

Published with Open Access at **Journal BiNET**

Vol. 08, Issue 01: 443-458

**International
Journal of Business, Management and Social Research**Journal Home: www.journalbinet.com/ijbmsr-journal.html

Survey to collect information on pre- and postharvest handling status and assess postharvest losses of cucumber

Sarwar-E-Jahan¹, Md. Kamrul Hassan², Shomosh Roy³, Quazi Maruf Ahmed⁴, Gazi Nazmul Hasan⁵, Afshara Yeasmin Muna⁶ and Md. Mainul Islam⁷

¹Bangladesh Agricultural Development Corporation, Sylhet

²Department of Horticulture, Bangladesh Agricultural University, Mymensingh

³On-Farm Research Division (OFRD), Bangladesh Agricultural Research Institute (BARI), Tangail

⁴Plant Genetic Resources Centre, Bangladesh Agricultural Research Institute, Gazipur

⁵On-Farm Research Division, Bangladesh Agricultural Research Institute, Bhola

⁶Dept. of Horticulture, Sylhet Agricultural University, Sylhet

⁷On-Farm Research Division, Bangladesh Agricultural Research Institute, Patuakhali, Bangladesh

For any information: shomoshroy@gmail.com (S. Roy)

Article Received: 01.12.2019; Revised: 30.01.2020 and Published online: 05 March 2020.

ABSTRACT

A survey was conducted to collect the pre-and postharvest practices information and assess postharvest loss of cucumber starting from producer to consumer. Raipura and Shibpur Upazilas of Norshingdi District are major cucumber growing area. The farmers of the selected Upazilas use pesticides in combination with plant growth regulators at 2-day intervals. The major pest of cucumber was wasp. The result showed that 16-20% of the growers used pheromone trap to reduce insect attack. The postharvest loss for cucumber from the harvest to retail sales was 19.99%. Retail price of cucumber increased about fifty percent from the farm gate price. Postharvest losses resulted mainly due to lack of careful handling, adequate transport systems, and storage facilities. Major problems of the growers were pest infestation, lack of adequate transport system, and unavailability of quality seed and fertilizer. Lack of proper transport systems and storage facilities were the concerned problems at the 'Bepari', wholesaler, and retailers' level.

Key Words: Pre harvest, Postharvest, Handling, Cucumber, Survey, and Loss

Cite Article: Jahan, S. E., Hassan, M. K., Roy, S., Ahmed, Q. M., Hasan, G. N., Muna, A. Y. and Islam, M. M. (2020). Survey to collect information on pre- and postharvest handling status and assess postharvest losses of cucumber. International Journal of Business, Management and Social Research, 08(01), 443-458. **Crossref:** <https://doi.org/10.18801/ijbmsr.080120.47>



Article distributed under terms of a Creative Common Attribution 4.0 International License.

I. Introduction

Vegetables are good sources of vitamin A, vitamin C, vitamin B1, vitamin B2, vitamin B3, and minerals such as calcium, iron, zinc, magnesium, manganese and selenium (Fasuyi, 2006; Ihekoronye and Ngoddy, 1985). They contribute to the intake of essential nutrients from other foods by making them tastier, they supply dietary fiber important for digestion, and they are a must to maintain health and

cure nutritional disorders (Hanif et al., 2006). Malnutrition and under-nutrition have now become alarming problems of the people of the third world countries affecting their economic and physical developments. Vitamin deficiencies are the most serious nutritional disorders in low income groups (Blossner and Onis, 2005). Deficiency of nutrients results in under-weights, high mortality in pre-school babies and infants. These vitamins and minerals deficiency can be prevented through increasing vegetable consumption. To ensure food security production and availability should be increased. Varieties of vegetables are produced in Bangladesh. The summer vegetables include cucumber, pointed gourd, teasel gourd, Indian spinach, and bitter gourd and the winter vegetables include cabbage, cauliflower, and tomato. The area under vegetable cultivation, excluding potato and sweet potato, is 0.41 million ha producing 4.07 million metric tons with an average yield of 9.98 t/ha (BBS, 2019). Among the SAARC countries, namely, Nepal, Pakistan, Sri Lanka, and India consume per capita 42, 69, 120, and 135 g vegetables, respectively Ramphal, 1990. The average Bangladeshi eats a total of 126 g of fruit and vegetables daily (leafy vegetables are 23 g, non-leafy vegetables are 89 g, and fruits is 14 g), which is far below than the minimum daily requirement of 400 g as recommended by FAO and WHO (FAO, 2003). Hossian (1992) reported that to supply the minimum daily requirement of 200 g vegetables for the population of Bangladesh, the national production of vegetables should be over 120 million tons.

Hence, a massive effort required to bridge the wide gap between supply and demand for vegetables. The per capita availability of vegetables is further reduced sometimes due to a high level of postharvest losses. The storage of the vegetables in different ways can make the products available all year round and can help meeting nutrient deficiencies. Because of being perishable, vegetables need to be reached to the consumers as quickly as possible to satisfy the market requirement. Even the retailers should sell the product as soon as possible to avoid qualitative and quantitative losses, poor handling, and marketing systems cause huge postharvest losses of commodities (Hassan, 2010). Quality of vegetables deteriorates gradually during storage, transport, wholesaling, and retailing, particularly when the conditions remain unfavorable, and at one stage produce becomes unfit for marketing or human consumption. It is estimated that a loss of nearly 25-40% of the vegetables occurs due to rough and improper postharvest handling, transportation and storage practices, and the variation often depends on type of vegetables (Singh and Chadha, 1990). Sharma (1996) reported that postharvest losses of vegetables in Bangladesh could be as high as 43%. The average postharvest loss as estimated by Khan (1991) is 26%. The agricultural system of South Asia is mainly based on small farmers. (Srinivasarao et al., 2019). Furthermore, these farmers use rare pre and postharvest technologies because of their poor economic condition and high initial cost. A considerable amount of fruits and vegetables (20-44%) are wasted due to the absence of preharvest and postharvest technologies (Faqeerzada et al. 2018). Hassan (2010) reported that 23.6 to 43.5% of fruits and vegetables do not reach to the consumers due to postharvest losses.

Postharvest losses of vegetables due to fungal and bacterial decay are also especially threatening in the tropical and subtropical regions, because warm and humid conditions favor the rapid growth of most microorganisms. If the possibility to economically offset postharvest losses by increasing crop production, it does not guarantee that more perishable foods reach the consumer. This is because many of today's marketing systems in the developing countries are stretched to their limits, and many experts believe that larger volumes in the systems would necessarily lead to even greater waste. Information related to the causes and magnitude of postharvest quantitative losses of important vegetables of Bangladesh is meager in the scientific literature. The present study included an important vegetable of Bangladesh; named cucumber (*Cucumis sativus* L.) belongs to the family *Cucurbitaceae*. Cucumber is a summer vegetable, which is grown in 9,716 hectares of land with a total production of 65,000 metric tons (BBS, 2019). Cucumber can be eaten both fresh and cooked form as an important source of different types of nutrients. According to Gopalan et al. (1989), 100 g cucumber contains 96.3 g moisture, 0.4 g protein, 0.1 g fat, 0.3 g minerals, 0.4 g crude fiber, 2.5 g carbohydrate, 13 Kcal energy, 10 mg calcium, 25 mg phosphorus, and 0.60 mg iron. The present study was taken under consideration to collect the data on present pre-harvest and postharvest practices and assess postharvest quantitative losses of cucumber.

