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

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Acknowledgement and Dedication

I extend my deepest gratitude to everyone who has contributed to the successful completion of this research.

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Dedication:
This research is dedicated to the memory of my dearest friend and mentor Oscar “Brother A” Allen and to my daughter Malyka Dublin, to whom I will pass the torch.

Abstract

This research explores the feasibility and potential benefits of implementing commercial aquaponics systems in St. Vincent and the Grenadines (SVG) to enhance short crop productivity and promote sustainable agriculture. As a resource-efficient integration of aquaculture and hydroponics, aquaponics offers a promising alternative for improving food security and resilience in regions with limited arable land and freshwater resources. The study employs a mixed-methods approach, combining qualitative interviews with local farmers, students, potential stakeholders and agricultural officials, alongside quantitative analysis of crop yield data and economic assessments. Key areas of focus include function of different stakeholders, policy and regulation, potential niche opportunities and cost-benefit analysis to determine the viability of aquaponics within the local context.

The findings reveal that aquaponics presents numerous benefits, such as reduced water usage, accelerated crop growth, and minimized environmental impact. However, significant challenges include high initial setup costs, limited technical expertise, and sociocultural acceptance. Stakeholder engagement highlights the importance of education, training, and policy support to facilitate adoption. Recommendations are provided to address these challenges, emphasizing collaborative efforts between government agencies, private investors, and community groups.

This study concludes that aquaponics holds substantial potential for enhancing agricultural productivity and sustainability in SVG, contributing to food security, economic growth, and environmental conservation. Future research should focus on long-term monitoring, expanding stakeholder collaboration, and developing scalable models for broader implementation.

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Background

St. Vincent and the Grenadines (SVG), an archipelagic Small Island Developing State (SIDs), located within the hurricane belt in the Caribbean; faces the challenge of sustaining its agricultural sectors while addressing the dire concerns of climate change and that of increasing food insecurity. The negative impacts of these problems and the potential threats of delayed redress from developed states the major sources of atmospheric pollution; continue to add pressure on the agricultural and tourism sectors, the main economic drivers of SVG.

Agriculture and tourism the backbone of SVG's economy (Niddrie et al, 2025) battles constant setbacks due to the impacts of climate change, such as unpredictable weather patterns, extreme weather events, and rising sea levels (Chen et al 2008). Traditional farming practices, which are heavily reliant on the region's natural resources, are becoming less viable, prompting a need for innovative and sustainable agricultural solutions.

One alternative solution, which has gained significant global attention in for its many sided potential benefits is aquaponics. A closed-loop system that increases the efficient use of resources and minimizing wastage; thereby making it a more sustainable method to traditional farming methods.

Chapter One: *Introduction*

Sustainability and sustainable development has become a keyword and phrase respectively, in many sectors and industries inclusive of the agricultural sector and farming industry. The essence of sustainability is to promote and maintain the long-term viability of resources; renewable and more so non-renewable for future generation to benefit from them alike previous ones (Meadowcoft, 2025; Thiele, 2024; United Nation 1987). A growing world population demands more out of the agriculture sector, and it is imperative that the method/s used to supply this demand are sustainable in nature. One such innovation was developed by integrating two farming techniques into one.

Aquaponics is a farming method that couples two other farming techniques, namely hydroponics and aquaculture (Baganz et al, 2022). Although this farming technique has been around for centuries (Shabeer, 2016), it has gained significant importance in recent times as the world tries to counteract the challenges of a changing world, due to climate change and an increasing world population and all the indirect negative impacts that accompanies them. The cyclic nature and interdependency of the organisms within an aquaponics system, where the waste product of one organism is utilized by the other for energy; creates a sustainable environment for all organisms present within the system.

This sustainable advantage makes aquaponics a suitable option for a multi-island, agricultural nation like SVG, a SIDs country in the Caribbean, with its abundance of freshwater, solar energy and human resources. This small island-nation relies heavily on agriculture for food production and employment, with key crops including ground provision like; arrowroot, dasheen and yam and various fruits and vegetables. However, the sustainability and productivity of traditional agricultural practices are increasingly threatened by climate change, land degradation, and economic pressures.

In addition to the sustainable nature of this farming method on the environment, it has the potential to increase food production in both crop and fish production. Thus, creating direct opportunities for economic development. Adding value in all the areas necessary to promote sustainable development; people, place and profits. If there were any doubts that climate change was not as threatening as experts have been highlighting for the last decade. The 2024 hurricane season promises to be the most active season in years, with the seas warmer than normal. Records shows that the earliest category 5 hurricane, Hurricane Beryl wreak havoc throughout the Caribbean and parts of the US destroying lives, homes, crops and livestock (Poynting, 2024).

The adverse effects of climate change, such as rising temperatures, altered rainfall patterns, and more frequent extreme weather events, pose severe risks to agricultural productivity. In addition, traditional farming methods, which often involve extensive use of water and chemical fertilizers, contribute to environmental degradation and are becoming less viable. These challenges necessitate the adoption of innovative and sustainable agricultural practices that can enhance food security, promote environmental conservation, and support economic growth.

Aquaponics systems are designed to be highly efficient, using significantly less water than traditional agriculture and recycling nutrients to minimize waste (Danish et al, 2021; Colt et al 2022). This makes them particularly suitable for regions facing seasonal water scarcity and environmental degradation, such as St. Vincent and the Grenadines.

Aims and Objectives:

The principal aim of this study is to investigate the role of aquaponics in enhancing the productivity of short crop in SVG. By assessing the benefits, challenges and feasibility of aquaponics. The study seeks to provide analytical insight to encourage the implementation of this innovative farming method to effectively maximize local factors. Hence, nurturing the leading of sustainable changes that has the potential to increase food production, reduce food insecurity, promote the use of renewable energy, economic growth and environmental sustainability 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 and 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

Problem Statement

Although significantly underutilized due to its potential, aquaponics is exploited in a number of Caribbean countries with the expectation of adaptation throughout the region. Despite this, it is yet to be employed in SVG on a commercial scale. Some factors that may have hindered the adoption of this innovative farming technique are; limited awareness, lack of financial resources to overcome high initial cost and lack of expert knowledge.

Additionally, the specific conditions and resources of SVG, such as water availability, comparative cost of energy sources and economic potential in the local context has not been assessed thorough through research with regards to aquaponics; creating an information gap, that accounts for neglect in the employment of this sustainable potential in the country.

Notwithstanding, there is an urgent need in SVG where sustainable agricultural practices is concern. In order to ensure reduction in the importation of food that can be produced within the country and to lessen the negative environmental impacts of farming. Aquaponics offers a viable solution, but its potential to scale up short crop production and contribute to the sustainability goals of the country requires thorough investigation. This dissertation aims to address this gap by exploring the sustainable potential of using aquaponics to scale up short crop production in St. Vincent and the Grenadines.

Significance

The findings of this research have the potential to contribute significantly to the development of sustainable agriculture in St. Vincent and the Grenadines. By providing a comprehensive analysis of the feasibility, benefits, and challenges associated with aquaponics, this study can inform policymakers, practitioners, and stakeholders about the practical steps needed to implement this innovative farming method. Furthermore, the insights gained from this research can serve as a model for other developing countries facing similar challenges, thereby promoting the global adoption of sustainable agriculture practices.

In addition to its practical implications, this research also aims to contribute to the academic literature on sustainable agriculture and aquaponics. While there is a growing body of research on aquaponics, much of it focuses on developed countries with different environmental and economic contexts. This study seeks to address this gap by providing a detailed analysis of aquaponics in a developing country setting, thereby expanding the knowledge base and providing a foundation for future research in this area.

Context of St. Vincent and the Grenadines

St. Vincent and the Grenadines is an archipelago within an archipelago of 32 islands in the Caribbean Sea, with a total land area of approximately 389 square kilometres. The country's economy is heavily reliant on agriculture and tourism, with ground provision being the primary agricultural export. However, the industry has faced significant challenges in recent years, including praedial-larceny, stagnation in the adoption of new farming methods, competition from larger producers, and vulnerability to hurricanes and other extreme weather events.

In response to these challenges, there has been a growing interest in diversifying the agricultural sector and exploring alternative crops and farming methods. Short crops, such as lettuce, tomatoes, and herbs, offer a promising opportunity for diversification due to their relatively short growing cycles and high market demand. However, traditional farming methods are often resource-intensive and environmentally unsustainable, making it essential to explore more sustainable alternatives.

SVG is well-suited for aquaponics due to its abundant natural resources, including fresh water from rivers and a favourable climate for year-round crop production. Additionally, the country's commitment to sustainable development and environmental conservation provides a supportive policy framework for the adoption of innovative farming practices. Despite these advantages, the adoption of aquaponics in SVG remains limited, highlighting the need for research and capacity-building to promote this sustainable farming method.

Chapter Two: *Literature Review*

Sustainable leadership and it impacts on sustainable agriculture development

In this chapter, emphasis will be placed on defining leadership and its role in sustainability, more notably in the agricultural sector as it relates to aquaponics and its role in creativity and innovation. Likewise, the sustainable impacts of aquaponics will also be analysed through the utilization of relevant, credible and reliable academic resources.

To ensure a clear understanding of this paper it is imperative that key terms are defined. Key terms such as; Agriculture, sustainable development and leadership. The Merriam-Webster dictionary defines agriculture as, "the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products". Sustainable development is the utilization of resources in a way to meet needs that it will not compromise that resource for future generations to meet their needs (United Nation 1987). Leadership on the other hand is not as easily defined, with an abundance of varying definitions by different scholars (Lowell, 2023). But according to Koontz 1984, "Leadership is the process of influencing people so that they will strive willingly towards the achievement of group goals." This definition captures the essence of the research paper, as the transformation that is needed for the implementation of aquaponics farming will require willing leaders that can inspire and guide collaborative efforts among stakeholders, to achieve long-term strategic goals that will lead to holistic sustainable development.

Moreover, the attributes with which leaders focused on sustainability possess; inclusive of clear vision, commitment, strategic planning and creativity, have led to positive impacts and innovative development in agriculture for decades and more recently in the quest to tackle the impacts of unsustainable agricultural practices. Thus, modern sustainable agriculture has had and continues to contribute beneficial to all the sustainability pillars, commonly referred to as the three P's (People, Place and Profit).

Sustainability drive has led to shifting from traditional farming to more agro-ecological practices, which focus on more environmentally friendly farming practices. Agricultural practices with integrated effort to maintain food production, to building and preclude harm to biodiversity (Delonge et at 2016). Globally, research trajectory on the feasibility and development benefits of sustainable agriculture is being backed up through evidence backed by practical application, thus, continuing to propel creativity and innovation.

Thriving enterprises such as; The Plant in Chicago and the GrowHaus in Colorado have successful used sustainable agriculture to transform their local. By improving social life and the environment while remaining self-sufficient financially (Vinnitskaya, 2012; Hosking, 2020). The Plant utilized 95,000 out of a 100,000 square feet for the farming operation, while GrowHaus Colorado has been able to process 32 tons of waste at the facility.

Furthermore, in collaboration with FAO the government of Antigua and the Maritime Ministry and Adams Aquafarm and several other individuals in Barbados have successful implemented pilot projects in aquaponics farming, on small and medium scale relative to the countries

populations and land space, that also functions as training centres. The Adam Aquafarm uses 1500squarefeet of space, that yield on average 1000 heads of crops and 800 pound of fish, the project has resulted in a 90% reduction in water usage when compared to traditional farming (Barbados Today, 2020; Ibrahim, 2023). Though access to land space was unavailable for the farm in Antigua, they have released substantial yield figures; amounting to 24,000lbs of tilapia and 3,500 heads of lettuce monthly (FAO 2022). Aside from aquaponics sustainable leadership and development in agriculture have also resulted in the diversification of tourism in Latin American countries such as Mexico, Ecuador and Costa Rica and the Caribbean. With the aforementioned countries, offering agro-tourism as a services, with prime focus to create sustainable development in communities and environmental preservation (Little and Blau, 2020; Ariza-Velasco, 2022; Herrera Catalino & Lizardo, 2004).

In addition, it is relevant to note that, the projects in the Caribbean and those mentioned above, are significantly supported by the communities. In the Caribbean they operated both as businesses and training centres, building and nurturing the economic and human resources simultaneously. Partnering with the government has also allowed several of these farms to create employment, and stabilize food security in the community and the nation by extent (GEF 2010).

In contrast there are also failed enterprises that once resulted in sustainable development in the agriculture industry. One such example is the Sweet Water Organics enterprise in Milwaukee, forced to cease operation due to financial and management problems (Daykin, 2013). Considering this reality, it is vital that leadership play a pivotal role in this venture as strong resilient leaders are more adept will accomplishing goals (Muteswa, 2016).

