

Impact of ICT uses in Food Supply Chain: A case study of Narsingdi Vegetable Supply Chain

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requirements for the Degree of
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Submitted by
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BRAC Institute of Governance and
Development,
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A Thesis On -

**Impact of ICT uses in Food Supply Chain:
A case study of Narsingdi Vegetable Supply Chain**

For partial fulfillment of –

Masters in Procurement and Supply Management (MPSM)

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January 2015

**BRAC Institute of Governance and Development,
BRAC University**

CANDIDATE'S DECLARATION

It is hereby declared that this thesis or any part of it has not been submitted elsewhere for the award of any degree or diploma.

(MD. ENAMUL HUQUE)

CERTIFICATE FROM SUPERVISOR

This is to certify that Md. Enamul Huque, Cohort-3 (Session-2014), MPSM Batch # 7, ID-14282013 has prepared the thesis entitled “Impact of ICT uses in Food Supply Chain: A case study of Narsingdi Vegetable Supply Chain” under my supervision.

I do hereby approve the style and content of this thesis. This is for the partial fulfillment of the requirement for the degree of Masters in Procurement and Supply Management (MPSM) in The BRAC Institute of Governance and Development (BIGD) at BRAC University.

Mr. Suntu Kumar Ghosh
Assistant Professor,
BRAC Business School,
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Last but not the least, the author gladly acknowledges the patience and encouragement of his wife, beloved son and daughter during his research works.

ABSTRACT

Food security is always a high priority issue for the government of Bangladesh. Price instability in vegetable supply chain is a common phenomenon and is a big problem both for the retailers and for the farmers. Supply chain management using ICT tools can be beneficial for all the members of vegetable supply chain. Use of ICT tools like cell phone and internet is increasing rapidly in our country. ICT tools may be leveraged to make the vegetable supply chain more efficient and stable.

All farmers have access to mobile phone. Even though a farmer doesn't use a mobile phone personally at least one phone is available in his family which is shared by all family members. This indicates that cell phone may be a powerful tool to improve the performance of vegetable supply chain.

Education and income has positive correlation with use of ICT tools. Farmers having at least high school level education and yearly income of more than 2 lakh are highly motivated to use ICT tools.

The farmers should be encouraged to use ICT tools in production and marketing of vegetables as well as other agricultural products. ICT tools can help the farmers to choose the right type of vegetables to grow during different seasons, can reduce production and marketing costs and at the same time may ensure better prices for their produced vegetables.

Government should take initiative to establish telephone advisory service regarding use of insecticides for vegetables. At present the farmers consult with field representatives of different insecticide companies regarding use of insecticide. But those representatives very often do not provide advices impartially, rather their advices are biased towards the products they are selling. The vegetable farmers are located in remote villages which are quite away from Upazila towns. So the agriculture extension department can't provide face-to-face supports to the farmers. Thus telephone advisory service will be very much helpful for the vegetable farmers. Such telephone advisory service shouldn't be limited to insecticide only. Possible areas of service may be advices regarding selection of vegetables variety, plantation procedure, use of fertilizer, methods of preservation and transportation etc.

Chapter 1: Introduction

i. Background:

Food security is always a high priority issue for the government of Bangladesh. Being a densely populated nation ensuring food security is a big challenge for our government. Food security has two interrelated and often conflicting issues: firstly, to keep prices of the food products within purchasing power of common people; secondly, to ensure fair prices for the farmers. Traditional multi-tiered food supply chain has been identified as a strong bottleneck in ensuring fair prices for consumers and producers of agro-products and thus in ensuring food security. The intermediaries in the food supply chain often intentionally manipulate the food market for their own benefits. Vegetable supply chain is even more vulnerable as these are perishable items which can't be stored for long time. Price instability in vegetable supply chain is a common phenomenon and is a big problem both for the retailers and for the farmers. Supply chain management using ICT tools can be beneficial for all the members of vegetable supply chain. Usage of ICT tools like cell phone and internet is increasing rapidly in our country and our government has set goal to build digital Bangladesh by the year 2021. The members of vegetable supply chain are also using ICT tools in various ways for different purposes. ICT tools may be leveraged to make the vegetable supply chain more efficient and stable.

ii. Rationale:

This study will try to identify the impact of usage of ICT tools in vegetable supply chain of Narsingdi area. Efforts have been given in this study to assess whether use of ICT tools is helping the vegetable growers to get fair price for their produces. This study will further try to identify how ICT tools may be utilized more effectively to ensure fair price for the vegetable growers and to make the vegetable market more stable.

