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E-Marketplace in the Agricultural Sector in Sri Lanka: Challenges in Adoption

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Authors' contributions

This work was carried out in collaboration between all authors. Author NHE designed the study, managed the literature searches, collect data and performed the statistical analysis. Author KMVS wrote the protocol and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2021/v39i630592

Editor(s):

(1) Dr. Ian McFarlane, University of Reading, UK.

Reviewers:

(1) Winnie Wong, University College Of Technology, Malaysia.

(2) Tareq Nael Hashem, Isra University, Jordan.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/69781>

Original Research Article

Received 10 April 2021

Accepted 14 June 2021

Published 19 June 2021

ABSTRACT

Purpose: Agricultural e-commerce can assist in overcoming notable challenges and inefficiencies in the agriculture supply chain especially in developing countries. The aim of the study is to identify barriers to sustaining and further developing an E-marketplace in the agricultural sector in Sri Lanka.

Design: An exploratory qualitative research approach was used to provide an in-depth overview of adopting and sustaining an e-marketplace. Data collection was carried out using semi-structured individual interviews amongst mass producers and buyers of fruits and vegetables as well as an e-marketplace developing institution in Sri Lanka. As this is a qualitative study, non-probability sampling techniques were used. Sample for mass producers was selected using the snowball sampling approach. Criterion sampling approach was used for the selection of bulk buyers of fruits and vegetables and the e-marketplace developing institutions. Thematic analysis was employed.

Findings: The study found that while farmers and buyers both expressed an interest in joining an e-marketplace in the future, they had expectations that must be fulfilled to do so. Unawareness

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about its existence and the processes behind an e-marketplace was a major barrier common to both farmers and buyers. Further, both farmers and buyers were satisfied with their current process and therefore felt no need for an alternative and therefore would not join an e-marketplace unless that process is supported to an extent. Further, quality, transportation, certifications, and low mobile phone signal were considered major concerns and barriers. Developers face difficulty in acquiring necessary funding to invest in sustaining and further developing the platform. They also believe the absence of a method to guarantee quality and to resolve problems between participants requires an immediate solution. Further, as majority of the farming community is technologically illiterate, developers must account for this issue when developing the platform.

Research Implications: The findings of this study provide valuable knowledge necessary to increase the farmers' and buyers' adoption of an e-marketplace in agriculture which has been named as a high priority solution, by the Department of Agriculture in Sri Lanka, to solve the agricultural problems currently being faced.

Originality: The literature scores in developing context are limited to exploring the e-marketplace adoption in the agriculture sector. This study has deepened the authors' understanding by investigating farmers' and buyers' perspective on the adoption of an e-marketplace for agriculture.

Keywords: *E-marketplace; e-commerce; agriculture; barriers; adoption; Sri Lanka.*

1. INTRODUCTION

"Electronic commerce, or e-commerce, is the buying and selling of goods and services on the Internet" [1]. Agriculture e-commerce is the kind of trading model whereby buying and selling of agriculture products and services are carried out electronically with the use of computer systems linked together over inter network protocols and standards [2]. Thus, e-agriculture is an evolving field that is focused on the development of agriculture through ICT. Agricultural e-commerce can assist in overcoming notable challenges and inefficiencies in the agriculture supply chain especially in developing countries as online platforms can enable farmers to bypass intermediaries and sell directly to agri businesses, retailers, consumers and other customer groups, leading to increased efficiency of the supply chain and generating fairer incomes, as well as a transaction history for farmer [3].

Agriculture plays a significant role in Sri Lanka's economy by contributing 7% to the country's GDP and 25.5% to the employed population [4]. Further, 43.7% of the country's land was reportedly used for agricultural purposes in 2016 [5]. Understanding the importance of the agriculture sector, the Department of Agriculture in Sri Lanka collectively with the Telecom Regulatory Authority and other institutions have taken measures towards the use of ICT to achieve its goals in agriculture through its e-agriculture strategy according to the 'Sri Lanka E-agriculture Strategy' [6]. Within the e-agriculture strategy, one of the high priority

solutions to agriculture challenges which was to be implemented by 2017 is an e-marketplace in agriculture. Through an e-marketplace the participants in the agricultural sector are benefitted through market transparency, price discovery, promotion of information flow, and reduction or elimination of transaction costs [2].

An e-marketplace has recently been launched in January 2020 in the form of a website and mobile application by a private company in Sri Lanka. Although it is now in existence there are still many challenges being faced by its developers in further developing and sustaining the platform as well as in encouraging its adoption among farmers and buyers. Therefore, the main objective of the study is to identify the barriers to sustaining an E-marketplace in the agricultural sector in Sri Lanka with the hopes that the findings from this study will assist the relevant institutions to recognize and thereby overcome the existing barriers. Another objective of the study is to identify the strengths, weaknesses, opportunities and threats faced by institutions in the development of an e-commerce platform.

