

E-BAZAAR, FARMERS & CONSUMERS E-COMMERCE SYSTEM

MOHAMMAD TAHMID LODI¹, MUJIB MEHRAN^{1*},
ZAHIDAH ZULKIFLI¹

¹Department of Information System, International Islamic University Malaysia, Jalan Gombak, 53100 Kuala Lumpur, Malaysia.

*Corresponding author: mehranmuzib@gmail.com

ABSTRACT: Bangladesh suffers a loss of tons of fruits and vegetables every season due to a lack of post-harvest facilities and a lack of storage system. According to a report conducted by Bangladesh Agricultural University, approximately RM 3.6 billion worth of fruits and vegetables are wasted every year. According to another report, highly perishable fruits and vegetables can lose up to 40% of their value in a single season. **OBJECTIVES:** This paper aims to demonstrate how the E-bazaar application can contribute to reducing the wastage of fruits and vegetables. The purpose of E-Bazaar is to create a Horizontal Market for the farmers and the agribusiness owners. It will give farmers and sellers a versatile market to sell their harvest or products which can be fruits, vegetables, organic products, groceries, dairy products, meat, fish and all sorts of food items to meet the needs of a wide range of customers. **METHODS:** System Development Life Cycle (SDLC) was used to develop this system. For data collection, surveys and interviews were conducted to farmers, agribusinessmen and existing online businesses who sell grocery and uncooked food items on Facebook page and their websites. **DEVELOPMENT:** The researchers carried out the SDLC process to have a clear visualization of the processes involved in this project. MERN stack was used to develop the system which means MongoDB, Express, React Native, Node.js (MERN) were used. **SIGNIFICANCE:** From the user acceptance test upon completion of the development, it was proven that the E-Bazaar able to create a new platform for sellers. Farmers can sell their products in bulk and in small quantities. New businesses can be created since people will not require a shop to sell their products. It will create job opportunities and more business opportunities for people in Bangladesh and it can be applied to any other country. The success of this application can play a vital role to revive the economy.

KEYWORDS: Farmers, Consumers, Agribusinessmen, E-Commerce

1. INTRODUCTION

In Bangladesh, each year thousands of tons of fruits and vegetables are wasted due to a lack of post-harvest knowledge and insufficient technologies. The harvesters are exposed to a monopolized business model which results in insufficient profit compared to middlemen and the consumers are charged with much higher prices.

The purpose of this project is to develop a platform that connects farmers and Agribusiness owners to consumers. It will monitor the delivery system that consists of three stages of the delivery process and update the users. They will not have to depend solely on certain vendors to sell their harvests. It will create a new scope and a diverse market for the farmers and agribusiness men.

A study of Bangladesh Agricultural University reported that approximately 32.24 billion Taka worth, which is equivalent to about 1.6 billion Malaysian Ringgit, fruits and vegetables are wasted approximately every year. The report also showed that the post-harvest loss ranges from 23.6 to 43.5 percent of the fruits and vegetables that include jackfruit, pineapple, papaya, mango, litchi, banana, orange, cucumber, cauliflower, tomato, okra, brinjal, and red amaranth. Another study showed that, for highly perishable fruits and vegetables, the losses can hit up to 40% in one season (Hossain et al., 2018).

The loss of harvest has been an on-going problem in Bangladesh. The study also showed that there are scattered studies carried out to assess the crop loss and no systematic and scientific approach has been taken to assess these losses on different crops over the years (Hossain et al., 2018).

2. BACKGROUND OF THE PROBLEM

The Food Agricultural Organization (FAO) declared 29th September as International Day of Awareness of Food Loss and Waste. The first day was marked on September 29, 2020, and at an event, Bangladesh Agricultural University Professor of Horticulture Dr Kamrul Hassan presented a keynote paper. According to the FAO's report, one-third of the world's food production is wasted each year amounting to 1.3 billion tons. The paper goes on to say that though there is no precise data on the amount of food waste in Bangladesh, some studies have shown that post-harvest wastage of vegetables and fruits is 30-40 percent, with an annual financial loss of Tk 3,442 crore per year (Daily Star, 2020).

Currently, the farmers sell their crops to vendors who either store them in cold storage or re-sell them to other vendors who take them to the wholesale market of that district or the nearest town. There, the city or town vendors purchase and deliver them to wholesale markets of other cities and bigger towns; the retailers purchase from them and then, sell to the consumers. The number of transactions and transportation of fruits and vegetables increases the price of food and does not allow the farmers to make sufficient profit due to the control of food price.

3. PROBLEM STATEMENT

The number of stages from the harvesters to the consumers described in the background of the problem increases the food price. There is only one business model for the farmers which puts them into the monopolized business of the middlemen. It creates a fair business model for all related to it. It also results in some unethical businessmen who try to monopolize the business system by storing the harvested product and increasing the price. For storing the products and keeping them from perishing, they use excessive preservative which is extremely harmful for health.

In this era of technology when all the businesses are becoming digitized there is no B2C e-commerce platform for selling fruits and vegetables from the farmers or agribusinessmen to the consumers. This will introduce the farmers and agribusinessmen to digitize business. Dairy and cattle farmers and businessmen can take part too.

The proposed system will create job opportunities for handling, packaging, storing and transporting food from the harvester who is the seller to the consumer in the cities.

4. PROJECT OBJECTIVE

This proposed system, which is a mobile application, enables the farmers living in the village areas to connect to the consumers in the cities. This will secure the farmers' hard-earned harvested crop from perishing, simultaneously, consumers who are city dwellers will enjoy fresh products with reasonably cheaper prices. It will also allow anyone on the Internet to sell fruits, vegetables, dairy products and grocery products. The users for this system will be farmers or agribusinessmen, retailers, delivery partners and the consumer.

5. LITERATURE REVIEW

A very important study was carried by Hossain et al., 2018, which provided current insight on the condition of knowledge of pre and post harvest of Bangladeshi farmers and people related to agriculture. It was found that there was insignificant use of technologies that were recommended by the National Agricultural Research System (NARS), among the farmers and the distributors. A survey was carried out to identify the knowledge of technology and post-harvest of the farmers, extensionists, researchers and agribusiness personnel. The technological knowledge includes the index of ideas, perceptions, and skills respectively, the knowledge of the four categories has on farming technologies. The post-harvest comprises the harvest index, accompanying pest, processing, and marketing of four different crops which are cereal, vegetable/fruits, pulse and spices.