This study will try to identify how use of ICT tools may help to reduce production costs and marketing costs of vegetables.

iii. Problem Statement:

The vegetable farmers usually depend on local wholesalers or brokers known as Faria or Bepari to sell their products. As a result, very often they don't get fair prices for their vegetables. The farmers don't get any information regarding which products may have market demand. The farmers have very little scope to sell their products directly to the consumers or even to the retailers.

iv. Objectives:

The objective of the study is to examine the impact of usage of ICT tools on ensuring fair price for the vegetable farmers. Attempts will be made to identify how ICT tools can be used for knowledge sharing, training, marketing of agricultural products with special attention to vegetables. It will be analyzed whether it is possible to restructure the vegetable supply chain using ICT tools so that the farmers and the consumers can be benefited and whether ICT tools can help to reduce price instability of vegetable market.

v. Scope:

- This research applies for vegetable supply chain of Narsingdi area.
- Existing vegetable supply chain of Narsingdi area will be studied.
- Costs, margins and profitability of different members of vegetable supply chain of Narsingdi area will be studied.
- Nature of use of ICT tools in vegetable supply chain of Narsingdi area will be studied.
- The beneficiaries of the use of ICT tools in vegetable supply chain of Narsingdi area will be studied.

vi. Limitations:

Time and cost constraints, small sample size, geographical concentration of the samples, lack of rigorous study of existing literature, lack of application of sophisticated statistical tools are assumed to be the limitations of this study.

vii. Assumptions:

- The selected samples represent the research population i.e. vegetable growers of Narsingdi area with acceptable accuracy.
- The interviewees understand the questions and answer those voluntarily without any external pressure.

Chapter 2: Literature Review

A Case Study in Rural Northern Ghana by Francis Dittoh et. El (2) shows that ICT tools give the farmers access to more buyers. With access to more buyers, farmers are willing to produce more. Surprisingly, a considerable number of farmers are willing to change the crops they produce to suit buyers (56.5%), willing and able to provide transportation for medium to large scale buyers (42.6%), willing and able to store crops for sale (48.1%) and willing and able to package crops for sale (57.4%).

Supply Chain of Vegetables:

Vegetable supply chain consists of farmers, intermediaries and consumers. Intermediaries make link between farmers and consumers. Number of intermediaries in the supply chain is a function of product type, accessibility of market, etc. Earlier studies on Bangladesh food supply chain claim that there are many intermediaries involvement and they are sipping off a major portion of the consumers' price as profit. There are five intermediaries in the major distribution channel. Short description is as follows:

Faria:

A faria is a small trader who deals in products within a single or a few local markets and handles a small volume of products. He purchase products from farmers and sells those products either to the beparies or the consumers. They are usually landless labors or small farmers having no full time work on the farm (Tasnoova et al, 2006). Their volume of business is small because they possess little amount of capital.

Beparies:

Beparies are professional traders who purchase agricultural products from the farmers or farias in the local markets or from the villages. They handle larger volume of products than Farias. A bepari sells his products to an arathdar.

Arathdar:

Arathdar serves as a fixed commission agent who have fixed establishment and operate between Bepari and retailer and charge a fixed commission by providing storage facilities.

Retailers:

Retailers are the last link in the marketing channel. They buy product from beparies through Arathdar and sell them to the consumer.

Function of Intermediaries in vegetable supply chain:

As members of a vegetable supply chain, the intermediaries performs important value adding functions like transportation, storage, grading, financing, market information, pricing etc. detailed description of intermediaries are described as follows:

Transport:

Intermediaries make connection between consumer and producer. They provide transport to carry locally produced agro-product to distant market. They do the all activities involved in transportation such as packaging, crating and loading. Transportation cost is high in Bangladesh. Intermediaries use different modes of transportation depending on the availability. This creates place utility for the consumers.

Storage:

The storage function is primarily concerned with making goods available at the desired time. It creates time utility. Storage requirement is crop specific. Potato and paddy can be stored for many days. But vegetable need immediate transport to market. As vegetables and fruits are perishable, they need proper post harvesting treatment before reaching market. If seller cannot sell their product in same day, they need to store those products for the next day.

Grading:

Grading is one of the basic functions of intermediaries and it is defined as the classification of product according to some standard on measure (Kohlset al, 1980). Grading is a determining factor of buying and selling price. Quality is

determined by eye estimation. For fruits and vegetables grading is done by faria, bepari or retailer and sometimes by the farmers.

Packaging:

Packaging is an important job of intermediaries. Wastage largely depends on packaging. Packaging materials depends on type of crops. Fresh fruits and vegetables are generally packed in gunny sacks, bamboo baskets, plastic crates, plastic bags or nylon sacks for transportation, in Bangladesh. Sometimes, they are transported in an unpackaged form. Binding and packaging is mostly done by faria and bepari.

Financing:

Financing is of crucial importance for agro-product marketing since the financier needs to carry significant risk of losing investment. The intermediaries frequently lack sufficient finance. Sometimes intermediaries buy product from farmer on credit. 60% of intermediaries do operate their business by their self finance (Tasnoova et al, 2006). Sometimes the beparies get financing from the Aratdars and the farias get finance from the beparies.

Risk Bearing:

Vegetable reselling involves two major risks: risk of price drop and risk of damage of vegetables during transportation and storage. Insurance policy system has not been developed yet in Bangladesh. Matin et al (2008) found that many farmers sell their mango field to bairal to shift risk and bairal bear all risk of the orchard. Similarly, the intermediaries of vegetable supply chain share the risks of price volatility and physical damage of vegetables.

