Review on Disruptive Technologies in Agriculture based Small and Medium Enterprises in Sri Lanka

Champika D. Dharmasena

Doctoral Student, Faculty of Graduate Studies, University of Kelaniya, Sri Lanka
champika9743@gmail.com

ABSTRACT

In both developed and developing countries across the world, SMEs form an important fragment of the local economic system. In Sri Lanka, for instance SME contribute about 75% percent of businesses and contribute 52% percent of GDP. With the technological development, developed and developing societies are stepping by themselves into an era of a knowledge-based economies, indicating knowledge as the most important capital for all nations to propel socio-economic development. Having understood this fact, successive governments in Sri Lanka have taken various steps, from time to time, to promote this vital sector since independence. But, when analyzing the present contribution of this sector in the national economy, it is clear that the sector has not achieved desired level of contribution when compared with other developed and developing countries in the region. This is because of the lesser opportunities in adapting disruptive innovations by SMEs including agri based SMEs with the knowledge demanding society. So, there seems to be a vast opportunity for Sri Lanka to harness the opportunity by developing this vital sector through inventing on disruptive technologies. So, the objective of this paper is to provide a brief overview of the disruptive technology in agri based SME sector in Sri Lanka, and to make suggestions for enhancing the technological enhancement of agri based SMEs for a sustainable agriculture development in Sri Lanka.

Keywords: *Digital Agriculture, Disruptive Technology, Small and Medium Enterprises*

1. INTRODUCTION

In general, disruptive technology challenges and changes or transforms the existing ways or methods of doing things (Chishakwe and Smith,2012). Technology has thus improved and continues to improve social and economic behavior of people and the way of doing businesses. Technology is undergoing massive and rapid changes daily; new and improved technological innovations emerge frequently. With these changes, developed and developing societies are stepping by themselves into an era of a knowledge-based economies, indicating knowledge as the most important capital for all nations to propel socio-economic development. This is evidently reflected by the economic growth of the world's leading countries, such as the USA or Japan, or even of Singapore, the city state without abundant natural resources but with a highly advanced economy (Seenuankaew et al, 2017).

In both developed and developing countries across the world, SMEs form an important fragment of the local economic system (Ismail, 2015). In Sri Lanka, for instance Small and Medium Enterprises contribute about 75% percent of businesses and contribute 52% percent of GDP (Central Bank,2018). Among these, most are based on agriculture covering peasant agriculture, minor export crops and plantation sector. In developed and developing nations, the contributions of SMEs have been faced with multiplicity of challenges such as lack of access to improved and affordable technology (Quaye, 2014), and finance (Abor and Quartey, 2010; Fraser et al., 2015). Quaye and Mensah (2017) identified these challenges as either from the internal or external environment. The lack of access to appropriate technology alternative termed, disruptive technology, is amongst the major challenges faced by Small and Medium Enterprises (SMEs) in Sri Lanka; specially the agriculture-based SMEs.

In this context, development of an information-based decision making in agricultural production and marketing which will enable small and medium scale agricultural entrepreneurs to access information economically, on demand at the right time in both local as well as international context is essential to withstand against the challenges faced by them. On the other hand, globalization trends have led the entrepreneurs in agricultural production and marketing to adopt new behaviors that depends on modern technology.

1.1. Scope of the Study

There have been few studies of Sri Lankan agri entrepreneur's information needs, and most of those that do exist have focused on the needs of small holder farmers in general and not particularly on Agri SMEs. One of an important primary issue is the fact that the existing information does not correlate to the needs of emerging and existing agricultural related entrepreneurs in Sri Lanka for improving their production and marketing.

The government of Sri Lanka identified and indicated in National Policy Framework for SME; the importance of technology driven SME sector for the economic development, a study of the requirement of the agri based entrepreneur's information and information-seeking needs, technology adaptation would facilitate the relevant authorities to identify the gaps in traditional and modern trends in world agriculture and to address it.

Therefore, this paper aims to explore the potential of the disruptive technology in agri based SME, barriers for technology adaptation, policy intervention to develop agri based SMEs in Sri Lanka with the digitization of the economy; comparing the global context.

1.2. Methodology

Journal articles, industry related publications and government publications were reviewed to build this article to support the explanations and to find out the Potentials of Disruptive Technologies in Agriculture based Small and Medium Enterprises in Sri Lanka. The paper followed deductive approach where arguments and explanations mainly supported by empirical evidences and associated Literature. Therefore, literature review was the main research tool. Paper tried to discuss the empirical evidences found globally and how those concept and practices apply in Sri Lankan context. Finally, author conclude the paper by proposing future research direction according to the discussions.