Table 1: Farmers' perception of technological knowledge on pre- and post-harvest agricultural pests and their economic impact in Bangladesh (Hossain et al., 2018).

Technological Category	Crop wise Technological knowledge									
	Cereal		Vegetable/fruit		Pulse		Spices		Total	
	*NARS Tech. (No.)	Response (%)	NARS Tech. (No.)	Response (%)	NARS Tech. (No.)	Response (%)	NARS Tech. (No.)	Response (%)	NARS Tech. (No.)	Response (%)
1. Technological Knowledge										
Ideas	22	29.68(6.53)	28	17.46(4.89)	14	22.29(3.12)	11	26.18(2.88)	75	23.25(17.44)
Perception	22	28.14(6.19)	28	16.32(4.57)	14	21.93(3.07)	11	25.27(2.78)	75	22.15(16.61)
Skills	22	23.00(5.06)	28	12.64(3.54)	14	14.93(2.09)	11	19.82(2.18)	75	17.16(12.87)
2. Post Harvest Activities										
Harvest index	9	43.42 (5.48)	9	52.88 (2.85)	9	45.26 (2.29)	9	56.87 (2.65)	36	47.82 (13.27)
Accompanying pest at harvest	9	16.88 (2.13)	7	14.29 (0.77)	7	21.15 (1.07)	7	19.96 (0.93)	30	17.59 (4.88)
Post-harvest processing	12	39.70 (5.01)	6	32.65 (1.76)	3	33.60 (1.70)	3	23.82 (1.11)	24	21.01 (5.83)
Marketing	9	27.03 (1.83)	9	32.39 (2.18)	9	40.34 (1.44)	9	40.72 (0.79)	36	32.86 (6.25)

Table 2: The distributors' perception of technological knowledge on pre- and post-harvest management of agricultural pests and their economic impacts in Bangladesh (Hossain et al., 2018).

Technological Category	Crop Wise Technological Knowledge									
	Cereal		Vegetable/Fruit		Pulse		Spices		Total	
	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)
1. Technological Knowledge										
Ideas	22	43.41 (9.55)	28	32.36 (9.06)	14	37.00 (5.18)	11	41.64 (4.58)	75	37.83 (28.37)
Perception	22	43.14 (9.49)	28	30.36 (8.50)	14	35.36 (4.95)	11	40.82 (4.49)	75	36.57 (27.43)
Skills	22	35.91 (7.9)	28	26.79 (7.50)	14	22.64 (3.17)	11	24.91 (2.74)	75	28.41 (21.31)
Average	22	40.82/ (8.98)	28	29.83/ (8.35)	14	31.66/ (4.43)	11	35.79/ (3.93)		
2. Post Harvest Activities										
Harvest Index	9	74.22 (6.68)	9	61.78 (5.58)	9	50.33 (4.53)	9	48.56 (4.37)	36	58.72 (21.14)
Accompanying pest at harvest	9	25.13 (2.01)	7	14.33 (0.43)	7	8.33 (0.25)	7	9.67 (0.29)	30	17.53 (2.98)
Post-harvest Processing	12	49.75 (5.97)	6	54.50 (3.27)	3	51.33 (1.54)	3	51.67 (1.55)	24	51.38 (12.33)

Table 3: Perception of researchers' technological knowledge on pre- and post-harvest pest management systems and their impact on agribusiness in Bangladesh (Hossain et al., 2018).

Technological Category	Crop Wise Technological Knowledge									
	Cereal		Vegetable/Fruit		Pulse		Spices		Total	
	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)
1. Technological Knowledge										
Ideas	22	68.18 (15.00)	28	58.57 (16.40)	14	71.36 (9.99)	11	69.73 (7.67)	75	65.33 (49.00)
Perception	22	67.18 (14.78)	28	58.39 (16.35)	14	68.93 (9.65)	11	68.91 (7.58)	75	64.48 (48.36)
Skills	22	66.73 (14.68)	28	57.64 (16.14)	14	67.71 (9.48)	11	68.55 (7.54)	75	63.79 (47.84)
2. Post Harvest Activities										
Harvest Index	9	96.22 (8.66)	9	96.22 (8.66)	9	95.22 (8.57)	9	95.22 (8.57)	36	95.72 (34.46)
Accompanying pest at harvest	9	55.78 (5.02)	7	51.71 (3.62)	7	50.29 (3.52)	7	48.00 (3.36)	30	51.73 (15.52)
Post-harvest Processing	12	80.33 (9.64)	6	93.00 (5.58)	3	89.00 (2.67)	3	88.00 (2.64)	24	85.54 (20.53)

Table 4: Agribusiness personnel's perception of technological knowledge on pre- and post-harvest management of agricultural pests and their economic impacts on Bangladesh (Hossain et al., 2018).

Technological Category	Crop Wise Technological Knowledge									
	Cereal		Vegetable/Fruit		Pulse		Spices		Total	
	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)	*NARS Tech (No.)	Response (%)
1. Technological Knowledge										
Ideas	22	41.59 (9.15)	28	48.29 (13.52)	14	50.93 (50.93)	11	53.45 (5.88)	75	47.57 (35.68)
Perception	22	36.45 (8.02)	28	47.36 (13.26)	14	48.86 (6.84)	11	53.09 (5.84)	75	45.28 (33.06)
Skills	22	23.41 (5.15)	28	21.50 (6.02)	14	20.14 (2.82)	11	25.64 (2.82)	75	22.41 (16.81)
2. Post Harvest Activities										
Harvest Index	9	73.11 (6.58)	9	67.00 (6.03)	9	64.67 (5.82)	9	66.33 (5.97)	36	67.78 (24.40)
Accompanying pest at harvest	9	17.89 (1.61)	7	13.14 (0.92)	7	11.86 (0.83)	7	11.57 (0.81)	30	13.90 (4.17)
Post-harvest Processing	12	67.42 (8.09)	6	75.00 (4.50)	3	52.00 (1.56)	3	49.67 (1.49)	24	65.17 (15.64)

From Tables 1, 2, 3 and 4 shown above, it was obvious that researchers had the highest knowledge on the technologies used in farming and the post-harvest activities. However, farmers, extensionists and the agribusiness personnel had much lower knowledge of technologies and post-harvest. In a nutshell, the study identified several shortcomings in the techniques of farming for the wastage of crops. The increase in the use of technology can increase the yield of harvest and the increase in knowledge in the post-harvest activities can save the hard-earned crops from perishing. There were some constructive suggestions such as a platform

is needed to connect the sectors involved in farming and the consumers. The idea of the e-commerce system for farming could be one of those which could attract more entrepreneurs, investors and increase job opportunities and diversify the market.