Consequently, this type of leadership, that integrated vision, creativity, resource management, training and coaching, stakeholder engagement and commitment can drive initiatives like aquaponics to address short-crop productivity in St. Vincent and the Grenadines. Leaders who promote such systems would support local farmers with training, technology, and market access, creating a resilient and self-sufficient agricultural sector. One that bolsters economic resilience, social equity, environment protection and increase production.

Sustainable Nature of Aquaponics

The sustainable nature of the aquaponics system is underscored in the diversity of advantages that can be derived through its employment. Firstly, the environmental benefits include: Resource efficiency and reduced environmental impacts. The concept of nutrient recycling as was mentioned above, eliminates the need for chemical fertilizers and runoff into the environment, promoting and preserving the health of ecosystem and biodiversity. In addition, the cyclic nature allows for continuous recirculation of most of the water within the system, hence, reducing the water usage. Tyson (2011), when compared to traditional soil-based farming it promotes water conservation. Likewise, the impossibility of soil erosion and degradation helps to maintain the value of arable land making aquaponics a better alternative in regions were water and land scarcity is generally a problem. Although, St. Vincent and the Grenadines has a number of rivers and an estimated renewable water index of 100 million cubic meters (Index Mundi, 2021), thus a significant amount of water- the intensity of global warming and its impacts has results in severe periods of drought in recent time (Harry, 2024; CariCOF, 2023). Therefore, this advantage is helpful to mitigate against such occurrences.

Similarly, the economic benefits associated with aquaponics are; higher productivity and viability. Local food production can be increased and income stream diversified- as both fish and crops generates revenue. The system allows for the utilization of small spaces, creating opportunities for substantive and vertical farming, which in turn promote the reduction of the nation's carbon footprint, enhance economic resilience while promoting food security.

Parallel to theses sustainable benefits, is the alignment of the aquaponics principle with that biomimicry and circular economy. Two sustainable concepts that is embedded in emulation of natural systems to solve human problems and effective and efficient use of resources and respectively (Geisendorf and Pietrulla, 2018; MacArthur, 2013). Aquaponics, mimics that natural synergy of aquaculture, maximizing the symbiotic nature of the fish and plants as would be the case in the natural ecosystem. Furthermore, resulting in the creation of the closed-looped system that is efficient, resilience and sustainable- by reducing dependency on external input, minimized wastage and environmental impacts and providing a sustainable environment for regenerative agricultural practices. By patronizing nature; some areas of a circular economy are realized: optimization of the available resources; risk reduction; and renewable flow of resources and products (MacArthur, 2013).

In short aquaponics denotes a transformative, sustainable agriculture prospect; with its many benefits that are interconnected to other sustainable principles as outlined above. This innovative method, that gears at maximizing resource efficiency and productivity whilst reducing environmental impacts is viable alternative to inhibit challenges associated with traditional agriculture. Aquaponics represent a sustainable model, one designed to mimic the natural occurrences of earth's aquatic system; to provide sustainable development in the agricultural industry.

Economic, Social, and Environmental Impacts of Aquaponics and the Feasibility of its Implementation in SVG

The viable features of an aquaponics systems allow its impacts to be multi-dimensional, spanning all three pillars necessary for sustainable development. These three areas are; the economy, society and the environment. Nevertheless, the collective advantages of the impacts determine the feasibility of the system and thus will affect it adoption and implementation.

Moreover, the main economic contribution that is created by aquaponics operations is that or creating opportunities for employments, both skilled and unskilled labour (Egyir et al 2023; Milliken & Stander, 2019). Directlyand indirectly linked to employment opportunities is that of income generation and reduction of food import expenses. To date a number of research has confirmed that aquaponics (Rakocy, 2000; Goodman, 2011), is a viable agricultural method, while there are others that indicate that it may not be profitable (Schram et al 2001; Bailey et al, 1997), with only sales from fish and crops, or policy mandates and consumer to improve profitable margin. Love et al. (2015) suggested that aquaponics has the potential for high return on invested once managed efficiently.

Successively, there are several social impacts that aquaponics has the potential to create. The most notable one is that of enhancing food security, and thereby improved nutrition through the production of healthy, organic food production (Sundari, 2021; Flores-Aguilar, 2024). Junning & PingSun (2022), highlights the significant potential to increase fish consumption which will improve nutrition and reduce malnourishment rate in the Caribbean and Africa, which is a grave social challenge. Additionally, Laidlaw and Magee (2016) reported that aquaponics promotes community development and cohesion with local communities through as the part take in the sustainable agriculture practice. This leads to improve quality of life, and resilience as aquaponics systems are less affected by climate change. Similarly, the are a variety of social benefits that aquaponics can add to in the unban space. They include integration in the, ""blue and green" infrastructure in cities", used as an educational tool and as therapeutic tool/environment (Konig, 2016). Furthermore, the environmental imprints of aquaponics include due to the closed-loop nature of the system are; waste reduction, reduction or elimination of chemical usage and reduce waste usage (Danish et al, 2021; Colt et al 2022). The net result of these benefits is a substantial decrease in the environmental footprint of food production and energy efficiency (Goddek et al, 2015). The nature of operating an aquaponics system also eliminate further land degradation. Despite, it must be noted that it is difficult to truly quantify the social and environmental impacts (Rizal et al, 2018; Konig et al, 2016).

Despite, the many-sided benefits and the potential for further improvement of aquaponics, the feasibility for profitable operation is significantly affected by the availability of a number of factors. These factors include; Environmental conditions, social acceptance, economic viability.

Within the context of SVG, there are favourable environmental conditions that supports the set-up of aquaponics farming. According to Love et al (2015), the climate in SVG allows for yearlong crop production, which is an essential element and the most profitable fraction of the system (Bailey et al, 1997). In addition, the nation's rivers provide an abundant source of freshwater, although the quality of the water is projected to decrease due to population increase

and demand, the Central Water and Sewage Authority does daily quality check in regulation with local laws (Khalid, 2017).

Moreover, the successful implementation of aquaponics in SVG also requires social acceptance and engagement from local communities. Studies by Mchunu, Lagerwall, and Senzanje (2018) indicate that awareness and education about the benefits of aquaponics are crucial for its adoption. In SVG, limited awareness and understanding of aquaponics among farmers and the general public have hindered its widespread implementation. Initiatives to educate the younger generation through agricultural programs that are already present in most primary and secondary schools and train local communities about aquaponics could foster greater acceptance and participation in this sustainable farming method. Equivalently, the economic feasibility of aquaponics depends on several factors, including initial setup costs, operating expenses, and market demand for the crops and fish produced. Quagrainie et al (2018) emphasize that while the initial investment for setting up an aquaponics system can be high, the long-term operational costs are often lower than traditional farming methods due to reduced water and fertilizer usage. In SVG, the high cost of energy and limited financial resources pose significant barriers to the adoption of aquaponics. However, a shift towards renewable energy sources, such as solar power, among businesses could mitigate these costs and enhance the economic viability of aquaponics systems.

Stakeholder engagement to foster an enabling creative and innovative environment

A focal aspect in achieving sustainable development is integration, the acceptance of the intrinsic links between the social, economic and environmental factors that are interconnected and interdepend. Similarly, within each division of the sustainable pillars, effective and efficient operation is accomplished through collaboration. Thus, the role of stakeholders is critical in creating an enabling environment that nurtures creativity and innovation among each other the promotes and maintains sustainable development.

Journeault (2021), divides stakeholder's roles into five categories, namely; Trainer, Coordinators, Specialist, Analyst and Financier, these 5 categories can be further classed as absorbers or providers of resources. It is important to know that each role is vital in the overall operation of sustainable development and stakeholders can function in different capacity simultaneous at times bases on their functions in a given venture. Considering that this is a research paper, the role of policy makers, educational institutions farmers and local communities are the key stakeholders under analysis.

Firstly, policy makers are leaders task with legislative and enforcement authority, therefore the government and ministry official falls within this sect. Their role in this aquaponics venture will be to design supportive framework and policies that will creative a stimulus for financiers to join forces with famers and other shareholders by investing. Such policies would include clear, evidence base regulatory guidelines on farm or production management, income support, incentives for adaptation of agro ecological practices (UNEP,2025; FAO,2025). This is important as policies is key in driving revolutionary changes, that fosters sustainable transformation such as; climate change mitigations, conservation of natural resources and resilience (Hasan, 2024; OECD, 2024). The (2015) GSDR report highlight the need for strong political will and good governance in the planning and implementation of sustainable agriculture, likewise (Bellmann, 2019) emphasized the need to understanding domestic dynamics in crafting policies. So that such policies align with the sustainable goals outline in the UN report on sustainable goals (2015). In addition, policy makers can facilitate knowledge sharing and partnership among other stakeholders (FAO, 2023).

Subsequently, educational institutions roles, more notably tertiary establishments lie in research, training and raising awareness (Kurtsal, 2023; Pisante et al, 2023). Research provides factual information in a manner that will be used to raise awareness to stakeholders. In terms of the aquaponics venture Bailey et al. (2019) outline the importance of integrating aquaponics into the educational curriculum. In St. Vincent and the Grenadines this integration can be accomplished from primary school level upwards, as there is already agriculture programs in many schools (Searchlight, 2022; Ministry of Agriculture, 2022). The is also collaboration with NGO's and school associations. This elementary training will be vital to create cultural shift which leads to great impacts as it can be paralleled with system shifting. Conversely, a major role of the education tertiary institution will be piloting an aquaponics farm, that can highlight the benefits to stakeholders.

Furthermore, as equally important as the aforementioned stakeholders is the private sector, whose major role is investments (Agnew and Nakelse, 2024; Bulman, 2021). Not only should the private sector invest in scaling up operations, alternative technologies and other solutions for producers and partners that are in line with national and international regulations. They should be selective and prioritize projects that are sustainable in nature, to optimize ecosystem

services, restoration and to promote and maintain a sustainable production and marketing chain (FAO, 2024). The private sector should always be mindful of social and environmental impacts, thus focus should be to reduce inequity among male and female farmers and large scale and small scale producers. Similarly, a key aspect should be to promote increase production in local and regional markets, as these are the market accessible to small scale operators in the industry (Sahan &Mikhail, 2012).

However, it is important to recognize that investment should also come from the public, the government nature of investment is to ensure effective and adequate infrastructure (OECD, 2024) be put in place, for ease of operation. Allowing the private sector to zone in on job creation, adoption of sustainable models, improvement and innovation and building partnership with farmers and the local communities where they are investing. Leading to adequate and efficient stakeholder engagement, there can be a reduction of limitations to the implementation of commercial aquaponics farming, As the relevant stakeholders play their part. Limitations such as high initial cost, limited awareness and lack of expertise in can be counteracted through stakeholder engagement and networking, to designs, operate and successfully manage a sustainable aquaponics farm, with the long-term goal of becoming self-sufficient.

In view of the academic resources explored, it is evident that St. Vincent and the Grenadines will need to foster deeper stakeholder collaboration. Infrastructure to most rural farmland is poor, due to the mountainous topography of the nation and its vulnerability to annual natural disasters. And although, the government of SVG has gratified the UN Sustainable Goals, collaborates with regional and International organizations such as FAO, UNEP and CANARI to implement sustainable policies; there remain a gap when it comes to enforcement due to limited resources and training for stakeholders. Similarly, within the Caribbean farming is regarded as a risky business with zero to minute insurance coverage (Shynkarenko, 2023). Added to that, there is limited research currently being done. Despite these immediate challenges, their negative impacts can be reduced through keen collaboration considering the nature of the aquaponics project.

Aquaponics, doesn’t require land farm land but a suitable space which can be located in both rural or urban spaces. The sustainable nature of aquaponics would attract grant funding for sustainable agriculture missions, from regional and international bodies, such as OPEC FUND, IFAD and GAFSP (Marcelino, 2024; OPEC FUND, 2024; WorldBankGroup,2023) as seen with the Barbados and Antigua aquaponics pilot projects. This reduces the burden on local public and private investments, and with the reduce vulnerability to natural disaster insurance maybe less rigid. Likewise, being a part of several research institutes or associations in the Caribbean, such as CANARI, CARICOM and the UWI, ST. Vincent can benefit from research conducted within similar environments. Alike sharing or academic resources among common bodies, training can also be facilitated for farmers and young, inexperienced scholars to operate an aquaponics plant.