2. LITERATURE REVIEW

E-commerce for agriculture has gradually become an important manifesto and plays a unique role by expanding market opportunities at low operational costs, in turns gaining competitive advantage. Countries with a rapid movement of technology advancement will gain economic benefits of e-commerce [7]. One emerging aspect of e-agriculture is agricultural e-commerce. An e-marketplace (also known as an

e-market, virtual market, or market space) is an electronic space where sellers and buyers meet and conduct different types of transactions [8]. Functions of an e-marketplace are almost identical to that of a physical marketplace; however, electronic markets are made more efficient, by providing more updated information and various support services such as rapid and smooth executions of transactions, through computerized systems. The term 'digital platform' which is defined as online businesses that facilitate commercial interactions between at least two different groups—with one typically being suppliers and the other consumers [9], has also been used interchangeably with the term 'e-marketplace'. The core function of an e-marketplace can be described using the 3C's: commerce, content, and collaboration. The 3C's mix should be used by each e-marketplace operator in a specific way that is suitable for the unique features of the e-market and industry [2]. A popular theory of e-marketplace adaptation is technological, organizational and environmental (TOE) [10]. The TOE focuses on either individual or organizational level factors of adoption. This study thus aims to explore empirically the presence of e-marketplaces in the agricultural sector in Sri Lanka and identify the barriers to sustaining an E-marketplace.

2.1 E-marketplaces for Agriculture

Sturiale & Scuderi [11] conducted a study to contribute to the knowledge on the presence of e-marketplaces in the Italian agri-food economy and the analysis of the new e-commerce models for the fresh fruit and vegetables in Italy. Findings of the study highlighted that although Food & Grocery represents one of the main items of Italian spending, its share of online purchases on total retail purchases remained at 0.35% in 2017. Platforms set up by the large distribution chains and specific online supermarkets are very successful. Further, the "subscription models" are being launched where customers who are repeat purchasers and who perceive this to be low risk, are being transformed into subscribers.

Carmichael [12] used the Miles and Snows typology of strategic management to explore small farm farmers' decision-making regarding use or non-use of e-commerce, in managing farm operations in the USA. It was found that the factors affecting the decision to adopt e-commerce were cost, family history, perceived use for e-commerce and reduced need to take risks.

Agriculture e-marketplaces are also in operation in certain developing countries. Lilavanichakul [13] conducted a study to explore e-commerce of agricultural products in Thailand and found that the internet has been used to buy and sell agricultural products over the past 5 years. Agricultural e-marketplace platforms were started by start-ups and SMEs which required venture capital and government support. Further, traditional/fresh markets have launched digital platforms and invested in developing logistics networks to support it.

Lee and Tao [14] interviewed and analysed the data of ten agricultural firms from a rural area and identified 5 major barriers for e-commerce implementation for small agriculture firms in rural areas in Taiwan. The major barriers are e-commerce implementation knowledge, skill, capability, human resource and needed capital. Further, it was found that most respondents had no time to manage e-commerce as a result of their heavy workload and limited manpower. Another major barrier is the uncertainty of business value of e-commerce and the reserved attitude towards the benefits of e-commerce.

Although Agri e-marketplaces are in operation in India, Kalpana and Shibu [15] identified that farmer's perception and awareness about the use of e-commerce has an impact on constraints of its use in agricultural practices in India. Constraints were found to be unavailability and unreliability of infrastructure, high cost of implementation, lack of trust in payment systems and unawareness about the benefits of e-commerce.

Asadihkoob and Ebrahimi [16] investigated the challenges and solutions of e-commerce in Iran's agriculture. Based on the results, it was found that the most important barriers for e-commerce development in Iran's agriculture are farmer's low level of literacy, not having computer as a business tool among farmers, lack of information technology (IT) knowledge among the general public and lack of trust in electronic transactions. Similarly, Saban and Timalsina [17] investigated the challenges of e-commerce in agriculture in Nepal. This study also found that computer's unpopularity as a business tool among farmers and farmers' low levels of literacy are major challenges. Further they also identified the lack of the culture of using computers for marketing purposes, online payment system complexities and lack of government serious support and investment in e-commerce as challenges.

Jin [18] conducted a study to analyse mobile e-commerce operating model of "agricultural products" and research on development strategy in China. In his study he mentioned that an e-marketplace for agriculture was first introduced by the government in 2006 and has grown significantly over the past 5 years. In addition, all provinces and cities have built their own e-commerce platforms, such as Guangxi Agricultural Information Network, Guangxi Agricultural Products Trade Network, etc. These e-commerce platforms allow users to post supply-demand information or apply to establish their own online stores with a registered account.

Recently, Lilavanichakul [13] identified logistics as a challenge for agricultural e-commerce in Thailand due to the long delivery time as well as complexities in handling fresh produce. Lack of trust in digital payment as well as the importance of quality control and reliability were considered limitations in the adoption of e-commerce for agriculture. As solutions to these problems, he recommended that the government provide projects and funding to new farmers and SMEs for development of new business models for agricultural produce and to promote the use of digital payment and mobile internet by final consumers. It was also suggested that agricultural e-commerce enterprises require a growing economy and sustainable business in order to succeed.