For the agriculture e-commerce system, there are several advantages and challenges that a farm or business owner may face. The first advantage is market outlet diversification which is e-commerce that can expand the portfolio of marketing outlets of the business. Different outlets have more activities and high traffic while some of them may have less activities and traffic. An e-commerce system minimizes them and offers a stable presence that can become invaluable. The second one is product details and suggestions. In the e-commerce platform, the buyer can get detailed information of the product and get the photos. Suggestions of other products can also be shown which will help the buyer to buy the products they need in a fast and convenient way. E-commerce in agriculture also expands the customer base. Normally, most of the customers are one-time visitors to the shop but in e-commerce system, they can buy the products any time, anywhere. A flexible timeline offers customers more convenience. Another great advantage is collecting the data of the customers and tracking their activities on the website. By analyzing these data, the owner can understand customer behavior and their priority easily.

Nothing comes without any challenges. Attracting customers is one of the biggest challenges that business owners may face because a business cannot be a success if the customers do not know about it. It is easier to build a good customer relationship in a physical store but in an online store, it is much more difficult. E-commerce includes the technological understanding of the platform, as well as any interconnected systems that have been put in place (inventory management and accounting). The owner needs to either have or improve these abilities or recruit someone who does, much as with the time part. Seeing physical products provides a different experience to the customer which online shopping does not provide. The owner can influence a customer's purchase decision in a physical store with his talking and showing of samples. In an online store, this kind of activity is not possible. Packaging and distribution are the most difficult challenges that the business may face. For agricultural products, most of them are very easy to rot if the packaging is not done in a proper way. Self-delivery requires additional employees to the business which adds more expenses. Introducing a scheduling mechanism or making all orders packed and ready to go before customers arrive would require customer pickup.

5.1. The Development of E-commerce Model of Agricultural Products

Sales of agricultural products surpassed 69.55 billion yuan on the Ali platform in 2015, according to the Alibaba agricultural e-commerce white paper (2015). In 2014, the number of agricultural product sellers was 762,100, and in 2015 the number of sellers was more than 900,000, which accounted for 97.73 percent of retail platforms. Agriculture in E-Commerce generally faces problems like slow development of electronic commerce in traditional enterprises, only internet

transactions are carried out by farmers, denying the quality of agricultural products, and lacking the support of the government (Xiao, 2022).

TooToo is an industrial commune which is a B2C online store, and they specialize in providing fresh products. Tootoo Industrial Commune produces its own delivery of the cold chain. From the outset, it is focused on creating its own logistics infrastructure. The organization set up a logistics centre of 4,000 square meters, which combines cold storage, freezing and packaging into one body. It purchased a refrigerated truck. By using the complete distribution model of the cold chain, it achieves the objective of "fresh distribution daily". It has also opened its own shop on third-party platforms. At the beginning, it took several categories to test and took the approach of virtual inventory to carry on the remote control and eventually provide all products (Cui Jing, 2021).

The Sui Chang model is the first agricultural e-commerce model driven by China's service network. It is driven by a regional integrated e-commerce service provider. It supports the ecological growth of county e-commerce and fosters traditional local industries. Online trade of agricultural goods includes nuts and sweets, dried products, tea, fresh fruits and vegetables. Now, fresh fruits and vegetables are increasingly becoming the key items in the transaction. Local cooperatives have high-quality commodity capital but lack expertise in e-commerce and talent. The electricity businessmen achieve a lower cost of network purchases on the agricultural goods delivery platform set up by the organization and accelerate the transition phase of conventional businesses.

For the development of e-commerce of agriculture in China, it is recommended that the farmers focus on cultivating quality products as the quality of products is one the key factors to increase sales. For the e-commerce companies, it is recommended that the security of the system is enhanced so that the buyers and the sellers buy and sell products without any security issues. To increase market engagement, e-commerce firms can develop a customer relationship management system.

6. METHODOLOGY

Researchers carried out the SDLC as the system development methodology to have a clear visualization of the processes involved in this project. MERN stack is used to develop the system which means MongoDB, Express, React Native, Node.js (MERN) are used.

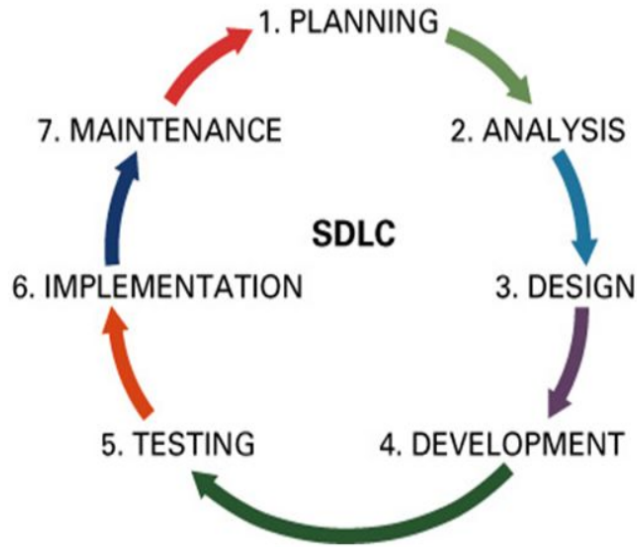


Fig. 1. The SDLC

Table 5: The Implementation of SLDC to the Proposed System

SDLC PHASE	PHASE DESCRIPTION	PHASE OF PROPOSED SYSTEM
1. Planning	This phase defines user requirements, identifies needed features, functions, and customizations, and investigates overall us abilities.	<ul style="list-style-type: none"> The problems which will be solved was predicted. The functionalities in the system were planned.
2. Analysis	The requirements from the users were gathered, analysed and documented into diagrams.	<ul style="list-style-type: none"> Conducted interviews of potential users for user requirements, which was a farmer, an existing and a distributor who is also an agribusinessman.
3. Design	Converting the requirements into software design	<ul style="list-style-type: none"> Create a low fidelity prototype. Create high fidelity prototype
4. Development	Building the system.	<ul style="list-style-type: none"> Database will be connected. Building the app using frameworks. Ensuring all the features are developed.