II. Materials and Methods

To collect data on the existing pre and postharvest practices and to assess postharvest losses of cucumber a survey was conducted at Raipura and Shippur Upazilas of Norshingdi District. Structured interview schedules were prepared to interview the stakeholders that include growers and intermediaries ('Bepari', wholesaler, and retailers).

In Phase I, growers of Shibpur and Raipura Upazilas of Norshingdi District of Bangladesh were interviewed. Names of growers (population) from the above two Upazilas were collected. From the above population, 25 growers for each Upazila randomly selected as the samples. Besides, 5 percent of the population was randomly selected as reserve candidates who were used only when a farmer in the original sample list was not available during data collection.

In Phase II, data were collected from cucumber traders. To do this, 25 cucumber trading intermediaries ('Bepari') were randomly selected from the vegetable traders of Jossore Bazaar of Shibpur Upazila and Shibjunlipur Bazaar of Raipura Upazila.

In Phase III, 25 intermediaries (wholesalers) for cucumber were randomly selected for data collection on marketing and postharvest losses. The traders were selected from the Jessore Bazaar of Shibpur Upazila, Shibjunlipur Bazaar of Raipura Upazila, Karwan Bazaar of Dhaka City, and Machoua Bazaar of Mymensingh Sadar.

In Phase IV, 25 intermediaries (retailers) for each experimental crop were randomly selected for collecting data on marketing system and postharvest losses of cucumber. The retailers were interviewed from Jossore Bazaar of Shibpur Upazila, Shibjunlipur Bazaar of Raipura Upazila, Karwan Bazaar of Dhaka City, Machoua Bazaar of Mymensingh Sadar, KR Market of BAU, Mymensingh and Shesh Moore of BAU, Mymensingh.

To collect information on existing pre- and postharvest practices for cucumber, 4 sets of interview schedules were prepared for cucumber keeping the objectives of the research in mind. The interview schedules were prepared for the stakeholders in vegetable trade including growers, Bepari, wholesalers, and retailers. The schedules were translated to Bengali for ease of understanding of the respondents. The interview schedules were pre-tested in actual field conditions/situations, and necessary modifications were made before finally printing the schedules. The responses to the questions in the interview schedules were transformed into an EXCEL master sheet to facilitate tabulation. Tabulation and computation were done based on categories developed. The collected data were converted into percent based on the sample number. For describing the collected information, categories were developed in respect of each of the selected respondents for the sake of having a better understanding of the characteristics of the growers and traders. Different categories according to their respective characteristics were developed. Procedures for developing the categories have been discussed while describing the characteristics of respondents in the results and discussion part. The data collected from the respondents were compiled, tabulated, and analyzed following the objectives of the study. Descriptive statistics such as number and percentage distribution, range, mean, standard deviation, and rank order were used in describing the performance and selected characteristics of the respondents. The survey was conducted using structured and pre-tested interview schedules at four stages of cucumber marketing in Norshingdi District. The respondents were growers, 'Bepari', wholesalers, and retailers.

III. Results and Discussion

Respondent: Growers

Growers' individual characteristics play an important role in crop production and subsequent operations. The major results in relation to the individual characteristics of the growers are briefly discussed below.

Age: The age of cucumber growers ranged from 25 to >50 years. In Raipura Upazila most of the growers were in the age range of 35-50 years, whereas in Shibpur it was above 50 years ([Table 01](#)). In

the recent years, the youths of Norshingdi District showed interest to work in the Milkvita Milk Company, and possibly due to this fact, percentage of young cucumber growers was less in the area.

Table 01. Cucumber growers according to their age

Category of age (years)	Raipura	Shibpur
	%	%
25 to <35	24	4
35-50	64	40
>50	12	56
Total	100	100

Education: Cucumber growers of both Upazilas were classified into five categories on the basis of level of education. Only 12% of cucumber growers had higher education. On the other hand, 40-56% cucumber growers were illiterate in both Upazilas of Norshingdi District (Table 02). This higher level of illiterate growers in Norshingdi District was possibly due to the fact that as Norshingdi is a leading vegetable growing area, people do not show interest to educate them rather than they prefer to be involved in income generating activities like vegetable growing.

Table 02. Education levels of cucumber grower

Upazila	Level of education					Total
	Illiterate	Signature	Class I to <V	Class V to <SSC	S.S.C to <Graduation	
Raipura	% 40	12	8	28	12	100
Shibpur	% 56	12	8	12	12	100

Land holdings: The total land possessed by the growers ranged from 0.02 to 3 ha. The land holdings were classified following the method of classification published by the Manual of Agriculture Extension Department. The categories of the farmers on the basis of occupied land are: marginal (0.02-0.2 ha), small (0.21-1 ha), medium (1.01-3 ha), and large (>3 ha) (DAE, 1999). The patterns of land holding of the growers are summarized in (Table 03). Maximum cucumber growers of both Upazilas (72-80%) had small land size.

Table 03. Land holding categories of cucumber growers of two Upazilas of Norshingdi District

Upazila	Categories of land holdings (ha)			
	Marginal	Small	Medium	Large
	0.02-0.2	0.21-1	1.01-3	>3
Raipura	% 16	80	4	0
Shibpur	% 28	72	0	0

Land under cucumber cultivation: The cucumber growers were classified into four categories depending on their land under cucumber cultivation. As different vegetables grown by one grower there was no large-scale cucumber grower in either of the two Upazilas of the District (Table 04).

Table 04. Growers according to their cucumber cultivable land

Upazila	Categories of land under cucumber cultivation (ha)			
	0.02-0.2	0.21-1	1.01-3	>3
Raipura	% 100	0	0	0
Shibpur	% 100	0	0	0

Percentage of land leased: Negligible percentage of the cucumber growers of both Upazilas had leased land. The percentages of the growers took lease are shown in the (Table 05).

Table 05. Percentage of land taken as lease by cucumber growers

Upazila	Cucumber	
	Yes	No
Raipura	% 12	88
Shibpur	% 28	72

Duration of cucumber cultivation by the growers: In case of duration of cucumber cultivation in Raipura, 44% growers were involved with cucumber cultivation for 5-10 years. In Shibpur 40% growers were involved in cucumber cultivation for 10-15 years (Table 06).

Table 06. Duration of cucumber cultivation by the growers

Upazila	Categories of growers according to cucumber growing duration					
	<1 Y	1 to <5Y	5 to <10Y	10 to 15Y	>15Y	
Raipura	%	0	16	44	32	8
Shibpur	%	0	4	32	40	24

Modern cultivation techniques

Use of manures and fertilizers: Range of manures and fertilizers were used by the growers cucumber (Table 07). It was found that all growers of both Upazilas used manures and fertilizers to grow cucumber.

Table 07. Organic and inorganic fertilizers used by cucumber growers

Upazila	Manures and Fertilizers						
	CD	MOC	Urea	TSP	MP	Others*	
Raipura	%	100	0	84	84	84	4
Shibpur	%	88	12	88	52	68	0

*Boron, FYM NB. Due to duplication and overlapping sources exceed 25.

Use of plant growth regulators and pesticides by the growers: The interviewed growers were found to apply growth regulators to obtain larger sized fruits. The rates of application varied from 5-15 ml/10-16 L of water. In cucumber cultivation, the growers used less (24-48%) amount of growth regulators (Table 08). The growth regulators used by the growers were Agron, Planofix, Biogreen, Lily, and Voxal Super. The majority of the growers used Agron in both Upazilas. Results showed that cent percent of the growers used insecticides and fungicides to grow cucumber (Table 08). Among the pesticides, Redomil Gold and Minicaper were mostly used. Forty five percent of the cucumber growers could not tell the names of the pesticides they used. They used insecticides and fungicides along with hormones as cocktail.