In short, the fundamentals required to establish aquaponics farming in St. Vincent is in need of strong leadership to enable the alignment of the varying aspects of assistance available, and to stimulate the collaborative nature of aforementioned stakeholders for successful implementation.

Chapter Three: *Methodology*

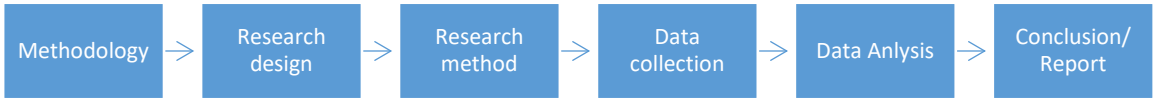
Methodology is "an articulated, theoretically informed approach to the production of data" (Ellen, 1984). It is in the essence of this definition that this chapter outlines the research design, data collection methods, sampling techniques, and analysis procedures. Likewise, ethical considerations and study limitations are also addressed to ensure transparency and objectivity.

By comprehensively detailing each methodological step, this chapter gives an in-depth analysis, of the data processing measures used throughout this project, providing a framework to support clearer understanding of the study's approach to exploring aquaponics as a sustainable agricultural innovation.

Research Paradigms and Methods

A paradigm can be defined as the way of understanding realities through studies. Merton (2012) and Kivunja and Kuyini (2017), describes a paradigm as a framework that influences how knowledge is studied. As was noted above, the methodology directs the format for data collection. Therefore, a paradigm impacts the overall outcome of research projects, as it dictates the methodological aspect of any research. Mackenzie and Knipe (2006), states that a paradigm has three commonalities;

1. A belief of the nature of knowledge



2. Methodology and
3. Criteria for validity.

Consequently, data processing for research is governed by three P's (Paradigm, Purpose and Practice); where the paradigm dictates the methodology, the purpose the research design and the practice the research methods. Below is a visual simplification of the steps used in data processing for academic discourse.

Figure 1: A linear chart showing a summation of data process.

Moreover, (Kivunya & Kiyini 2017; Mackenzie & Snipe 2006; Turin 2024) critically examine the genesis of major research paradigms, along with the strengthens and the limitations, affirming the earlier observation made by Thomas Kuhn, that reformulation of paradigms was necessary in all sciences (Kuukkenen, 2021). In accord with this level of academic research (MBA Thesis), the short time span available for data collection and processing and the number of researcher; the selection of paradigm was narrowed down to the positivist/post-positivist and the constructivist approaches. Notwithstanding, if the factors outlined above were to be eliminated, the researcher would have opted to use the pragmatic paradigm, as the aim of the research will best be determine, by the realities in SVG and by determining what will work. In light of the many models of aquaponics systems available and the complexity of the technical, social and economic interplay in this innovative venture.

Subsequently, each paradigm perceives knowledge in a unique way. The positivist/post-positivist has an objective outlook on obtaining knowledge through the use of test and experiments, to obtain facts making it more numerical or quantitative in nature (Mackenzie, 2006 citing Creswell 2003). While the constructivist approach tries to understand knowledge through human experiences, upon the notion that reality is a social construct (Mackenzie, 2006; Calder, 1977; Morgan and Smircich, 1980) unlike the scientific nature of the former. This makes it more subjective in nature and very participant dependent, leading to qualitative research and findings. It is used to deepen understanding and therefore, relies on using opened ended questions to explore the experiences and wisdom of participants. It is in this context that some would refer to a paradigm as research qualitative or quantitative research.

It must be noted that prior to the 1980s quantitative research was the accepted approach (Guba,1994). Despite there being only two accepted methodologies in academic research post 1980s, the combination of both is today referred to as a mixed-method research and accepted as a third (Sreekumar, 2023). The mixed-method methodology retains the advantages of both quantitative and qualitative research, while reducing the limitations of each. This is due to the oppositional nature of both research methods.

Considering this, and the investigative nature of the aim of this research, to analyse the sustainable potential of using aquaponics to scale up short crop production in St. Vincent and the Grenadines to strengthen food security. A mixed method will be utilized to conduct data gathering for this research. As there is a need obtain facts and a deeper understanding from different stakeholders.

Burns (1997) as cited by (Mackenzie and Knipe,2006), describes research as an “systemic investigation” to make sense of data collected in a methodological way, to acquire new knowledge, or to deepen understanding of different realities. The systemic, cyclic manner of obtaining knowledge, is assessed on three fronts, namely; ontology- which questions reality, epistemology- that focus on the perception of reality and methodology- is the frame work employed to draw conclusion.

The studies ontological position adopts critical realism, acknowledging that while physical systems and economic outcomes represent objective realities, their interpretation and implementation are mediated through social, cultural, and personal contexts. This philosophical foundation allows for a comprehensive understanding of both the technical aspects of aquaponics systems and the social dynamics of their adoption and implementation. Whereas, the epistemological stance embraces a mixed approach, recognizing that knowledge about sustainable aquaponics development emerges from both observable phenomena and social construction of meaning.

As was mentioned earlier, this study employs a mixed-method serial descriptive design, integrating quantitative and qualitative approaches to provide a comprehensive understanding of the research objectives, through the assessment of primary and secondary data. Ensuring that both measurable and contextual factors on the implementation of the sustainable initiative under investigation are analysed thoroughly.

So, within this scope, the quantitative phase includes a market analysis survey, targeting, existing farmers, potential youth entrepreneurs. Its purpose is to determine economic feasibility and resources availability. In contrast there is the qualitative phase that focuses on delving

deeper into stakeholder perspectives, with interviews and with educational institutions representatives, agricultural experts, ministry officials and a comprehensive review of relevant literature on similar projects in aquaponics. To provide insights into social, cultural and practical challenges that may hamper this agricultural venture. A week of observation of a pilot project was also conducted. Providing provide crucial contextual information about the practical constraints and opportunities within the local agricultural sector. The research also incorporates case study analyses of successful aquaponics operations in similar contexts to identify best practices and potential adaptation strategies.

Research Ethics

Research ethics are practices used to ensure that research is carried out in a manner so that the rights and welfare of persons involved and that may be affected are respected and protected. With this in mind this research on the implementation of aquaponics to enhance short-crop productivity in St. Vincent and the Grenadines (SVG) is conducted with strong commitment to ethical standards. Confirming to the notion that all participants should be protected from harm (Fujii, 2012). Therefore, the research will comply with all relevant local, regional and international laws. Likewise, the institution's Research Ethics and Integrity Code of Practice of the University of Wales Saint Trinity David (UWSTD (2022). Also, permission will be sought from appropriate authorities in SVG before the commencement of fieldwork.

Moreover, information will be presented in clear, simple language to all participants about the purpose, methods, potential benefits and risks of the study; as highlight in the UWSTD code of ethics practice. Similarly, each participant is informed of the voluntary and anonymous nature of process, from which they can withdraw at any time without any consequences and by their response consent would be implied. Important to note is that a mandatory ethics form was approved by a board of supervisor, outlining the selection of participants to exclude vulnerable members of the community.

In adhering to research principles thoroughly discussed in the "European Code of Conduct for Research Integrity" (Allea, 2023) the research will respect the cultural practices, traditions, and values of the local communities in SVG. Efforts will be made to engage local stakeholders in a manner that is inclusive and respectful, ensuring their voices are heard and valued.

In addition, given the environmental focus of this research, the research is keen on identifying and understanding potential negative impacts to the environment on the local ecosystem. As the aim of this research is to provide tangible benefits to the local community and nation by extension; through enhance agricultural productivity, economic opportunities and social and environmental sustainability.

Parallel, to these focus is that of confidentiality during data collection, and thus identifiable information will not be disclosed without explicit consent by participants. All data will be securely stored and only accessed by authorized personnel (the University of Wales Saint Trinity). An institution that uses encryption, limited access and data protection laws in compliance with the Data Protection Act 1998 (University of Wales, 2025). Nonetheless,

Anonymized data may be used for academic publications, with acknowledgment of participants' contributions

Transparency is a key factor throughout this study, accordingly, findings will be shared openly with stakeholders, to ensure practical and culturally appropriate solutions.

A proposal of this study was reviewed and approved by a supervisor and upon completion would be reviewed by an accredited ethics review board to ensure compliance with established ethical standards. By adhering to these ethical principles, the study seeks to contribute meaningfully to sustainable agricultural practices while respecting the rights, dignity, and well-being of all involved.

Data Collection

The aim of this research, is to offer a balance perspective on the feasibility of aquaponics in St. Vincent and the Grenadines (SVG). By adopting a mixed-method approach in the data collection process, both quantitative and qualitative data will be collected to give a blend of objectivity on the current agricultural industry, and an in-depth analysis from the wisdom and experiences of trained and schooled persons. Allowing for a comprehensive investigation by addressing both numerical data and nuanced experiences of stakeholders, in keeping with the epistemological stance of critical realism being explored in this research (Mackenzie & Snipe, 2006) that simultaneously analyses objective realities and social constructs.

The qualitative component focused on in-depth insights from key stakeholders, including Ministry of Agriculture officials, local farmers, business owners, and educators. Semi-structured interviews will be the primary tool for this phase, designed to explore stakeholder experiences, perceived challenges, and opportunities related to aquaponics implementation. A purposive sampling technique was employed to select 10 participants, ensuring a focus on individuals with significant knowledge or experience in agriculture. Also, a week observation to a Technical Centre played a critical role, providing first-hand insights into operational dynamics, resource usage, and environmental impact of cottage scale aquaponics operation.

On the other hand, the quantitative aspect employed structured surveys targeting young and creative segments of the population, such as students and aspiring entrepreneurs. These surveys will give data on attitudes toward aquaponics, perceived benefits, and the willingness to adopt sustainable farming practices; that will be analysed using statistical methods to evaluate trends and correlations The questionnaire will feature closed-ended and Likert-scale questions, allowing for statistical analysis of patterns and trends. The inclusion of this demographic is crucial, as they represent the generation most likely to drive innovation in agriculture and are directly impacted by food security challenges (Bhandari, 2020).

Both primary and secondary data sources will be utilized to strengthen the study. Primary data, collected through interviews, observations, and surveys, will provide localized insights tailored to the research objectives. While secondary data, such as academic literature, government policies, and case studies from similar contexts, will provide a comparative lens to assess best practices and inform local adaptation strategies. The triangulation of these data sources will

enhance the validity and reliability of the findings, addressing potential biases inherent in any single method (Leung, 2015).

The strategic combination of qualitative depth and quantitative range design used in this study, will broaden understanding of the social, economic and environmental impacts of the sustainable potential of aquaponics. Increasing awareness in the agricultural industry of the innovative alternative. However, it is important to note that the sample size and natural bias (Hammersley & Gomm, 1997) are potential limitation in this research. Time constraints may impact the breadth of analysis. These considerations highlight the importance of transparency in interpreting findings and acknowledging contextual influences.

As outline above ethical considerations are integral to this research, thus the data collection process was done in alignment with the University of Wales Research Ethics and Integrity Code of Practice (UWSTD, 2022) and other regulations to minimize biases where possible.

Questionnaire Design

A questionnaire is a formalized tool used in surveys to obtained significant amount of information in a standardized way that allows for consistency and cohesion when being analysed (Malhotra, 2006). It has its advantages and disadvantages; however, the latter can be minimized in a number of ways, inclusive of using clear simple words, multiple for a scales and sections that flows (Murray, 1999; Tashakkori & Teddlie, 1998 as cited in (Tashakkori & Teddlie, 2011).

With reference to Dillman's Tailored Design Method (2011), which emphasizes the need for clear instructions, logical flow, and user-friendly language to minimize respondent burden and improve data accuracy; the questionnaire was well-constructed to align effectively with the research objectives of assessing the sustainable potential of aquaponics in St. Vincent and the Grenadines. The introductory section clearly defines aquaponics, situates it within the local agricultural context, and articulates the purpose of the survey. This provides respondents with an understanding of the relevance of their input, fostering engagement and thoughtful participation. Additionally, the use of simple language and clear instructions enhances accessibility for diverse respondents, including students, farmers, and policymakers.

A significant strength of the questionnaire is its diverse question types. The inclusion of multiple-choice, Likert-scale, ranking, and open-ended questions ensures that a broad range of data can be collected. Multiple-choice and Likert-scale questions facilitate quantitative analysis by providing measurable data points, while open-ended questions encourage qualitative insights, allowing respondents to elaborate on their perspectives. This dual approach aligns with the mixed-methods research design, offering both depth and scope in data collection (Tashakkori & Teddlie, 1998 as cited in (Tashakkori & Teddlie, 2011). This mixture of quantitative and qualitative elements, ensuring that the findings will be both statistically valid and contextually rich.