5. Testing	Ensuring the system meets the user requirements.	<ul style="list-style-type: none"> • Conducting the User Acceptance Test (UAT) • Fixing errors based on the feedback
6. Implementation	Deliver the software to the user.	<ul style="list-style-type: none"> • Feedback will be taken, and the system will be evaluated.

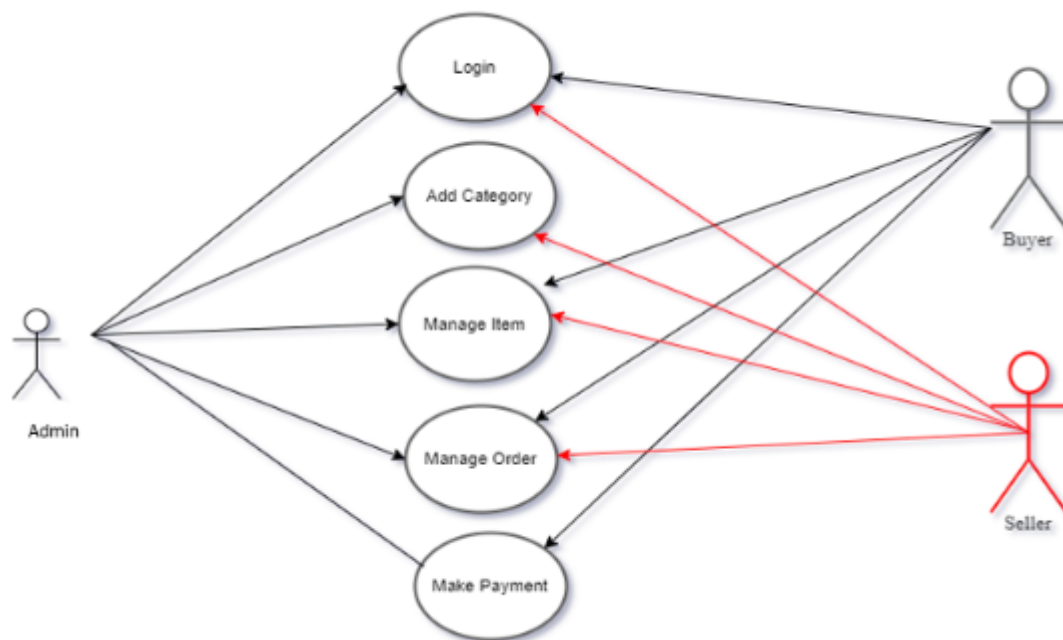


Fig. 2. Use Case Diagram

The system has three types of users and they are admin, seller and buyer. One login and registration system is used for both the buyers and sellers. Admin can register to the system but an approval is required from the authority using the database. After the approval, admin can login to the system. The buyer can browse products and add the products to cart without any login or registration but if he wants to confirm the order, he must login to the system. For the payment, a buyer can use cash on delivery, credit card or mobile banking. Buyer can add or delete items from the cart and also set the amount of the products the buyer wants to purchase. The seller can add products to the system choosing a certain category of the product. Once logged in to the system, a seller can see the status of the products which have been sold already. The admin of the system handles all the products of the system. The admin can add, edit or delete a certain product and can also handle the category of the products. In the admin section, all the pending orders according

to the current state of the product can be managed. It is the admin's duty to check the validity of payment and also send money to the seller if the product is approved.

