

## SUSTAINING THE FARMING OVER OPERATIONAL PERFORMANCE: A STUDY OF CONTROLLED ENVIRONMENTAL AGRICULTURE IN SRI LANKA

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### ABSTRACT

Among all other agricultural production, the average yield of greenhouse agriculture per square feet has drastically reduced during the last ten years in Sri Lanka. Accordingly, this study reviewed the emerging themes of operational performance (OPP) of sustained farmers engaged in controlled environmental agriculture (CEA) in the Uva Province in Sri Lanka. The researchers used qualitative research methodology applying the inductive approach. A sample of 5 most successful farmers in terms of longevity of undertaking agriculture and gaining a substantial harvest in CEA was selected to conduct data interviews. The data were analyzed using content analysis. The data analysis indicated four main themes: experience, family support, knowledge, and knowledge sharing as determinants of operational performance. These themes highlighted the need for a committed, knowledgeable person surrounded by a supportive family environment to sustain in OPP to sustain in CEA.

**Key Words:** Operational Performance; Knowledge; Experience .

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## **INTRODUCTION**

Today, the business world is moving towards the competitive priorities that most organizations focus on increasing their operations while reducing the environment's impact. The business environment is more global and competitive than it has been in the past. The individuals' success factors like having business play a key role in enhancing the competitive priorities like cost, quality, delivery, and flexibility. In this regard, the competing priorities in a business emphasize competitive priorities linked with business performance. Further, when success stories of the companies are considered, the supporting evidence from reliable sources highlights that knowledge and experience are determinants of business success and competing priorities.

Knowledge is crucial in creativity, performance with the development of technology, innovations, and ICT (Abualoush et al., 2018). The knowledge generated and knowledge sharing, represented by human experience, values, beliefs, and skills, is now one of the most effective and influential elements in knowledge and managerial processes. Knowledge has become one of the most important resources in building competitive advantage (Sweis et al., 2011). Thus, most of the present firms make knowledge and experience as significant role which makes administrative decisions, encourage creativity, achieve strategic goals of the organizations, increase their values and also improve their performance and achieve the best possible positive impact as a result of the competitive advantage (Shannak et al., 2012).

There is a lack of available research studies that focus on sustaining the farming over operational Performance. Among the available literature that addresses successful practices, a study based on the controlled environment Agriculture in Sri Lanka is scarce in the existing literature. Sri Lanka is known to the globe as a country where it dominated agriculture operations. Similarly, the ever hearing claim from farmers from the last couple of decades is that they face trouble to continue the agriculture due to insufficient amount of profits from the agricultural operation. Recently, few farmers who performed well in CEA came out as success stories. Various national forums appreciated such farmers in Sri Lanka. Thus, this study contributes to the literature with a comprehensive investigation on sustaining the farming over operational Performance in CEA in Sri Lanka to identify farmers' supporting factors in CEA in Sri Lanka.

The study addresses the problem of "how farmers in agriculture become successful over the operational performance of the controlled environment agricultural sector in Sri Lanka." Knowledge and experience play a vital role in the world's economy, especially in the agricultural sector. Sri Lanka is a country where agriculture makes up the lowest proportion. Most of the greenhouse agricultural products for export expand to European countries where the product quality requirements are major criteria. The purpose of this research is to conduct a qualitative study in the field of operational performance in the CEA sector in Sri Lanka that enhancing the competitive priorities of the entire sector performances considering cost, quality, flexibility, and delivery by knowledge and experience to reduce the existing gaps of current conditions. This will lead to identifying the sustainable farming practices of prosperous farmers in CEA in Sri Lanka to enhance efficiency and effectiveness to improve the entire agricultural sector's operational performance in Sri Lanka.

This paper consists of four parts. Following the introduction second part discusses the literature review of the study. The third part discusses the methodology, while the fourth part addresses the analysis results and discussion. As the final part focuses on the study's conclusion by describing managerial implication, limitation of the study, and directions for future research.

## **1. LITERATURE REVIEW**

This section focuses on both the theoretical and empirical reviews of individuals' success practices and controlled environmental agriculture's operational performance.

A firm's operational performance is one of the critical indicators of how well a firm operates in a given environment. Performance is a measure for assessing the degree of a firm's objective attain-

ment (Amit & Pratik, 2012). Organizational performance measures can be classified under several categories of environmental performance, operational performance, and financial performance (Zhu et al., 2012; Zhu & Sarkis, 2004; Laosirihongthong et al., 2013). Further, as explained in the research problem statement, farmers' performance has been not increased while the cultivation area shows gradual increments from the year 2004-2018. The main argument that the present literature review develops is as follows: The OPP comparatively differs from the success factors. In this regard, success factors have a vital role in enhancing the firm's OPP.