The structure of the questionnaire reflects thoughtful design, as it moves logically from general information about respondents (e.g., age, occupation, familiarity with aquaponics) to more

specific inquiries about perceived benefits, challenges, and recommendations for implementation. This logical progression helps maintain respondent focus and avoids overwhelming them with complex questions upfront. Furthermore, the inclusion of ranking questions allows for the prioritization of factors, such as the effectiveness of aquaponics and the barriers to its adoption, providing valuable insights into respondent preferences and priorities.

The content of the questions is also a strong point, as they are directly aligned with the research focus. Questions explore key themes such as awareness of aquaponics, attitudes toward organic farming, interest in adopting innovative agricultural methods, and perceptions of government and institutional roles. Additionally, in keeping with the participatory research principle (Chambers, 1994) questions address specific challenges and opportunities relevant to St. Vincent and the Grenadines, such as the availability of freshwater, land space, and renewable energy. Enable respondents to prioritize challenges and opportunities relevant to St. Vincent and the Grenadines, ensuring data reflects the region's unique agricultural context. Adding relevance to data collected, leading to more tailored, actionable recommendations.

While the questionnaire demonstrates many strengths, there are minor areas that could have been improved. Upon reflection, the phrasing of some questions, could have been made simpler and carry a follow up question. For instance, two questions; "Are most short crops readily available throughout the year?" and "Do you believe that aquaponics can create a viable niche market?". Additionally, questions like "Would you be interested in farming if it was less labour-intensive?" could include more nuanced response options to capture varying levels of interest. However, these limitations do not detract significantly from the overall quality of the design. And it has the benefit of not producing a long questionnaire, which may impact non-responses and turn respondents off (Murray, 2006; Malhotra 2006).

The questionnaire's comprehensive nature and targeted focus on stakeholders such as farmers, students, and policymakers enhance its utility in gathering diverse perspectives. By addressing local environmental, economic, and social factors, it offers a strong foundation for analysing the feasibility and sustainability of aquaponics. Nonetheless, it is important to note the probability of bias, there exist a language and cultural bias- more notably with interacting with some farmers and the younger target group. Similarly, the use of technology to capture data through subconscious bias, however this method is most suitable to collect data for this short term research.

Survey Distribution

The administration of surveys, is one of several objectives that must be fulfil for data processing in research (Fink, 2003). And there are different was this can be done, including asking direct question or by review written or recorded data (Fink, 2003). This makes distribution of questionnaires a critical factor in the effective collection of data, thus it is imperative that a well-planned strategy is employed to maximize, response rate, diversity of respondents and the overall quality and reliability of data to be collected. One important aspect of this journey is access to suitable participants, which can be challenging. Hence, in this research a considerable amount of time was placed in identifying suitable participants and briefing them beforehand, to determine willingness. Official permission was solicited and granted from the Ministry of Education to select agriculture students from the top boys secondary school at grade 11 level and to carry out a week of observation at a Technical Institution that has a piloted aquaponics program. Other participants were emails directly, highlight my student status and the reason for conducting the research.

Concise explanation of the study's objectives, emphasizing its potential benefits to local agricultural practices, and ensuring confidentiality was used to help to build trust and promote participation and honesty. This aligns with ethical research practices and ensures respondents are fully informed about the purpose and use of their data.

Many individuals responded but never followed through with their previous decision to complete the questionnaire and or inform me of an available time to conduct an interview, even after several follow-up emails. This experience highlighted the reluctance to support research that may be deemed far-fetched, as some person are unable to make a direct connection.

For this research, the survey's distribution prioritized accessibility and inclusivity to capture perspectives from key stakeholders, including farmers, students, educators, and policymakers. Google Form was the medium through which the questionnaire was administered. Important to note is that some data collected was done in persons for persons not able to capable of navigating the electronic form. Respondents were given a week to complete the form, a reminder was given once to several persons that missed the timeframe, nonetheless there was no closing time and the questionnaire still remains open.

In summary, an effective survey distribution strategy for this research combined digital accessibility with selected outreach to some stakeholder. By employing diverse methods and prioritizing inclusivity, the survey will achieve a representative sample, ensuring that the findings accurately reflect the views of key demographic groups.

Chapter Four: *Data Analysis*

Survey Analysis

The survey analysis will be done in subdivisions, following the format of the electronic questionnaire that was distributed. The questionnaire was completed by 31 respondents.

General Information

The general section of the questionnaire had two questions, these questions obtained the profession and age range of the respondents. Of the 31 persons, 64.5% constituted teachers, farmers and students, while the remainder was others. Most respondent were from the age bracket 31-45 with 41.5% while the second highest was 15-20 at 25.6%, of which most were students. While reflecting on this information, it would have been more insightful if the others were asked to state their professions. However, the spread of the age group was insightful, as it captures the input of both young and seniors. Figure one and two below, give the breakdown to the question in the general section.

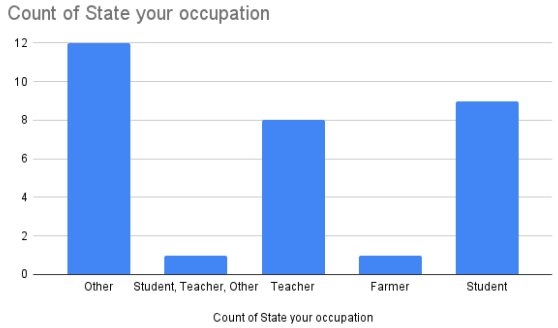


Figure 1: **Shows Occupation of Respondents**

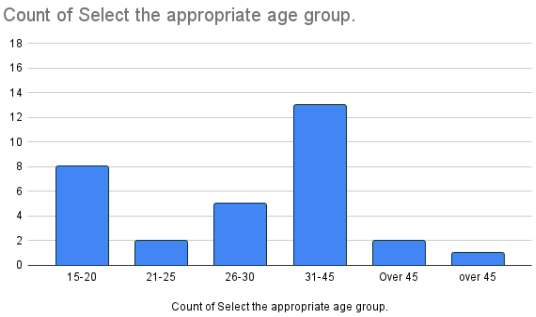


Figure 2: **Shows Age Group of Respondents**

This data aligns with the global trend of an increase in the average age of persons interested in farming, although the is constant expansion in the farming/ agriculture industry (Ngadi 2023; Jayne 2017; Mangal 2009). In addition, the number of students' response were less than 20% of the Agriculture and Integrated Science students that were asked to participate in the survey. Ganpat and Webster (2019), discussed a number of challenges that limits and account for youth decline in agriculture; inclusive of negative perception, manual labour and the minimal involvement in the equation for development and change.

Experience and Knowledge

In this section, 11 questions were asked to determine the level of knowledge and interest possessed by the respondents, in the area of agriculture; more specifically in the production and availability of short crops, the concept of aquaponics and its potential in comparison to traditional farming.

The responses to the question of interest in agriculture indicated that less than 9.7% (n=3) were not interested, of the 90.3% (n=28) remaining 35.5% were indifferent. Indifference tends to mean lack of interest but by design, in this scenario it indicates that borderline interest or lack thereof, thus, with the right motivation agriculture could becoming interested to the 35.5% (n = 11) of respondents. Reiterating the point above, the varying limitation with the agriculture industry, may lead to a wider gap of indifference towards agriculture. Since the skills, knowledge and passion is not being taught/learned in schools, especially to rural youths who rely significantly on it for a livelihood (Godfrey 2005). The second question, indicates that a slight majority of respondents have knowledge of the concept of aquaponics, signifying a correlation of the results and reasoning of question one.

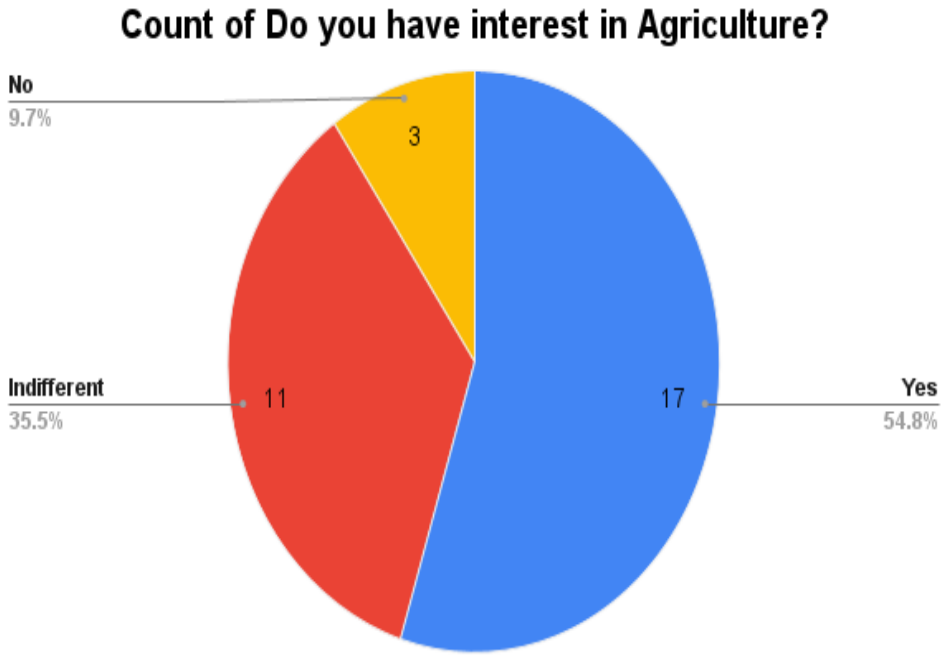


Figure 3: **A Pie Chart Highlighting Respondents Interest in Agriculture.**

The second question, indicates that a slight majority of respondents have knowledge of the concept of aquaponics, signifying a correlation of the results of question one.

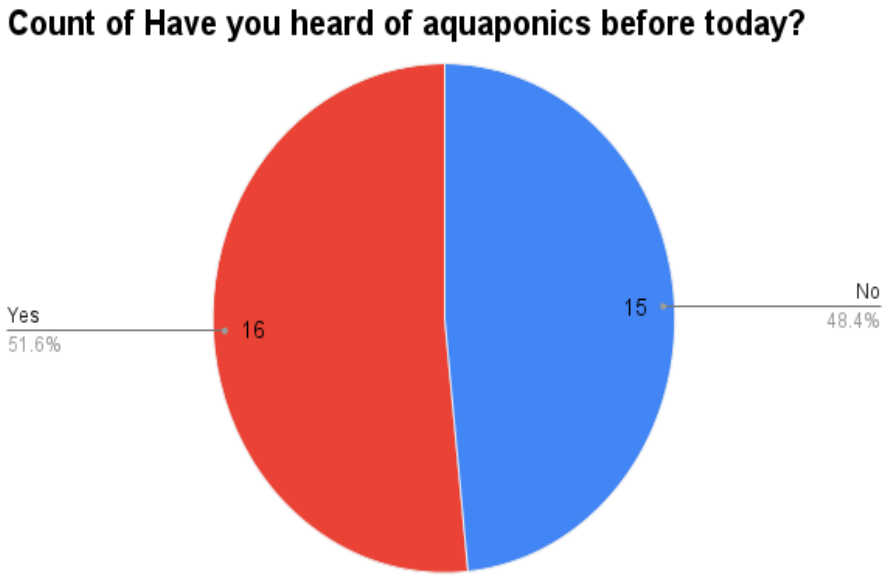


Figure 4: **Highlights respondents' awareness of the concept of aquaponics.**

Interestingly, with only 22.6% indication of being very familiar with short crops; approximately 96% of persons indicated having a level of familiarity with short crops. Giving evidence that even the majority of persons that doesn't have interest in agriculture still have a level of familiarity, with short crops. Indicating that they may directly or indirectly fit into a branch of the agriculture stakeholder buying. The importance of agriculture is undeniable, as it has diverse roles in a nation's development. Food security, modernization through industrialization and even health and rural culture are all linked to the agriculture industry (Hoddinott 2012; Bresciani 2004; Johnston and Mellor 1961). Also, with growing health consciousness and sustainability many are opting to be more mindful of their nutritional intake and paying attention to farming practices that promotes such (Parashar et al 2023).

Also, the following question, geared at determining the availability of short crops throughout the year, it was determined that equal amount (41.9 % (n=13)) of the participants has opposing responses. The remaining 16.2% was unaware. On hindsight it would have been more impactful if the location of participants were collected. This would have given insight on areas affected by shortage. Below figure 5 and 6 gives visual representations of this data.

