R4TLI
ISSN: 2513-2504

A SMART DIGITAL PLATFORM FOR PROPER DISTRIBUTION OF FARMER HARVEST

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ABSTRACT - The cultivation of vegetables becomes a prominent income among the farmers in Sri Lanka. Main objective of this research was to find an optimal solution for the transportation problem with an efficient and low cost. We are trying to bring together farmers, vendors and transportation providers all in a single platform through a mobile app. This involves the sale and purchase of vegetables and fruits, and the creation of a specialized system for transport management. By improving transport efficiency, low cost, fast, reliable, time consuming and choosing the optimal path. Information of farmers, vendors and transporters were gathered through semi-structured interview phone calls and observations, whereas information that is needed for our product were gathered through a study of relevant literature augmented by key informant interviews and we shared posts on Facebook and got the feedback of farmers, vendors and transporters. The expected outcome of this project was that the mobile application deals with farmers, vendors, and transport providers. So it should be easy for all three parties to perform their task. Here we tried to solve the main problem faced by farmers, vendors and transporters especially in vegetables and fruits through this application, building the connection between each other. This enables vendors to purchase products faster and at a lower cost. This reduce the need to travel to wholesale centers for buying and selling, without a middle seller man

Keywords: Vegetable; Mobile application; Farmers; Vendors; Transporters; Optimal Path

1. INTRODUCTION

As a developing country Sri Lanka has less experience of management and communication techniques or mechanisms. From producers to consumers, this industry faces several problems. Due to that, small-scale producers must sell their products to distributors, for lower costs. It directly affects the earnings of small-scale producers. And also most of the time, their harvest is wasted with no way to sell them. In Sri Lanka we don't have a mechanism to distribute food in any disaster even if it is natural or human created. This problem is very highly affected due to the COVID – 19 pandemic situations. As a result, farmers become helpless without a way to sell their harvest. But in developed countries which are using proper management systems gain many benefits. Small and big scale producers in developed countries are utilizing fruit and vegetable company management software to get the full benefits of their labor. They also don't need to go to the market to observe consumer behavior because of vegetable ordering and delivery applications. They can use in-app integrated analytics to target potential consumers. Vendors created buying stations in high-growth areas in industrialized countries like the United States to provide fresh vegetables. They can even run a company aggregator and handle everything on a single panel with veggie ordering and delivery applications. So the scope of this project was to create an app to buy and sell vegetables and fruits in bulk directly from the farmers to vendors who are seeking fresh, quality and organic vegetables and fruit bulks. And also to give fresh food everywhere in Sri Lanka and give reasonable prices or profit for farmers, not only that our system is to get services of middlemen

also. Nuskiya, F., (2019), studied the challenges in vegetable production and marketing in the up-country region (Nuwara-Eliya, Badulla, Kandy & Matale) and proposed suggestions to mitigate such challenges within the study area to reinforce the socio-economy of the people.

