Introduction

India is a vast country with majority of its rural population dependent on agriculture. Agriculture in India is diverse with several agricultural produces unique to a geographical location. With several challenges in terms of production, distribution, marketing, income, etc. traditional approaches of agriculture cannot be adopted. Information and Communication Technology (ICT) has revolutionized different sectors and a significant number of stakeholders have been benefited by it. By the usage of ICT, the challenges encountered using traditional agriculture can be tackled substantially. ICT plays a crucial role in improving the livelihoods of small and marginal farmers in rural areas. The rural population is empowered as they get better access to new agricultural technologies, strategies for effective production, various natural resources, wider markets and financial services such as banking, loans, etc. Uesugi (2008) expressed that many of the rural communities want development in their areas and with an extremely positive attitude welcome ICT projects. But due to their lack of ICT knowledge prohibit themselves from its usage. Thus, a good amount of research is needed for the development and implementation of ICT related projects for the agricultural sector which are specific to a geographic location.

1.1 Overview

This chapter deals with the background to the research subject followed by proposing the purpose of the research. The chapter then puts forward research questions and defines the research objectives. The scope of the research explains the extent to which the research area will be explored and specifies the parameters within which the study will be operating. It is then followed by the methodology pursued in conducting the research so that the research objectives are met. Finally, the significance of the research
provides the importance of the research that is undertaken, and the chapter ends with the outline of the thesis.

1.2 Agriculture and ICT in India

Agriculture as the cornerstone of the Indian economy has the most pivotal role in the socio-economic growth of the nation. Indian agriculture is a broad area, including a vast number of populations involved in it. It has been one of the striking examples of overcoming adversity of the post-independence period through the adoption of modern methods and technology.

The agriculture sector is a major source of Indian economy. It ranks second in terms of farm output in the world and is a major contributor to the country’s Gross Domestic Product (GDP). An estimated 58% of the rural population depends on agriculture for their livelihood and 17-18% of the country’s GDP is provided by it, as on February 2018. Increase in agriculture has a direct effect on the food industry. The food industry in India which employs more than 50% of the workforce is expected to grow considerably due to its increase in contribution to world food trade. In terms of production of jute, milk, and pulses India is the largest producer in the world. India ranks second in terms of the largest producer of sugarcane, rice, groundnut, wheat, cotton, fruit, and vegetables. India is also the prominent producer of livestock, fish, plantation crops, poultry, and spices. India is the third-largest economy in the world at 2.1 trillion dollars. Gross Value Added (GVA) is a measure of value of goods and services produced in an area, industry or sector of an economy. The GVA of agriculture and allied sectors is estimated to be 7% for quartile 2 of 2017-18, as per data based on


the Central Statistics Office (CSO). The contributions of agriculture to India’s economy is irrefutable and it is going to play a major role in the development of the country. Figure 1.1 shows the percentage contribution of agriculture to GVA growth.

![Graph showing percentage contribution of agriculture to GVA growth](image)

Figure 1.1: Percentage contribution of agriculture to GVA growth. (Source: Central Statistics Office (CSO), Government of India, 2018)

1.2.1 Information and Communication Technology (ICT) in India

ICT is an umbrella term which includes telecommunications, broadcast media, intelligent building management systems, internet services, audio-visual processing, transmission systems, network-based control and monitoring functions. The scope of ICT is generally wider when compared to Information Technology (IT) although it’s generally taken as an alternate expression for IT. In more recent times ICT is accepted as a convergence of multiple technologies and the use of common transmission lines that carry diverse data, formats and communication types.

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The components under ICT is extensive, and it continues to grow. Some components, such as computers and telephones, have existed for years. Other components such as smartphones and digital TV’s are more recent entry under the ICT umbrella. Though ICT encompasses applications from those various components it means much more than the list of components under it. Components of ICT, including, but not limited to, the components listed are shown in Figure 1.2.

![Figure 1.2: Components of ICT. (Source: Techtarget, 2017)](image)

There have been several milestones in agriculture development in India they include Green Revolution, Blue Revolution, White Revolution, Evergreen Revolution, Yellow Revolution, Biotechnology Revolution and Information and Communication Technology Revolution, which is the most recent one. With the rapid advancement of agricultural science and technology, access to modern technologies have become available to farmers through various sources.
Traditionally, farmers in India have been following age-old production methods that have been passed down from generations. ICT plays an important role in the dissemination of information to farmers enabling them to apply modern agricultural practices. This helps them in their farming practices like cropping pattern, usage of seeds that produce high yield, application of the right fertilizer, management of pests, agricultural marketing, etc.