OPP refers to a firm's improvements in response to a changing competitive environment (Flynn et al., 2010). It consists of multiple dimensions: flexibility, delivery, quality, and cost (Roberto et al., 2014). The indicators of cost, quality, flexibility, and delivery were selected because they are the most widely used indicators of OPP in the existing literature (Zhu et al., 2010; Eltayeb et al., 2011; Jabbour et al., 2015; Wallace et al., 2016; Ayoub & Abdallah, 2019). The concept of operational performance is novel in the field of agriculture than the manufacturing and service sectors. Agriculture is also transforming inputs into output that is the same as manufacturing firms, but less focus on past literature's agricultural performance.

According to Sarkis (2012), knowledge and learning management activities are also critical in determining a firm's informational boundaries. Collaborative supply chains are applied for knowledge-sharing activities, such as seminars and workshops, which may help supplier training and development efforts in environmental issues (Bai & Sarkis, 2010). The awareness about the benefits of sustainability among the top management members will support making environmentally friendly determinations (Hsu & Hu, 2008; Raut et al., 2019). Knowledge and Experience is the most crucial factor that most of the researchers have missed. But it is the most important factor that impacts the operational performance of any firm. The knowledge level and the experience of the farmers at greenhouses can affect the performance heavily. But, there's less available previous literature on the successful practice to prove the linkage with operational performance. Thus, the study is focusing on sustaining farming over operational performance. Knowledge and experience is the successful primary practice that has less focus on previous findings. The sustaining practices of the farmers are less available in the existing literature. However, successful farmers' successful practices in the CEA in Sri Lanka are most vital to find for the better analysis of results in CEA in Sri Lanka. As per the HARTI Survey Data-2014, farmers' knowledge level, training received, and experience of farmers in CEA in Badulla district leads to better production targets. The sub-criteria's of training, past experience, knowledge, new technology, more information of farmers in CEA in Sri Lanka explained by the Knowledge and experience practice. In CEA, the knowledge level of farmers and experiences leads to a higher quality production output.

As discussed in previous studies, it is apparent that sustainable farming over operational performance is very rare to be available in the existing literature. The only available findings show that knowledge and experience act as the primary determinant of operating performance. But there is a theoretical gap in the research area as most studies focus only on the impact of the practices operational performance of manufacturing and industry sectors. Simultaneously, no published research studies emphasized the Sri Lankan Agricultural firms concentrating on sustainable farming over operational performance. Simultaneously, it is very rare to find qualitative research based on the agricultural sector that focuses on sustaining factors. In Sri Lankan literature, it is challenging. So this study will be a turning point of literature to focus on sustaining the farming over operation performance in CEA in Sri Lanka.

## **2. RESEARCH METHODOLOGY**

The study takes the form of Interpretivism research, which beliefs in the critical objective of realities. When considering the location of the problem, it is to locate the problem by reaching the truth. In identifying the nature of the existence of farmers' operational performance, qualitative research methodology was used. The researcher's methodology choice was qualitative methods with more emphasis on the in-depth interviews (Tashakkori and Cresswell, 2007).

The study was classified as an explanatory study in which the sustaining farming over operational performance was examined and understand success factors using by the successful entrepreneurs in CEA. The unit of analysis in this case was an individual farmer who engaged in controlled environmental agriculture. The research can be classified as a cross-sectional study in which data was gathered only once but over a period of time.

The current study used both primary and secondary data. The study aims to identify successful practices used by the highly successful farmers. Therefore the researcher has conducted five (05) in-depth interviews based on the six (6) interview-guidelines with the most successful farmers within the Uva province. Most of the interviews took place on their farm or the business premises and lasted 20-30 minutes. All the interviews took place in the local language (Sinhalese) and were then translated into English by the researcher. The open-ended, semi-structured questions were used in the interviews. The interview guidelines that were used for gathering data by most successful farmers were history. History of the business, factors behind the success of the company (personal/family/government/institutions/associations' involvements), Practices used to achieve the success of the business, plans, and how to retain the success of the farm.

Secondary data for the analyses were gathered from secondary sources, such as published and unpublished research articles, journals, books, newspaper articles, and other documents made available in Agriculture. Simultaneously, secondary data have been collected through the UPEDB, Department of Agriculture, AG Office, Gemidiriya Association, Small industry project at Welimada, and Agricultural service Department in Welimada.