Available ICT tools:

There are many ICT tools available and new technologies are emerging frequently. The available ICT tools many categorized broadly into two categories:

a) Synchronous tools:

- Voice calling (e.g. Telephone, cell phone)
- VoIP (e.g. Viber)

- Instant messengers (e.g. Skype)
- Teleconferencing
- Video conferencing
- Desktop sharing (e.g. TeamViewer, LogMeIn)

b) Asynchronous tools:

- Email
- Newsgroups
- Podcasts
- RSS feeds
- Video sharing (e.g. YouTube)
- Online forums
- Social networks (e.g. Facebook)
- Text messaging i.e. SMS
- eCommerce websites (e.g. Amazon.com)
- Online marketplaces (e.g. Bikroy.com)
- electronic payments (e.g. PayPal)
- mobile payments (e.g. bKash)

Our farmers are not yet using most of the ICT tools. But all of them are used to utilizing voice call through cell phones in their everyday living. Use of other ICT tools like social networks, video sharing are being increasing as internet is becoming cheaper and more speedy.

Use of ICT tools in vegetable supply chain:

The members of vegetable supply chain are using cell phone extensively for marketing vegetables. The beparies frequently check market price with aratdar and other beparies while they go to purchase vegetables in remote village markets. This helps them to reduce risks of price volatility. They also use cell phone to know which vegetables are available in which market or which big farmers have good quality vegetables of the particular variety they want.

Very small farmers are not that much beneficial of using ICT tools. They either do not know how to be benefitted from using ICT tools or their income is too low. But most of the big farmers use mobile phone in different activities during farming and marketing. Some of the activities are finding out good quality seeds and seedlings, getting advices regarding use of insecticides and fertilizers, to know where particular insecticide or fertilizer is available, learning new cultivation techniques, knowing market prices and different markets, contacting with beparies for selling vegetables so that the beparies can directly collect from vegetable gardens etc.

Supermarkets like Agora, Shapno are using cell phone, website, POS, SMS and many other ICT tools extensively to manage their vegetables supply chain effectively. They use ICT tools for placing orders, forecasting demands, inventory management, supplier relationship management etc.

Online free market places are becoming popular in our country. Websites like Bikroy.com, Ekhanei.com, OLX.com.bd have got popularity as platform where the producers can directly reach the consumers avoiding the intermediaries. Although agro-products are not yet being advertised that much on these platforms, some farmers are trying to sell their agro-products on these sites. Hopefully, within few years, these free marketplaces will play significant role for direct selling of agro-products including vegetables.

Bangladesh government has also put emphasis to utilize ICT tools in agricultural sector. As part of this policy government has launched some useful websites which may be of great help for the vegetable growers. Some important websites are discussed below:

- *e-Krishok* (<http://wp.ekrishok.com>): This is an initiative from Bangladesh Institute of ICT in Development (BIID) to utilize ICT tools in agriculture extension and management of agro-market. The aim is to provide latest information and advices regarding agricultural production, distribution and marketing. Using various ICT tools like mobile phone, internet, computer and through local information center services are delivered to the farmers. The farmers can get the services directly too.
- *Fertilizer Recommendation System* (<http://www.frs-bd.com>): This is an initiative from Soil Resource Development Institute (SRDI) of Bangladesh government. The aim is to suggest appropriate types of fertilizers to be used for a particular

crop in a particular location. It has extension database regarding soil type of every upazila of our country.

- <http://www.dae.gov.bd>: The website belongs to Department of Agriculture Extension, Ministry of Agriculture. The site provides a list of approved fertilizer dealers, a list of banned insecticides, latest information on crop production technologies, pest management of different crops as well as other useful information.
- *Agriculture Information Service* (<http://ais.gov.bd>): The aim is to disseminate latest information and technologies regarding agricultural production system quickly to the farmers of grass root level.
- *Bangladesh Agriculture Development Corporation* (<http://www.badc.gov.bd>): BADC provide market price of seeds regularly on this website.

Tasnoova et al (2006); Matin et al (2008); Rahman et al (2006) made field survey in different region in Bangladesh on different agro-product and found that intermediaries in the market were in small number but they were organized. So they dominant farmers and compel them to sell product at lower price as farmers has no way to bring back the product from market as it involve extra cost.

Chapter 3: Methodology

This research will be exploratory in nature. For conducting this research both primary and secondary data will be used. For collecting primary data, fifty two samples comprising farmers of different vegetables having varying range of income has been selected randomly. A questionnaire has been used as a data collecting instrument. Descriptive method will also be applied for the analysis of the study.

a) Type of research design:

The research conducted is quantitative in nature. To get insights about the variables related to it, descriptive research is done. Single cross-sectional research design is used in this study. Data will be collected through surveying from different vegetable farmers of Narsingdi selected randomly. After collecting data some quantitative techniques e.g. ANOVA, regression analysis and discriminate analysis will be done by using Ms Excel, SPSS to measure the relationship among the variables.

b) Information needed:

Information needed in this research includes use of mobile phone, internet, mobile money transfer for vegetable marketing. Information needed for this study can be classified into two categories: Dependent Variable and Independent Variables.

i) Dependent Variable:

Selling Price of vegetables growers of Narsingdi area.

ii) Independent Variables:

Following are the main independent variables have been identified through literature review, consultation with industry experts and preliminary investigation into the problem:

1. Use of mobile phone
2. Use of internet
3. Use of online market places
4. Yearly revenue from vegetables
5. Education
6. Use of mobile money transfer

c) Data collection from secondary sources:

Secondary data is collected through different sources like annual reports of the ministry of agriculture, research publications, news papers etc.

d) Data collection from primary sources:

Primary data has been collected through face to face interview & conversation by the researcher himself. Samples are selected randomly from vegetables farmers of Narsingdi area.