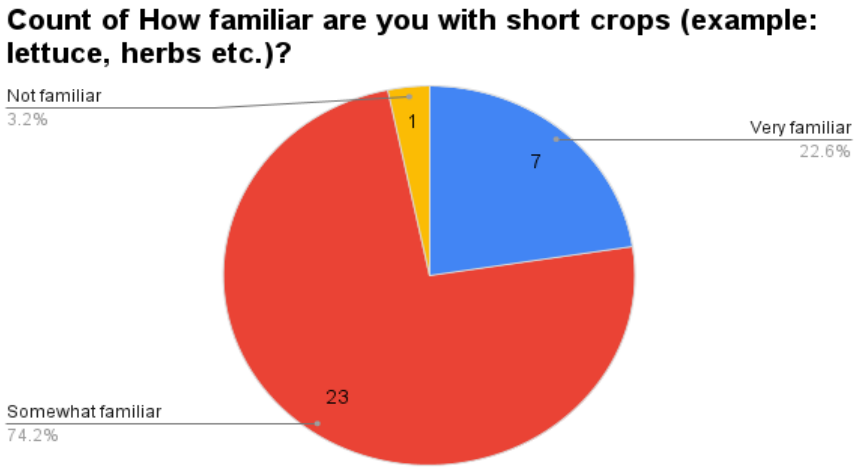


Figure 5: **Shows number of persons with knowledge of short crops.**

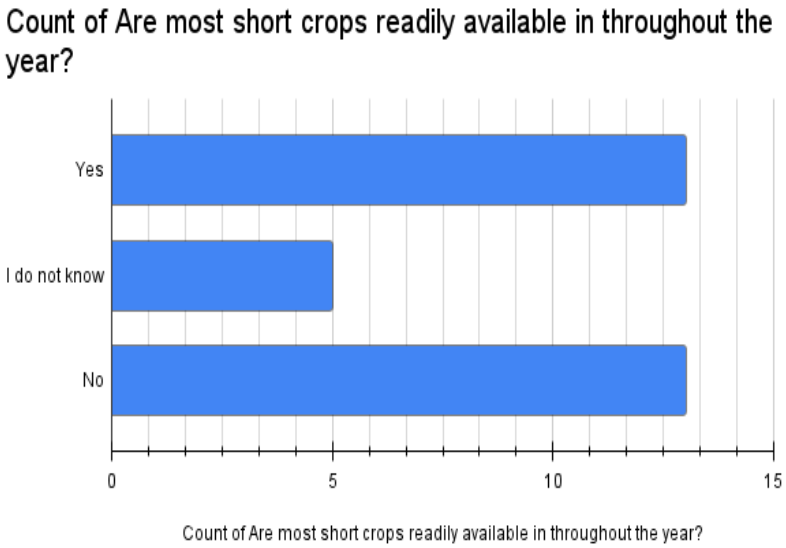


Figure 6: **Showing response to availability of short crops.**

Moreover, in response to "What short crop would you like to see increase in production?", Lettuce was listed as the number one crop, followed by Tomatoes and Herbs and Cabbage respectively. Coincidentally, these options are almost synonymous with aquaponics, as they are the most common crops globally on aquaponics farms; due to their short cycle, higher profitability, and lower nutrient requirement (Ibrahim, 2023; Vancore et al 2024). It must be noted that only 27 persons completed this question. In 2022, St. Vincent imported on average 19 million worth of vegetables according to OEC. The implementation of aquaponics will not only help to reduce this bill; it has the potential to allow surplus production that can be exported with in the region, which will help to reduce the region import bill which CARICOM has set to reduce by 25% in 2025 (Robertson and Ellsworth 2024; CARICOM 2022).

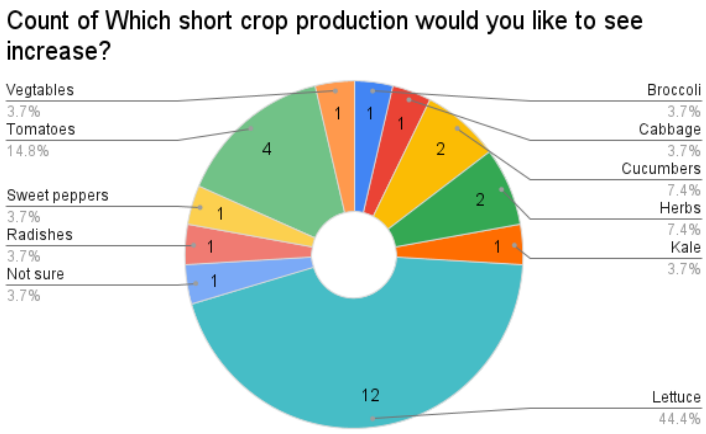


Figure 7: **A pie chart showing the types of short crops respondents wants to increase in production.**

Subsequently, the question that followed in this section was and open question. The responses (27 of the 31) were quite diverse, with some overlapping. Nonetheless it was very insightful. A summation of the replies, suggest that aquaponics would function best as a complement to traditional farming offering benefits that can drive economic, environmental growth and increase food security. In addition, some replies highlight the health benefits of organically grown crops, leading to improving health and wellness. Also, mention was made of increase crop production and saving land. These replies align with proven research, discussed in the literature review. As was mention earlier, some respondents have no interest in agriculture and haven't heard of aquaponics before but using the summary provided at the start of the questionnaire and their experiences and realities, many of their responses are aligned to credible and reliable research.

The researcher, interpreted the saving of land to mean, utilization of land space better for other purposes. Though most of the replies were positive, regarding aquaponics farming as a good initiative, there were a few responses that stated their uncertainty of the concept. One respondent, is of the opinion that it is a good idea but a venture that cannot be done in St. Vincent due to financial limitation to implement it. In Goddek (2015) education/ training and technical limitation were perceived to be limiting factors to commercial aquaponics farming. Additionally, within the context of a developing country acquiring capital through financial institutions maybe another limiting factor; emphasizing the need for stakeholder partnership, incentives and financial investors.

After asking for their opinions, they were then asked if they think it aquaponics farming would benefits St. Vincent and the Grenadines, 71% agreed that it would while the others were unsure. No one was completely convinced that it would not be beneficial. Given the similarity of the agriculture nature in the Caribbean, one can deduce that like the farm in Antigua and Barbados (Phillips 2020 and Indies Green 2016), St. Vincent and the Grenadines while benefit in similar ways, directly through increase fish and crop production and indirectly through the indirect opportunities that will be created such as employment, wellness and sustainability.

The succeeding question, asked about interest in farming, if the production was less labour intensive. To this 64.5% (n=20) responded in the affirmative while 12.9 (n=4) said no. When compared to question three, there was a slight increase (54.8%- 64.5%) of persons that would be interesting in agriculture. Thus, one can deduce that manual labour or the intensity of labour required is a significant deterrence factor in the agriculture industry. And seeing that aquaponics is not as labour intensive, it would be a more attractive option. This coincides with the viewpoint on the hindrances of youth involvement in agriculture, mentioned earlier from (Jayne 2017).

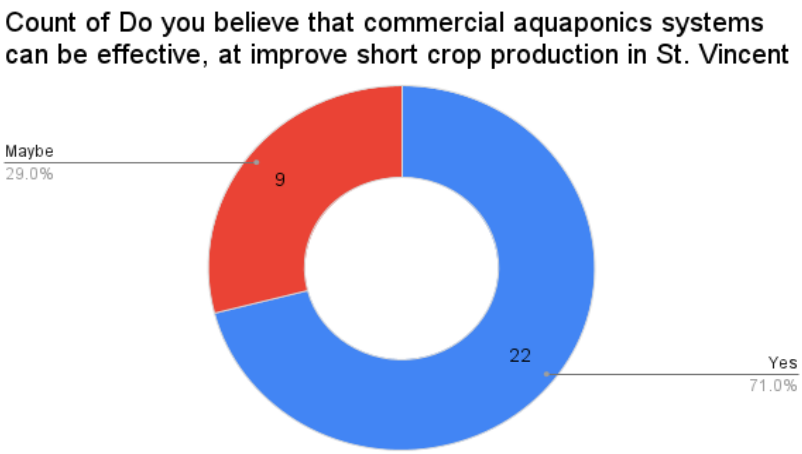
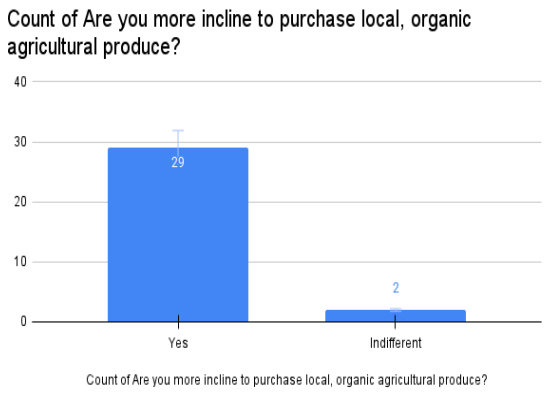


Figure 8: **Shows result to the question "Do you believe that commercial aquaponics systems can be effective, at improving short crop production in St. Vincent.**

Sequentially, the last three questions were tailored to determine what niche area aquaponics may open up. The first two questions were completed by 100% of the participants. The first question which asked about preference for local, organic produce, had an overwhelming 93.5% (n=29) that were inclined to it, while the remaining 6.5% (n=2) were indifferent. Similarly, 87.1% (n=27) expressed that they believe that organic production is a niche area that aquaponics can fill. In contrast 3.2%(n=1) didn't agree to it filling that niche, the remaining 9.7% (n=3) were indifferent. With the overwhelming numbers that are incline to supporting local, this could lead to large customer base allowing local economic growth. It should be noted that it this type of development that Johnston and Mellor (1961) credits for leading industrialization and modernization in developed countries. However, it must be noted that several factors play a role in product selection, economic circumstances being an important one (Trapnell 2023). Figure 9 and 10 displays visual depictions.



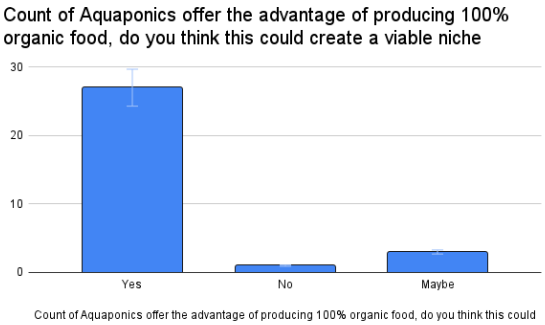


Figure 9: **Shows respondents preference to buying local organic crops.** Figure 10: **Shows respondents view on aquaponics creating a viable niche in organic production**

The last question was and open question that asked for potential niche that aquaponics may open up, there were only 23 persons that completed this question. In addition to persons that didn't complete this question, there were 5 respondents that stated that they did not know, therefore there were on 19 workable suggestions. Nonetheless, the responses varied broadly. An overview of the respnses, highlighted its potential for increase crop production and fish farming, stimulate economic growth - hrough increase profitability to farmers and the creation of employment. A few mentioned the possibility of agro-tourism and education/training.

Correspondingly, the potential to diversity crop prodcution to growing high value herbs such as; basil, mint can lead to an increase in agroprocessing and promotion of healthier lifestyles and practices. Aquaponics can lead to incorporation of more advantage technologies, making it more attractive than regular farming.

Remarkably, some of these responses, aligns with scholarly research; that documents that aqauponics can create, economic, social and environmental benefits (Johnston and Mellor 1961; Hoddinott 2012). The nature of aquaponics involes the use of technology as the system needs close monitoring. Bearing in mind that agriculture is a signifant industry in SVG, with tailored policies and investments the possibilty of these niche markets will be attainable.

Next was section three, consisting of 6 question, formulated to gather data that will allow a comparison between tradional and aquaponics farming and on perceived environmetal impacts. The first two questions along with number 5 were ranking questions. For these questions, instructions were not followed; possibily due to language bias and method used, a limitation that was discussed in the metholodology chapter. This led to discrepancies of the data collected, reducing crediblity and insightfulness. In order to gain some useful insight the responses (5 that were completed correctly) will be used for this analysis, however a chart with all data will be attached to the appendix.

The tables below show that ranking for the aforementioned questions. Questions were ranked in order of most effective to least effective, where 1 is most effective and 6 the least.