2.2 Sri Lankan Agriculture Sector and E-marketplaces

Agricultural practices in Sri Lanka have taken place from the times of the ancient Sri Lankan Kings, as is evident by the irrigation systems such as tanks and canals that had been built for agricultural purposes [19]. Sri Lanka was once called the "Granary of the East" which emphasizes the importance of cultivation of rice in ancient times. In modern times, further action has been taken to uplift agriculture through methods such as modern multifunction water supply schemes, rehabilitation of tanks, systematic fertilizer application and labour application to name a few [19]. Steps have also been taken by the Department of Agriculture to harness the ICT potential of Sri Lanka in achieving agricultural goals. One such recommendations made by the Department of Agriculture in the E-agriculture action plan was the development of an e-marketplace, indicating that it would be a high impact solution to current agricultural issues [6]. Further, TAMAP believes

that this type of e-marketplace could instigate market-oriented development and uplift the agriculture sector in Sri Lanka [20].

An e-marketplace was recently launched by an Agri-tech company in Sri Lanka which allows registered farmers to list their produce for sale, specifying the required price, available quantity and any other information the farmers wish to provide. When a registered buyer searches for their requirement on the app or website they are provided with the best matches using a colour scheme (Green indicating the best match and red indicating the worst). The buyers are able to pay using debit cards and credit cards as well as the m-cash facility. In the future, there are hopes that this platform will be further developed to incorporate facilities such as a digital real time price index, transportation facilities, organic certification, traceability and crop insurance among others.

The prior studies conducted on e-commerce adoption highlighted the limitations as well as challenges related to e-marketplaces in the agricultural sector in developed and developing countries. However, there are insufficient studies to date specifically focused on the barriers to sustaining an e-marketplace in the agricultural sector in Sri Lanka. Acknowledging the literature, the present study attempts to fill this gap by investigating farmers and buyers perspective on the adoption of an e-marketplace for agriculture as well as the strengths and weaknesses and opportunities and threats faced by institutions in sustaining an e-commerce platform in Sri Lanka.

3. METHODOLOGY

The main intention of this study was to identify the factors inhibiting the adoption of an e-marketplace in the agricultural sector in Sri Lanka. Exploratory studies are carried out when there is little or no scientific knowledge about the group, process, activity, or situation that is considered to be worthwhile examining [21]. Exploration is the preferred method for this study as it has received little or no prior systematic empirical scrutiny in a Sri Lankan context.

Qualitative research approach was used as it is an organized method of describing people's experiences and internal feelings and therefore is the most suitable method. Qualitative research is a flexible method of research that provides an in-depth overview of a phenomena through data collection and presents qualitative information

[22]. The qualitative study has been conducted by conducting semi-structured interviews with selected respondents and analysing the collected data using the thematic analysis approach.

Three target populations have been selected for the purpose of this study: Mass producers of fruits and vegetables including companies and individuals, bulk buyers of fruits and vegetables and developing institutions of an e-marketplace in the agricultural sector. The reason behind the selection of fruit and vegetable farmers is because fruits and vegetables are highly perishable and therefore, this type of efficient digital market would most benefit these types of crops by connecting buyers and sellers in less time than the traditional method. Further, mass producers were selected as opposed to small scale farmers as this platform is most beneficial when large quantities are purchased and sold due to transportation costs. While adoption by fruit and vegetable producers is important, the use of such a platform by buyers is also critical for its success therefore, it is important to understand the buyer's perspective. Buyers were selected from the tourism industry, supermarket industry and exporters of fresh and processed fruits and vegetables. Developing institutions of an e-marketplace in the agricultural sector will be the best source of information to understand the limitations faced in developing and sustaining an efficient e-marketplace as they have first-hand knowledge on the subject.

As this is a qualitative study, non-probability sampling techniques were considered to be most appropriate. Sample for mass producers was selected using the snowball sampling approach. In this method, the existing study subjects recruit potential subjects among their acquaintances [22]. Snowball sampling was practiced in this study by farmers introducing other farmers as suitable participants for the study. The farmers that were introduced were evaluated based on the selection criteria and thereafter suitable candidates were selected for the study. Sampling continued until no new information or themes were observed in the data. Purposive sampling and more specifically the criterion sampling approach was used for the selection of the sample for bulk buyers of fruits and vegetables. The criteria being that it must be a company and it must procure fruits and vegetables in large quantities on a regular basis as a part of its key operations. A list of bulk buyers that fit the required criteria for the sample were identified and thereafter contacted to participate as

respondents for the study. Criterion sampling approach was also used when selecting the sample for the e-marketplace developing institutions. The criterion being that it must be a company that is currently operating an e-marketplace in the agricultural sector in Sri Lanka. There was only one such institution at the time of conducting the study therefore they were the only such respondent.