2. LITERATURE REVIEW

2.1. Global Practice of Agri based Small and Medium Enterprises

Globally, a major portion of the food industries participating in the Food Supply Chain comprises of small and medium-sized enterprises (SMEs) (Mertins et al., 2012). The annual statistics of Food Drink Europe (2016) shows that about 99.1 per cent of all food processing industries in the EU are SMEs. The food processing SMEs comprise dairy, beverages, food chains, spice trading, meat, fruits, vegetables, etc.

Literature shows that ongoing round of multilateral (World Trade Organization (WTO)) trade negotiations seems set to result in further liberalization of agricultural trade, hence lower trade barriers, less protection for domestic firms, and greater market access and opportunities for internationally-oriented agri-food enterprises (Ackerman, 1994; The Scottish Office, 1997; Lawson, 1998; Barkema and Novack, 2000; WTO, 2004). On the other hand, the increasing concentration of food retail power in oligopolistic chains and vertically integrated corporations and the resulting significant reductions in channel availability, domestic growth opportunities and farm-gate prices (Carter, 1996; Gorelick, 2000; Shaw and Young, 2000) suggest that growth-seeking agri-food enterprises might be better served by an increased focus on international markets. Further, the size of this potential market is reflected by the

approximately two billion people who are currently connected to the Internet, with a further three billion people forecast to be online by 2020 (Wadhwa 2014). Therefore, these continuous changes in consumer behavior leads the SMEs to use disruptive technologies and to be updated focusing on the survival and sustainability.

2.1. Role of Technology in Agriculture

Technology has played a significant role in new industrial revolution, that is Industry 4.0 (Kaur,2019). Innovations associated with high-tech areas such as artificial intelligence (AI), data science (DS) and Internet of Things (IoT) are rapidly penetrating all productive sectors and one of the sectors in which this process is proceeding at a strong pace is agriculture (Lachman and Lopez,2019).According to the literature, currently the use of technologies like IOT in designing and implementing a sustainable food security system is getting a huge attention from researchers, academicians, practitioners and policymakers. The use of these technologies will result in food wastage minimization and optimal planning of distribution networks, which will reduce the carbon emissions of the entire supply chain (Irani and Sharif,2016).

First introduced by Christensen (1997), the concept of disruptive technology has become a popular topic in both academic research and business practices (Christensen, 1997; Obal, 2017). While sustainable technology makes incremental improvements to the business processes, disruptive technology shakes up an industry or enables a business model that creates a completely new industry, even though these technologies may be unfavorable to the users at the early stage (Bower and Christensen, 1995; Christensen, 1997). Business models based on disruptive technologies are typically more efficient, more productive and more convenient than those established on the incumbent technology (Christensen, 1997). For example, Internet of Things (IoT) has radically changed warehouse and inventory management by tightly coupling distribution center, transportation and customer management system (Yang et al., 2013; Banker, 2014; Parry et al., 2016a). It is evident that in recent years, the integration of the disruptive technologies, namely blockchain, Big Data Analytic, Artificial Intelligence, robotics, etc., in agriculture and food security is hugely stressed upon globally.

2.2. Disruptive Technologies in SME – Empirical Evidences

ICT use for leveraging agricultural performance is not so new. Precision farming in early 1990s used technology-based engineering and computers focusing on production efficiency. However, nowadays value creation in agro-food system is more linked with other segments of agribusinesses further than farm stage (Caiazza, 2012).

Electronic Data Interchange between the different businesses of the chain allows for the recording of operations and for managing interactions from input providers to retailers and consumers. That feeds

traceability systems for legal or marketing purposes. Machine learning and artificial intelligence also use those data for consumer's consumption forecasts, market assessments and other issues of great value the in modern food chain (Garcia and Jarez,2019).

In the agricultural sector, information and communication technologies (ICTs) have emerged in the last years and this growth is expected to continue. Investments in tech startups oriented to the farming sector grew 63 percent from 2010 to 2015, reaching that year $4.6bn (Laugerette and Stöckel, 2016). Elements of the so-called smart agriculture market are envisaged to rise from $ 5.18bn in 2016 to US$ 11.23bn by 2022, with an annual growth rate of 13.27 percent (Market sand Markets, 2017). In Europe, political efforts to boost digital markets and specifically the digitalization of farming sector are continuous; Cork 2.0 declaration "A better life in rural areas"; EU Commission proposal for Common Agricultural Policy beyond 2020; EU Communication "Digitizing Europe Industry"; or Digital Single Market (DSM) initiative are good examples of this strategy (Garcia and Jarez,2019).