For this study, Primary data were employed with a questionnaire survey to determine the socioeconomic data required for the study. Brar., G.S., and Saini, G., (2011), have reviewed the literature on Milk Run Logistics and presented an overview of its implementation practices adopted by the manufacturing organizations. The paper also discussed milk-run logistics in the procurement system with a special emphasis on the automobile industry. The milk run system is all about logistics support for the supply chain. Milk run system results in a reduction in the cost of transportation, traveling path, and fuel consumption. According to the study, the overall supply chain cost can be minimized by using a milk-run system in transportation instead of direct shipment. Priyankara, E.A.C., (2016), has reviewed the present status and discussed the possibilities of improving the vegetable direct marketing system in Sri Lanka as an alternative to the present vegetable marketing system. Secondary information was collected through a literature survey while primary data was gathered from a field survey. The sample included 72 direct vegetable marketers to draw the present experience and 214 vegetable farmers who are not so far engaged in such a system to obtain their views and their willingness for direct marketing. Findings of this study reveal that vegetable direct marketing farmers have allocated smaller land extents for a single crop presently (mixed crop). Also, farmers who expressed their willingness to practice vegetable direct marketing are engaging in the same practice in cultivation. Therefore, farmers who can allocate small land extents for a single crop can cultivate at least 5- 6 crops that are more suitable for direct marketing. Vegetables are produced on a year-round basis and a large number of farmers are involved in the process of production. However, many people criticize the vegetable marketing system due to fluctuating prices. In this background, Sandika, A.L., (2011) identified the long-term behavior of Market Margin (MM) of middlemen on vegetable marketing channels in Sri Lanka. This study was mainly done using secondary data. Fruits and vegetables are damaged due to inappropriate methods of picking, packing, storage, and transportation. They perish during this process. Insufficient information flow is another major handicap. Chandana, D.P.M., and Ramachandran, P., (2007), studied the whole supply chain of the Fruit & Vegetable industry and identified the weak links of the supply chain and the Improvements in order to maximize profit for the growers and minimize the cost to the consumer. Also, he has identified the extent of fruit and vegetables damaged by the methods of wrong handling, storage, and packaging. And also identified the gaps and necessary improvements for the fruit & vegetable supply chain using the Supply Chain Operation Reference Model (SCOR). When analyzing the price breakdown for supply chain threads for fruits and vegetables in this research, the maximum portion was found to be the profit component, second came costs due to damage/ perishing, and thirdly basic production cost. Around one-fifth portion is only the amount for the cost of these fruit and vegetable items and the balance part of what the consumer pays consists of the profit, cost due to damage, transportation cost, packaging cost, loading unloading cost, and overheads.

However, this issue has not yet been resolved in Sri Lanka. So, we decided to find a practical solution to this problem using these studies. We often see the problems faced by vegetable and fruit farmers and vendors on Television, on Social media, and in the newspapers. For now, as a solution, there are Facebook pages to sell the harvest to the buyers. But they are not practically useful. Therefore, as a solution to that problem, we decided to create this platform. So with this app, we are providing maximum opportunities to the vegetables and fruits growers, vendors, and transport service providers in Sri Lanka. The farmers have the ability to post their vegetables and fruit bulks in this app, a week before harvest. They do this to stop their harvest from being wasted. Also, the facility for selling the currently harvested products is also provided here. Also, there are some legal regulations for the

transportation of goods through this application and the use of containers (baskets) for transportation is mandatory. It is hoped to reduce the damage caused to the products during transportation. The research problem was how to combine farmers and the vendors. Vendors can find transporters through this mobile app, if they are not near to the location where harvest they bought is available. So that we created/planned an optimal path for transportation methods with efficiency, low cost and reliability. That means if the harvest is transported from Dambulla to Bandarawela, the harvest in Bandarawela will be loaded on the same turn. In that way it minimizes the time, and cost for the transportation.

2. MATERIALS AND METHODS

The biggest problem of farmers and buyers is the lack of a proper transport system. Therefore, there are problems in distributing and receiving the harvest. So our research component was to find an optimal path selection in transportation. Accordingly, we hoped to plan the transport through the system according to a good methodology.

2.1. REQUIREMENT GATHERING

First we have decided to do our surveys with farmers, vendors and transporters in physical manner. But due to the COVID – 19 pandemic situations in the country we had to do our survey through phone calls. And also used paper articles and social media to find the issues that the farmers and other parties are facing nowadays.

Table 1: Distribution of the Sample

District	Sample						Total
	Kurune-gala	Matale	Badulla	Nuwara Eliya	Anuradha-pura	Manning Market	
Farmers	3	3	3	4	3	4	20
Vendors	3	3	3	4	3	4	20
Transporters	2	2	1	2	1	2	10
Total	8	8	7	10	7	10	50

Figure 1.

And also using the posts we shared on Facebook we got about 30 feedbacks from farmers, vendors and transporters.