e) Scaling techniques:

In this study, the nature of the data is metric in nature. To conduct survey for data collection 05 (five-point) Likert scale is used for the main independent and dependant variables.

f) Questionnaire development and pretesting:

A questionnaire is used to collect primary data. Both structured and unstructured questions are included in the questionnaire. Some questions are included to indicate the degree of agreement or disagreement of the farmer with the respective research question. Those questions are constructed based on five-points Likert scale. There are few unstructured questions: age, how ICT tools help to reduce production cost and marketing costs of vegetables.

g) Sampling techniques:

In this research, target population is the vegetables growers of Narsingdi. Sample size is 52 respondents. They are selected randomly. In this study, simple random sampling technique is used. The respondents are chosen from three upazilas out of six upazilas and five villages were selected on convenience basis.

h) Fieldwork:

A pre-written questionnaire is used for collecting data. The language of the questionnaire is in English. Although the questionnaire is written in English, it has been communicated with the respondents in Bangla. The survey is conducted by the researcher himself. Interviews are taken suitably at village markets, vegetable gardens and home of the farmers. Majority of the study is based on primary data. However some secondary data sources will be used for background study and for literature review.

Chapter 4: Results & Analysis

This study has revealed several important points regarding use and impact of ICT tools in vegetable supply chain of Narsingdi:

- 1) All farmers have access to mobile phone. Even though a farmer doesn't use a mobile phone personally at least one phone is available in his family which is shared by all family members. This indicates that cell phone may be a powerful tool to improve the performance of vegetable supply chain.
- 2) Less than 15% farmers have a smartphone in his family.
- 3) Less than 15% farmers use internet. Farmers use internet through mobile network using their smartphones. The farmers are not aware of the Union Digital Center set up by the government in each union of Bangladesh.
- 4) Although some farmers use internet, they do not use it for the purpose of farming at all. They use internet for social networking, watching video, getting latest news and other purposes.
- 5) The farmers are not aware of online free marketplaces (e.g. Bikroy.com) through which they can sell their products directly to consumers bypassing the intermediaries.
- 6) Around half of farmers use their cell phone to know market prices of vegetables. Among them 40% farmers do such on a regular basis.
- 7) 56% farmers think they get fair price and among them 10% are very much happy with their earnings from vegetable production. On the other hand, 25% farmers are not happy with market prices of vegetables and among them 8% farmers are very much disappointed with market prices.
- 8) 48% farmers think that use of ICT tools may help to get better prices for vegetables while 37% have no idea regarding this. Only 15% of them think that this will not help significantly.
- 9) All the farmers who use ICT tools (namely cell phone) for marketing their vegetables think they get better prices as compared with current market prices. 5% of them think they get 16-20% additional prices, 15% thinks they get 11-15%

additional prices, 65% thinks they get 6-10% additional prices and the remaining 15% thinks they get 1-5% additional prices as a result of using ICT tools.

10) The farmers whose yearly income is less than Tk. 2.00 lakh rarely use any ICT tools for marketing their vegetables.

11) 38% farmers think use of ICT tools helps to reduce production costs while 6% farmers disagree on this point and the remaining 56% have no idea regarding this. The identified possible ways of cost reduction are following:

- The farmers can get advice regarding use of fertilizers and insecticides from experts while staying at their home. This will save time and money. At present, sometimes they need to spend a whole day to go to an expert and get advice.
- Farmers can ask their family members or neighbors who go to nearby bazaar for other purposes to buy insecticides over telephone.

12) 38% farmers think use of ICT tools helps to reduce marketing costs of vegetables while remaining 58% farmers have no idea regarding this. The identified possible ways of cost reduction are following:

- The farmers can call the beparies and the beparies can take delivery of vegetables from the vegetable fields directly. This saves the cost of transportation.

13) 84% of the farmers use just only one ICT tool which is voice call using cell phone. Only 16% of them use more than one ICT tools.

14) Education and income has positive correlation with use of ICT tools. Farmers having at least high school level education and yearly income of more than 2 lakh are highly motivated to use ICT tools.

Chapter 5: Discussions & Conclusions

From this research following conclusions can be made:

- 1) The farmers should be encouraged to use ICT tools in production and marketing of vegetables as well as other agricultural products. ICT tools can help the farmers to choose the right type of vegetables to grow during different seasons, can reduce production and marketing costs and at the same time may ensure better prices for their produced vegetables.
- 2) A farmer does not need to use a mobile phone personally. As long as he has at least one mobile phone in this family he can still reap the benefits of using a mobile phone.
- 3) The farmers who use ICT tools for marketing their vegetables are happier with selling prices of their vegetables than those who don't use any ICT tool.
- 4) Government should take initiative to establish telephone advisory service regarding use of insecticides for vegetables. At present the farmers consult with field representatives of different insecticide companies regarding use of insecticide. But those representatives very often do not provide advices impartially, rather their advices are biased towards the products they are selling. The vegetable farmers are located in remote villages which are quite away from Upazila towns. So the agriculture extension department can't provide face-to-face supports to the farmers. Thus telephone advisory service will be very much helpful for the vegetable farmers. Such telephone advisory service shouldn't be limited to insecticide only. Possible areas of service may be advices regarding selection of vegetables variety, plantation procedure, use of fertilizer, methods of preservation and transportation etc.