Table 08. Use of hormones and by cucumber growers

Upazila	Use of plant growth regulators		Use of pesticides		
	Yes	No	Yes	No	
Raipura	%	24	76	100	0
Shibpur	%	48	52	100	0

The major insecticides and fungicides used were Superthion and Tipgor, and Diathane M 45, Thiovit, Minicaper and Redomil, respectively.

Insects of cucumber: Insects of different kinds were found to cause serious problems to cucumber. Most of the growers knew the names of the insects by the local names. To control insect damage high doses of the insecticides were used. The names of the insects which were known by the growers are shown in Table 09.

Table 09. Different kinds of insects responsible for damage to cucumber crops

Upazila	Insects						
	Cucumber fruit borer	Fruit fly	Wasp	Leaf sucker	Others*	Unknown	
Raipura	%	4	12	24	20	0	56
Shibpur	%	4	16	32	8	8	40

* Mite NB. Due to duplication and overlapping sources exceed 25.

Diseases of cucumber: Most of the cucumber growers of both Upazilas (56-64%) did not know the names of the diseases. Types of diseases found in cucumber are shown in Table 10.

Irrigation in cucumber cultivation: Cucumber growers of two Upazilas provided irrigation particularly in case of hot weather. The percentage of growers irrigated their land and the irrigation intervals are shown in Table 11.

Table 10. Harmful diseases of cucumber

Upazila	Diseases				
	Foot rot	Powdery mildew	Mosaic	Others*	Unknown
Raipura	% 16	28	20	0	56
Shibpur	% 20	16	12	12	64

* Leaf curl NB. Due to duplication and overlapping sources exceed 25.

Table 11. Irrigation intervals used by cucumber growers

Upazila	Irrigation		Intervals (days)				
	Yes	No.	3	5	7	10	Others*
Raipura	% 100	0	20	0	44	0	36
Shibpur	% 100	0	28	0	44	0	28

* 15 days interval, NB. Due to duplication and overlapping sources exceed 25.

Grading of the fruits: Grading of fruits is one of the important tasks in marketing. However, results of the present study suggest that 40-44% cucumber growers did not grade the produce (Table 12).

Table 12. Percentage of cucumber growers' use grading system

Upazila	Grading		Basis of grading		
	Yes	No	Shape	Size	Color
Raipura	% 60	40	0	40	20
Shibpur	% 56	44	12	44	0

Damage during harvest

In the case of the cucumber, the maximum damages occur due to cuts (33-39%) followed by bruises (20-32%) (Table 13).

Table 13. Damage of cucumber fruits during harvest

Upazila	Types of damage				
	Bruises	Blemishes	Cuts	Others*	None
Raipura	% 6.45	0.00	38.71	22.58	32.26
Shibpur	% 33.33	6.06	33.33	9.09	18.18

* Shrinkage NB. Due to duplication and overlapping sources exceed 25.

Losses of cucumber at grower level in two Upazila: In Raipura and Shibpur Upazilas, 3.46% and 4.94% loss occurred during harvest and until selling to the immediate intermediary (Figure 01). The average loss of cucumber at the growers' level in both Upazilas was 4.20%.

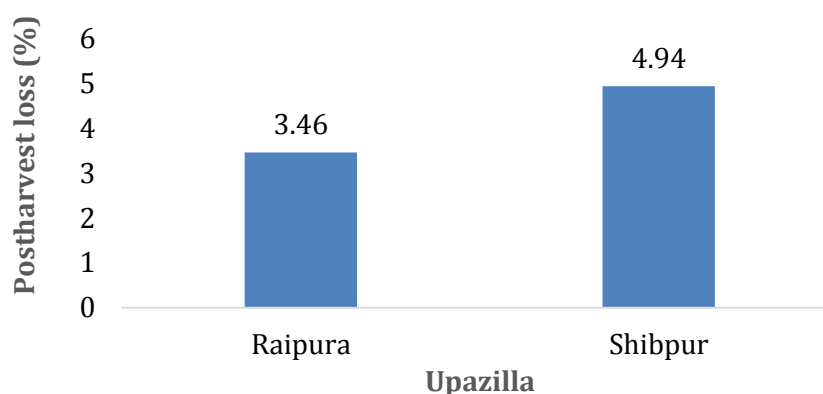


Figure 01. Postharvest losses of cucumber at the stage of harvest to sale to the intermediaries

Buyers of the produce: The buyers of cucumber were mainly the 'Bepari'. About 80-85% of the growers' sell their produce to the 'Bepari'. Often single growers sell their produce to different

intermediaries. As a result, the overlapping of the data occurs. The following Table 14 shows the percentage of different buyers who purchase the commodities from the growers.

Problem in cucumber cultivation: In both Upazilas, the problems were mainly related to insect and disease attacks, availability of quality seeds and fertilizers, and lack of adequate transport of the growers' produce to the nearby assemble markets (Table 15).

Table 14. Buyers of the cucumber from the growers

Upazila		Buyer				
		Faria	'Bepari'	Wholesaler	Retailer	consumer
Raipura	%	24	80	24	0	0
Shibpur	%	40	85	20	0	12

NB. Due to duplication and overlapping sources exceed 25.

Table 15. Problems of the growers in cucumber cultivation

Upazila		Problem in Cucumber cultivation						
		Diseases	Insects	Seed	Water	Fertilizer	Transport	None
Raipura	%	8	16	0	0	4	16	56
Shibpur	%	0	0	20	4	0	16	60

Respondent: 'Bepari'

'Bepari' plays an important role in vegetable marketing. Randomly chosen 'Bepari' of different markets such as Josohore Bazaar of Shibpur (Norshingdi), Shibjonlipur Bazaar of Raipura (Norshingdi), Machua Bazaar of Mymensingh Sadar and Karwan Bazaar of Dhaka city. The important results concerning the individual characteristics of the 'Bepari' are briefly discussed in the following.

Age: The age of the cucumber 'Bepari' ranged from 15 to above 50 years. Based on age, 'Bepari' were classified into four categories. The highest percentage of 'Bepari' was of 35-50 years of age (Figure 02).

Education: Cucumber 'Bepari' were classified into five categories based on their level of education. The education level of 52% cucumber 'Bepari' was class from Class V to <S.S.C. The majority of the 'Bepari' had some level of education, and percentage of illiterate 'Bepari' was less (Figure 03). This was possible because to carry out this sort of business and to make profit out of this, the intermediary, especially 'Bepari' need to have some level of education.

Total amount of cucumber traded per year by the 'Bepari': Results showed that on average quite large amounts of cucumber (52 M. tons) are traded by each 'Bepari' each year (Figure 04). So, interventions could be launched at the 'Bepari' level to adopt modern techniques and to make them aware of suitable postharvest handling systems to reduce loss and maintain the quality of the produce.