2.3. Disruptive Technologies in Agri based SME – Empirical Evidences

Most of the developed economies largely based on SMEs and facilitate in all forms to develop their businesses. South Korea is one of the rapid developing economy and an Study done by Shin (2017) regarding the internet of things (IoT) and SMEs in South Korea found that that there exist disruptive and open innovation attributes in the IoT industry that enable IoT-SMEs to enhance their structure and process related capabilities, to create business models for products and services and to collaborate with external parties in marketing to enter the market and excavate practical insights into driving innovation based on IoT attributes and suggest enabling paths for pursuing innovation and entering overseas markets for IoT-SMEs. A survey on analysis of procedures within digital revolution: Agro Food Projects conducted interviewing professionals of businesses and entities from14 European countries revealed that awareness about the importance of end user involvement and they are eager to incorporate innovative farmers and early adopters to collect the best requirements for products and services; the core of developing SMEs.

With the increasing digital technologies, designing/restructuring the agricultural production and marketing that involves SMEs is a challenging task for developing countries including Sri Lanka. In most of the developing countries, including India, food SMEs provide not only huge employment opportunities but they also ensure regional balance by taking industrialization to rural and backward areas (Jose and Shanmugam, 2019). Therefore, encouraging SMEs is important in developing economies and in the era of smart agriculture, SMEs should be able to take data driven decisions and generate value through intuition, intelligence and insights. As the intensity of global market competition has created dynamic and fast-changing business environment which has affected all enterprises including small- and medium-sized enterprises (SMEs). SMEs have, therefore, realized the need to

explore, exploit and deploy innovative strategies in order to stay competitive in the changing business environment (Carvalho and Costa, 2014).

3. SRI LANKAN EXPERIENCE IN DISRUPTIVE TECHNOLOGIES

Sri Lanka Digital Economy Strategy published in 2018 indicated the current status, potentials and opportunities in disruptive technologies to enhance the productivity of manufacturing, agriculture and tourism sectors. "In manufacturing, there is an opportunity to unlock potential of small and medium-sized companies while reinforcing digital innovation in large companies. In agriculture, the focus would be to build on government's current plans, and focus on execution. The sector's E-Agriculture Strategy already contains a clear roadmap by which ICT developments can significantly contribute towards achievement of the country's agricultural vision and development objectives. In tourism, the digitalization of tourism has started gaining momentum; harmonizing and building upon existing efforts can accelerate pace." (Sri Lanka Digital Economic Strategy,2018). In comparison with other Asia Pacific emerging markets, Sri Lanka exhibits strengths in connectivity, digital marketing, investment in digital initiatives, and the ability to move quickly. Yet when compared with China, India, and more-developed countries, Sri Lanka is well behind. Its companies lag in appetite for risk, ability to integrate their digital priorities into the overall business strategy, automation of internal and customer-facing processes, and adoption of a collaborative culture between the digital teams and business functions. (MaKinsey,2018).

Further, Information and Communication Technology Agency of Sri Lanka (ICTA) has initiated a digital transformation and adoption program, 'Sri Lanka Go Digital', to empower entrepreneurs from regional SMEs with knowledge on the importance of embracing digital technologies to uplift their businesses. This was aimed to acts as a platform for regional development through digitization and links the regional businesses with global organizations by enabling local IT companies to reach global standards whilst remaining on par with the latest trends of technology. The program will also support the digitizing of businesses across all regions and act as a catalyst for the digital transformation of SMEs.