Appendices

Appendix – A: Questionnaire

Name:

Age:

Village:

Upazila:

Listed below are some questions regarding use of ICT tools by vegetable growers. Please rate how strongly you agree to disagree with each of the following statements by placing a tick mark.

Question 1:

- a) Do you use a mobile phone? i) Yes ii) No
- b) If yes then which type? i) Normal ii) Smartphone
- c) Do you use mobile phone to know market prices at different markets of the vegetables you grow?

i) Yes		ii) No	
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Question 2:

- a) Do you use internet? i) Frequently ii) Occasionally iii) No
- b) If yes then how? i) Mobile phone ii) Cyber café iii) broadband
- c) Do you use internet to know current market prices at different markets?

i) Yes		ii) No	
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Question 3:

- a) Have you ever tried to sell your vegetables directly using online marketplaces like Bikroy.com?

i) Yes		ii) No	
--------	--	--------	--

- b) If yes then which one?

Bikroy.com	OLX.com	Ekanai.com	Facebook	Other

Question 4:

Do you think you are getting fair prices for the vegetables you grow?

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
5	4	3	2	1

Question 5:

a) Do you think use of ICT tools help to get better price for vegetables?

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
5	4	3	2	1

b) If yes, how much extra price do you get as a result of using ICT tools?

0-5%	6-10%	11-15%	16-20%	21-25%	>25%	>50%	>100%

Question 6:

To whom do you sell your vegetables most frequently?

Faria	Beparies	Arathdar	Directly to Consumers	Other

Question 7:

Your income range (lakh Taka per year):

<2	2-4	4-7	7-10	>10

Question 8:

a) Do you use mobile payments to receive money for the products you sell?

i) Yes ii) No

b) If yes then which one do you use?

bKash	DBBL	Other		

Question 9:

a) Does use of ICT tools helps you to reduce production cost?

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
5	4	3	2	1

b) If yes then how?

Question 10:

a) Does use of ICT tools helps you to reduce marketing cost of your products?

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
5	4	3	2	1

b) If yes then how?

Question 11:

Which of the following ICT tools do you use:

Email	Social networks	Video sharing sites	Instant messengers	News sharing
Blogs	SMS	Online forums	Govt. portals	Other

Question 12:

Your education:

No education	Primary school	High school	College	Graduate

THANK YOU

Appendix – B: Analysis results

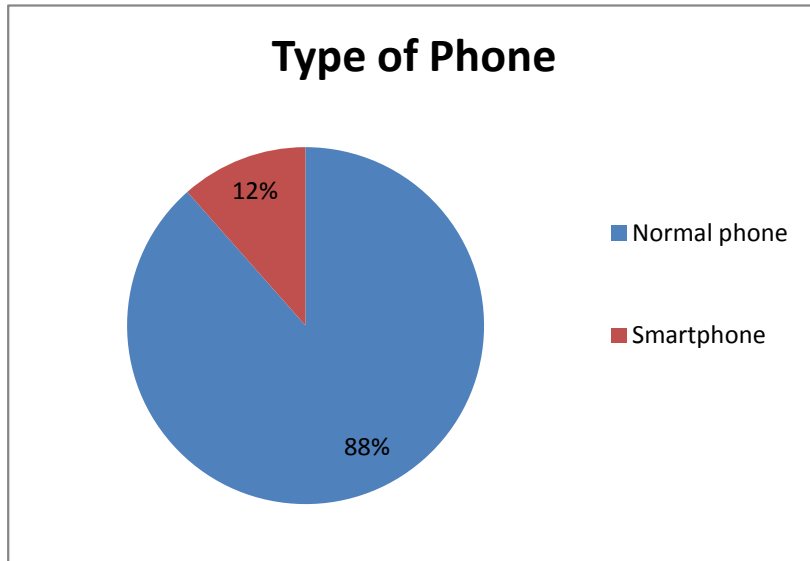


Figure 1: Type of phone used by farmers

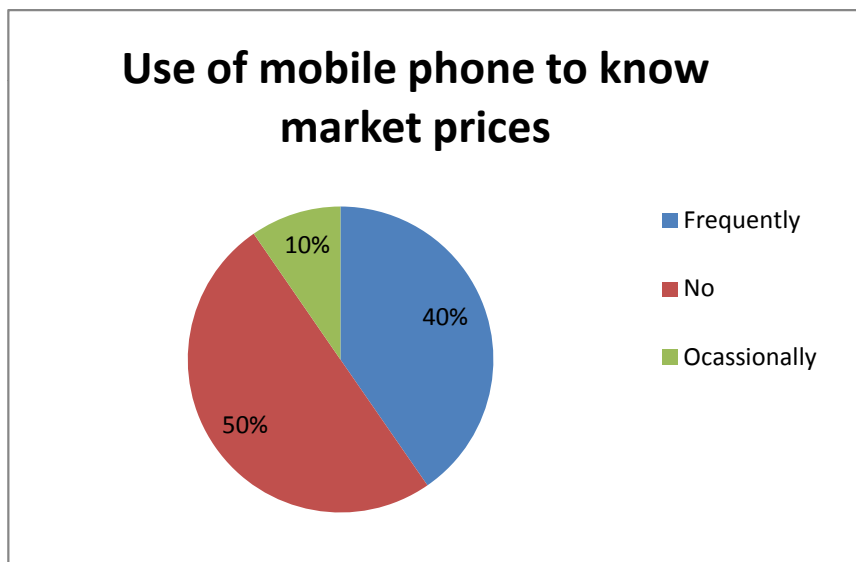


Figure 2: Use of mobile phone to know market prices

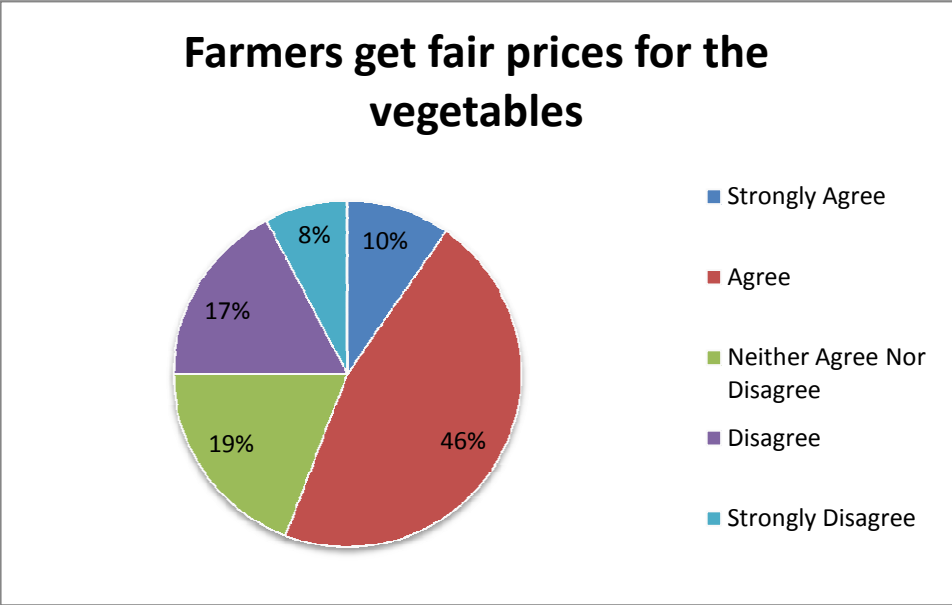


Figure 3: Satisfaction with market prices of vegetables