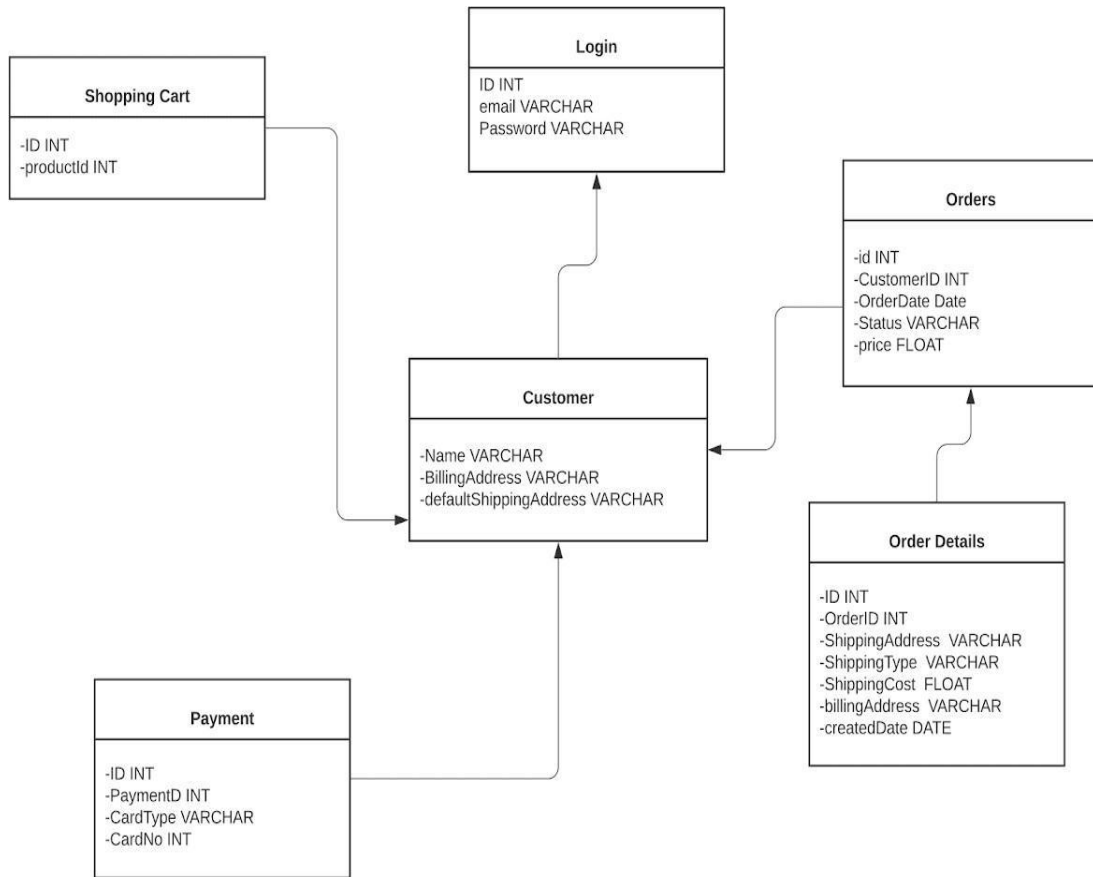


Fig. 3. Entity Relationship Diagram

Fig. 3 is the ER Diagram which defines the Information System of the application. There are six entities.

- I. Login: The "login" has three attributes which are the ID of a particular user which only the admins can see and it has the email and password of the user.
- II. Order: The entity order is the details of an order placed by the buyer. This entity has a unique key id which is the order number of a product and the status attribute shows the condition of a product whether it is delivered, processed or cancelled.
- III. Order details: It is simply the further details of an order made and delivered to a buyer.
- IV. Customer: Here are the details of the customer, the buyer.
- V. Payment: Here are the payment credentials of the customer.
- VI. Shipping Cart: This entity holds two foreign key IDs which are the unique information on an individual buyer and the product id, which is the

reference for a specific product.

Scope for the users:

- Fresh vegetables and fruits at lower price for the consumers.
- A new business model.
- A digitized platform for the sellers and the consumers.
- It will encourage more people into agribusiness.
- It will create more job opportunities in packaging, storing, delivery, and transportation.
- It will play a key role in wastage of harvested crops.

Scope for the application:

- Registration system for the two types of end users.
- A navigation bar which consists of a home which will be the feed, my account, add to cart and messages. For the seller, there will be another option as my item instead of a cart.
- There will be a checkout option for the customers which will lead them to the billing option.
- Tracking option for the seller and the buyers.
- Review and rating.

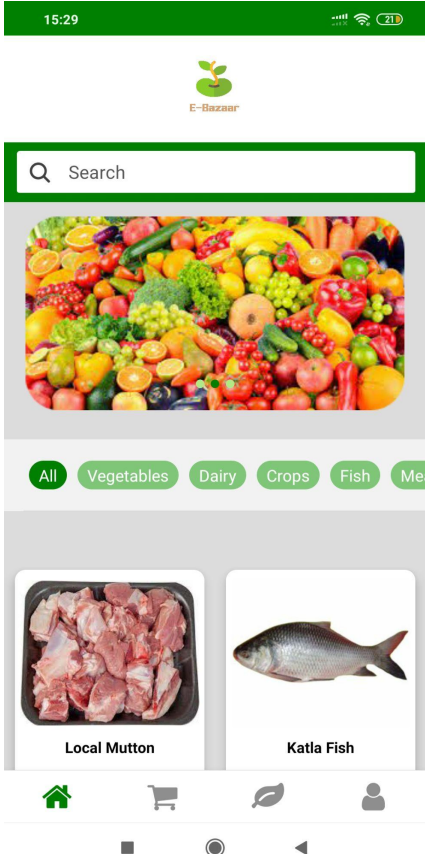
Targeted Users

The targeted users will be the sellers in the specific villages, the farmers and the agribusinesses, and the consumers in Dhaka city.

Specific Platform

The application is built from scratch using React Native, Node JS, MongoDB, Express Node JS, native base.

7. INTERFACE OF THE SYSTEM

INTERFACE IMAGE	DESCRIPTION OF THE INTERFACE
 <p data-bbox="395 1339 699 1370">Image 1: Product Page</p>	<p data-bbox="874 398 1465 631">Description of Image 1, after opening the application, a user will see this product page. The user can browse around the application and check the products, search any product, select a specific category such as vegetable, dairy, crops, fish, meat etc. or just select "all" to view all products together.</p>

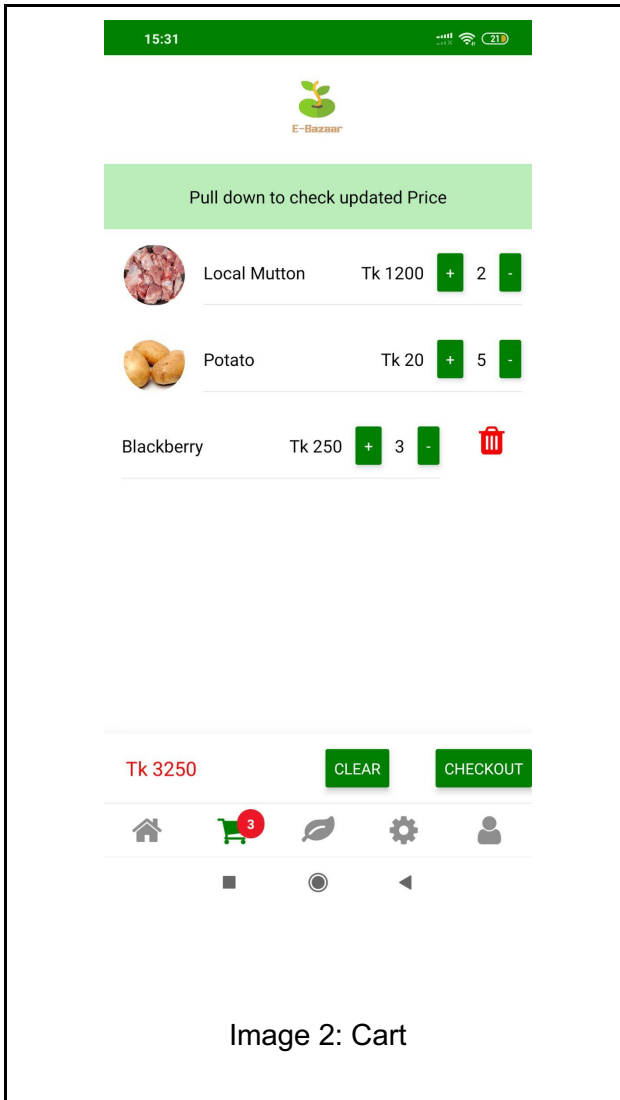


Image 2: Cart

Description of Image 2, when a buyer selects a particular product and adds it to the cart, the user will see the “cart” page where the products chosen will be shown and the total price of the products will be displayed.