Personal interviewing technique was used as it was the most appropriate method to gather in-depth information. Semi structured face to face and telephone interviews were conducted with fruit and vegetable mass producers and buyers as well as developers of an e-marketplace in the agricultural sector. For the purpose of the interviews three separate interview protocols were prepared for mass producers, buyers and e-marketplace developers. To ensure validity and reliability of the questionnaire, a comprehensive list of interview questions was designed based on the commonly asked questions in questionnaires of similar studies and the key issues identified in similar studies. Further, as it was a semi structured interview, follow up questions were asked to encourage respondents to disclose more details when required.

The interview protocol designed for farmers consisted of open-ended questions to obtain a basic understanding on whether farmers understand the concept of an e-marketplace, whether they are aware of the existence of an e-marketplace in Sri Lanka for agricultural produce, whether they have a history of selling online and if they perceived themselves as being capable of selling online. Further, they were also questioned as to whether they perceived an e-marketplace to be beneficial to them and what features they would require such a platform to possess in order for them to be encouraged to use it. The interview protocol designed for buyers consisted of open-ended questions to gain an understanding on the extent to which online platforms were used to buy produce and if it was not used, the reasons behind it. Further, they were questioned as to whether they were aware of an e-marketplace for agriculture in Sri Lanka, their willingness to join the e-marketplace as well as whether they felt it would benefit them and how. They were also inquired as to what features they would expect such an e-marketplace to possess in order to be willing to use it. The interview protocol designed for the developing institutions consisted of open-ended questions to

gain an understanding about how the company felt the e-marketplace would benefit the economy, the steps that have been taken thus far in the creation of the e-marketplace, the resources and capabilities the company possessed that enabled them to create it as well as the external support they have had in creating this platform. Further, they were also asked about the challenges they face in developing this e-marketplace and which of these barriers arose as a result of this e-marketplace being established in the agricultural sector.

The thematic analysis approach was used for data analysis. "It is a method for identifying, analysing, organising, describing, and reporting themes found within a data set" [23]. Using this approach involved six steps. Upon completion of the interviews they were transcribed, and these transcriptions were read and re-read, audio recording of the interviews were listened to, and initial notes taken during the interview were examined to enable familiarization with the data set. The second step involved coding which is a systematic process of identifying and labelling the most important and relevant data. The codes were then examined to identify patterns in the data by grouping together similar data segments. Common themes and sub themes that arose in the interviews were generated by clustering codes together to create a map of key patterns in the data. The themes were then reviewed to ensure that the themes match the data and have a central organizing concept. The themes were then named and a brief summary describing each theme was given. Finally, the report was written using the themes to draw analytical conclusions [24].

4. FINDINGS

Semi structured face to face and telephone interviews were conducted with 10 respondents. More specifically interviews were conducted with 5 farmers to gain an understanding of the farmers' perspective on the adoption of an e-marketplace for agriculture while 4 buyers were interviewed for the purpose of understanding the buyers' perspective in this respect. Further, a company that has developed an e-marketplace in Sri Lanka for agriculture was interviewed to obtain their views on the barriers they face in progressing the platform in the future. The breakdown of respondents is shown in Table 1.

4.1 Understanding the Farmers' Perspective on the Adoption of an E-Marketplace for Agriculture

4.1.1 Unawareness about an e-marketplace in Sri Lanka

A major factor behind non-use of an e-marketplace among respondents is the unawareness about the existence of an e-marketplace for agriculture in Sri Lanka. Further, there is an impression among farmers that selling online is troublesome. This is due to lack of knowledge on the operating process of an e-marketplace which leads to uneducated assumptions.

4.1.2 Unwilling to join unless a significantly higher price can be obtained

All the mass producers stated that price was a huge determining factor in joining the platform. If the e-marketplace would provide them with a significantly higher price than what can be obtained through traditional channels, they would be willing to join the platform.

If the price is 80 now even if we get 85 from e-marketplace it is a loss for us. There's no point. We can get that price from here anytime without any trouble because the customer comes and harvest it and takes it themselves (11)

4.1.3 Lack of trust in an e-marketplace

From a company perspective, their willingness to join an e-marketplace depends heavily on the availability of two key features such as a secure payment gateway and verified buyers which indicates that lack of trust in an e-marketplace is a key concern.

Verified buyers are needed to ensure that produce is sold to a reliable party (C)

Further, individual mass producers do not conduct online transactions for business purposes or for personal purposes therefore they are sceptical about online trading and online payments.

4.1.4 Problems in transporting produce to customer

Arranging transport of produce to the buyer is not considered a major issue to most individual

sellers however, it is considered an added burden as roads may not be in good condition. From the company perspective as well, transporting produce to the customer was not considered to be a major issue, however, transportation being provided by the e-marketplace developers themselves would be preferable as the company felt that if the order is small, transportation across a wide distance would not be profitable.

4.1.5 Infrequent use of internet and insufficient signal in rural areas

From the individual mass producers' perspective, although none of the respondents possess laptops or computers, all the respondents except for one possess smart phones which can be used to access the internet. However, the internet is not used frequently especially not for business purposes, and none of the respondents have sold their produce online previously. Therefore, they may face difficulties due to lack of knowledge.