Table 1: ***Shows response to the question, " Of the following factors listed which do you think may promote the effectiveness of this type of farming in SVG?"***

Options	**Questions and Rank**					
	8	***14***	***16***	***26***	***27***	***29***
Availabilty of Water	6	1	1	4	1	2
Suitable Land	3	3	3	1	2	3
Solar Energy	4	2	5	5	3	1
Available Market	2	5	2	3	4	5
Adaptable Human Resource	5	4	4	6	5	6
Regulations and Incentives	1	5	6	2	6	4

Looking at the table there is no eminent trends, however based on the ranks, the top three factors that were estimatded to promote the effectiveness is availbility of water, suitable land and solar power. All factors that were highlighted earlier, this show that others share the researcher's perspective. The least favorable is adaptable human resource. Water and an energy source is vital for the operation of an aquaponics farm, the cheaper the rates for these the lower

the larger te revenue and profit margin will be. Thus increasing the opertaion's profitability. On the contrary, suitable land being ranked in the top three doesn't aligns well with literature, as aquaponics can be done on smaller, less fertile spaces, even indoors if necessary compared to traditional farming. However, considering the mountainous topograpgy in St. Vincent it is possible that was the reasoning for this selection, as flat lands are perceived to be most suitable for commercial farming.

Table 2: ***Shows response to the question, "What factors do you think will limit the effectiveness of aquaponics in SVG?"***

Options	**Questions and Rank**					
	8	***14***	***16***	***26***	***27***	***29***
Set-up Cost	1	2	2	1	1	4
Natural Disaster	3	6	5	5	3	1
Lack of Government Collaboration	2	4	6	1	2	5
Limited Market	6	5	1	6	4	6
Ineffective Regulation	4	3	4	3	5	2
Limited Skill-set	5	5	3	4	6	3

The data shows that cost of set up, lack of government collaboration and ineffective regulation are the most limiting factors, while the least limiting is limited market and skill set. As argued earlier in the research, for this venture to be successful, there must be partnership, financial investments, training and suitable regulations. Within the Caribbean financial institutions are reluctant to fund farmers, due to the risk of climate change and slow development and adaptability to modern food safety and quality standard (Clarke 2023). Also, the lack of defined use of land polices, land fragmentation and poor infrastruture are some of the issues that speak to poor government involvement and the failure of their part to implement effective strategies and regulation (Madramootoo et al, 2000). Pemberton (2005), inadequate research and development, unskilled human resource, unorganization in both government and private sector through fragmentation and out dated systems, were listed as some of the major hinderance in agricultural development in the Jagdeo inititaive.

Table 3: ***Shows response to the question, "How might the development of commercial aquaponics farm affect traditional farming communities?"***

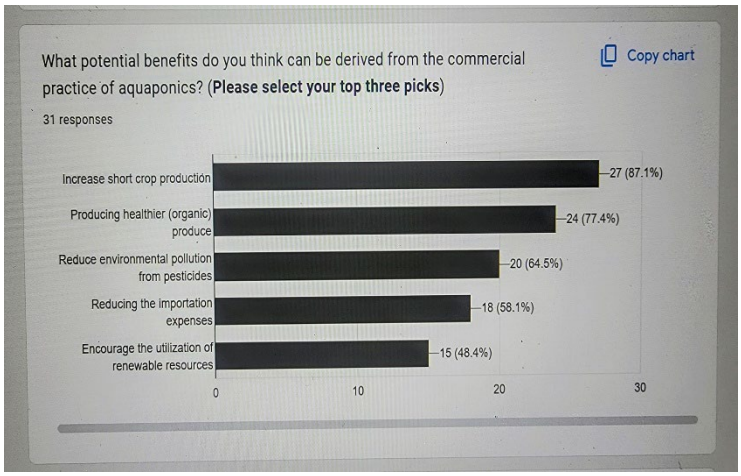
Options	**Questions and Rank**					
	8	**14**	**16**	**26**	**27**	**29**
Diversification of farming	5	2	1	2	5	3
Economic growth	1	3	3	3	1	5
Increase sustainability	2	4	4	4	1	1
Employment	3	1	5	5	3	4
Demand Technical Skill	4	5	2	1	4	2

To summarize, aquaponics would affect or complement traditional farming best by creating economic growth and diversification in farming according to the respondents. Considering that the aim of the venture is to increase short crop production, that will lead to increase profit margin in crop production, as well as fish production in a similar way as other Caribbean countries (Phillips 2020 and Indies Green 2016). Such economic growth leads resources increase that can promote further development in agriculture, modernization and industrialization. As the surplus from agriculture are usual directed into other industry to stimulate development (Johnston and Mellor 1961).

Futhermore, the other three question were more direct about the perceived impact that aquaponic may have on the environment. The first of these asked, "**What potential benefits do you think can be derived from the commercial practice of aquaponics?".** Respondents were given 5 options of which the choose the top three, the selected three are;

1. Increase short crop production **87.1%** (n=27)
2. Producing healthier goods **77.4%** (n= 24)
3. Reduce environmental pollution from pesticides **64.5%** (n=20)

Options that have discussed and backed by research in other countries, with similar economy and agricultural challenges and limitation.



In the following question a minority agreed that commercial aquaponics will significantly affect water supply. The results are displayed in figure 12 below.

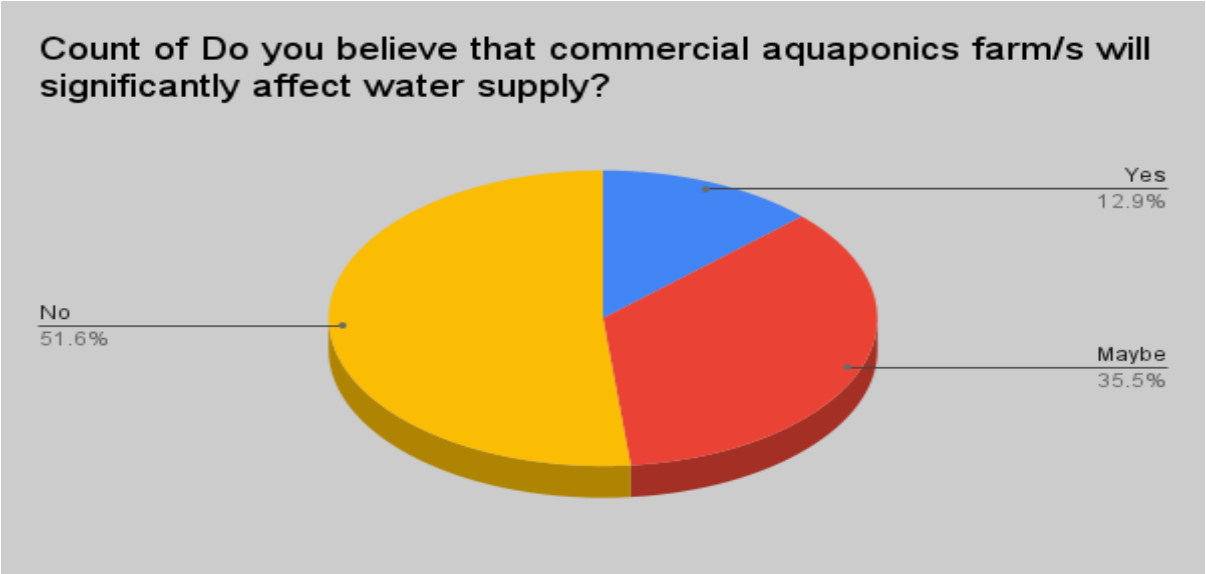


Figure 12

The literature on aquaponics have given credible and reliable evidence that state that aquaponics used less water that traditional farming (Phillips 2020). And should reduce the impacts of water supply in that comparison, nonetheless water is a vital resource in it operation. However, it is not impacted by traditional farming and most person don't see aquaponics as a treat to water supply. This highlights the need for collaboration with educational institutions- to train and educate, equipping the human resource with knowledge and skills.

Sequentially, the last question was opened ended, and like most of the opened end question were only completed by a fraction of the respondents. 21 such persons completed this question. It allowed for subjectivity, this gave the diverse realities of what each envision for short crop production and agriculture through aquaponics facilities. Upon analysing the response, the most common expectations are:

- Increase in organic/ healthier crop production of varying herbs and vegetables
- Creation of jobs (which are more attracted to youths
- Economic growth (more profits for farmers)
- Enhance food security and sustainability on all fronts.

Next, was the section used to collect data on barriers and regulations. It comprised of 5 questions; questions 1 and 2 were linked, as question two was a follow up to determine the reason behind the answer in number 1. However, although there was a 100% response in number 1, there was 83.9% for the follow-up.

Figure 13 and 14 below gives a visual record of responses to question one and 4 in this section

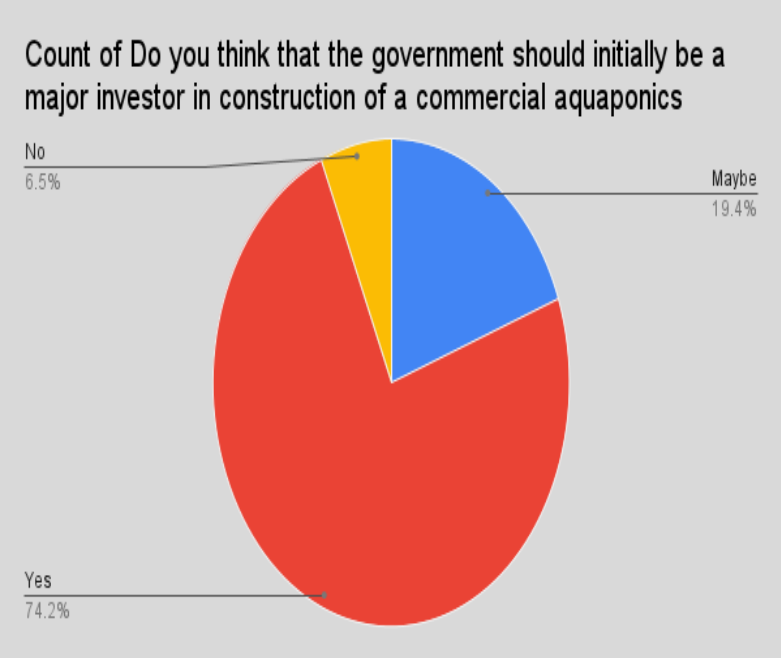


Figure 13

majority agreed that the government should be an initial investor, the reasons were mainly because it would be able to secure start-up funds, it can facilitate training to farmers and they have a great chance of a successful sensitization campaign. Person, see the government contribution as a trade-off for reduction of imports, unemployment, enhances food security and promotion of sustainable living.

Similarly, majority of respondents agreed that the government should regulate commercial aquaponics albeit, was a slight margin. Only 6.7% indicated that it shouldn't be regulated. In contrast a significant majority, 86/7% believes that educational institutions should be heavily involved in the promotion of commercial aquaponics farming. While 13.3% and 3.35 stated such institutions should have little involvement and none respectively.

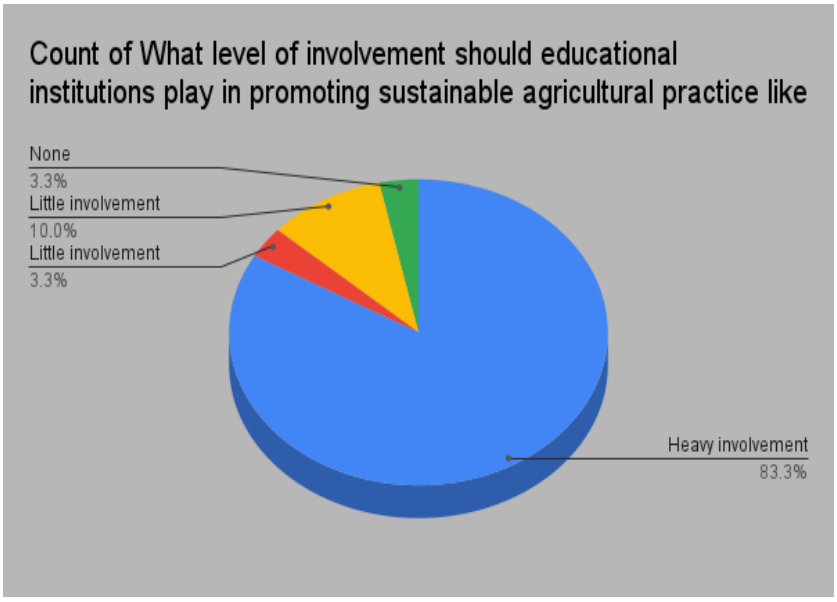


Figure 14

This stark differences, is not surprising considering that nature of politics. The scepticism people have of government leads to mistrust, while educational institutions are seen as independent and possible training partners. Nonetheless, the final question asked participants to select from a given list what regulations should be mandatory. The top three picks were;

1. Regular testing of water and food quality
2. Environmental regulation to manage waste and prevent chemical use
3. Standardized measures to control pathogens

Figure 15, will give a complete breakdown of the other selected option and the ratings.