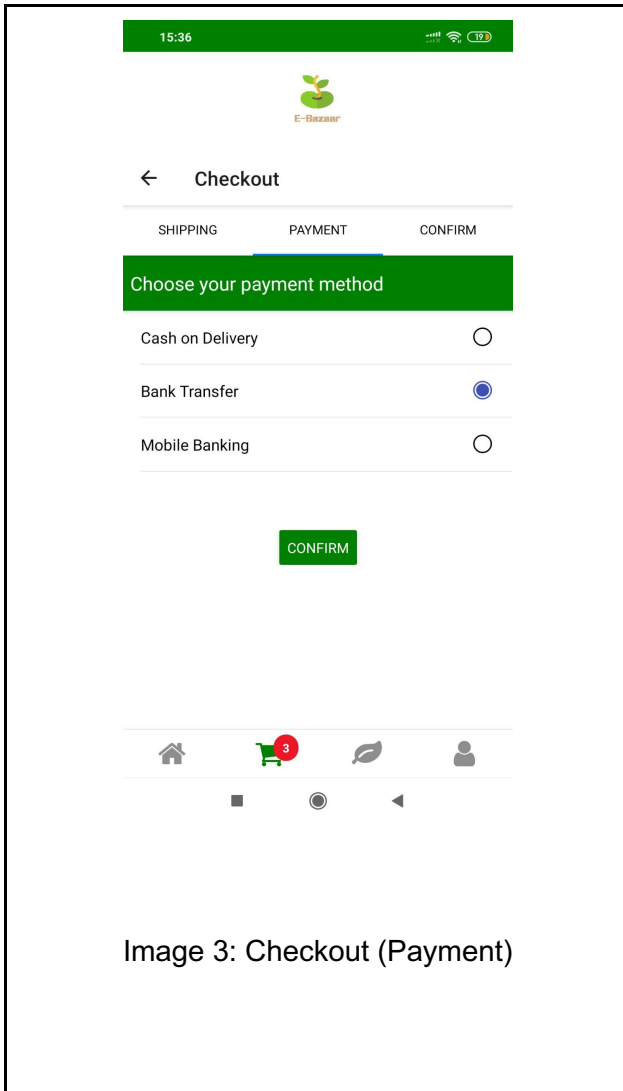


Image 3: Checkout (Payment)

Description of Image 3, this is the payment method selection page.

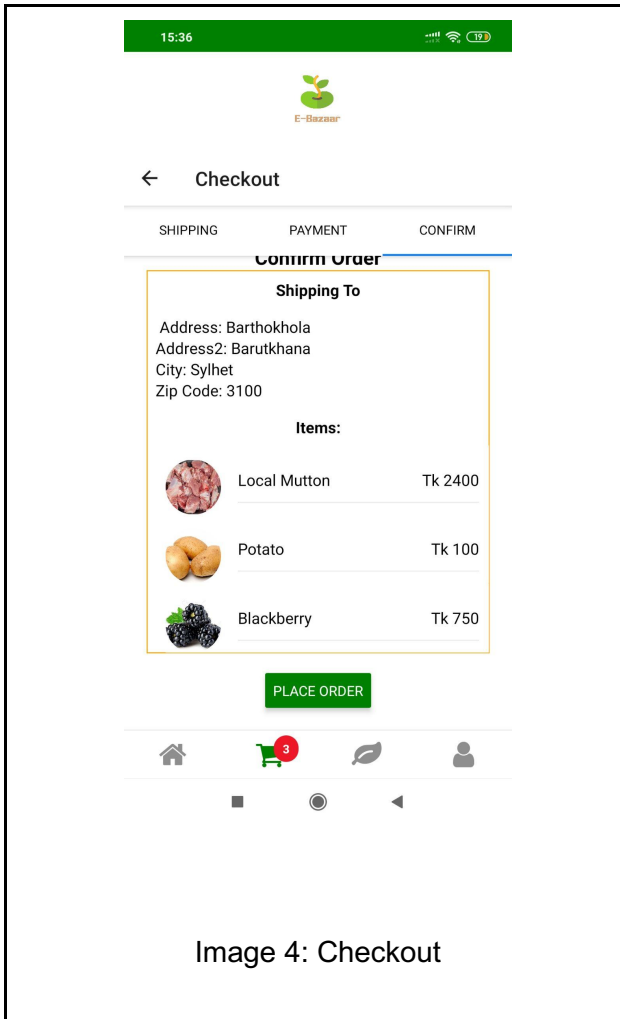


Image 4: Checkout

Description of Image 4, after the buyer presses the green “checkout” button shown in the ‘Image 2’ bottom right side, the user will see the interface of the checkout page where the shipping address will be shown along with the items selected.

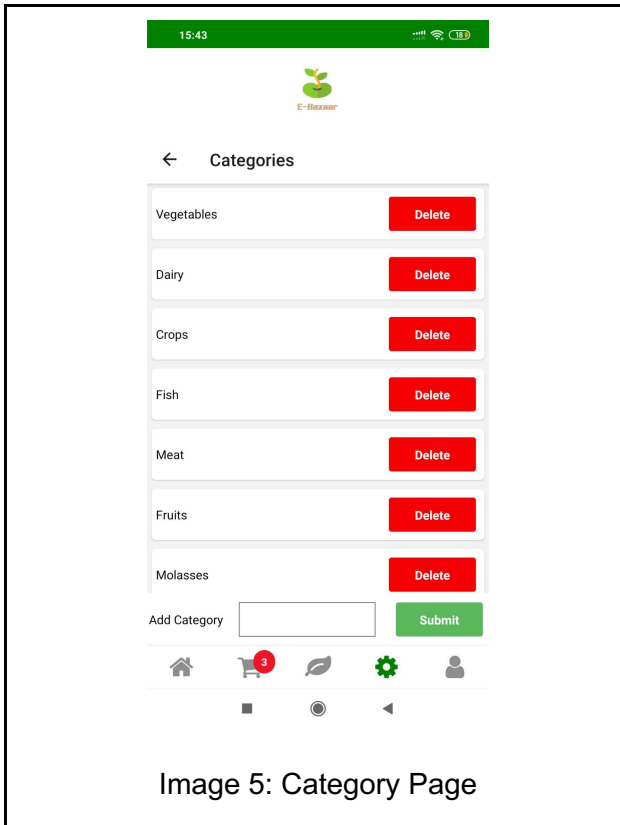


Image 5: Category Page

Description of Image 5, this is the category page which enables the seller to add a category and put the items of the category in that specific category. Example: there is a specific seller who wants to sell different types of cheese. The seller can create a category as “cheese” and advertise the varieties of cheese.