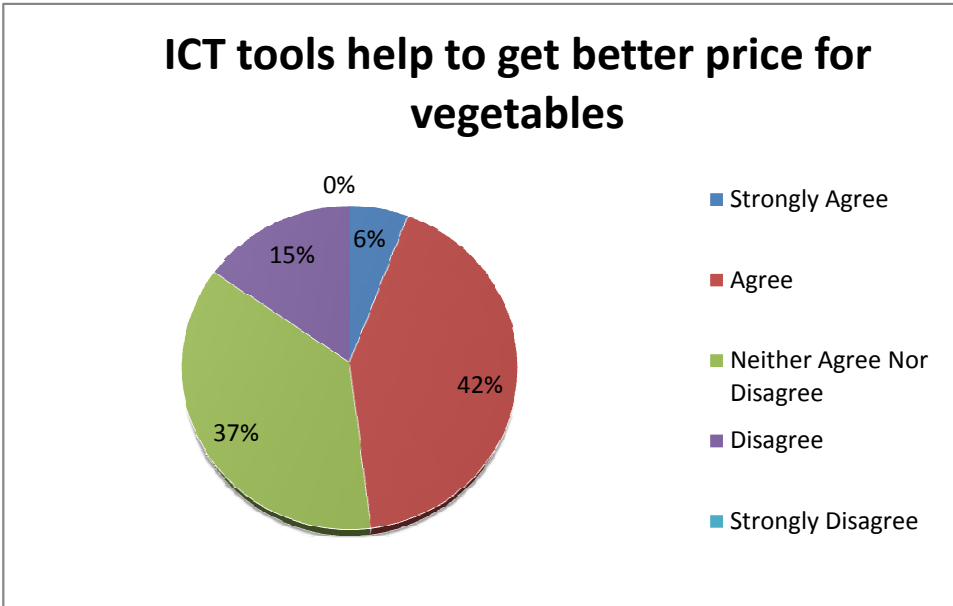


Figure 4: Whether ICT tools help to get better price for vegetables

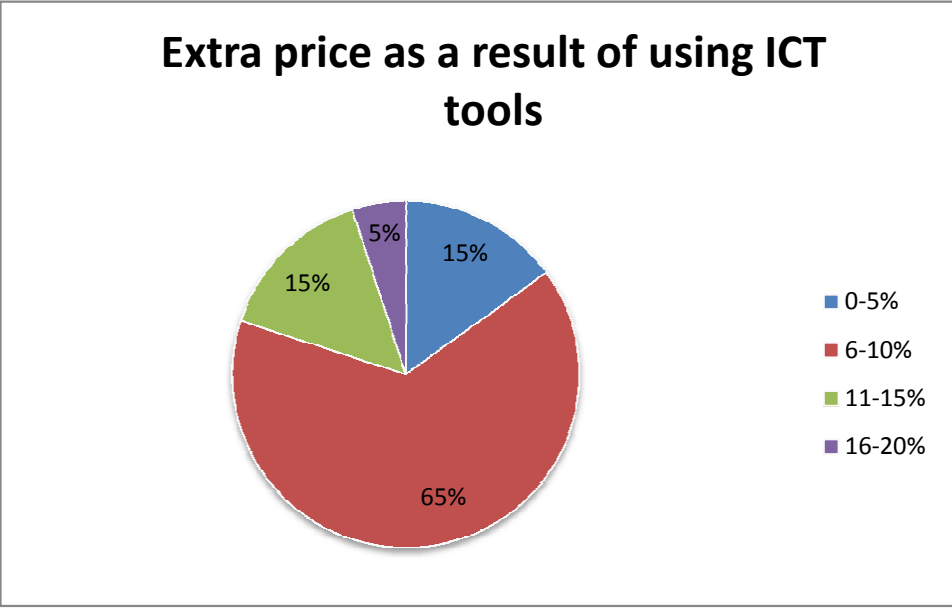


Figure 5: Extra selling price of vegetables as a result of using ICT tools

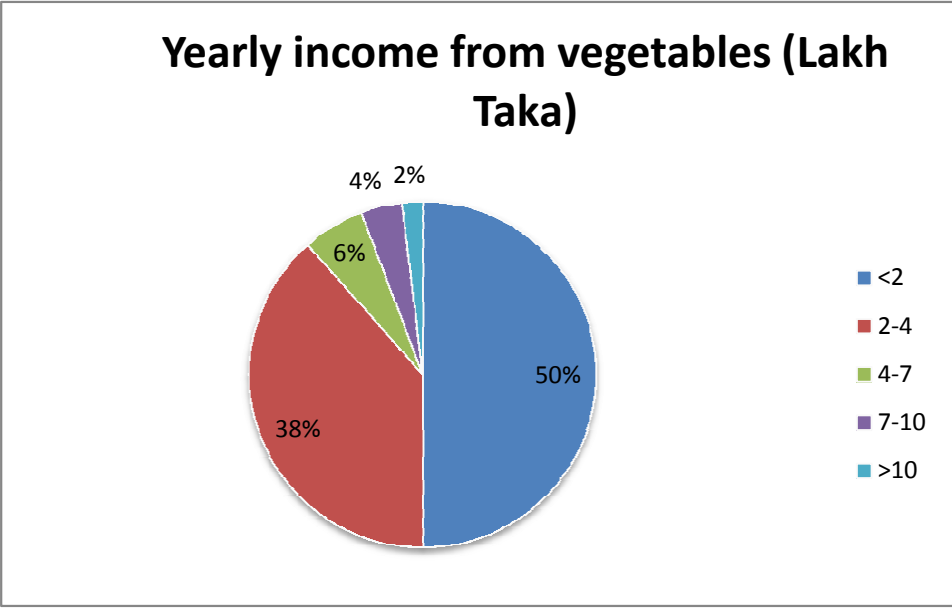


Figure 6: Yearly income from vegetables

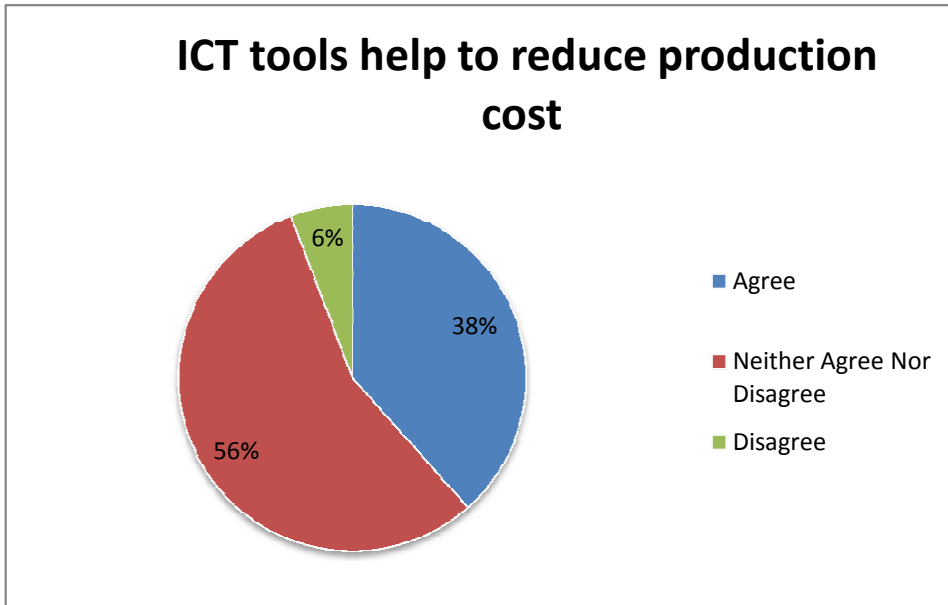


Figure 7: Whether ICT tools help to reduce production cost