E-agriculture is a relatively new term in the field of agriculture and rural development practices. Food and Agriculture Organization (FAO) describes e-agriculture as an emerging field through improved information and communication processes, focuses on the enhancement of agricultural and rural development. E-agriculture to be more specific comprises of the approach, designing, development based on the design, assessment, and application of ground-breaking ways of using ICT in the rural area, with the focus being agriculture.

The government set up National Policy on ICT in agriculture extension has expressed to transmute agriculture into a driving force. By the promotion of agriculture diversification and commercialization, it intends to improve the economic growth within a market-oriented policy framework. To boost the agricultural performance government has introduced several policies such as:

- Developing information-based websites on agriculture that would provide information on weather, soil conditions, different crops, pesticides, and fertilizers.

- Publishing daily information on minimum and maximum market prices of commodities which will help strengthen the agricultural marketing system.
• Setting up of knowledge centres in each village for effective and timely transmission of knowledge to farmers.

• Use of modern IT resources for the promotion of communication that involves the transfer of ICT in a cost-effective way between experts, researchers, and farmers.

• Mission Mode Projects (MMP) of services in agriculture which provide farmers with information on various government schemes, ecological friendly fertilizers, seeds, pesticides, soil fertility information, weather, appropriate crop management and marketing of agricultural produce.

The direct effect of the above is the ability of the agricultural stakeholders to contact, collect, analyse and use information to understand market signals and respond to them appropriately.

1.2.2 Agricultural e-commerce in India – Business to Business (B2B), Business-to-Consumer (B2C)

In this digital age, e-commerce has become a symbol of globalization and represent a whole new way in which business is conducted. It has become a cornerstone for the success of any industry. E-commerce stands for electronic commerce and relates to trading in goods and services through the electronic medium, i.e. the internet or phone.

In India e-commerce has transformed the very strategies of business from its traditional approach. According to the Morgan Stanley report, the e-commerce market in India will be valued worth $200 billion by 2026 at a growth rate of 30% annually. This growth in the industry is caused due to the increase in the penetration of smartphones and the internet.

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The transformation in digital usage in the country is expected to increase the number of internet users from 560.01 million to 829 million by 2021. Because of e-commerce, India's internet economy is expected to reach from US$ 125 billion in 2017 to US$ 250 billion by 2020. Growing at an annual rate of 51%, India’s e-commerce revenue is going to be the highest in the world from US$ 39 billion in 2017 to US$ 120 billion in 2020.

Business to Business (B2B) involves online transactions between businesses which are similar or equal partners in trade. B2B transactions include buying, selling, trading, delivering and contracting (Shapiro & Varian, 1999). In Business to Consumer (B2C), there is a transaction between the two parties, and it involves the retail transactions of products or services from businesses to individual customers. To improve the trading and marketing of products, several agricultural businesses have reaped the advantages of e-business. While e-business is similar to e-commerce, it goes further from the simple process of buying, selling of products and services online. Electronic order processing, supply chain management, and customer relationship management are the essential process of e-business. There are large benefits of e-commerce in promoting success in agriculture. Marketers in other industries are either B2B or B2C. However, for Agri-marketers, the line between the two is blurred. Marketing to farmers combines the best of both worlds for the following reasons:

- Farmers are individuals and have a lot of freedom in making decisions, they exhibit many of the behaviours that consumers do.
- Farmers oversee operations that involve large amounts of financing, they exhibit many of the behaviours of a business.
1.3 Profile of the study area - Udupi jasmine community-based enterprise

Udupi jasmine growing community in coastal Karnataka of India is a successful viable community-based enterprise. For this community despite having other sources of income, jasmine cultivation has provided them with a sustained regular income. It safeguards them against poverty even if their other sources of income diminish. Jasmine cultivation plays an important role in economic and social growth. It helps in promoting rural livelihoods, food security, and poverty reduction.

Majority of the Udupi jasmine is grown in the Shankarapura and surrounding villages, including Shirva, Belle (Moodubelle and Padubelle), Belman, Kaup, Katapadi, Bantakal and Innanje of Udupi district of coastal Karnataka, India. Udupi jasmine is well known for its exquisite fragrance. It is a favoured flower in ceremonial events and for personal use.