The sample framework of the study is farmers who engage in CEA in Uva province, Sri Lanka. The Five respondents were selected using the purposive sampling technique for data collection. The respondents were selected based on their performance in the field. They are highly successful farmers and have the expert entrepreneurial ability in the field of CEA. The data has been analyzed using an inductive approach. All the interview responses were recorded, transcribe, code, and categorize for the purpose of analysis.

### **3. DATA ANALYSIS**

This section reports the empirical findings on sustaining farming over the operational performance of CEA in Sri Lanka. It presents the analysis concerning research objectives of the study on "To review the sustainable farming practices in the CEA in Sri Lanka." Thus, this section concludes with a discussion related to the analysis's main themes as explained in methodology, the data generated by the semi-structured interviews conducted with 05 highly successful respondents. A single respondent is recognized as appropriate to make the analysis. This study followed the content analysis method as the strategy of data analysis.

The study used thematic analysis (Braun and Clarke, 2006), which analyzes interview transcripts. The process of identifying themes was performed manually using codes. Codes directed to recognize emerging themes of research question from the interview data. At the initial stage of data analysis, the researcher closely examined the connection between the interview data to the relevant research objective (Strauss and Corbin, 1990). Then researcher started to code the transcribed interview data. After reading the interview transcripts a couple of times, coding was performed by highlighting important statements in each paragraph. After familiarizing themselves with diverse codes, Strauss and Corbin (1998) explained that paragraphs of interview transcripts were come up with different themes.

#### ***Sustaining farming practices***

When analyzing sustainable farming in controlled environmental agriculture in Sri Lanka, it plays a prominent in understanding the history of the business and the successful practices behind its success. Accordingly, the researcher assigned a name to all individual respondents separately. The five most successful farmers or entrepreneurs were Respondent 1, Respondent 2, Respondent 3,

Respondent 4, and Respondent 5. The detailing of each category ended with essential findings of this study as discussed below sections.

### **Theme 1: Experience**

The category of "Experience," which is defined as a unique character and attitude of the respondents, emerged as one of the themes in analyzing interview data. It has been identified in each area discussed in the interview. Almost all respondents were the view that they are experienced more than ten years of a time period. One respondent said that:

*"I have started greenhouse cultivation in the year of 2000. Yet, I have more than 15 years' experience in this field which helped me to achieve my all targets." (Respondent 5)*

Another respondent emphasized that the experience is one of the success factors of their business. It is as follows.

*"We have not been given any support from any of the organization or at least government, we, with our self-commitment and the experience we come to the present situation." (Respondent 3)*

The experience has emerged as one of the main themes in this study. The experience of the respondents can improve the abilities of a person. Thereby, it will lead to a person more specialized in working and ultimately leads to higher performance. This experience is one of the main aspects that has been discussed in the quantitative part. As per the first qualitative findings, it can be enhanced that a respondent's experience can lead to higher operational performance.

### **Theme 2: Family Support**

The "Family Support" was emerged as the second category of data analysis. Family support describes the help of the family members in the operational activities of the business. The respondents have been identified family support as one of the main success factors of their business. They also confirmed that their average yield had been increased due to the support given by their family members. Almost all the respondents have mentioned that they won't be able to come to the current position if they were not gaining support from their family.

*"The first party who is behind my success is my family. They come the number one in my way of success to present situation." (Respondent 5)*

*"Any of the institute or government organization was not given any guidance to achieve our targets. We our-selves improve our average yield of the organization. We, as family members, have given our fullest effort to come to today's position." (Respondent 2)*

### **Theme 3: Knowledge and Knowledge Sharing**

The knowledge and Knowledge sharing is one of another theme emerged in data analysis. When sharing knowledge through discussions, understanding, and unconditional support among the individuals led one way of success in their business activities. The study further indicated that sharing experience and knowledge helps in developing common sense and work practices. All the respondents suggest that knowledge plays a key role of their in their business success.

*"The common issue in our area is lack of knowledge within farmers. Whenever possible, I try to develop my knowledge regarding the business activities, and at the same time, I am seeking to exchange my knowledge with other farmers. It positively affects my business". (Respondent 3)*

Many respondents express that the most common issue to the low development of the CEA is the Lack of Knowledge and training regarding operational activities. They also highlighted the need for sufficient training to achieve the target level of success.