3.1. SME Sri Lankan Experience

SME sector in Sri Lanka is considered as core segment of economic development of the country (SME Framework). The country has a SME economy comprising of 70% of plantation sector, 85% of rubber, 90% of coconut sector and almost 100 percent of other agricultural crops within the 70% of total SME sector (Central Bank,2018).
Today, Small and Medium Enterprises (SMEs) plays an important role in any economy contributing to the growth of GDP, embarking on innovations and stimulating other economic activities (National SME

framework). This sector is said to be the backbone of all the developed and developing nations. So that, irrespective of the level of development of SME sector is very important for any economy. Having understood that successive governments in Sri Lanka have taken various steps from time to time to facilitate and promote this sector. National Policy Framework for SME Development in Sri Lanka highlight that, the Small Medium Enterprise (SME) sector has been identified as an important strategic sector in the overall policy objectives of the Government of Sri Lanka (GOSL) and it is seen as a driver of change for inclusive economic growth, regional development, employment generation and poverty reduction. Further, it says, the Government of Sri Lanka recognizes SMEs as the backbone of the economy, as it accounts for more than 75% of the total number of enterprises, provides 45% of the employment and contributes to 52% of the Gross Domestic Production (GDP).

Identifying the nature of the SME sector and challenges faced by the sector, government of Sri Lanka intervene to upgrade and strengthen this sector to meet the expectations of the country. Based on that policy framework tries to promote high potential, promising SME and improve business environment to allow them to realize their full potentials in today's globalized economy. Since different countries use different definitions for SMEs based on their level of development based on total number of employees, annual turnover and total investment. In the Sri Lankan context, the SME policy framework defines SMEs based on the number of employees and annual turnover. Accordingly, the category of Small and Medium sized Enterprises (SMEs) in Sri Lanka is made up of an enterprise which employ less than 300 employees and which have an annual turnover not exceeding Rs.750 Mn.

SME Policy Framework in Sri Lanka broadly set out the policy direction, the challenges to be addressed and the broad intervention strategies identifying into six core areas namely enabling environment, modern appropriate technology, entrepreneurial culture and skills development, access to finance, market facilitation and research and development. Policy Perspective 5.2. of the framework indicate that, "the Government will facilitate the acquisition and adoption of state of-the-art modern and appropriate clean technologies for SMEs to increase quality, innovative, productive and competitive products. Industrial policy thrust is directed towards the promotion of knowledge based, technology intensive industry while focusing on regional industrialization." To address the challenge in less accessibility to appropriate and affordable modern technology, it suggested to establish a strong network, platform and link between SMEs and technology providers while strengthen the technology transfer programs, outreach of technology demonstration platforms and centers in the industrial park sand through special technology showcase and dissemination exhibitions. Further it, proposed to promote and conduct special technology transfer and diffusion programs to promote the adoption of modern technology by SMEs and to establish and strengthen technology bank for collection and dissemination of information on technology resources.

3.2. Digital interventions in Agriculture in Sri Lanka

Sri Lanka e- agriculture strategy launched by Department of Agriculture with the blessings of Ministry of Agriculture together with Telecom Regulatory Authority of Sri Lanka (TRCSL) in year 2016 focusing on a roadmap by which ICT developments can significantly contribute towards achievement of the country's agricultural vision and development objectives. One of the expected outcomes is to reduce demand-supply gap and enhance outreach and profitability of Sri Lankan product and services through vibrant e-agriculture market places and efficient logistics. For that, it proposed to establish E-market place for agriculture expecting market information and scalable payment systems for national and international trade, promotion and awareness raising on use of e- market services where agri-based SMEs benefitted (e-agriculture strategy,2016). In addition, Ministry of Agriculture together with the Department of Agriculture and other stakeholders is implementing various local and foreign funded projects to enhance technological adaptation of small holder farmers and the agri based SMEs (Annual Report, 2018). E- Extension, drone technology, aquaponics, eMarketing are some of the examples. In addition, Sri Lanka Digital Economy Strategy Blueprint has indicated the importance of investing on disruptive technologies in SME sector.