Udupi jasmine flower growing community of coastal Karnataka have maintained a community-based enterprise for more than 85 years. Many of the farmers of this region depend directly on the cultivation of Udupi jasmine for their livelihood (Krishnamurthy MK, Parameshwar NS, Sridhar Herle P, 1995). With an efficient system of pricing and distribution, trust and cooperation among the community and an accepted method of matching demand and supply just by thumb rule, the community has kept poverty away for nearly three generations. Jasmine cultivation has a significant socio-economic impact on the cultivators. Although the cultivators have other sources of income, jasmine cultivation is the major source of their economy. Figure 1.3 and 1.4 show the Udupi jasmine growing areas in coastal Karnataka.
Figure 1.3: Map of Karnataka with the location of Shankarapura. (Source: Google maps)

Figure 1.4: Map of Udupi jasmine growing areas in and around Shankarapura. (Source: Google maps)
1.3.1 Udupi Jasmine – farm to market

Jasmine is a year-round crop generally grown in a small piece of land near to the households. Individuals or entire family members engage in the activity of jasmine cultivation and collection. The process of jasmine collection by growers starts early in the morning and ends by 10 am. The process starts with the collection of jasmine buds. Figure 1.5 shows growers collecting jasmine buds from jasmine plants.

![Growers collecting jasmine buds from jasmine plants.](image)
The collected buds are not directly sold to the consumer. Instead, they are tied together to a 6-inch chain approximately. The assembling of jasmine buds into units is shown in Figure 1.6. These tied chains of buds are then wrapped in banana leaves with a slip of paper containing information like household name and number of buds assembled. These wrapped chains of jasmine buds are kept aside to be collected by “agents”. This proves advantages to the growers as they can attend to other jobs.

Figure 1.6: Assembling of jasmine buds into units by the growers.

Each household is connected to one of the 150 agents who operate in these jasmine growing areas. The responsibility of the agent is to collect the buds from the households on a daily basis. Some of the growers deliver the collected buds to an assembly point called as “katte” to which an agent is associated. The agents then arrange the collected buds into commercial units called “chendu” comprising of 800 - 805 buds each. Since not all households will be able to produce a unit with the desired number of buds, the agents form these units with whatever buds they have collected from multiple households.
These units are then combined into a bundle called as “atte”. Four “chendus” make one “atte” (bundle). The agents follow this process of bundling the units into “atte” as this is then supplied to flower traders. The agents also collect the information slips from each household which the grower inserted into the tied flower unit and is stored in a small plastic box. Figure 1.7 shows the way in which the grower places the slip of paper on top of the flower unit containing information of the grower and number of buds collected. A separate book is also maintained with the information of each grower and price to be given for that day. Every seven days the grower gets the payment based on the flowers supplied.

Figure 1.7: Collected flower buds tied together with the information slip placed on top.

The entire process of jasmine from farm to market is shown in Figure 1.8.
Figure 1. 8: Udupi Jasmine process from farm to market.
Once the agents create these commercial bundles, they are then given to a designated trader in Shankarapura region. There are 6 traders in total to whom all the agents supply. Some of the agents directly sell the flowers to the local flower vendors who in turn sell it to customers as shown in Figure 1.9.

Figure 1.9: Udupi jasmine sold at different local markets in Udupi and Mangalore.
Every day these bundles of jasmine arrive Shankarapura by 11 a.m. These 6 traders who operate from Shankarapura region contact wholesale dealers from outside the region for the collected units to be sold. These units reach wholesalers as far as Mumbai and Dubai. Udupi jasmine is a favoured flower in religious ceremonies, formal events and for personal use. Figure 1.10 shows jasmine used as ornamentation on women's hair. Once the demand is established the six traders determine the price and the amount that they need to pay for each bundle to the agents. The traders keep track of the units received from agents and appropriate payments are made to them on a weekly basis.

Figure 1. 10: Jasmine used as ornamentation on women's hair
1.3.1.1 Determination of jasmine price

Jasmine price determination is done by the dealers daily based on the demand. The price is determined for one “atte” (bundle). There is a unique method in determining daily price for one “atte” (bundle) of jasmine. Based on the demand from the wholesalers, one of the 6 traders say trader A, establishes a price of X for that day. If the price X is not acceptable by the wholesalers of the other 5 traders, they decrease their demand. So, the remaining 5 traders are left with additional supply. The price X will be agreed upon by the other 5 traders only if the trader A who quoted price X agrees to buy the additional supply. Thus, the traders engage in negotiations on price X and will reach on a consensus in establishing the price of jasmine for that day. The overall price for jasmine for that day is determined by the demand of 6 traders receive from their wholesalers. The wholesaler's purchase decision depends on the overall market demand.