*"I attended a special training program in Bidunuwewe Agricultural training Centre in 2001, and it enhanced my knowledge on CEA." (Respondent 4)*

They enhanced that when they were able to share the knowledge of the business activities. The risk of failure will be at the lowest level. When they share knowledge, they can improve their

knowledge regarding the business activities. They also illustrated that knowledge plays a key role in their success and improvement of operational performance dimensions.

#### **Theme 4: Green Practices**

The Green practice is another specific emerged theme in data analysis. The green practices or environmental consideration in their manufacturing process plays a crucial role in their success factors. The research further indicated that sustainable practices help to improve the efficiency and effectiveness of the organization. As per the respondents' views, their average yield has been increased when they are using environmental management techniques with ecological consideration. The respondents view on this criterion was,

*"In the process of production, we are using the environmentally friendly mechanisms but, we don't have any specific policy. Usually, we care about the environment or surroundings. We have some greenhouses that we are using organic materials for the whole production process." (Respondent 4)*

*"Nowadays, Sri Lankan all farmers depend on the NPK fertilizers, instead of that method we are using a magical, really it is a magic "EM"-Effective Micro-organisms for the cultivation process. And all for growing media we use quality raw materials and converts into media pack using experience gained from this field." (Respondent 5)*

*"We are using not using too many pesticides in our cultivation. I also have obtained a GAPP certificate in my production as I use only organic materials in my cultivation. Actually, for greenhouse cultivation, we no need to use more pesticides as the traditional agriculture." (Respondent 3)*

The sustainable techniques used in the production processes had led them to success by improving efficiency and effectiveness. The new environmentally friendly production techniques that are using by the respondents have improved their production capability. Finally, they have improved the operational performance dimensions by reducing production costs, improving the quality of the products, etc. The following view can illustrate it.

*"We have rainwater harvesting ponds, installed drip irrigation systems with solar power, new technological agri-equipments in our production process that leads to reduce the labor cost. At the same time, we don't have any waste materials because we can use all the inputs several times. We have that ability by ourselves. Those practices, directly and indirectly, improve our average yield." (Respondent 5)*

*"The production in the greenhouse with controlled climatic conditions and best irrigation methods with integrated misting system, solar system in environmental friendly leads to achieving best targets of the yield." (Respondent 1)*

#### **Main Findings**

Several conclusions could be derived based on the analysis of the interview data and relevant existing literature. The study suggested the following findings are more appropriate for the Sri Lankan context. The first finding is that the CEA's operational performance in Sri Lanka will be determined with the sustaining factors of Individuals' Experience, Family Support, Knowledge and Knowledge Sharing, and Green Practices, which have been emerged through the interview data. The most successful sustainable farming practice among the above-identified practices of controlled environmental agriculture in Sri Lanka is the "Knowledge and Knowledge Sharing." Each individual has been highlighted knowledge sharing as a key determinant of their unpredictable success. They further emphasized that the knowledge and experience will determine the level of their business's operational performance than other practices. As the third finding, it can be revealed that successful individuals in the agricultural sector in Sri Lanka are more concentrated on green practices with new technological innovations. The majority are using environmentally friendly management techniques with new technological innovations as their business's primary success tool.

## CONCLUSION

This study has been conducted to review how farmers in agriculture become successful over the controlled environmental agricultural sector's operational performance in Sri Lanka. There are only limited available studies on the agriculture sector, although this sector is dominated in Sri Lankan economy. It is also sporadic to find qualitative research based on the sustained farming over operational performance in Sri Lankan context. Most of the studies have been analyzed quantitative relationships rather than a qualitative aspect. Theoretically, this study covers all those limitations and contributes to existing knowledge in different ways. The study identifies sustaining farming practices over the agricultural sector's operational performance in Sri Lanka concerning CEA. The identified emerging themes of maintaining farming over operational performance were experience, family support, knowledge and knowledge sharing, and green practices. Government policymakers could use the study's findings to make new policies for the sustainability of the environment, society, and industry. The most benefited party of study is farmers. The identification of sustainable farming practices assists farmers in achieving a higher standard of farming. This becomes more critical to scholars also as a lesser amount of writers have focused attention towards the agricultural sector as a process of input and output.

This study carries several limitations as well. The selected area is greenhouse cultivation in the Uva province, which is only a part or section of agriculture. Similarly, only a few respondents have been interviewed for the data. By removing the study's limitations, the study provides an opportunity to research further in the same field. Further research could be done to study the influence of successful practices on other dimensions of performance. Similarly, the study can use a higher number of respondents for data. Simultaneously, the research can be distributed to the service and industry sectors to represent the whole economy.