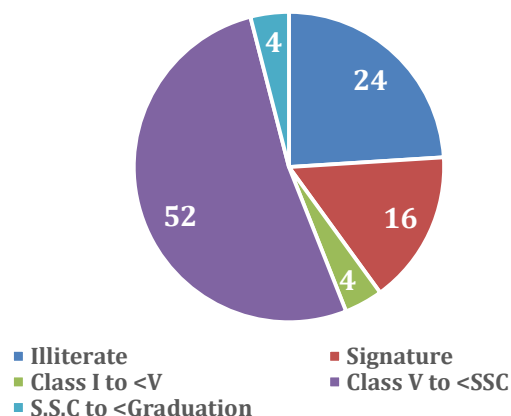
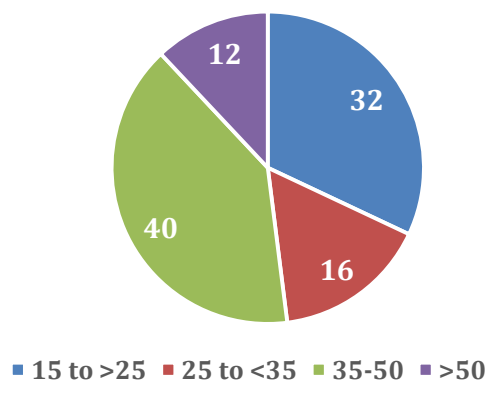


Figure 02. Age of cucumber 'Bepari'

Figure 03. Level of education of the cucumber 'Bepari'

Place of purchase cucumber; 'Bepari' purchase produce from the assemble markets or from the growers' field. The present study revealed that maximum 'Bepari' purchased cucumber from the

assemble market (Figure 05). However, to validate this statement, more respondents should be included in the survey.

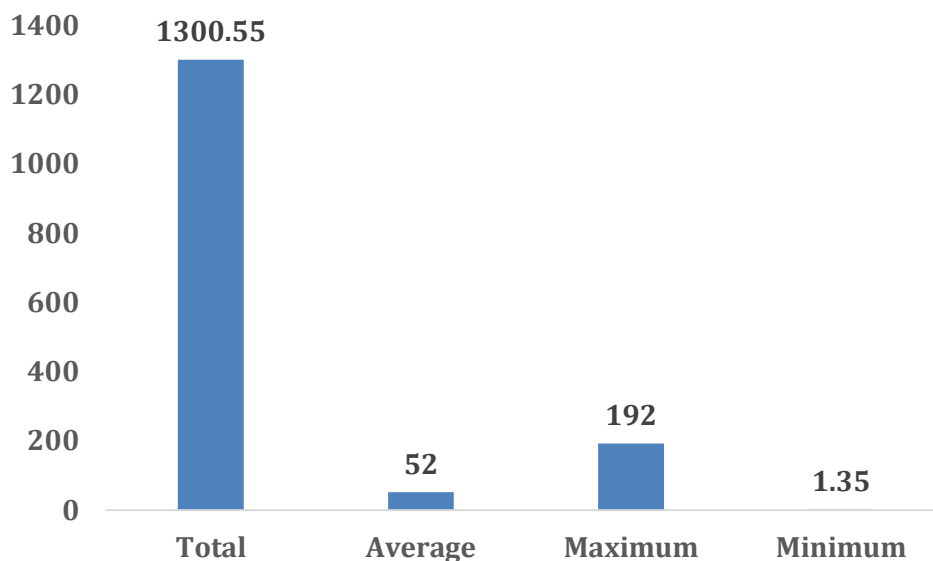


Figure 04. Amount of cucumber (M. tons/year) traded by the 'Bepari'

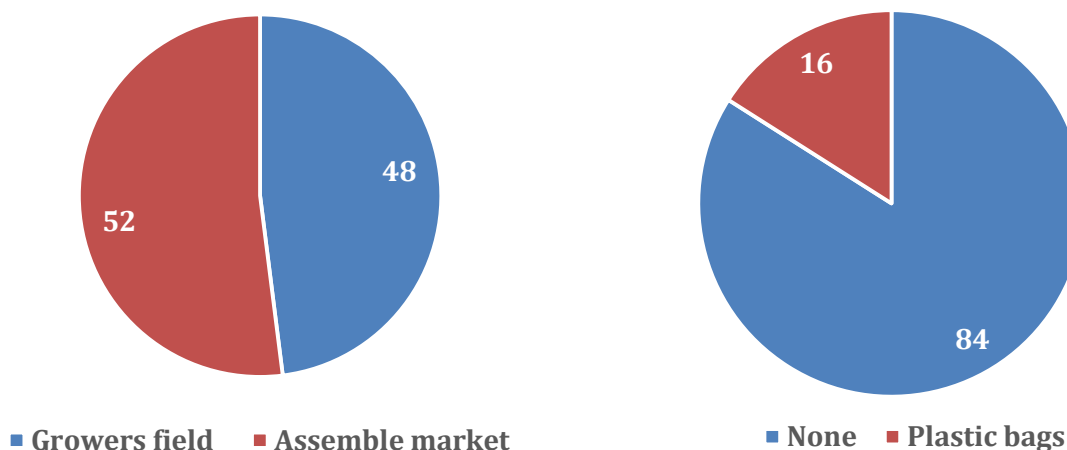


Figure 05. Place of purchase cucumber by the 'Bepari'

Figure 06. Use of packaging materials by the 'Bepari'

Mode of transport of cucumber: Rickshaw, van and truck were mainly used for transportation of cucumber from growers' field to the local assemble markets and to the destination markets (Table 16). Truck was found to be the main transport vehicle to carry produce from the place of purchase to the destination markets. No 'Bepari' was found to use the refrigerated covered van to carry perishables despite the fact that refrigerated van is used to carry perishables in developed countries, and many of our neighboring countries. Measures to be taken so that refrigerated covered van could be introduced in our marketing channel to reduce huge postharvest loss and maintain quality of perishables.

Table 16. Transportation system of cucumber by the 'Bepari' from growers' field to destination markets

Mode of transport	Percentage
Rickshaw	10
Van	80
Truck	20

NB. Due to duplication and overlapping sources exceed 25.

Types of packaging materials used for cucumber: Packaging was not usually practiced in case of the cucumber trading by the ‘Bepari’. There were some ‘Bepari’ (16%) who used packaging materials (plastic bags) for cucumber marketing (Figure 06).

Grading of cucumber: ‘Bepari’ prefer to purchase well-shaped cucumber. They usually purchased cucumber on the basis of the color, size and shape of the fruits (Figure 07).

Damage during transport: Huge losses were faced by the ‘Bepari’ every year due to lack of proper transport system. Maximum damage to cucumber fruits occurred due to bruises (64%) and vibration damage (62%) during transport (Figure 08). Hassan (2010) report that the maximum damage occurs due to cuts. Huge losses are faced by the ‘Bepari’ every year due to lack of proper transport system. Maximum loss of cucumber occurs due to bruises and vibration damage during transportation. Shrinkage is also an important postharvest problem for cucumber due to weight loss.

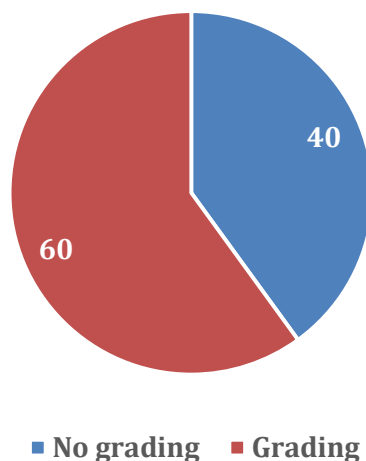


Figure 07. Grading of fruits by the ‘Bepari’
(NB. Due to duplication and overlapping sources exceed 25.)

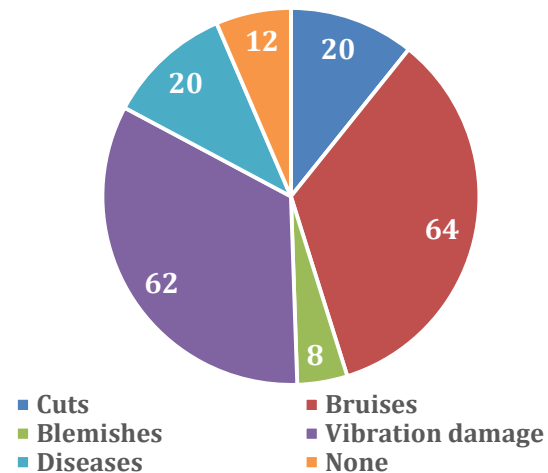


Figure 08. Damages occurred during transport of cucumber

Precautions taken by ‘Bepari’ to reduce damage during transport: Results showed that 100% ‘Bepari’ used various types of leaves to reduce damage of cucumber fruits during transport to distant markets. They use leaves as cushions among layers of produce so that the damage could be minimized.