The traders pay the agents on the number of buds received. Finally, growers receive appropriate payments on a weekly basis from the agents who keep track of the grower’s produce. This process has been followed for decades and is still in practice.

1.4 Purpose of the Research

E-commerce application in agricultural sales will enable farmers to plan the production of crops on a rational basis and thus avoid the asymmetry in information, which is the general case in traditional farming. Most of the agricultural websites in India give information about crops, price, weather and agricultural practices but very little work has been done in developing India’s agricultural e-commerce. Several of the e-commerce models in India do not cater to the problem of marketing of agricultural products, rather they are more towards providing information. Popular agricultural e-commerce websites cater to agricultural products that are grown on a larger scale while the small produces are neglected. Geographical Indication (GI) based crops don’t have
the luxury of e-commerce as they are specific to a geographic location. Existing e-commerce models cannot be used to market such crops as it does not suit the requirement of area-specific conditions.

Udupi jasmine is one of the GI based crop which is synonymous with the Udupi district and is an important aspect in terms of socio-economic development of a large community. The community largely depends on the revenue generated through the cultivation of jasmine. Udupi jasmine market is confined to the coastal areas and it is not effectively marketed outside coastal Karnataka. The major reason for this is lack of exposure and marketing facilities hinders it from reaching a wide range of customers.

It is well documented that ICT has proven beneficial in uplifting the socio-economic status and agricultural productivity of a farming community. Presently there is no accurate data on various jasmine growers and their yearly output. This information is critical as it can be used to keep a check on the farming community for irregularities in production or any other problems associated with farming. The information is also crucial for the formulation of government policies when necessary.

1.5 Research Questions

The formulation of research questions has an important social function (Shoket, 2014). ICT is prevalent in all realms of society and success stories of ICT in agriculture and rural development have been well documented in many cases (FOA, 2015). The research question is triggered by the limited literature on the application of ICT in marketing of Udupi jasmine. The research explores the areas in which ICT can be integrated into this community-based enterprise, improve the existing system and provide alternate marketing solutions.
The research tries to discern various problems faced by the jasmine community-based enterprise of Udupi district and to provide progressive, sustainable solutions towards viable business opportunities using e-commerce.

Following are the research questions the research identifies:

1. Question 1: Does jasmine cultivation bear a socio-economic impact on the jasmine growing community?
2. Question 2: Whether the community-based enterprise is proficient and willing to use ICT?
3. Question 3: Can various information about the jasmine growers and their agricultural output be digitized?
4. Question 4: As the situations of each agricultural producing community is unique and existing scenarios vary for a crop from place to place, can an e-commerce model be developed to assist this community-based enterprise to market their products?
5. Question 5: Will consumers accept e-commerce to buy jasmine if an online application is provided to them?

1.6 Objectives of Research

The principal aim is to contribute to this less explored area of e-commerce in marketing crops that belong to a specific geographic location. The research intends to persuade the utilization of customized e-commerce model for marketing Udupi jasmine considering the existing crude system.

Hence the primary objective is to develop an e-commerce model, which will assist the farmers to market their products (Udupi jasmine) and a database that will keep track of various farmers and their yearly agricultural output.
The secondary objectives that aid in achieving the primary objective are as follows:

1. Study of different agricultural models and agricultural marketing techniques.
2. To design an e-commerce model.
3. To deploy and test the model.
4. To validate the e-commerce model.

1.7 Scope of Research

The present study was envisaged to analyse the working of Udupi jasmine community-based enterprise, identify the key factors that drive this enterprise and check for the socio-economic impact of jasmine cultivation. This would also shed light on understanding the challenges faced by the actors involved. Thus, the convergence of the study is to provide necessary ICT intervention in the form of an e-commerce model to overcome these challenges which in turn would help in the socio-economic development of this community-based enterprise.

