4.2		95.0
B45	21.4	0.0	4.2	4.2	4.2		95.0
B46	21.4	0.0	4.2	4.2	4.2		95.0
B47	21.4	0.0	4.2	4.2	4.2		95.0
B48	21.4	0.0	4.2	4.2	4.2		95.0
B49	21.4	0.0	4.2	4.2	4.2		95.0
B50	21.4	0.0	4.2	4.2	4.2		95.0
B51	21.4	0.0	4.2	4.2	4.2		95.0
B52	21.4	0.0	4.2	4.2	4.2		95.0
B53	21.4	0.0	4.2	4.2	4.2		95.0
B54	21.4	0.0	4.2	4.2	4.2		95.0
B55	21.4	0.0	4.2	4.2	4.2		95.0
B56	21.4	0.0	4.2	4.2	4.2		95.0
B57	21.4	0.0	4.2	4.2	4.2		95.0
B58	21.4	0.0	4.2	4.2	4.2		95.0
B59	21.4	0.0	4.2	4.2	4.2		95.0
B60	21.4	0.0	4.2	4.2	4.2		95.0
B61	21.4	0.0	4.2	4.2	4.2		95.0
B62	21.4	0.0	4.2	4.2	4.2		95.0
B63	21.4	0.0	4.2	4.2	4.2		95.0
B64	21.4	0.0	4.2	4.2	4.2		95.0
B65	21.4	0.0	4.2	4.2	4.2		95.0
B66	21.4	0.0	4.2	4.2	4.2		95.0
B67	21.4	0.0	4.2	4.2	4.2		95.0
B68	21.4	0.0	4.2	4.2	4.2		95.0
B69	21.4	0.0	4.2	4.2	4.2		95.0
B70	21.4	0.0	4.2	4.2	4.2		95.0
B71	21.4	0.0	4.2	4.2	4.2		95.0
B72	21.4	0.0	4.2	4.2	4.2		95.0
B73	21.4	0.0	4.2	4.2	4.2		95.0
B74	21.4	0.0	4.2	4.2	4.2		95.0
B75	21.4	0.0	4.2	4.2	4.2		95.0
B76	21.4	0.0	4.2	4.2	4.2		95.0
B77	21.4	0.0	4.2	4.2	4.2		95.0
B78	21.4	0.0	4.2	4.2	4.2		95.0
B79	21.4	0.0	4.2	4.2	4.2		95.0
B80	21.4	0.0	4.2	4.2	4.2		95.0
B81	21.4	0.0	4.2	4.2	4.2		95.0
B82	21.4	0.0	4.2	4.2	4.2		95.0
B83	21.4	0.0	4.2	4.2	4.2		95.0
B84	21.4	0.0	4.2	4.2	4.2		95.0
B85	21.4	0.0	4.2	4.2	4.2		95.0
B86	21.4	0.0	4.2	4.2	4.2		95.0
B87	21.4	0.0	4.2	4.2	4.2		95.0
B88	21.4	0.0	4.2	4.2	4.2		95.0
B89	21.4	0.0	4.2	4.2	4.2		95.0
B90	21.4	0.0	4.2	4.2	4.2		95.0
B91	21.4	0.0	4.2	4.2	4.2		95.0
B92	21.4	0.0	4.2	4.2	4.2		95.0
B93	21.4	0.0	4.2	4.2	4.2		95.0
B94	21.4	0.0	4.2	4.2	4.2		95.0
B95	21.4	0.0	4.2	4.2	4.2		95.0
B96	21.4	0.0	4.2	4.2	4.2		95.0
B97	21.4	0.0	4.2	4.2	4.2		95.0
B98	21.4	0.0	4.2	4.2	4.2		95.0
B99	21.4	0.0	4.2	4.2	4.2		95.0
B100	21.4	0.0	4.2	4.2	4.2		95.0
Schwerz			-8.1	-8.0			
Takt 1°C			3.1	4.5	4.2	5.2	
R.M.	-8.0						
	3.7	4.5					