Measures taken to prolong shelf life of cucumber: No ‘Bepari’ undertook measures to prolong shelf life of cucumber. They are very often unaware about the term ‘extension of shelf life’. This would be another important area where appropriate steps to be taken to make the Bepari aware in relation to storage of perishables for some period of time in case of emergency or lack of market demands.

Delivery markets: From ‘Bepari’ maximum products were purchased by the wholesalers. It was found that 100% of the produce was purchased by wholesalers in cucumber some ‘Bepari’ also sold cucumber to the retailers (Figure 09). The present study found that the wholesalers are either ‘Aratdar’ himself (carry wholesale business from his own arat in big city) or wholesalers (who use arat by paying commission to the ‘Aratdar’).

Destination markets: Maximum ‘Bepari’ come from big city, especially from Dhaka. They purchase products from local assemble markets and supply the products to the city (ies). The present survey found that 32% of the ‘Bepari’ supplied cucumber to local markets (Table 17). Other destination markets included Dhaka, Chattogram, Cumilla, Sylhet, Rajshahi, and Brahmanbaria.

Problems in relation to cucumber business: As cucumbers are moderately perishable products, few problems were faced by the ‘Bepari’. But among the problems, lack of proper transportation system was the main (Table 18).

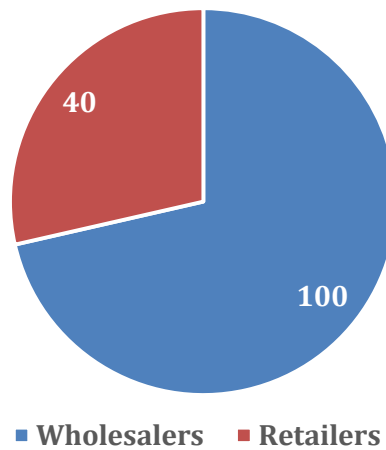


Figure 09. Buyer of the products from the 'Bepari'

Table 17. Destination markets for cucumber as traded by the 'Bepari'

Category	Percentage
Local market	32
Dhaka	20
Rajshahi	4
Chattogram	8
Sylhet	4
Cumilla	8
Others*	24
Total	100

Table 18. Problems in relation to cucumber business by the 'Bepari'

Respondent	Lack of storage	Transport	None
'Bepari' %	8	16	80

NB. Due to duplication and overlapping sources exceed 25.

Respondent: Wholesalers

The traders who buy the products from the growers and also from the 'Faria' and 'Bepari' and sale the products to the retailers and sometimes to the consumers are known as wholesalers. The selected characteristics of cucumber wholesalers are as follows.

Age: The age of the wholesalers ranged from 15 to above 50 years. On the basis of age of the wholesalers were classified into four categories. Around 40% of the wholesaler was of 35-50 years of age (Figure 10).

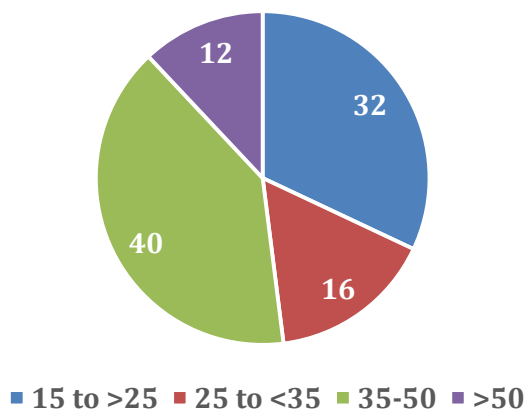


Figure 10. Age of cucumber wholesalers

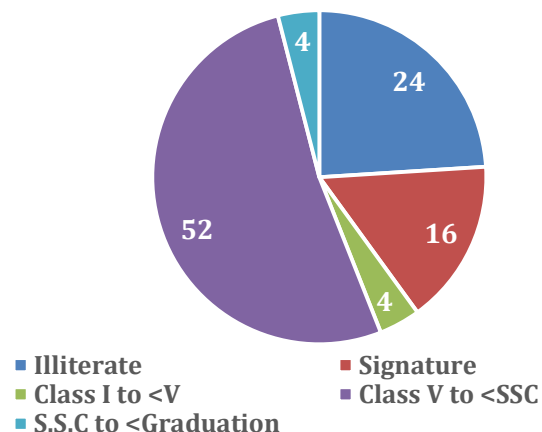


Figure 11. Education level of cucumber wholesalers

Education: The cucumber wholesalers were classified into five categories. It was found that 52% of the wholesalers of cucumber had primary to secondary education. Results suggest that the wholesalers had reasonable level of education. Around one-fourth of the wholesalers were illiterate (Figure 11).

Total amount of cucumber traded per year: The wholesalers of cucumber traded on an average 98.8 metric tons per year (Figure 12).

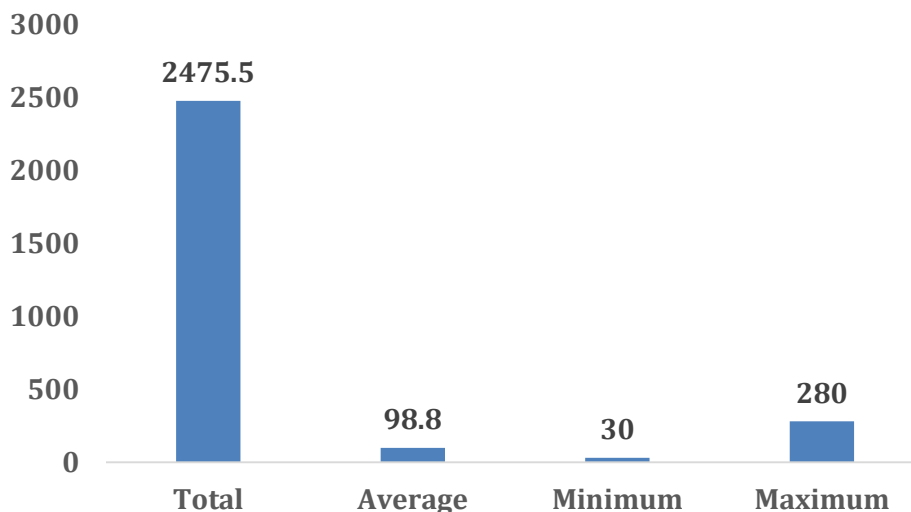
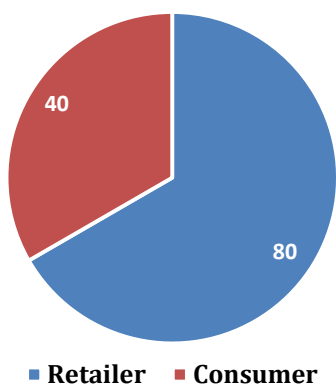
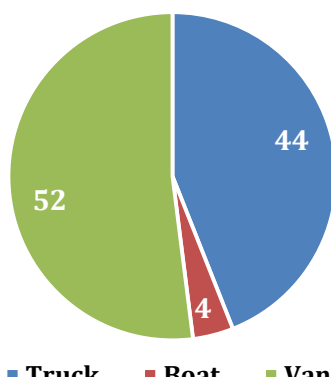


Figure 12. Cucumber (M. ton/year) traded by wholesaler

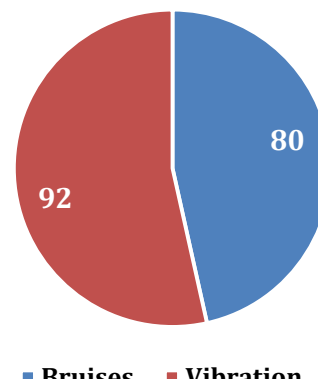
Buyers of the produce: From wholesalers the main buyers were the retailers. The wholesalers also sometimes sold to the Consumers (40%). Results showered that 80% of the wholesalers sold their cucumber to the retailers (Table 13).