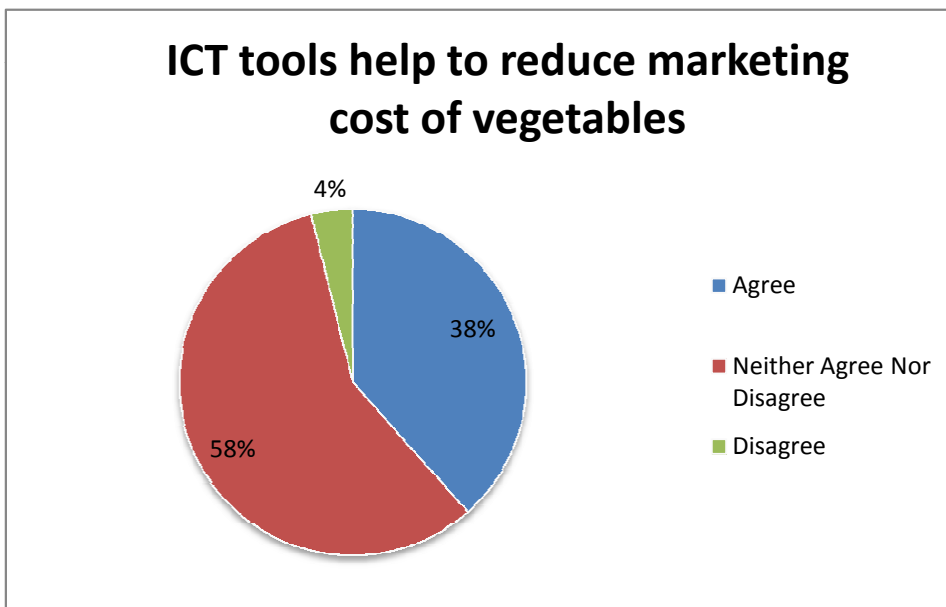


Figure 8: Whether ICT tools help to reduce marketing cost of vegetables

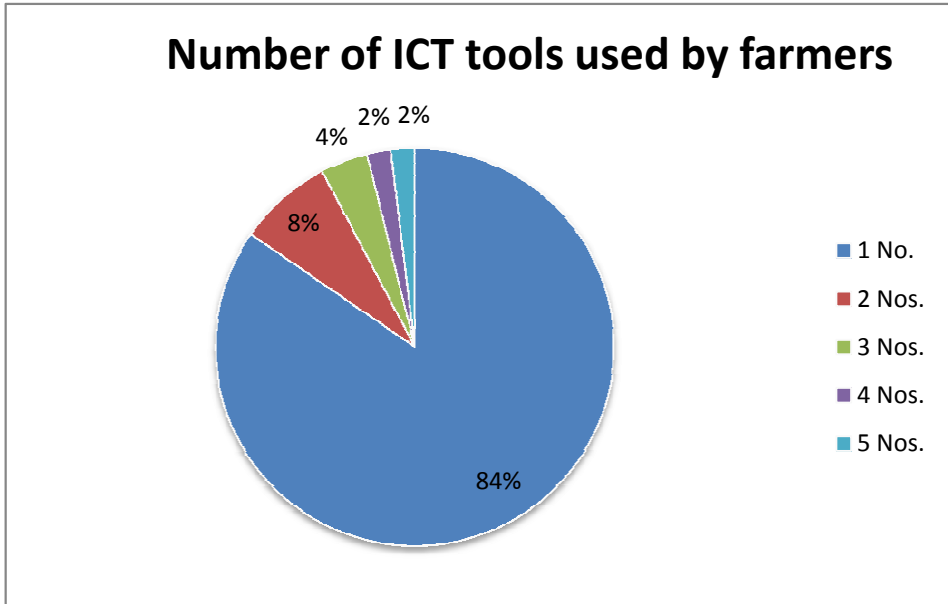


Figure 9: Number of ICT tools used by farmers

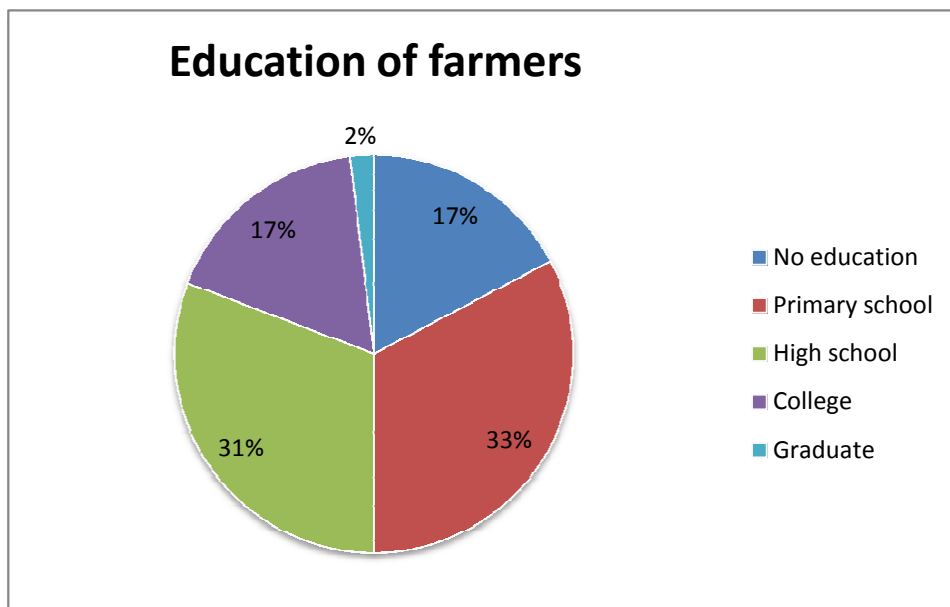


Figure 10: Education level of farmers

Appendix – C: References

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