3.3. Gaps and Opportunities for Agri based SMEs in Sri Lanka

The growth and expansion of SMEs are constrained by problems originating from product and factor markets and the regulatory system they operate in. These problems fall into broad areas of access to finance, physical infrastructure, level of technology, regulatory framework, access to information and advice, access to markets, business development services, industrial relations and labour legislation, intellectual property rights, technical and managerial skills, linkage formation and environmental issues (SME Framework, 2018). The presence of e-commerce technologies has brought a vital impact on performance of the businesses. Although, Sri Lanka has a large number of SMEs, the number of the SMEs that adopts e-commerce technologies is low (Arawwawala& Gunawardane, 2017). The inadequacy of skills in product development, packaging, distribution and sales promotion are further areas of weakness. Difficulties in accessing information and markets are also highlighted. Compounding these difficulties, the prevailing business and regulatory environment raises costs and creates unnecessary hurdles. In addition, Agri based SMEs many challenges like climate change, irregularity in supply and market accessibility.
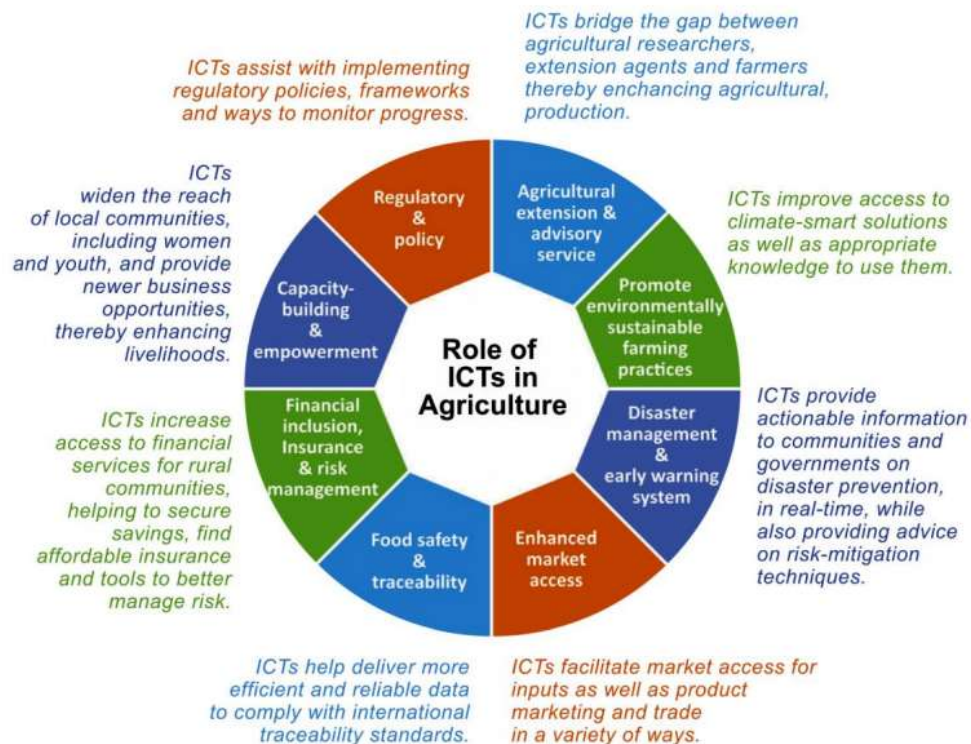
Source: e-agriculture Strategy, 2016

Since ICT plays a critical role in agriculture, government of Sri Lanka has to address the challenges and problems faced by the SMEs including Agri based SME and focus on increasing the investment on Disruptive technologies to survive in the modern trade. As proposed in Science, Technology & Innovation Strategy for Sri Lanka (2011 – 2015), a mechanism should be introduced to support SMEs to innovate and transfer technologies, giving priority to high end technologies through Small Business Innovation Research (SBIR) and Small Business Technology Transfer (SBTT) schemes. Taking full advantage of the IP system would enable SMEs to profit from their latent innovative capacity and creativity, which would encourage further innovation. The capacity of relevant public, private and civil society institutions, such as business and industry associations, to provide IP-related services i.e. provide comprehensive web-based information and basic advice on IP issues to SME support organizations.

4. CONCLUSION

Having understood the positive impact of SMEs development on economic growth, many countries have done many interventions to develop this vital sector regardless the agriculture or manufacturing. In Sri Lanka too, successive governments have taken various steps to develop SMEs since independence. But the contribution of SMEs to the national economy in Sri Lanka is still low when compared with the other developed and developing countries in the region. In order to fill the gap in SME sector to, the role that the government has to play is very important. First of all, it should have a

national policy on SMEs with special focus on Agri based SMEs as they have unique characteristics. As the fast-moving counties like South Korea, Malaysia; Sri Lankan government also have to pay attention on enhancing disruptive technology adaptation in Agri based SMEs in Sri Lanka. Further, creating an inter-industry linkage and establishing funding institutions for financial support to expand the sector should be considered. Finally, in a broad perspective, it is imperative to change the curricular to give impetus to entrepreneurship through general, technical and vocation education in Sri Lanka adding new knowledge to encourage youth in engaging agriculture. Further, new policies should strongly aim to encourage and promote the development of local technologies that are matching with Sri Lankan environment.

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