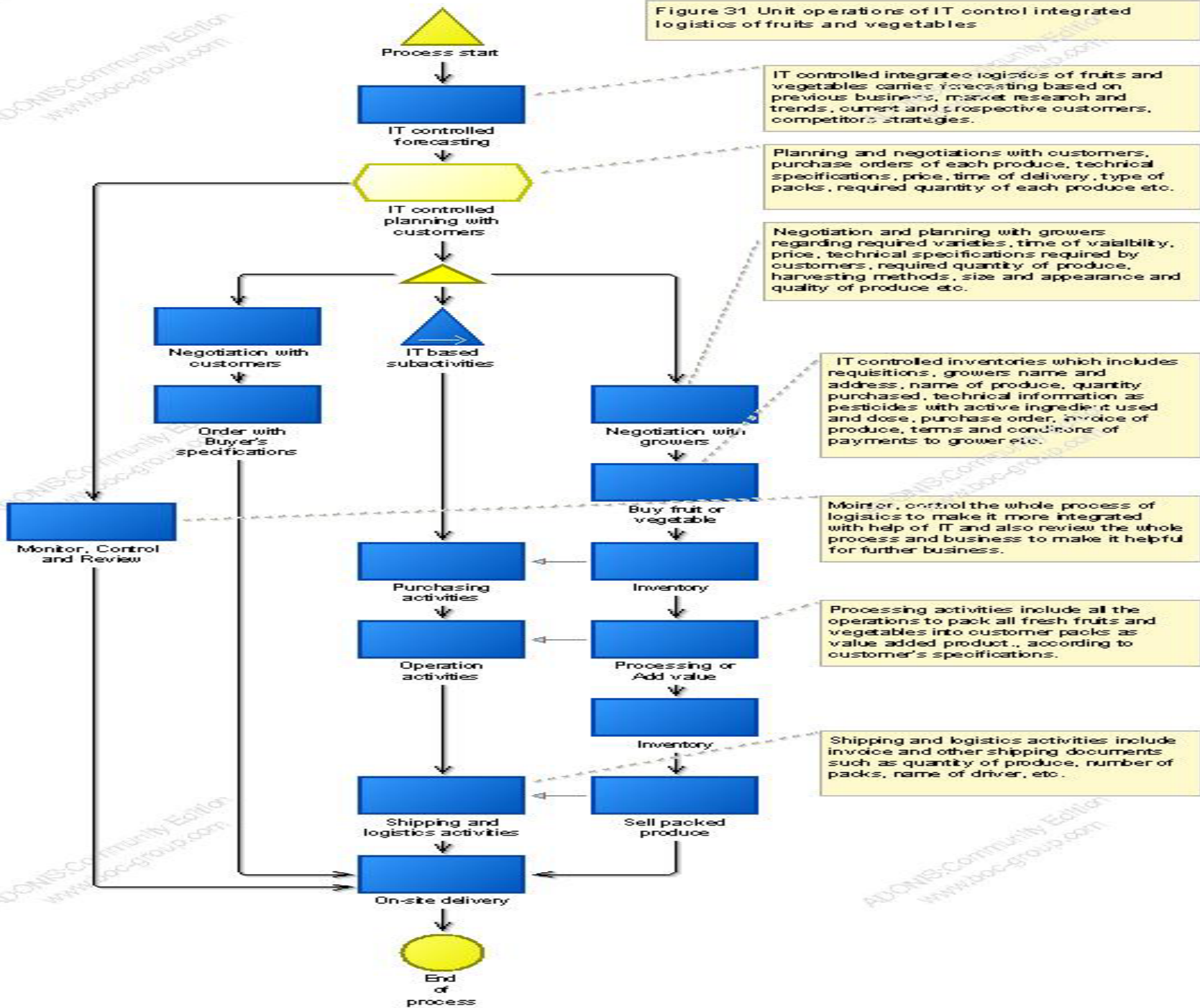
Avvio Isocell Italia S.p.A. LG

Isocell Italia S.p.A. logo and text: ISOCCELL ITALIA, ISOCCELL CONTROLLATE E GESTITE

System tray: Außentemp. 4, Isocell Übertragung



Figure 31 Unit operations of IT control integrated logistics of fruits and vegetables



# Conclusion

1. **Mind mapping technique** was considered to be an appropriate to devise a methodology to represent the complex supply chain of F&V.
2. Some of the unit operations of core and supporting business processes were missed or not practiced which carrying the gaps between **AS-IS and TO-BE approach**.
3. There is a dire need to **bridge these gaps** through:
  - Stakeholders more commitment to time and timeliness
  - Adopting quality assurance practices and habit
  - Strict implementation of food safety and security regulations
  - Traceability to help avoid health risks and
  - More dependency on IT integrated business.

# Recommendations

## A. Policies for Strategic Competitiveness

through:

1. By using certified nurseries and seeds by the farmers.
2. Growing export oriented varieties of fruits and vegetables to create competitiveness.
3. Long time market availability e.g. salad.
4. Creation of sustainable supply chain due to transparent tax system.
5. Government backup to give incentives to growers.

6. Effective participation by government authorities in international standards setting.
7. Management of regional data base of health risk/ food borne diseases cases.
8. Capacity building for the compliance of international standards such as GLOBALGAP, HACCP, IFS.
9. Strict compliance for traceability.

## **B. Harvest Management Practices**

1. Refrigeration transport or efficient field heat removal technique must be applied immediately by pack houses or large growers at farm level after harvest, to prevent any damage to crop.

## C. Planning and Sustainability of Supplies

1. Planning for offering some good price to growers for a particular period for managing time frame and continuous supplies.
2. Market survey by pack houses to assess the implied needs of the potential customers .

## D. Sustainable Availability of Risk Free Produce through:

1. In-house QC labs for physico-chemical and microbiological analyses , pesticide residues and sensory evaluation to combat any risk
2. Annual meetings of all business partners for improvement.

# THANK YOU

Actually, sky's not the limit...

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