Figure 15: **Showing rating of regulations that should be mandatory**

The questionnaire ended, with an invitation asking respondents to state any additional comment, 15 persons responded to this. A summation of this, states that aquaponics can allow production all year round, increase jobs from farm to fork, foster stronger partnership among educational institutional and farmers. Important to note, is the ability to foster economic growth and self-reliance in fish and short crop production. A visual display of this will be placed in the appendix.

Analysis and Interpretation of Interviews

The interview section was done with two different selection of stakeholders; the first set was done with a senior official of the ministry of agriculture and the other was a set of three large scale farmers from different parts of the country. The questions posed to each set were structure different and seek to address different aspect of farming.

Firstly, the question posed to the ministry's official focused on current policies in place and the capability of the government to improve conditions that are deemed limiting factors for farming and the implementation of aquaponics commercially.

The first question; "What policies or incentives are currently in place, that will promote aquaponics farming?" revealed that there are a number of initiatives that are in place to help farmers and to promote agriculture, because they are general base they can also help persons interested in aquaponics. But as they are they would not directly promote it. The Zero Hunger Trust Fund is one program that would with agriculture classes in secondary school to promote food security. The Farmers Support Program, Pryme grants and FAO support are all strategic programs but in place by the government to offer financial and technical support to farmers and agribusinesses (St. Vincent Times 2025). It is worthy to note that person can access through

Pryme grant a maximum of 40000 dollars from the government to start or advance their business. One way to promote aquaponics is to have a number of grants that are only accessed by person interested in aquaponics farming.

The follow up question was "how can government work with farmers to implement a commercial aquaponics farm?", in addition to the above programs that were mentioned, which provide financial and technical support, there were the opportunity to lease government lands which are reserved only for agricultural production. Also, duty-free privileges for the importation of equipment, and vehicles that will be used for farming purposes (FAO 2011; Ministry of Finance 2024). The last question asked the officer to give one limitation on agricultural productivity and one way he thinks the ministry can address it. Seeing that the question was limited the officer, indicated that labour was a major limiting factor to productivity. Records highlight that there is a significant amount of unused agriculture land due to the shortage of labour, with the dwindling interest from the youth population in the agriculture more specifically the farming sector. The government is working with NGO's, and schools to implement agriculture as a subject in most secondary schools and primary school in the country. Records showed that the top performing secondary schools, started offering agriculture in as recent as two years prior. Also, the constant collaboration with regional and international institutions and countries like FAO, and Taiwan to facilitate training programs geared at modernization and agro processing (St. Vincent Times 2025). This interview was very informative, as it shed light on a number of strategies in place for development in agriculture, and although, it wasn't directly linked to aquaponics, the nature of aquaponics to increase productivity and new opportunities with the incorporation of technology its potential of attracting support from these programs are ranked high (Afere et al 2019).

Moreover, the other set were asked question to gather information on the operations of farming and its productivity and challenges. The first question pried on the receptiveness of the local market and the projection for increase sales, the farmers agreed that the local market was not enough to sustain large scale farming. Competitive pricing from similar imported goods and economic status of the average consumer is a limiting factor to profitability. However, it was noted that in expansion of the hotel industry, in creating new customers and demands; which may be indicating a need for increase production. it was noted by one farmer that, "despite the limitation, increase production, and excess can be used to supply neighbouring country through exportation as with other commodities, such as ground-provision".

Following this, there were asked to identify their biggest challenge and to state if the think aquaponics can help to alleviate it. Two of the three farmers mentioned available market and pricing as their biggest challenges. The lack of price regulations, causes significant fluctuation throughout the year, where the middle man sets the price as most farmers don't directly supply to most, big businesses, such as hotels, that prefers to work through and aggregator or regional buyers that goes through traffickers. Again, they both could not think of a way in which aquaponics can help with marketing and pricing issues, one farmer saw it as added competition to the local market, that may negative affect small scale farmers. Madeley (2002), highlights the importance of small scale farming in narrowing the poverty gap, and promoting development. If then aquaponics will widen this gap it can be seen as counterproductive, unless the benefits to the general public creates the type of modernization and industrialization that Johnston and Mellor (1961) described. The third farmer, stated that poor infrastructure is one of his major problems. Pointing out that due to the road network, it requires a lot of manual

labour to get produce from his farm. Considering the decline in youth involvement in agriculture, discussed earlier this becomes an exacerbating factor to this challenge.

The final question asked was, "would you be interested in diversifying your farm to include aquaponics and what is your take on fish farming?"

Interestingly, all three farmers said no, they also all believe that fish farming may be a good initiative although they believe fish is currently readily available in the country. One farmer indicated that if the challenges mentioned earlier are rectified then there will be no need for him to diversify his farm, suggesting that the aquaponics can be a lucrative venture for youth and a way to promote agriculture in a more appealing way.

Considering that all three farmers were fifty plus, their reluctance when compare with the investment needed; financial, technical and research may see to huge a sacrifice to transform their profitable business that is not yet tested and tried in St. Vincent and the Grenadines.

Themes Deduction and Reviews of Interview Section of the Research on Aquaponics Implementation

Theme	**Stakeholder Findings**		**Analysis and Discussion**
	Ministry of Agriculture	**Farmers**	
Government Support and Policies	There are several existing programs that offers varying general support, to farmers but none specific to aquaponics. However, they can be accessed by all farmer thus aquaponics farmers will be able to benefits from the grant program called Pryme and others government and government partnerships programs such as Zero Hunger Trust and FAO initiatives (Searchlight, 2025; Searchlight; 2020)	The farmers are aware of the current programs, but they believe that for the success of aquaponics there should be specific programs and incentives that will create the interest in that area.	As suggested by the farming community, tailored programs for aquaponics could increase adoption. Therefore, there need to some policy shifting to facilitate this venture (OECD/IDB, 2024). Obirikorang et al. (2021) highlights the absence of structured policies for aquaponics in many African countries, emphasizing the need for government intervention to promote this technology.
Financial Feasibility	Through the Pryme grant farmer can access up to 40,000 dollars, also current farmers can access	Farmers are hesitant due to the high initial cost and considering it is a new venture they are	There is a reluctance due to cost of setting up a commercial aquaponics farm, where its

	farmers loan. There are also access to regional and international funding through FAO, the Taiwan/government partnership, however there are no guarantees.	concern about market uncertainty and visibility.	profitability is uncertain. As mentioned earlier tailored programs for aquaponics, which could include, grants, low interest loans and training can help to lower the risk and increase interest, especially among the more technologically savvy youth population. (CDB, 2023).
Market Demand and Sales Challenges	There is a belief that a thriving and expanding tourism industry creates a demand for agricultural produce and thus the need for increased production is necessary (API, 2024).	There is a belief among farmers that the spending power of local consumer is not sufficient to create a profitable market. However, the opportunities to export is lucrative as the Caribbean region suffers from high importation bills (FAO, 2024).	Aquaponics farmers will need to strategically align with high-demand industries alongside locals to be profitable. Marketing will be a necessity.
Infrastructure and Logistics	The government is committed to the modernization of agriculture, evident through the Taiwan and FAO and local partnerships however, the focus is on improving traditional farming rather than aquaponics.	Farmers belief are disgruntled with infrastructural framework in place, as it leads to labour shortages and a decline in youth involvement in agriculture.	Although aquaponics is less demanding, labour shortage remains an issue. Thus, there needs to be a rectification of the infrastructural issues that can create challenges for farmers in every regard including aquaponics framers.
Youth Involvement	The government ha programs in place, in school to educate, encourage youth participation and eradicate the negative misconception of the agriculture industry.	Farmers confirms the lack of youth decline in agriculture. They believe that aquaponics might be more appealing to the upcoming	Aquaponics being a modern and tech-driven farming alternative to traditional farming has the potential to attract youth entrepreneurs (IICD,

	Local collaboration with NGO's is geared towards the family to grow what they eat. (St. Vincent Times, 2024).	generation but they are not will to make this transition.	2013), but there must be an awareness campaign to educate and train interested persons. Also, funding would be needed. Additionally, partnership farming can be encouraged to reduce risk and raise capital for start-ups where funding is not possible.

In short, aquaponics is a potentially feasible sustainable alternative to traditional farming, that can be employed to significantly increase short crop production while creating other niche markets, as fish production and agro-tourism services. However, there needs to be tailored policies and incentives to encourage farmers and youths, as the current incentives and programs are general to all farming practices. Similarly, infrastructural improvements will be needed as it is a current deterrent in the farming industry, accounting for labour shortage and youth involvement. If this venture is positioned as an innovative, sustainable solution, with the right marketing strategies, network and stakeholder partnerships it would be a very attractive, profitable attraction for the younger generation; that will create social, environment and economic benefits to local community, the country and the Caribbean region.

Chapter Five: *Recommendations and Conclusion*

The research revealed on a number of limitations, interesting factors, and insight for improvements. The survey was conducted using 35 persons, 31 completed questionnaires and the other 4 were interviewed. Although this small sample size may be considered significant for an MBA research paper it cannot accurately represent the wider population despite the small size of the country population, just over 100,000 (Bryman, 2007; Worldmeter 2025). Similarly, as mentioned in the analysis there were some questions that were not completed, and there were some questions that were completed but not as instructed, which had to be eliminated during analysis. This further reduced the sample size and the magnitude of qualitative insight. According to Moridpour (2024) a sample size that is to small can lead to results being unscientific and unethical. Additionally, the incomplete questions could have affected the reliability of data however they were omitted to eliminate this inconsistency.

Subsequently, the lack of geographical information prevents deeper understanding in terms of crop availability, as there were significant percentage of the respondents with conflicting views to the availability of short crops. Such information would have uncovered some potential areas for the aquaponics site, and other possible trends. Nonetheless, the vital finding is the need for increase production both for local and regional consumption, as the need exist. It would contribute to the reduction of the food import bill within CARICOM set to reduce by 25% in 2025 (Robertson and Ellsworth 2024; CARICOM 2022). Market research is a vital component of start-up business conducting this will be able to correct this shortcoming. And finally, the potential of respondents' bias cannot be overlooked as personal biases and limited knowledge would have influenced their responses.

Moreover, from the data collected one can infer the following interesting factors; that there is a level of interest in aquaponics that can be exploited, there are tremendous social, economic potential benefits and the need for institutional support and the vitality in the scale of operation that will determine profitability and overall sustainability. To reiterate there were a notable percentage of respondent that indicated their indifference towards agriculture, from an optimistic viewpoint, this indifference is an opportunity to create the necessary factors that would nurture such interest in the younger generation. Tackling two major challenges, the repealing of negative perceptions towards agriculture and the declining youth involvement as described in (Ganpat and Webster, 2014). One way to effect such change is through the introduction of alternative farming methods such as aquaponics. That incorporate the use of technology devices which is a major determinant in job acceptance (World Economic Forum 2025) that reduces the need for manual labour, while fostering improvement in crop production; that creates benefits in the three pillars of sustainability. People gain employment, and have healthier options, that drive the local economy through sustainable usages of the natural resources available.

Furthermore, it was determined that for a successful implementation of aquaponics, collaboration would be a necessity especially among the government, educational institutions, the entrepreneur/ farmer owner and financer if independent of the others (CDB, 2023). The government where possible will be needed to assist financially but its primary involvement is regulatory (FAO, 2022 and Agnew and Nakelese 2024). Training which is also vital will ensure the human resource is readily available and adept in knowledge and skills for management and

operation. It is only through keen collaboration, of vital stakeholders will the operation realize success, due to varying limiting factors that can cause hiccups.

Also, the importance of scalability plays a role it the profitability and sustainability (Love et al, 2015), although there are benefits to be gained, should first be seen as a business and one that must operate effective and efficiently to make a profit. Start-up cost, technical management and maintenance of the system is costly, thus the output must be at commercial level to offset expenses to make this venture feasible (Love et al, 2015). It is for this that all market- related challenges should be eliminated by different stakeholders to advance the success rate.

Considering the aforementioned findings, listed below are some recommendations that the research believes will be beneficial in the implementation of this aquaponics venture, or for further exploration of this research.

Recommendations:

1. **Enhancement of Public Awareness and Education**
   Although there is a level of interest in agriculture and aquaponics it can be enriched through the launch of educational campaigns that focuses on aquaponics, with a well-defined target group that should include young and local farmers. Key focus area should include the social and economic benefits. Schools, colleges and community groups can be used as information centres and mobilization forces. (Godfrey 2005) highlights the need for training for rural youths who are more reliant on farming and agriculture for their livelihood. Training must therefore match the reality, to achieve maximum benefits.