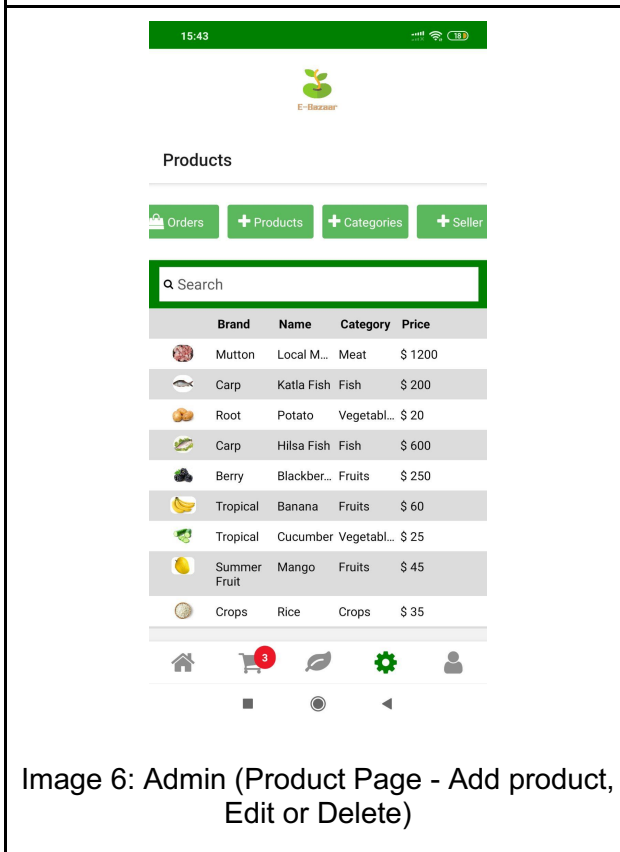
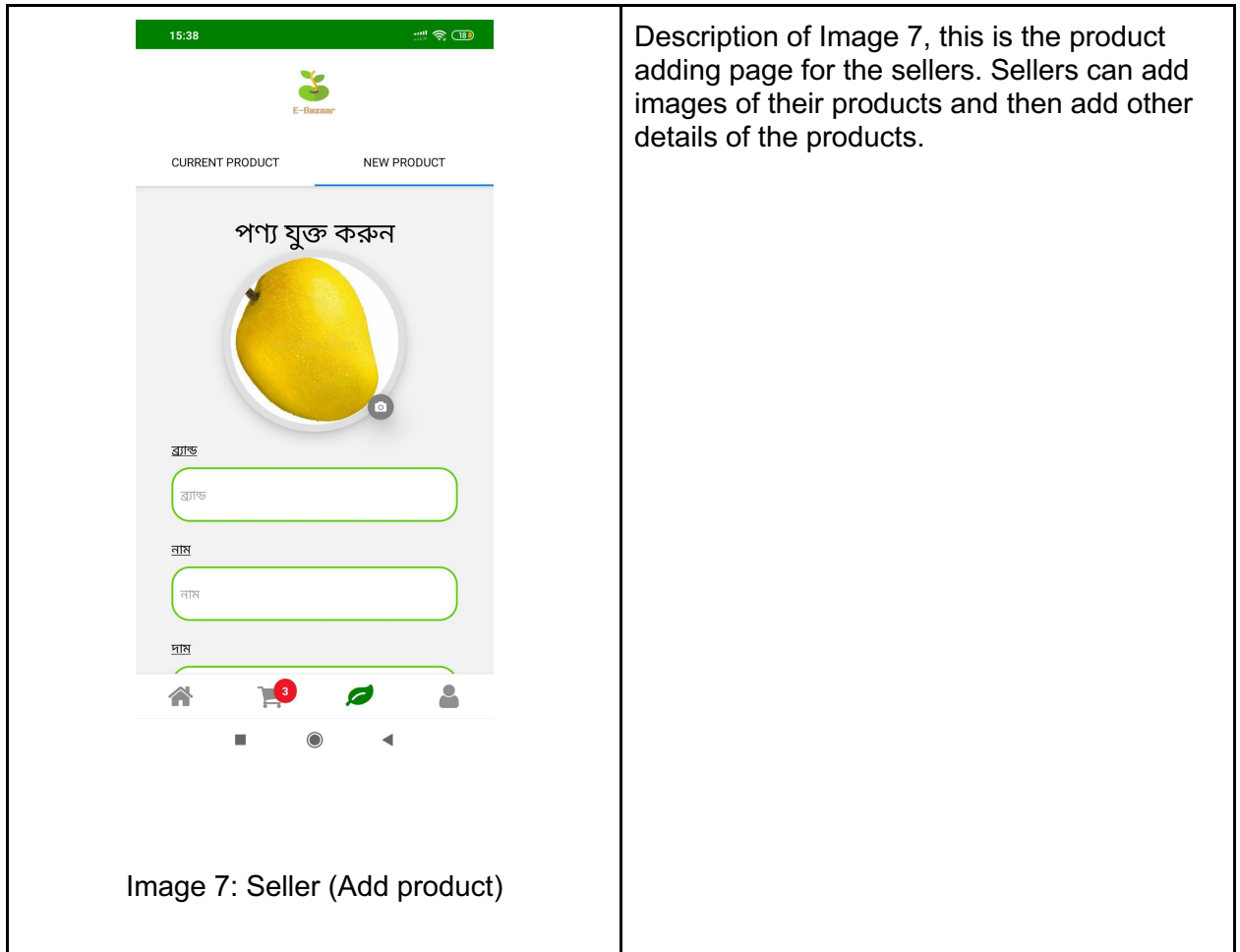


Image 6: Admin (Product Page - Add product, Edit or Delete)

Description of Image 6, this is the product page for the admins. The admins can see the category, brand, name and price of all the products which are advertised. The admins can add, edit or delete any product from the list.