Hence the scope of the research is to provide a strategic e-commerce model to market Udupi jasmine. In the process, the research tends to explore factors such as socio-economic impact of jasmine cultivation, ICT awareness among growers and agents, jasmine price analysis and consumer's acceptance of e-commerce, etc. This is achieved through focus group discussions, opinions from experts, collection of data based on a relevant questionnaire, analysis of the data collected, development of an e-commerce model, deployment of the model. Technology Acceptance Model (TAM) has been effectively and suitably used to predict the personal acceptance of technology use and hence the same is used in the validation of the e-commerce model.
1.8  Research Methodology

A research methodology involves specific techniques that are adopted in the research process to collect, assemble and evaluate data. The research methodology used in achieving the objectives of research is described in Figure 1.11.

Figure 1.11: Research Methodology used in pursuing the objectives of the research.
In order to achieve the research objectives stated, both Exploratory Research Design (qualitative) and Descriptive Research Design (quantitative) is used. A combined approach is used since a quantitative approach has the limitation that the inferences made are through statistical data which provides only a brief prudent summary of major patterns. The problem statement is formed based on focus group discussions with the relevant stakeholders and expert opinions. Based on the literature review, the objective and problem statement are refined. This is followed by the development, refining and redefining of the questionnaire for qualitative and quantitative data collection. Data is collected and then analysed using both qualitative and quantitative approaches. The methodology concludes with contributions, recommendations, conclusions, and scope for future study.

1.9 Significance of the research

With India moving rapidly towards digital literacy, the use of ICT in agriculture is the need of the hour. With the identification of the challenges involved, possible ICT solutions can be applied to overcome these challenges. If these solutions are used effectively, a complete effective ecosystem can be created that can work as a single unit.

Marketing of agriculture products through the internet has its own challenges due to several factors like shelf life, price, quantity, storage, and location. In India, there are many crops that are specific to a geographical location and Udupi jasmine is one among them. The application of e-commerce in the process of agricultural sales enables farmers to arrange the production rationally. This will enable them to avoid the information asymmetry predicament which is liable to happen in the traditional agriculture production. Agricultural e-commerce models cannot be like other traditional e-commerce models. It needs to evolve based on the geographical area, policies governing that area, entities involved in the production and distribution of that agricultural crop.
Localization of e-commerce is necessary to market such crops. The model proposed is localized to market Udupi jasmine and the model considers several factors that govern the entire jasmine growing community-based enterprise. Udupi jasmine market is confined to the coastal areas and it is not effectively marketed outside coastal Karnataka. The major reason for this is lack of marketing facilities.

Hence e-commerce can be used to provide a wide range of customers across geographical locations and the gap between the farmer and the buyer can be reduced significantly. This will also reinforce the socio-economic growth of this community-based enterprise as there will be a well-organized circulation of agricultural products on a larger scale. Information on any farming community is critical for its sustenance in the long run as interventions can be provided when necessary. Hence with the use of ICT, digitized information about this community-based enterprise will prove crucial for its sustenance in the years to come.

1.10 Outline of the Thesis

Chapter 1- Introduction

This chapter deals with the introduction to the research topic and states the research questions along with the objectives of the study. Further, it elaborates on the purpose of the research, thus giving the motivational factors that led to the study. While elucidating the scope of the research the methodology followed in conducting the research is described. The significance of the research is highlighted, and the chapter ends with the layout of the thesis provided in the form of chapters.

Chapter 2- Literature Review

This chapter makes a detailed review of the past literature that will assist in understanding the existing work done and identify the research gaps. In doing so, the
Chapter 3- Methods and Materials

This chapter describes the methodology that is adapted to study the research problem. The chapter on research methodology outlines the selection of research methods along with the logic behind the methods used in the context of the research study. The study employs a mixed-method approach qualitative and quantitative technique used in the collection of data and its analysis.

With the aim of accomplishing the research objectives, this chapter focuses on the research techniques adopted and employed for the purpose of the study. Various constructs that are applicable for the study are also described in this chapter.

Chapter 4- Results and Analysis:

This chapter lists the analysis of data and the result of the study. The chapter discusses and identifies the determinants required to build an e-commerce model. The chapter identifies various factors that will be used in the designing of the e-commerce model. Based on the findings of empirical study and information analysis an e-commerce model is developed and modules of the model are discussed. Working of the Web application developed based on the model is described and validation is done using TAM. This followed by the analysis of the results.
Chapter 5 – Discussion and Conclusions

This chapter discusses the outcome of each objective by summarising the results presented in chapter 4. Further, the chapter highlights the implications and contribution of the research towards Udupi jasmine community-based enterprise. It also outlines the limitations of the study and concludes with recommendations for future study.