■ Retailer ■ Consumer



■ Truck ■ Boat ■ Van



■ Bruises ■ Vibration

Figure 13. Buyers of cucumber from wholesalers

Figure 14. Transport vehicles used by the wholesalers for cucumber business

Figure 15. Types of damages occur during transport of cucumber

Mode of transport: Wholesalers usually used truck or van for transportation (Figure 14). It was observed that 52% of the wholesalers of cucumber used van for transportation followed by truck (44%).

Damage during transport: In case of cucumber the highest damage occurred due to the vibration (92%) of the vehicles during transport. More than 80% damage occurred due to bruises of the cucumber fruits (Figure 15).

Problem in cucumber business: Twenty four percent wholesalers faced storage problem in cucumber trading (Table 19). Most of the wholesalers had no proper knowledge about the storage and transportation of the cucumbers.

Table 19. Problems of wholesalers in cucumber business

Respondent	Problems in cucumber trading			
	Lack of storage	Transport	Money	None
Wholesaler %	24	20	4	60

NB. Due to duplication and overlapping sources exceed 25.

Respondent: Retailers

Retailers play an important role in vegetables marketing. They are the final stage of marketing channels. Consumers usually purchase cucumber from the retailers. The present survey on retailers was conducted in different retail markets located Machua Bazaar of Mymensingh Sadar, and K.R. Market, Sesh More of Bangladesh Agricultural University, Mymensingh. The major results in relation to the individual characteristics of the retailers are briefly discussed below.

Age: The age of the cucumber retailers ranged from 25 to 50 years. On the basis of age of the retailers were classified into four categories. Around 84% of the retailers were of 35-50 years of age (Figure 16).

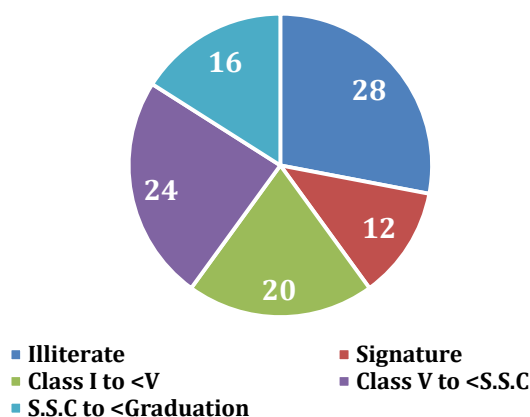
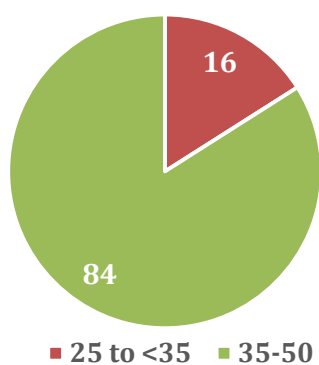


Figure 16. Age of cucumber retailers

Figure 17. Education level of cucumber retailers

Education: The cucumber retailers were classified into five categories according to their level of education. Result showed that 28% of the retailers of cucumber were illiterate 24% of the retailers had education level from Class V to < S.S.C (Figure 17).

Total amount of cucumber traded by each retailer: The amounts of cucumber as traded by retailers were remarkably lower as compared with those of the amounts traded by ‘Bepari’ and wholesalers as described earlier. Results showed that on an average 0.67 tons of cucumber were traded by each retailer per year (Figure 18).

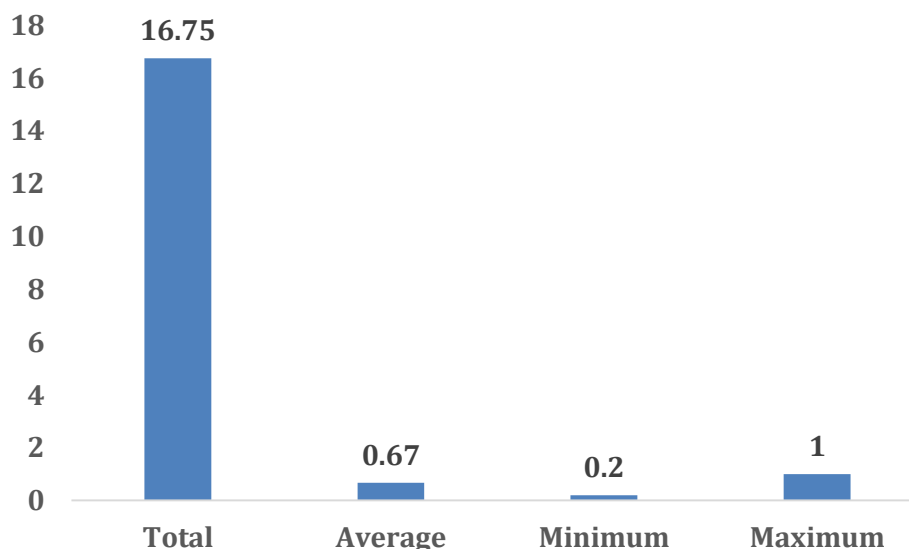


Figure 18. Cucumber traded by the retailers per year

Sources of cucumber: The majority of the retailers obtained cucumber (64%) from wholesalers. Vegetables were sourced from growers and other forms of intermediaries (Figure 19).

Mode of transport: Fifty percent of the retailers used van for the transport of cucumber to their retail markets. Some retailers also carried cucumber by rickshaw (45%) (Figure 20).

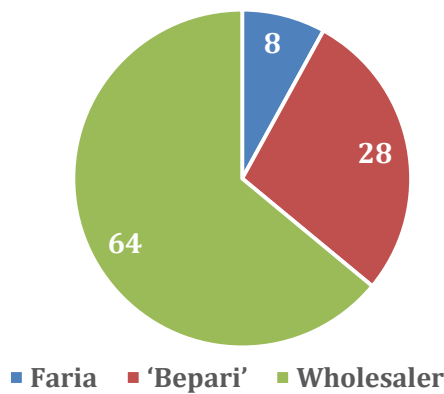


Figure 19. Sources of cucumber to the retailers

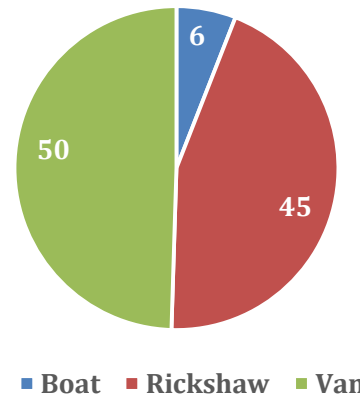


Figure 20. Cucumber transportation vehicles of the retailers

Buyers of cucumber from the retailers: Retailers are the last step in the trading of the cucumber. So, the retailers sold their commodities principally to the consumers.

Damage at the retailers' level: According to 48% retailers maximum damage of the cucumber occurred by vibration followed by shrinkage and bruises in case of the cucumber (Figure 21).

