

Academic Focus and Research Rationale:

Title:

A critical analysis of the sustainable potential of using aquaponics to scale up short crop production in St. Vincent and the Grenadines to strengthen food security

Introduction:

The need for sustainability is growing as the world tries to navigate its way around global warming and a rapidly rising world population that accounts for several other universal challenges inclusive of food insecurity (Pelletier. et al 2011, Anderson, Bayer and Edwards 2020 and United Nation 2022). One pillar of this multifold venture rest in the effective and efficient utilization of the environment for food production through agricultural practices.

Agriculture and the agricultural sector is vital to sustaining life by providing food and is thus a mega economic contributor in many nations (Maryville University 2022, Saud 2022 and Crevantes-Godoy and Dewbre 2010). Residing in a developing country, where the negative effects of climate change are more severe and the agricultural sector is major stimulus for economic activities, it is paramount that such sustainable practices are embedded within policies. That encourages innovative ideas and practices, that aligns with the relevant 2030 sustainable goals. It is for this reason the research will be focused on investigating the role, aquaponics can play in the upscaling of short crop production in St. Vincent and the Grenadines. Through collaborative enterprising and innovative initiatives that will generate positive economic, social and environmental impacts.

Aquaponics is an agriculture method that integrates aquaculture and hydroponics in a sustainable recirculating system, where the waste product of one organism in the system is utilize by another organism (Academic Press 2019 and Okomoda 2023). This farming method dates back to the Aztec Indian but have recently gained traction by mega corporations, in light of rising concerns to increase food production and security in the face of climate changes and the growing world population.

This simple method, is not without its challenges, however, it has potential that could lead to reducing some negative impacts of unsustainable methods of farming while contributing significantly to creating a more sustainable future (Modarelli et al 2023, Goddek 2015 and Walraven 2014). Especially in developing countries that has an abundance of natural resource that increases the efficiency and effectiveness of the sustainable nature of the system.

The versatility of an aquaponics system is heavily dependent on the availability and source of water a renewable resource, that is readily available in St. Vincent and the Grenadines, found in its rivers and large sea space and it predisposition to rainfall throughout the year. Another, natural resource that is available is solar power that can be utilized as a cheaper and more sustainable power source for the system, thereby reducing the limitation of this method of food production to improve the sustainable nature of the system and its application.

The factors and scope of this research will explicitly lead to exploration of a wide range of literature as the subject area examines several sustainable concepts and principles, namely;

that of the sustainability challenges, the circular economy and embedding and leading sustainable changes in the agricultural sector.

Concepts and Principles:

As mentioned above, this research paper will utilize a wide range of literature as the subject areas of focus are: Sustainability challenges and the circular economy and embedding sustainable practices and fostering sustainable changes in the agricultural sector in St. Vincent and the Grenadines. However, the central theoretical ideas will be that of Circular economy and Leading sustainable changes.

The essence of the circular economy is rooted in the notion of reduce, reuse and recycle to minimize the wastage, and conserve the integrity of natural resources (Ikwandowski 2016, Kalmykova 2018 and Ellen Macarthur Foundation 2024) This is one sustainable method that can be employed creatively to create changes that promote sustainability, leading to sustainable changes, which is the other key principle that will be analysed in this paper. De Smet 2023, outline the importance of leaders' roles and responsibilities to employ strategic thinking and creativity to reduce unsustainable practices, thus leading in the quest to sustainability.

Aim:

- Is to encourage leading sustainable changes by the utilization of a more sustainable method of farming that will increase food production, reduce food insecurity, promote the use of renewable energy to embed sustainable practices/ changes to tackle sustainability challenges in the agricultural industry.

Objectives:

- 🚦 To assess the feasibility of implementing aquaponics as a niche market in St. Vincent and the Grenadines to create an enabling environment for investment opportunities that can stimulate partnership amongst creative and passionate youths in the agricultural sector
- 🚦 To highlight and analyze the role/s of stakeholders (policy makers, educational institutions etc.) in the successful implementation of commercial aquaponics farms
- 🚦 To evaluate the potential economic, social, and environmental impacts of aquaponics

Research Paradigm and Methodology:

The scope of the research will utilize a combination of the Positivism and Interpretivism paradigm (Ryan 2018 and Alharahsheh 2020), as the researcher aim is to present an objective discourse on the subject matter, by critically analyzing reliable and credible data. However, the realities of different locales are different which may lead to relativities in the findings.

Therefore, the mixed method; which uses both qualitative and quantitative methods will be used in this research paper to collect data during the research. This will allow for a balanced overview of the paper, as the limitation of one method will be reduced or eliminate the weaknesses of the other and vice versa (Tashakkori & Teddlie 1998 and Polit & Beck 2004). The advantages disadvantages of each method, makes them suited for different research purposes.

Moreover, qualitative research is effective at giving an in-depth analysis while quantitative research is central to offering a more objective analysis (Lund 2012). These two parameters are essential in this research to determine the potential viability of introducing aquaponics operations for agricultural sustainability; which is the aim of this research.