Further, lack of connectivity is another significant issue in rural areas as low signal levels hinder the trade of produce online.

There is less signal here that's why most people here don't use the internet much (I2).

From the company perspective, necessary devices and connection needed to access the internet are available and internet is used frequently, although it has never been used to sell produce online.

4.1.6 Satisfied with the traditional method of selling

Another reason for reluctance to join an e-marketplace is because mass producers have built a network of buyers with whom they have

dealt with for many years, therefore, they have no difficulty in selling their produce. In some cases, arrangements have been made for the buyer to harvest the crop and transport it themselves therefore, the producer experiences minimal hassle and cost. They believe this convenience may not be available to them if they use an online platform.

Further, they are hesitant to join as they have no prior experience using such a platform and they are comfortable with process they currently use and therefore believe it is unnecessary to change methods since they are able to sell all their produce through traditional methods.

Now we can sell using our current methods. But in the future, we may need to use the e-marketplace. For now, we can sell all our produce and there is no surplus (I3).

4.2 Understanding the Buyers' Perspective on the Adoption of an E-Marketplace for Agriculture

Every respondent showed willingness to join an e-marketplace later on in time as they realise that technology is the future, and it is essential that they adapt. However, there are a number of reasons behind non-use of an e-marketplace currently and in the immediate future which need to be addressed to encourage faster adoption.

4.2.1 Unawareness and lack of technical knowledge about an e-marketplace in Sri Lanka

Three out of four respondents were unaware that an e-marketplace for agriculture existed in Sri Lanka therefore, unawareness about its existence. Further, they lack knowledge on the process and functions behind an e-marketplace. Therefore, this is a major reason for not adopting an e-marketplace in Sri Lanka.

Table 1. Breakdown of respondents

Type of Respondent	Number of Respondents
Farmers:	
Company (C)	1
Individual (I)	4
Buyers:	
Hotel (H)	1
Supermarket (S)	1
Fresh Fruit Exporter (FFE)	1
Food Processor for Export (FPE)	1
E-marketplace Developer	1

Table 2. Respondent information (Buyers)

Organisation	Position
Hotel (H)	Restaurant Manager
Supermarket (S)	Senior Manager Procurement - Fresh
Fresh fruit exporter (FFE)	Deputy Chairperson
Food processor for export (FPE)	Chairman/CEO

4.2.2 Uncertainty about the quality of produce sold through an e-marketplace

Another major concern for respondents was the quality of the produce sold through an e-marketplace and ensuring that the produce purchased is of the required quality standards.

We are in a very competitive business environment; therefore, quality is one of the main parameters we need to get our customers. Once we start purchasing online, quality maintenance will be a problem (S1).

One respondent emphasized the importance of incorporating a rating system as a measure of judging the quality and reliability of a particular farmer. The respondent also mentioned that farmers should be screened prior to being granted permission to trade via the e-marketplace in order to ensure farmer reliability.

4.2.3 Unwilling to join unless produce is transported and packed according to standards

During transportation of produce from the farmer to the seller, the produce may get damaged or spoilt unless it has been packed correctly and the required levels of humidity and temperature are maintained. Therefore, three out of four respondents expect suppliers to follow guidelines in terms of packaging and transportation which currently cannot be ensured when purchasing through an e-marketplace.

4.2.4 Satisfied with current suppliers and procurement process

Due to all the requirements in terms of quality, transportation and packaging standards, respondents are comfortable dealing with their current suppliers and following their current procurement process, as a result there is presently no interest in pursuing an alternative.

Getting the goods delivered to the pack house with minimal damage, post-harvest loss in Sri Lanka is almost 35% which is partly to do with

transport. Existing suppliers have been given crates and been told what methods they can use to transport them safely to the pack house. These needs to be communicated to the suppliers (FFE1).

4.2.5 Supplier should meet certification requirements

Additionally, the respondents in the export sector require suppliers to be GATT certified, Organic certified and adhere to ISO rules and regulations to ensure the respondent's company keep their own certifications and meet customer requirements and international standards.

4.2.6 E-marketplace procedure mismatched with their current procurement process

Individual respondents had additional concerns specific to their company processes such as requiring the e-marketplace to possess mechanisms to negotiate price, provide an option to continuously deal with one supplier, support purchases on a credit basis and facilitate smooth operation of Just-In-Time method of purchasing.

4.3 Identifying the Strengths, Weaknesses, Opportunities and Threats Faced by Institutions in Sustaining an E-Commerce Platform

One objective of this study was to identify the strengths, weaknesses, opportunities and threats faced by institutions in the development of an e-commerce platform. In order to achieve this, an interview was conducted with the institution responsible for the creation and operation of an e-marketplace for agricultural produce in Sri Lanka. In launching this app and website the company is hoping to give farmers a better income as well as give consumers better prices by reducing the gap between the price farmers receive and the high price at which produce is sold at retail which is a result of the number of middlemen between the farmer and end consumers. They also hope to create price transparency and give farmers deeper knowledge on the different prices around the country.