2.2 CONCEPTUAL DESIGN OF THE APPLICATION

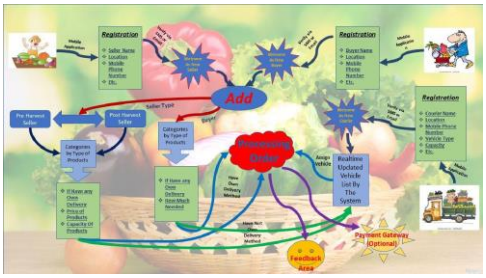

Figure 2.

The Figure shows the rough basic operation of the application. It allows the user to access the system in three modes: Farmer, Vendor, and transporter. After the authentication process, they are given the opportunity to access the system. Both the farmer and the vendor have the opportunity to advertise their sale or purchase of the desired products. Here the vendor has the option of posting an advertisement stating his requirement or purchasing through the advertisements posted by the farmer. The farmer has the opportunity to post advertisements as a pre-harvest seller or as a post-harvest seller.

2.3 DEVELOPMENT OF THE SYSTEM

The system development process is as follows.

Figure 3.

1. Registration
2. Sign Up/Sign In
3. Search Items and a variety
3.1. Select the Grade
3.2. Finalize the Price
4. Transportation
5. Confirm Order
6. Delivery
7. Payment
8. Feedback

Frontend Development

- We are using "Flutter" with "Visual Studio code" as the framework to build the cross platform of our mobile application. "Dart" is the language.

Backend Development

- We are using ASP.net core, SQLite with Visual Studio for backend development

API

- We are using "Swagger UI" to integrate the frontend with backend.

2.4 OPTIMAL PATH

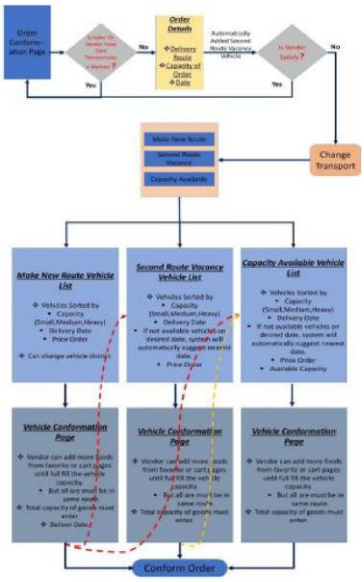

Figure 4

Figure 4 shows, that the buyer can arrange transportation under three conditions as he wishes.

Starting a new path

Choosing a return path

Search for a carrier that has space

After selecting one of these options, our application will display a list of carriers currently in the database. Starting a new route in this list basically uses the manufacturer's district and selects the nearest carrier.

The manufacturer's district and date are used in the other two cases. The buyer can complete the order after selecting a carrier and completing all the details related to his order.

2.5 TRADITIONAL METHOD VS DESIGNED SYSTEM

Figure 5

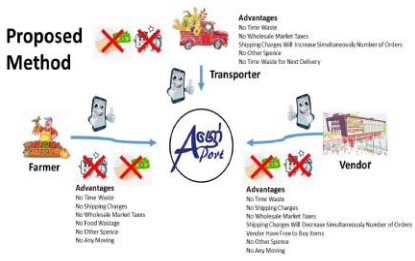

Figure 7

Here we try to solve the main problem faced by traders, wholesalers, and transporters especially in vegetables and fruits through this application, building the connection between each other. This enables wholesale buyers to purchase products faster and at a lower cost. This will reduce the need to travel to wholesale centers for buying and selling, without a middle seller man. Also, due to the absence of middle seller man and additional costs, the buyers are able to buy a minimum fair price, cutting the high price paid with buying traditional stocks.

Figure 6

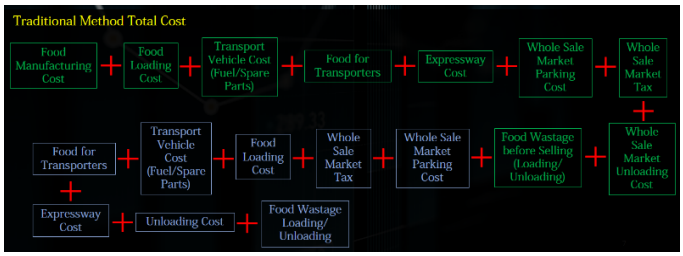

Figure 8

In the traditional method, the price of the products is very high during the movement of the products from the producer to the consumer. The reasons for that are because of the additional expenses for the people who go to buy and sell the products. Also, cash payments to wholesale centers, payments for food, omissions in their daily work, increased loading and unloading times may indicate unnecessary destruction of food items.