Qualitative research will help in help the researcher to identify trends and learn from the experiences and experimentation of key stakeholders, this exposes the realities of person in the agricultural hierarchy and will account for clear understand of how the operation of an aquaponics system will be affect person at every level. However, it is important to note that this has a limitation of introducing biasness and subjectivity, due to the interpretative nature of this method (Johnson, Adkins & Chauvin 2020). Yet, it is inevitable to ignore those the understanding of those that are within the agricultural system or are affected and will impacted by it. Additionally, the open-ended nature of qualitative research also for the expounding on specific line of questioning, it allows for a reduction in sample size, while facilitating immense understanding of values and beliefs, it is more accommodative to creativity and cost effective. Whoever, these advantages are paired with limitation of the method that includes; difficulty in data presentation, researcher's influence during the data collection period and subjectivity (Gaille 2017, Australian Aid 2019 and Aspers & Corte 2019). Similarly, it is time consuming and requires good communication skills (Choy 2014) to hone the relevant data and guide and understand participants' perspectives.

In contrast quantitative research revolves around numerical data collection. As with qualitative research, there are strengths, weaknesses and biases that arises in the application of this approach.

The major strengths of this method resides in the ability for large sample sizes, replication of studies due to the standardization of the approach and the ease of comparing and verifying data and ascertaining response on a scales basis (Bhandari 2024 and Choy 2014). This simultaneously reduces subjectivity and increases rationality.

Moreover, the standardization and objectivity of this approaches, removes the human element from data collected, while introducing hollowness that can result in a tunnel vision. In addition, there is structural biases, misconception of interpretation on both ends and the risk of missing data, due to the lack of following up and perceives expectations on the end of the participants (Choy 2014).

Subsequently, the outcome of this research paper will be impacted by a number of limitations due to the nature of the methodology and the study design. In addition to a number of limitation that will be listed shortly, a major one is the lack of research in this specific area and the agricultural sector in St. Vincent and the Grenadines. This will result in lack of relevant statistics. Sample bias and time constraint will also impact the research (Wordvice HJ 2023) (Hofstee 1978 and USC 2024).

Data Collection:

The qualitative methods that will be used are; market surveys, interviews, focus group and observation. These methods will be used to acquire in-depth understanding from small samples of some potential stakeholders; inclusive of authoritative figures in the agriculture ministry, business owners, farmers and relevant educators would allow for critical analysis in the given area. Thus giving clearer understanding of the parameter that will impact the potential and effectiveness of the aquaponics system, as it is within this domain and by these persons the system will be operated. Sample size for the qualitative methods will range from 1-20 persons, on the account that the person that will participate are experts and has a wealth of knowledge to share. (Boddy 2016), states that the sample size utilized in qualitative research is contextual, and based on the research paradigm, while in (Bacchetti 2005) it was stated that the key is that ethical measures be taken, that the benefits outweighs the burden to participants. Nonetheless it must be noted that there is no rigidity in the stipulations to determine appropriate sample size when using qualitative research methods (Sarfo et al. 2021).

Additionally, data will be collected through the use of questionnaires, which is a quantitative research method. These will be administered to the younger, more innovative, imaginative and creative section of the populace, to gain better understanding of futuristic ideas, as their generations will be affected in the future.

Consequently, the data to be collected and analysed will be primary and secondary information. This mixed method of data collection will lead to mixed methods of data analysis. Data collected via the qualitative methods will be subjected to content analysis that would inform the findings of the researcher. However, in presenting this information the use of statistical charts will be used to validate the reliability and credibility of the research paper. The latter helps to visualize and simplify the more in-depth discoveries and predictions (Leung 2015).

Important to note is that collection of primary and secondary data bring a level of limitation to the credibility and reliability to this research. The challenges associated with the use of primary and secondary data are; time consuming and cost effective and lack of control over content respectively. Likewise, the subjectivity that is introduced through the qualitative aspect of this research can limit the reliability of the research as it makes it difficult to replicate, nonetheless the scope of the paper is to determine the potential of a venture, which will always be time dependent, as the environment, economy and mindset of generations are altered with time.

Data Presentation:

The main form of data presentation would be that of text, with tables and visual aids to reinforce significant points and findings and to achieve clarity and understanding.

Time Frame for research

Month	Workload	Literature focus
February Mid- End	Introductory Research Construction of questionnaire and interview questions Observing local aquaponics operation	Inception of aquaponics Benefits/ limitation Types of models
March First two weeks	Research on objective one -collecting and analyzing data collected from potential stakeholders	Leadership theory/ business models Circular economy (concentrating focus on economic and environmental benefits
March Second two weeks	Focus on objective two Comparing finding from research with credible literature, to develop concrete arguments to justified need for alternative sustainable farming methods	Embedding sustainable practices And leading sustainable changes Biomimicry and utilization of renewable resources
April	Putting together individual pieces of research, Reviewing data from stakeholders to find trends Focusing on the role of policy initiatives for innovative projects	Necessary area based on data collected, to verify subject area -roles of leaders and management in sustainable development
May	Editing each chapter of research and compilation Submit research	Reviewing citation and compiling reference list

NB: Due to the passage of Hurricane Beryl in 2024, an extension was granted for completion of my MBA program. The new deadline, March 31st 2025. The research took advantage of this extension of the disaster had delayed progress. The time was mainly utilized to explore more literature and be more strategic in completing each chapter.

After submission of the first two chapters and the draft proposal 2024, Chapter three followed in January 2025. Chapter 4 and 5 will be completed in February, while March will be used to arrange the chapter into one, along with other relevant parts.

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