Table 3. Respondent information (Mass producers)

Age of Individual farmers	Frequency	Percentage
40-50	2	50%
50-60	2	50%
Years of cultivation	Frequency	Percentage
5-10 years	1	20%
10-20 years	3	60%
20-30 years	1	20%

Table 4. Summary of key findings

Farmers' perspective on the adoption of an e-marketplace

- Unawareness about an e-marketplace in Sri Lanka
- Unwilling to join unless a significantly higher price can be obtained
- Lack of trust in an e-marketplace
- Problems in transporting produce to customer
- Satisfied with the traditional method of selling
- Infrequent use of internet and insufficient signal in rural areas

Buyers' perspective on the adoption of an e-marketplace

- Unawareness and lack of technical knowledge about an e-marketplace in Sri Lanka
- Uncertainty about the quality of produce sold through an e-marketplace
- Unwilling to join unless produce is transported and packed according to standards
- Satisfied with current suppliers and procurement process
- Supplier should meet certification requirements
- E-marketplace procedure mismatched with their current procurement process

Strengths, weaknesses, opportunities and threats faced by institutions in sustaining an e-commerce platform

Strengths –

- Integrating agriculture background with experienced parties in the technology field

Opportunities –

- Assistance from the Technical Assistance to the Modernisation of Agriculture Programme, EU
- Assistance from government extension services and media programs related to agriculture

Weaknesses –

- No clear revenue model
- No method to guarantee quality
- Lack of a problem resolution process to handle participant disagreements

Threats –

- Majority of the farming community is not tech savvy

This app began as a listing board where farmers were able to post the quantities and prices of their produce and likewise buyers were able to post their quantity and price requirements, and phone numbers were exchanged between parties in order to facilitate trade between the two parties. However, in January 2020 a payment gateway was incorporated to facilitate online transactions that enabled buyers to pay through debit cards and credit cards as well as through M-cash facilities. Prior to the addition of these features the app had more than 25,000 downloads, over 17,000 active users and more than 5,000 users performing transactions. Workshops have been conducted to increase

farmers' and government officials' awareness about the app in order to increase these numbers. There are still many more functions the developer hopes to incorporate into the digital platform in the future. The developer is also currently working on establishing an organic certification program and establishing traceability through the supply chain. Further, in order to overcome issues related to transportation, the developer is currently in discussion with logistics providers to integrate existing logistics platform with the e-marketplace to facilitate transportation of produce. The developer also hopes to include terms and conditions for payment and delivery in the future.

The respondent mentioned that interest in e-marketplaces for agriculture is much higher at a global level. E-marketplaces have been more successful in countries where farmers have a larger capacity for production and greater capabilities. In Sri Lanka as there are many small-scale farmers it is more of a challenge and it may take more time for an appropriate solution to come forward, but the developer hopes that this platform will be that solution and that at least 10% or more of the farming population would use this platform in time.

4.3.1 Strengths

The greatest strength that enabled the developer to create this platform was the ability to better understand the needs of the farmers as a result of the agriculture and farming backgrounds of the founders which they incorporated with experienced parties in the technology field.

4.3.2 Opportunities

The developer had assistance from the Technical Assistance to the Modernisation of Agriculture Programme funded by the European Union in developing a matching engine for the app. The developer has also had assistance from government extension services as well as media programs related to agriculture in generating publicity. Although the developer is given government assistance, it requires more support in terms of obtaining day to day price information as well as crop related information that can be disseminated to the farmers through this platform.

4.3.3 Threats

The biggest constraint was that a majority of the farming community is not tech savvy therefore only the younger farmers can be reached or else the older farmers would require help from their younger family members in bridging the tech gap. The developer hopes that as smart phone usage increases this problem will reduce over time. Farmers also tend to use low limit data packages as well as smart phones with limited storage. They also may reside in locations with weak signal or no 4G network therefore, infrastructure in these areas must improve in order to support the use of an e-market place.

4.3.4 Weaknesses

At present their main sources of income are the rent of advertising spaces on their platform as

well as charging a commission on the transactions executed, but there is still no clear revenue model and therefore the funds that are available for the further development of this platform are limited.

Further, due to perishability of fruits and vegetables "returns" are not practical therefore, they currently only permit verified buyers to use this platform. Although no arrangements have yet been made for problem resolution, there are hopes to provide insurance at a price in the future.

Further, there is no system in place to guarantee quality of the produce however, there are plans to include a rating system so the users can certify others. Fruits and vegetables have a short shelf life, therefore, delivering the produce in the least amount of time with the least amount of damage is also an important challenge to be overcome.

Finally, the study summarises the key findings of interviews conducted with mass producers, bulk buyers and a developer of an e-marketplace in Sri Lanka. Table 4 illustrates the summary of key findings.