As shown here, the most basic element of optimal path works and there is a special page that is visible only to the transporter, where he has to complete the task he receives. There may be several places for loading and unloading goods. And the process is informative for both the seller and the buyer.

And all these data and processes are stored in the database and used for later analysis and annual supply and sales chart.

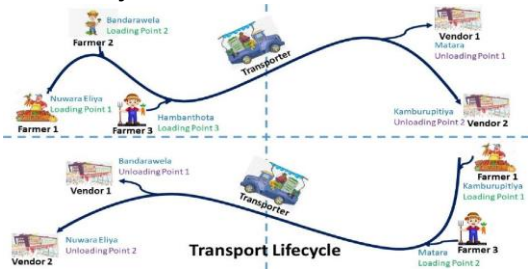

Figure 9

3. RESULTS AND DISCUSSION

70% of Sri Lanka's 21 million people reside in non-urban regions, and agriculture provides a living for about 40 percent of them. Due to the services and functions required in transferring a crop product from where it was produced to where it would eventually be consumed, the agricultural marketing process in the country is a complicated operation. After the recent establishment of regional wholesale markets centers known as Dedicated Economic Centers in a few strategic locations on the island, such as Tambuttegama, Vaunia, Veyangoda, Welisara, Meegoda, Narahenpita, and Embilipitiya, a change in the post-harvest channel of fruits and vegetables was observed. In addition, the Dambulla Dedicated Economic Center and Colombo's Manning Market serve as wholesale marketplaces. Currently, a large part of fruits and vegetables are transported from producing areas to central wholesale markets via regional wholesale markets hubs. The goods are then delivered straight to retail outlets. Several effective marketing routes have lately been developed directly between farmers/producers and the supermarket network, bypassing the collector or the entire vendor. Furthermore, several supermarket chains have developed their collection facilities in key vegetable-producing regions, with enhanced handling, packing, and shipping, as well as the integration of cold-chain elements when needed. Based on the above-mentioned pros and cons, this system is designed by us to have good communication with the manufacturer and the buyer and to enable proper shipment of the product without any waste. 25 This will ensure that product wastage, expiration, shipping errors, reliability, and time-saving during transportation can be done well. Also, problems with contacting buyers and manufacturers are currently emerging primarily in Sri Lanka. As a result, they have to go to economic centers and buy or sell their products at extra cost. It costs extra as well as time. As a successful step towards this problem, we have reserved space mainly for the manufacturers and buyers of the system. They are given the opportunity

to sell and buy their products in different sizes. The system is designed to show buyers the quality of the food and to get a rough idea of the prices at the Dambulla Economic Center, Colombo Manning Market Price Index. The system also pays special attention to regulating transportation from the manufacturer to the buyer. The system also provides low-cost transportation in a short period of time and provides a background that is not disadvantageous to the transport provider. This system is primarily focused on providing more efficient transport services. Looking at the traditional problems mentioned above and the solutions provided by our system, it can be concluded that successful answers to those problems will be found

4. CONCLUSION

There is a good relationship between the farmer and the vendor and the product can be shipped in the right way without wastage. Product wastage, expiration, shipping errors, reliability, and time saving during transport are well done. A prime space is reserved for farmers and vendors. They have the opportunity to buy and sell their products in different amounts. Vendors are likely to call everyone who looks appropriate if there are only a few. The system provides price indicators of the Colombo Manning Market at the Dambulla Economic Center as an overview of prices. Provides transportation facilities at low cost and in a manner that does not disadvantage the transportation provider. The focus was on providing more efficient transport service.

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