Problems in cucumber business

Above one fourth retailer faced problems with shrinkage of cucumber during retail sale (Figure 22). Shrinkage is caused due to water loss from the fruit, especially when sold at the open sun. In cucumber retailing, other problems were related to storage and transport.

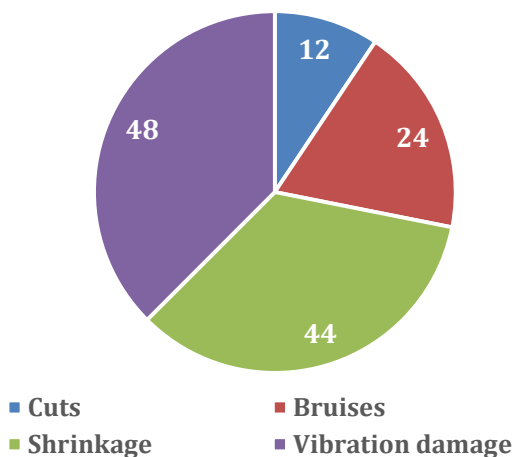


Figure 21. Damages of cucumber during transport at retailers' level

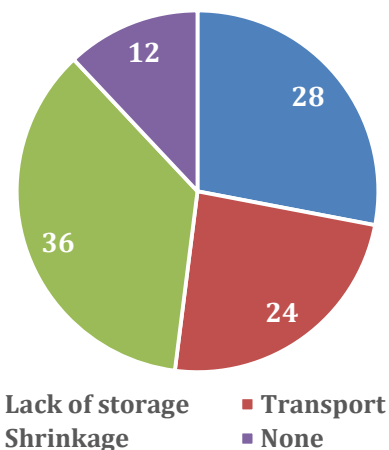


Figure 22. Problems in cucumber business faced by the retailers

Marketing channels of cucumber: Based on the results of the survey the following marketing channel of cucumber (Figure 23) were identified.

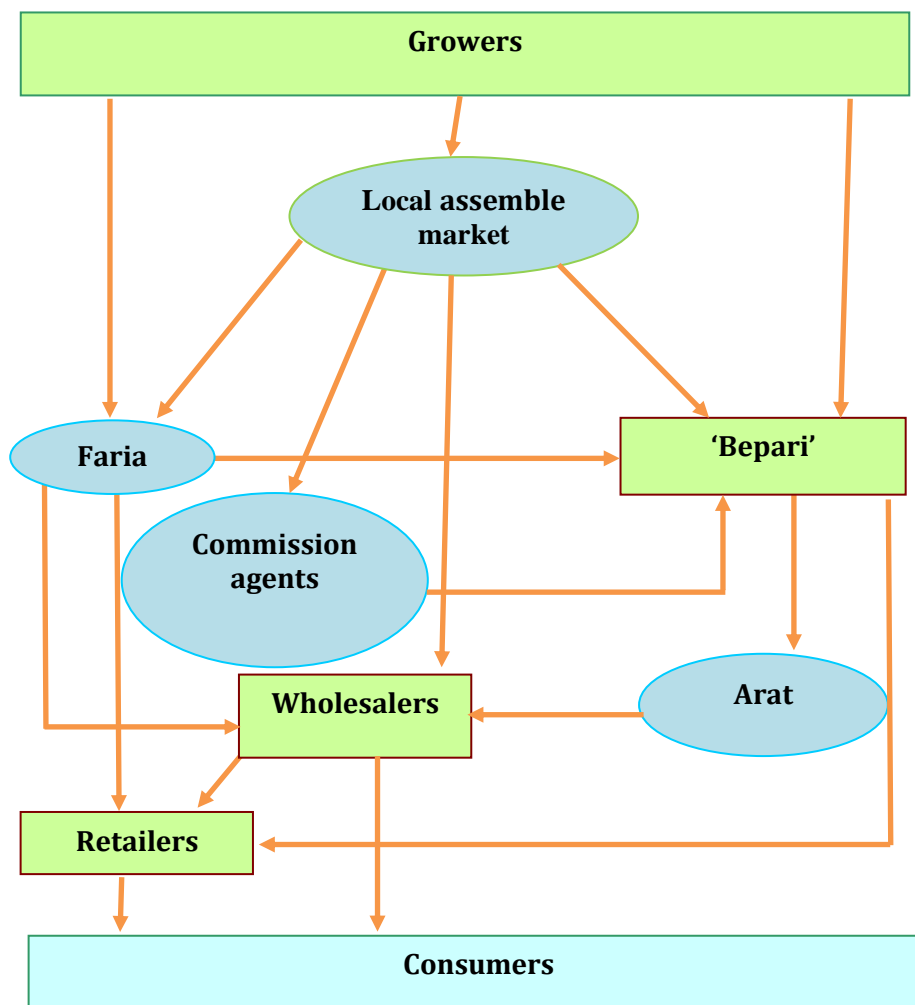


Figure 23. Marketing channel of cucumber

Shelf life of cucumber: Vegetables are perishable. Lack of knowledge on proper storage by the wholesalers and retailers results in huge losses of cucumber. Therefore, the wholesalers and retailers sell their products immediately after purchasing from the 'Bepari'. As per the respondent's views, the shelf life of cucumber was 1-4 days at wholesalers' level, and it was 1-5 days at the retailers' level.

Loss of the cucumber to different respondents through marketing channel

Losses of vegetables from harvest to retail sales were investigated in the present study. It was observed that around 19.99% of the produced cucumber did not reach the consumers due to loss. This finding is in agreement with the findings of Genova et al. (2006). The highest percentage of the loss occurred when the product goes to the wholesalers (Figure 24). The wholesalers brought their products from the 'Bepari'. In most cases, 'Bepari' purchase fresh produce from the growers, and they sale the produce to the wholesalers located at the destination markets in the cities. The produce reaches the wholesalers after a considerable time. As a result, the cucumber fruits start to shrink due to water loss at the wholesalers' hands. Wholesalers again transport their produce to different other places. For improper storage facilities both at the 'Bepari' and wholesalers' level and faulty transport, the loss possibly occurred at higher rates at the wholesalers' level.

Sale and purchase prices of cucumber at different respondents

From the present investigation, it was identified that growers get minimum profit from the cultivation of the cucumber (Figure 25). The intermediaries obtain maximum advantage out of the business. The price increased by around 88% in the marketing channel before the product reaches the consumers. Hassan et al. (2010) reported that the price analyses of the horticultural crop at different levels of marketing and from grower to consumer, the price increase in cucumber, banana, cauliflower, and okra were 94.31, 89.48, 88.13, and 86.40%, respectively. This is attributed possibly due to one or more of reasons like (i) growers are not interested in sale their products to the consumers, (ii) growers are

not aware about the prices of produce, (iii) no strong growers' society to preserve their right, and (iv) strong society of the intermediaries to preserve their right.