Description of Image 7, this is the product adding page for the sellers. Sellers can add images of their products and then add other details of the products.

Image 7: Seller (Add product)

8. USER ACCEPTANCE TEST

User Acceptance Test (UAT) was conducted face to face in Sylhet, Bangladesh. We conducted on June 4, 2021, with four participants. The first three participants were a farmer, the owner of an existing business, PaiKart and an agribusiness man who has a grocery shop and supply chain business. These three participants were interviewed during the data collection, and they knew the objective of this project and the background problem. The last participant was a BBA student in a university in Sylhet, Bangladesh. However, an order was made in conducting the UAT to make it organized. The team re-explained the background of the problem and project objectives where it was required. A brief explanation of the application was given. After that, the users navigated around the application and the team asked them and then the participants were asked questions about their experience and perception of the system. The results from the UAT are recorded in English. All the participants of the User Acceptance Test suggested we add Bangla in our system and one of the participants suggested we add the + and – for the quantity in the add to cart page which was the suggestion of our supervisor as well. The enhancement was done successfully.

9. LIMITATIONS

On statistics of crop wastage, some scattered studies have been initiated, currently, to assess crop losses, particularly on rice. However, no systematic and scientific approach has been taken to assess these losses on different crops (Hossain et al., 2018). The education of the farmers on ICT is insignificant, for this we will try to make the user interface simple and user friendly. However, the Mobile Internet users in Bangladesh has reached 87.91 million in April 2019 and is increasing at a significant rate. Within a period of ten months the mobile internet subscription increased to 94.236 million in February 2020 and there are about 5.748 million ISP, WiMAX and PSTN users across the country, which gives a cumulative of 99.984 million Internet users according to Bangladesh Telecommunication Regulatory Commission.

10. SIGNIFICANCE OF THE PROJECT

One of the main objectives of this project is to create an easy to interact UI. User-friendliness is very important for an application. The targeted users of this app are of all ages; hence it should be user friendly. The team will try to keep on enhancing the design and make it easier for human-computer interaction.

The aim is to create an e-commerce platform for selling fruits and vegetables along with other household food items which are uncooked. This will create a new business for the agriculture products. The farmers will be able to sell their products in bulk and in retail whichever process that provides them with higher profit, increasing the profit margin of the farmers. New online business model can encourage more people to be involved in this business sector. This can contribute to women empowerment, more women will be encouraged to entrepreneurship. If this project becomes successful it can contribute to the economy from creating new businesses to creating more job scopes in the logistics and packaging workforce.

There is no limit of betterment. In future, e-wallet can be implemented in the system besides a chat box system for the customers and sellers to get connected more conveniently. The participants of the UAT suggested implementing Bangla language on the system. Bangla along with English were used in interacting with the system. However, the commands were not able to operate because the commands were stored and fetched from the database. MongoDB, used as the system's database, does not offer the Bangla language.

11. CONCLUSION

Every year thousands of tons of fruits and vegetables are wasted and fed to domestic animals due to post-harvest facilities. This will create a new platform for selling fruits and vegetables. Since the system has category options, other uncooked food items can be sold as well through the system. This allows a customer to buy all the monthly food items required for a household from one system. This will encourage many people to use this application and conduct business and buy products. Through the system the farmers not only can sell in retail, but also sell in bulk to retailers and retailers can resell the same items at retail. This will help the poor farmers sell their products and avoid loss and increase profit. It will encourage farmers to harvest more and lead them to a better lifestyle. For the buyers, this platform will enable the city people to have a healthier lifestyle by consuming fresh fruits and vegetables.

REFERENCES

- (2013, October). Tonnes-of-vegetables-fruits-go-to-waste-annually. *Daily Star*. <https://www.thedailystar.net/news/tonnes-of-vegetables-fruits-go-to-waste-annually>
- Cornelisse, S. (2018) E-commerce for Ag Business: Advantages and Challenges. *PennState Extension*. <https://extension.psu.edu/e-commerce-for-ag-business-advantages-and-challenges>
- Cui Jing. (2021) Tootoo industrial commune: the control of whole supply chain.China 's Economy and Informa-tization, 56-57, 2013(14).
- FAO, IFAD, UNICEF, WFP and WHO. (2020). The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. <https://doi.org/10.4060/ca9692en>
- FOA. (29 September 2020). International day of awareness of food loss and waste, experts want end to wastage. *The Daily Star*.
- Hossain M. A.¹, Hawlader A. J.², Ali M. R.³, Khatun R.⁴ (2018). Article: Assessment of Technological Knowledge on Pre- and Post-harvest Agricultural Management System and its Economic Impacts in Bangladesh. *Universal Journal of Agricultural Research* 6(2): 79-90, 2018 [DOI: 10.13189/ujar.2018.060205](https://doi.org/10.13189/ujar.2018.060205)
- (2020, September). On Int'l day of awareness of food loss and waste, experts want end to wastage. *Daily Star*.
<https://www.thedailystar.net/country/news/post-harvest-food-waste-amounts-tk-3442cr-losses-year-1969661>
- Huo, Yaping & Mu, Huiping. (2017). Research on the Development of E-commerce Model of Agricultural Products. *MATEC Web of Conferences*. 100. 02040. 10.1051/matecconf/201710002040.
- Xiao, L., Li, C., Wang, R., Mei, S., Li, L. (2022). E-commerce Development of Characteristic Agricultural Products Under the Background of Computer Science and Technology. In: Atiquzzaman, M., Yen, N., Xu, Z. (eds) 2021 International Conference on Big Data Analytics for Cyber-Physical System in Smart City. BDCPS 2021. Lecture Notes on Data Engineering and Communications Technologies, vol 102. Springer, Singapore. https://doi.org/10.1007/978-981-16-7466-2_94