## REFERENCES

1. Abu Nimeh, H., Abdallah, A.B. and Sweis, R. (2018). Lean supply chain management practices and performance: empirical evidence from manufacturing companies. *International Journal of Supply chain Management*, 7, 1-15.
2. Abualoush, S., Masa'deh, R. E., Bataineh, K., & Alrowwad, A. (2018). The role of knowledge management process and intellectual capital as intermediary variables between knowledge management infrastructure and organization performance. *Interdisciplinary Journal of Information, Knowledge, and Management*, 13, 279-309.
3. Amit, R & Pratik, M. (2012). An empirical study of green supply chain management drivers, practices and performances: with reference to the Pharmaceutical Industry of Ankleshwar (Gujarat). *International Journal of Engineering and Management sciences*, 3, 339-355.
4. Ayoub, H. F., & Abdallah, A. B. (2019). The effect of supply chain agility on export performance: The mediating roles of supply chain responsiveness and innovativeness. *Journal of Manufacturing Technology Management*, 30(5), 821-839.
5. Bai, C., & Sarkis, J. (2010). Integrating sustainability into supplier selection with grey system and rough set methodologies. *International Journal of Production Economics*, 124(1), 252-264.
6. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
7. Creswell, J. W., & Tashakkori, A. (2007). Differing Perspectives on Mixed Methods Research. *Journal of Mixed Methods Research*, 1(4), 303-308.
8. Eltayeb, T., Zailani, S. & Ramayah, T. (2011). Green supply chain initiatives among certifies companies in Malaysia and environmental sustainability: investigating the outcomes' resources. *Conservation and Recycling*, 55, 495-506.
9. Flynn, B. B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of operations management*, 28(1), 58-71.
10. Hsu, C.W., Hu, A.H. (2008). Green Supply Chain Management in the Electronic Industry. *International Journal of Environmental Science and Technology*, 5, 205-216.
11. Jabbour, ABLS, Jabbour, CJC, Govindan, K, Kannan, D, Salgado, MU & Zanon, CJ . (2013). Factors affecting the adaption of green supply chain management practices in Brazil empirical evidence. *International Journal of Environmental Studies*, 70(2), 302-215. <https://doi.org/10.1080/00207233.2013.774774>.
12. Laosirihongthonga T, Punnakitikashemb P., & Adebajo D. (2013). Improving supply chain operations by adopting RFID technology: evaluation and comparison of enabling factors, Production Planning & Control: The Management of Operations. 24, 90-109. <https://doi.org/10.1108/IMDS-04-2013-0164>

13. Raut, R.D., Narwane, V.S., Gardas, B.B., Kavre, M.S. and Narkhede, B.E. (2019), Factors affecting the adoption of cloud of things: The case study of Indian small and medium enterprises, *Journal of Systems and Information Technology*, 21(4), 397-418. <https://doi.org/10.1108/JSIT-10-2018-0137>
14. Sarkis, J. (2012). A boundaries and flows perspective of green supply chain management. *Supply Chain Management: An International Journal*, 17, 202-216. <https://doi.org/10.1108/13598541211212924>
15. Shannak, R. O., & Obeidat, B. Y. (2012). Culture and the implementation process of strategic decisions in Jordan. *Simulation*, 4(4), 257-281.
16. Strauss, A. & Corbin, J. (1998). *Grounded Theory in Practice*, Sage, London.
17. Sweis, R., Fallaq, M., Buqjati, J., & Abu-Hammad, A. (2011). Knowledge management processes and effect on achieving competitive advantages: A case study of Jordan telecom group "Orange". *Jordan Journal of Business Administration*, 7(4), 511-526.
18. Wallace, A. & Omachar, A.E. I. (2016). Effects of green procurement practices on operational efficiency at Kenya Airways Limited, Kenya. *Imperial Journal of Interdisciplinary Research*, 2, 69-88.
19. Wijerathna, M., Weerakkody, W. A. P., & Kirindigoda, S. (2014). Factors affecting the discontinuation of protected agriculture enterprises in Sri Lanka. *Journal of Agricultural Sciences*, 9(2).
20. Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of operations management*, 22(3), 265-289.
21. Zhu, Q., Geng, Y., Fujita, T., & Hashimoto, S. (2010). Green supply chain management in leading manufacturers: Case studies in Japanese large companies. *Management Research Review*, 33(4), 380-392.
22. Zhu, Q., Sarkis, J., & Lai, K. H. (2012). Examining the effects of green supply chain management practices and their mediations on performance improvements. *International journal of production research*, 50(5), 1377-1394.