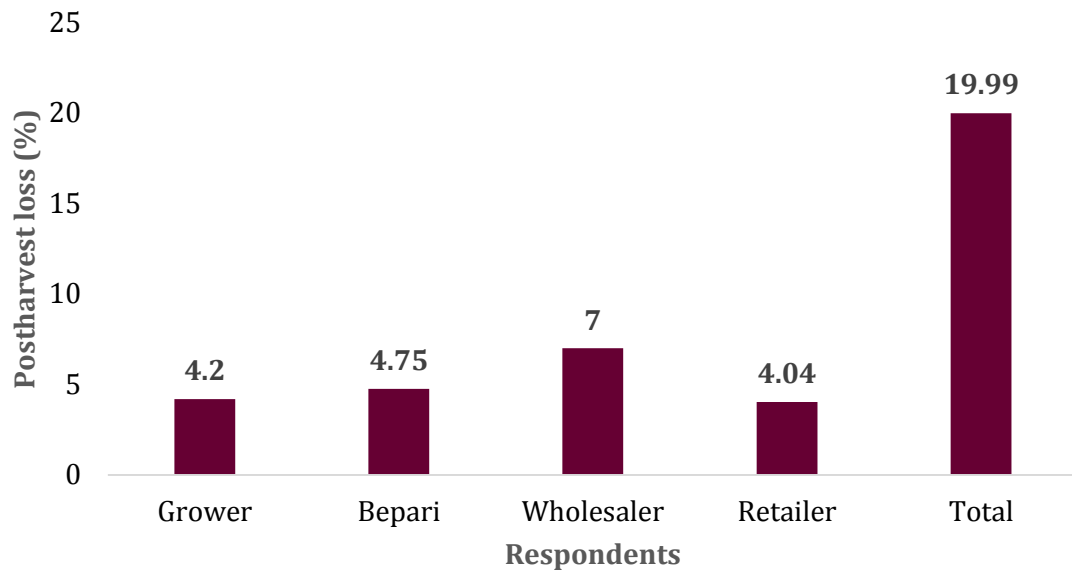


Figure 24. Postharvest losses of cucumber from harvesting to different levels of marketing

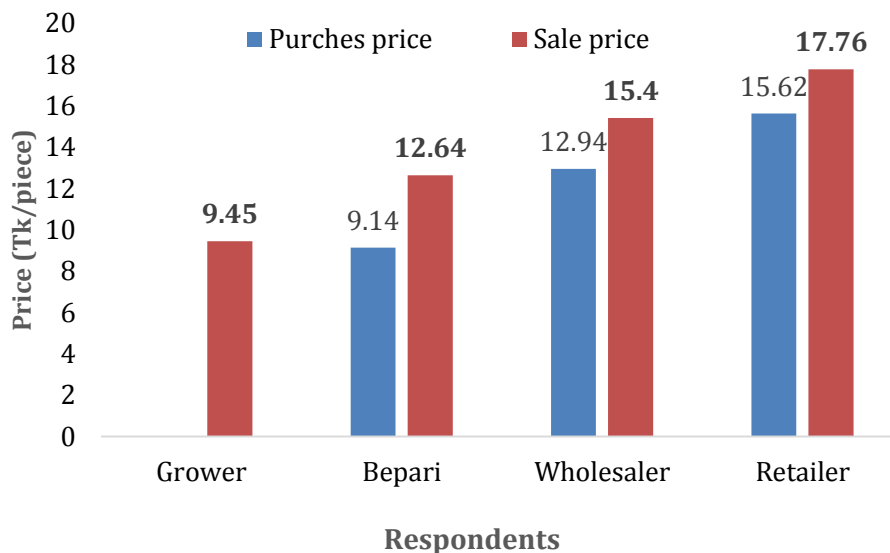


Figure 25. Sale and purchase prices of cucumber at different respondents

IV. Conclusion

In conclusion, growers use range of chemicals (insecticides, fungicides, and growth regulators) in growing cucumber. Huge postharvest losses occur from harvest to retail sales. Transport and storage were found to be major obstacles in fresh vegetable marketing. Future research works would be conducted about the safety of vegetable consumption. The residual levels of synthetic chemicals in vegetables would be extensively investigated.

V. References

- [1]. BBS. (2019). Yearbook of Agricultural Statistics-2018. Bangladesh Bureau of Statistics. Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. pp. 1-567.
- [2]. Blossner, M. and Onis, M. D. (2005). Malnutrition: Quantifying the health impact at national and local levels. Geneva, World Health Organization. (WHO Environmental Burden of Disease Series, No. 12). Retrieved 20 December, 2019 from

- https://www.who.int/quantifying_ehimpacts/publications/MalnutritionEBD12.pdf
- [3]. DAE. 1999. Agricultural Extension Manual. Department of Agricultural Extension Education. Ministry of Agriculture, Bangladesh.
 - [4]. FAO. 2003. Diet, nutrition and the prevention of chronic diseases. Report of a joint FAO/WHO. Expert consumption WHO Technical Report Series 916. Geneva. World Health Organization. pp. 1-160.
 - [5]. Faqeerzada M. A., Rahman A., Joshi R., Park E. and Cho, B. K. (2018). Postharvest technologies for fruits and vegetables in South Asian countries: a review. Korean Journal of Agricultural Science. <https://doi.org/10.7744/kjoas.20180050>
 - [6]. Fasuyi, A. O. (2006). Nutritional potentials of some tropical vegetables' meals. Chemical characterization and functional properties. African Journal of Biotechnology, 5(1), 49-53.
 - [7]. Genova, C., Weinberger, K., Sokhom, S., Vandy, M., Koh, K. and Yarith, E. C. (2006). Postharvest loss in the supply chain for vegetables – The case of tomato, yardlong bean, cucumber and Chinese kale in Cambodia. AVRDC - The World Vegetable Center, Shanhua, Taiwan. AVRDC Publication No. 06-683, Working Paper No. 16. p 27.
 - [8]. Gopalan, C., Sastri, B. V. R. and Balasubramanian, S. C. (1981). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. p. 51.
 - [9]. Hassan, M. K., Chowdhury, B. L. D. and Akhter, N. (2010). Final report: postharvest loss assessment: A study to formulate policy for loss reduction of fruits and vegetables and socio-economic uplift of the stakeholders (Jointly being implemented by FAO and FPMU of the ministry of Food and Disaster Management). pp. 1-189.
 - [10]. Hanif, R., Iqbal, Z., Iqbal, M., Hanif, S. and Rasheed, M. (2006). Use of vegetables as nutritional food: Role in human health. Journal of Agricultural and Biological Science, 1(1), 18-22.
 - [11]. Hossain, S. M. M. (1992). Status constraints and strategies of vegetables research in Bangladesh. Paper presented in National Vegetables Review and Planning Workshop on Production and Marketing, held at Bangladesh Agricultural Research Institute, Gazipur, 26-29, January.
 - [12]. Ihekoronye, A. I. and Ngoddy, P. O. (1985). Tropical fruits and vegetables. In Integrated Food Technology for the Tropics. Science and Macmillan Publishers, London. pp. 292-304.
 - [13]. Khan, A. R. (1991). Crop loss and waste assessment. Consultant's Report, USAID/BARC/AHECCI and Co. Inc. Dhaka. p.112.
 - [14]. Ramphal, C. (1990). Problems in marketing of agricultural products at market yards, Indian Journal of Marketing, 21, 5-10.
 - [15]. Sharma, P. K., Sharma, S. K. and Thakur, R. K. (1996). Marketing of vegetables in Himachal Pradesh. Indian Journal of Agricultural Marketing, 9(1), 44-50.
 - [16]. Srinivasarao, C., Kundu, S., Lakshmi, C. S., Rani, Y. S., Nataraj, K. C., Gangaiah, B., Laxmi, M. J., Babu, M. V. S., Rani, U., Nagalakshmi, S. and Manasa, R. (2019). Soil Health issue for sustainability of south asain agriculture. EC Agriculture 5(6), 310-326.
 - [17]. Singh, K. and Chanda, K. L. (1990). Vegetable production and policy in India. In Vegetable Research and Development in South Asia. Proceedings of a workshop, held at Islamabad, Pakistan, on September 24-29, 1990. S. Shanmugasundaram (ed.), AVRDC Publication No. 90-331. pp. 89-105.