5. DISCUSSION

Visible advancements have been made towards e-agriculture, a few of them being the use of digital technologies to reduce information asymmetries through market price information systems and using GPS technology for agriculture development [25]. It is important for the e-marketplace to reach its full potential and for farmers to gain maximum benefit from this digital platform. Despite the advancements that have been made in agriculture thus far there is room for further improvement and the countries policies are being directed accordingly.

The findings from the limited literature exploring the challenges in adopting an e-marketplace in the agriculture sector supports the findings of this study. From the farmers' perspective the study found that unawareness about an e-marketplace, satisfaction with traditional methods of selling, unwillingness to join unless a higher price can be obtained, infrequent use of internet and insufficient signal in rural areas, logistical challenges and lack of trust in an e-marketplace are the main barriers in sustaining and developing an e-marketplace. Further, from the buyers' perspective it was found that

unawareness and lack of knowledge about an e-marketplace, concern about quality of produce, concern about packaging and transportation methods, certification requirements and the preference to work within current procurement process have been identified as the main barriers. Although an e-marketplace for agriculture exists in Sri Lanka they face many challenges in sustaining and developing the platform. The key challenge from the developer's perspective is the lack of a tech savvy farming community. Further, solutions must be found for the absence of a clear revenue model, lack of a method to guarantee quality of produce sold and lack of a process to handle disputes as it is crucial for survival.

This study found that unawareness about the existence of an e-marketplace and lack of knowledge about the processes of an e-marketplace was a major challenge. This is supported by the study done by Kalpana and Shibu [15] which found that awareness about the use of e-commerce was a main challenge to e-commerce adoption.

Lee and Tao [14] identified uncertainty of business value of e-commerce and the reserved attitude towards the benefits of e-commerce as major barriers to e-commerce adoption while Kalpana and Shibu [15] also found that farmers perception and unawareness about the benefits of e-commerce were main challenges. These barriers support the results of this research, which indicated that farmers prefer their current method of selling as they are uncertain about business value and benefits of an e-marketplace.

Asadihkoob and Ebrahimi [16] found that non-use of computers as a business tool among farmers were main barriers to e-commerce implementation. This finding is similar to that of Jin [18], who identified the limited proportion of habitual users of the internet in rural areas and farmers' lack of computer and network skills to be barriers in e-commerce implementation. Supported by these previous studies, this study found that the signal in rural areas is low, which according to the farmers' is one reason the internet is not used frequently.

This study found that while farmers can arrange transportation of produce to customers, it can be challenging due to cost and the condition of the roads. This finding is supported by a study conducted by Lilavanichakul [13] which identified

logistics as a challenge in agricultural e-commerce.

Kalpana and Shibu [15] found that a lack of trust in payment systems is a main challenge to e-commerce adoption. Further, Asadihkoob and Ebrahimi [16] also found that lack of trust in electronic transactions was a main barrier to e-commerce implementation. This supports the findings of this study which identified a lack of trust in e-marketplaces and online transactions.

Further this study found that buyers were uncertain about the quality of the produce sold online and concerned about required certifications. This is supported by the study done by Lilavanichakul [13] which identified the importance of quality control and reliability.

Saban and Timalsina [17] found that lack of investment in e-commerce was a major barrier. This supports the findings in this study from the developer's perspective as there are limited sources of funds for investing in the development of the platform.

Aside from the findings which are supported by similar studies, this study found a few other key barriers. From the buyers' perspective these identified challenges are the unwillingness to join unless produce is transported and packed according to standards, satisfaction with current suppliers and procurement process, requirement for supplier to meet certification requirements, and the mismatch between e-marketplace procedure and current procurement process. From the Mass Producers' perspective, a key challenge identified was the unwillingness to join unless a significantly higher price can be obtained. Further, from the e-marketplace developer's perspective, lack of a method to guarantee quality, lack of a problem resolution process to handle participant disagreements and limited technological knowledge of the farming community were also identified as barriers.

6. IMPLICATIONS OF THE STUDY

The e-marketplace today plays an important role in the development of agriculture in both developed and developing countries. There are several factors that are crucially considered when adapting e-marketplace. Utilizing TOE as main theoretical foundation, the study expands the existing knowledge of individual (awareness, knowledge, trust) and organizational (IT

infrastructure, quality specifications, network build) level factors that influencing the e-marketplace adaptation in the agricultural sector. It is so expected that the government agencies as policymakers could take advantage of these results that will be useful in creating strategies and long-term plans in assessing the adoption of e-marketplace by agri-sector involvers in Sri Lanka.

According to the results of this study, the following implications are suggested to overcome the barriers to further developing and sustaining an e-marketplace in the agriculture sector in Sri Lanka. These suggestions will help to identify the features that need to be incorporated and steps that need to be taken to encourage farmers and buyers to use the platform and will ultimately assist in sustaining an e-marketplace.

One of the biggest barriers is the unawareness about the existence of an e-marketplace and lack of knowledge about the processes involved in its use. The developer can overcome this issue by marketing the website and app and posting videos or conducting workshops to train farmers and buyers on how to use the platform.

To solve the problems associated with transportation of produce from mass producers to the buyers while meeting the required standards and packaging expected from the buyer, the developer must either provide the transportation service themselves or ensure that only farmers capable of meeting these requirements are able to sell through the platform and it should be continuously monitored to ensure that the requirements are being met.

As farmers and buyers are sceptical about the trustworthiness of parties they transact with, the developers must incorporate a rating and review system to put pressure on farmers to provide quality produce and put pressure on buyers to make payments. Further, a dispute settlement process must be in place to provide solutions to buyers who are not satisfied with the produce or any other issues they may face when transacting with farmers or vice versa. Further, developers should implement a certification system to inform buyers of any certifications farmers may possess such as organic and GAP certifications. This is extremely important for exporters or purchasers of organic produce.

As farmers and buyers are satisfied with their current processes, developers must ensure that trading through the e-marketplace increases convenience, conforms to different procurement and selling processes and most importantly provides farmers with a higher price as it is their main motivation for joining an e-marketplace. If a higher price can be derived, this must be effectively communicated to farmers. Further, as majority of the farming community is technologically illiterate the platform must be user friendly.

As one main barrier faced by farmers is the unavailability of signal in rural areas, the telecommunications companies must take measures to expand and strengthen their service across the country to allow farmers to access the internet from anywhere.

Finally, in order to sustain an e-marketplace a proper revenue model must be used to meet working capital requirements as well as to invest in further developments. For this purpose, a subscription model and transaction fees may be the most practical method of raising an income. Further, the current method of selling advertisement space can also be continued.

The findings of this study provide valuable knowledge necessary to increase the adoption of an e-marketplace in agriculture, which has been named as a high priority solution by the Department of Agriculture in Sri Lanka to solve the agricultural problems currently being faced. Therefore, this study will assist in overcoming a few of these problems and may thereby contribute to the further advancement of the agriculture sector. As this study assists relevant parties in sustaining an e-marketplace, a few of the problems faced by farmers which have been identified by the Department of Agriculture in Sri Lanka such as the lack of proper market access and inadequate marketing can be overcome. It may even result in higher incomes for the farmers as intermediaries can be bypassed in the distribution of their produce. Further, it provides institutions with insight from different perspectives on the issues that need to be solved and assists them in increasing the adoption of the e-marketplace among farmers as well as in further developing the web based or mobile based application, which has proven to be a profitable project in other countries where it has already been implemented. Finally, the sustenance and advancement of this platform

may also be useful for agricultural development and if adopted in rural areas it may even contribute to rural economic development and therefore this study may have economic benefits.

7. CONCLUSION AND FURTHER RESEARCH SUGGESTIONS

Agriculture plays a vital role in Sri Lanka's economy and therefore, steps have been taken to incorporate ICT towards achieving agricultural goals. One high priority solution given by the Department of Agriculture in Sri Lanka to solve the agricultural problems currently being faced is an e-marketplace in agriculture, as agricultural e-commerce can assist in overcoming challenges and inefficiencies in the agriculture supply chain. Despite the launch of an e-marketplace in Sri Lanka its adoption has been slow and maximum benefit has not yet been derived from it, therefore, it is required to investigate the factors influencing the farmers' and buyers' decision to join an e-marketplace. The key objective of this study is to identify barriers to sustaining and further developing an e-marketplace in the agricultural sector in Sri Lanka. Primary data was collected through face-to-face interviews and telephone interviews from farmers, buyers and a developing institution. The study found that while farmers and buyers both expressed an interest in joining an e-marketplace in the future, they had expectations that must be fulfilled to encourage them to join and factors discouraging them from joining it at present. Unawareness about its existence and the processes behind an e-marketplace was a major barrier common to both farmers and buyers. Further, both farmers and buyers were satisfied with their current process and therefore felt no need for an alternative and therefore would not join an e-marketplace unless that process is supported to an extent. As a result of this, farmers were unwilling to join an e-marketplace unless they could obtain a significantly higher price. Further, quality, transportation, certifications and low mobile phone signal were considered major concerns and barriers. Developers face difficulty in acquiring necessary funding to invest in sustaining and further developing the platform. They also believe the absence of a method to guarantee quality and to resolve problems between participants requires an immediate solution. Further, as majority of the farming community is technologically illiterate, developers must account for this issue when developing the platform. In order to encourage farmers and

buyers to join the platform and continue trading online, it is important that these issues are addressed. By overcoming these issues, the e-marketplace for agriculture can be sustained and thereby may help to face the challenges faced in the agriculture sector in Sri Lanka.

This study attempted to identify the barriers to further developing and sustaining an e-marketplace in the agriculture sector in Sri Lanka focusing on the local market. However, this platform could be used to enable farmers to export their produce without the intervention of middlemen. When trading internationally, the system would be more complex and as a result further challenges may arise. It is worth identifying these challenges in order to overcome them and allow the platform to expand into the international market.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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