2. **Developing Training and Certification Programs**
   This will require collaboration with educational institutions and the government, as they are responsible for formalized teaching and learning. This goes beyond awareness by equipping participant with skills, building proficiency in the human resource. This facilitates knowledge transfer. Programs should be tailored to include study of the varying aspect of aquaponics farming, allowing for specialization in selected components, such as system designs, maintenance, fish farming and marketing etc.

3. **Providing Financial Support and Incentives**
   Government and financiers may be the forerunners in the initial stage, and can assist by create opportunities to assess government grants and low-interest loans respectively. However, overtime private investors should be encouraging to stimulate growth and expansion. Through direct or indirect means. The current risk associated with high start-up and the varying agricultural challenges present can be a deterrence as pointed out by Okomoda et al (2022). To reduce this the government can shoulder some financial burden at the start, considering the economic benefits to be gained if the venture is successfully managed.

4. **Creating Policy and Implementation Regulations**

The importance of the need for regulation was highlighted throughout the study. There must not only be regulations, they must be clear and in a simple language that the average man can understand. Obirikorang et al. (2021) highlights the need for effective policy frame works to promote success in the advancement of agricultural growth. Similarly, there must be repercussion for failure of implementation. Clear guidelines, on environmental standards and market access may encourage investment and young farmers.

5. **Encouraging Market Expansion and Diversification**

Marketing is vital for every business expansion, aquaponics has quite a number of selling points that can make it a little less challenging. Aquaponics must be sold as a healthier, more sustainable and environmental friendly alternative, that can boost export and drive the local economy. Considering that food is a necessity, and the importance of food security, the right marketing and diversification can create a much bigger network among other stakeholders, including hotels, supermarket and even the tourism industry if the farm is market as an agro-product/service tour site. Recommendation 5, 6 and 8 can lead to an expanded market, increasing the change of scalability and thus profitability (Love et al, 2025).

6. **Building Partnership and Network**

The point is similar to the previous one overlapping in many instances, however, it is much wider as it goes beyond just marketing. It includes networking with as many of the vital stakeholder as possible to build a supportive network that can facilitate innovation and knowledge collection and sharing. So stakeholders such as; the government, educational institutions, private investors, farmers and large and small scale customers etc.

7. **Promoting Sustainable Practices**

This is mentioned separately, however, it is one area that should be regulated to ensure that the benefits are maximized. It must be noted that there may be a need for incentives to support its adoption.

8. **Improving Data Collection and Research**

This recommendation is two parts: In relation to further research on this topic, it is suggested that a larger sample sized be used, and location of respondents be collected. Similarly, the language and options used should be simple for all to understand, or that a query time can be put in place to help confused participants. In the second aspect, a digitalized data collection method can be implemented for annual or biannual reviews to deduce market trends as they arise. Allowing for ease of adjustment and data sharing among stakeholders.

Revisiting Aim and Objectives.

The goal of this research was to determine the feasibility of implementing aquaponics in St. Vincent and the Grenadines to increase small crop production. Considering it is a more sustainable alternative that current traditional farming methods, with the potential to reduce or eliminate a number of challenges face in the agricultural industry such as; land degradation, fluctuating market, climate changes and the consequences of it. Through the uses of structure interviews, critical research and a questionnaire survey; the benefits, limitations and potential of commercial aquaponics were explored to gain insight into government support, existing policies, market dynamics, and infrastructural constraints affecting the agricultural sector were obtained.

A major finding of this research is the need for more tailored incentives and policy support towards aquaponics and by extension modernized agricultural farming methods as there is currently a gap since the current support programs are generalized to the farming industry. Initiatives such as the Zero Hunger Trust Fund, The Farmers Support Program, Pryme grants and regional and international collaboration with FAO and Taiwan (St. Vincent Times, 2025) will not be enough to guarantee interest in commercial aquaponics therefore it is recommended that other governmental mediations should be implemented to extend beyond conventional agriculture to include specialized grants, training programs, and research initiatives that promote aquaponics as a viable farming method.

However, (FAO, 2011; Ministry of Finance, 2024), showcased how some of the current programs and policies can support an aquaponics endeavour. The leasing of land, and concession for farming equipment are two such incentives. Implementation of aquaponics is an opportunity to utilized unused land, and attract technological savvy youth into the agriculture industry. This helps to tackle a number of challenges, labour shortage, unused land, shortage of short crops. Nonetheless, this will only be possible through acceptance and adoption, through training and support.

Moreover, the study revealed several challenges that could impact the adoption of aquaponics in St. Vincent and the Grenadines. Inclusive of instable market and pricing inconsistency- which can result in aquaponics farmer becoming competitors in the already limited market that small scale traditional farmers are struggling in (Madeley, 2002). Thus, keen consideration should be explored with regards to the local market dynamics. Alongside this the study highlighted the tendency for older farmer to reject to such adoption while the youth are reluctance to enter the filed due to the demand of manual labour. This creates a divide in the perception of agricultural innovation. While younger farmers might be more open to adopting aquaponics, established farmers with decades of experience may resist change unless clear incentives and support systems are in place. This aligns with research on agricultural modernization, which suggests that successful transitions require not only financial investment but also education, training, and long-term policy commitments (Johnston & Mellor, 1961).

Notwithstanding, the study emphasizes a boarder implication that is possible with aquaponics in SVG agricultural, social and economic backdrop. Potential benefits of integrating aquaponics into the agricultural landscape in SVG includes; enhance food security, reduction of importation bill and the creation of new opportunities for agribusiness development.

However, for this to become a reality, there must be a combined effort to address infrastructural deficiencies, improve market access, and provide tailored financial support.

Proceeding, it is recommended that further research in this area focus on the economic viability of aquaponics in the Caribbean, concentrating on production costs, yield efficiency, and market integration through pilot project. Additionally, future research should focus on the complementary nature of aquaponics to traditional farming, thereby positioning it as an enhancement instead of a replacement which will increase the likelihood of its adoption among the seasoned farming community.

Ultimately, this research has laid the groundwork for further discussions on sustainability, innovation, and resilience in SVG's agricultural sector. The findings emphasize the need for collaboration among policymakers, farmers, and researchers to ensure that aquaponics contributes to a more inclusive and sustainable farming future. While challenges remain, the potential benefits of aquaponics warrant deeper exploration, policy refinement, and strategic investments that align with national agricultural goals.

Conclusion

The key findings of the study show that there is a strong interest in aquaponics among the respondents, that indicates the availability of human resource for this venture, the enhancing of short crop production and the promotion of sustainable agriculture. However, there are factors that may impede the adoption of commercial aquaponics in St. Vincent and the Grenadines. High setup cost, limited technical skills, inadequate support from the government and other key stakeholders and ineffective regulation and implementation are among such factors

Furthermore, the right collaborative efforts can become the machinery that can resolves the above mentioned barriers, the need for better educational outreach and training programs is one way of resolving some of the limitation that currently exist. Such outreach should target various demographics, especially young people and traditional farmers. The mixed perceptions regarding short crop availability also highlight a lack of awareness about aquaponics' potential to address these concerns effectively.

However, aquaponics is a viable and sustainable option, that can be profitable through essential strategic partnerships between government agencies, educational institutions, private investors, and local farmers. Financial incentives, targeted training, and increased awareness about the benefits of aquaponics are critical to enhancing adoption and fostering community buy-in. In addition, it has the potential to positively impact the social and environment locale. Another prospective benefit of this niche market, in particularly in organic farming and agro-tourism is promising.

In short a strategic implemented, aquaponics system can significantly contribute to food security, economic growth, and environmental sustainability in St. Vincent and the Grenadines. However, moving forward, requires a comprehensive and collaborative if such a venture is to be realized and it potential maximized to benefit the country and region by extension.

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Appendix

Aquaponics Questionnaire Form

Aquaponics is a farming method that merge aquaculture and hydroponics to simultaneously grow fish or other aquatic creatures and plants in a sustainable

cycle. In St. Vincent and the Grenadines where farming plays a vital role in the nation's economic stability; it will be prudent to assess the potential profitability and sustainability of this method. Thus, I have decided to conduct studies in this area for my MBA dissertation research project.

The purpose of this survey is to collect data to be used in a research paper that aims to critically assess the sustainable potential of aquaponics in St. Vincent and the Grenadines. It is a primary method employed by the researcher to gather relevant, and credible information. Therefore, I'm seeking your assistance by taking a few minutes to complete the questionnaire.

Your response to this form, signifies your consent to use data collected to be used for the purpose mentioned above. The responses are anonymous for analysis and reporting only.

GENERAL INFORMATION

1. Select the appropriate age group.

Check all that apply.

- [ ] 15-20
- [ ] 21-25
- [ ] 26-30
- [ ] 31-45
- [ ] Over 45

2. State your occupation

Check all that apply.

- [ ] Student
- [ ] Teacher
- [ ]
- [ ]

Farmer

Other

Experience and knowledge with Aquaponics.

3. Do you have interest in Agriculture?

Mark only one oval.

- Yes
- No
- Indifferent

4. Have you heard of aquaponics before today?

Mark only one oval.

- Yes
- No

5. How familiar are you with short crops (example: lettuce, herbs etc.)?

Mark only one oval.

- Very familiar
- Somewhat familiar
- Not familiar

6. Are most short crops readily available in throughout the year?

Mark only one oval.

- Yes
- No
- I do not know

7. Which short crop production would you like to see increase?

_____

8. How do you perceive the replacement/complement of traditional farming with aquaponics?

9. Do you believe that commercial aquaponics systems can be effective, at improve short crop production in St. Vincent and the Grenadines?

Mark only one oval.

- ◯ No
- ◯ Yes
- ◯ Maybe

10. Would you be interested in farming, if it was less labor intensive?

Check all that apply.

- ☐ Yes
- ☐
- ☐ Maybe
- No

11. Are you more incline to purchase local, organic agricultural produce?

Check all that apply.

- ☐ Yes
- ☐ Indifferent
- ☐ No

12. Aquaponics offer the advantage of producing 100% organic food, do you think this could create a viable niche market in St. Vincent and the Grenadines?

Check all that apply.

- [ ] Yes
- [ ] Maybe
- [ ] No

13. Besides organic produce, what niche area might aquaponics farming create in St. Vincent and the Grenadines?

_____

ENVIRONEMTAL IMPACTS OF AQUAPONICS

14. Of the following factors listed which do you think may promote the effectiveness of this type of farming in SVG? (**Please arrange in order of most effective to least effective, where 1 is most effective and 6 the least**)

Mark only one oval per row.

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Availability of freshwater	◯	◯	◯	◯	◯	◯
Suitable land space	◯	◯	◯	◯	◯	◯
Availability of solar energy	◯	◯	◯	◯	◯	◯
Available market	◯	◯	◯	◯	◯	◯
Availability/adaptability of human resource	◯	◯	◯	◯	◯	◯
Available incentives and regulatory policies	◯	◯	◯	◯	◯	◯

15. What factors do you think will limit the effectiveness of aquaponics in SVG? (**Please arrange in order of most effective to least effective, where 1 is most effective and 6 the least effective)**

Mark only one oval per row.

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Startup cost	◯	◯	◯	◯	◯	◯
Predisposition to natural disaster	◯	◯	◯	◯	◯	◯
Lack of collaborative efforts from government	◯	◯	◯	◯	◯	◯
Limited market	◯	◯	◯	◯	◯	◯
Inefficient regulation	◯	◯	◯	◯	◯	◯
Limited skilled personnel for operation	◯	◯	◯	◯	◯	◯

16. What potential benefits do you think can be derived from the commercial practice of aquaponics? (**Please select your top three picks**)

Check all that apply.

- ☐ Increase short crop production
- ☐ Producing healthier (organic) produce
- ☐ Reduce environmental pollution from pesticides
- ☐ Reducing the importation expenses
- ☐ Encourage the utilization of renewable resources

17. Do you believe that commercial aquaponics farm/s will significantly affect water supply?

Mark only one oval.

- Yes
- No
- Maybe

18. How might the development of commercial aquaponics farm affect traditional farming communities? (**Please arrange in order of most probable to least probable, where 1 is most probable and 6 the least probable)**

Mark only one oval per row.

	Column 1	Column 2	Column 3	Column 4	Column 5
It may lead to diversification of farms	◯	◯	◯	◯	◯
Create most business opportunities (economic growth)	◯	◯	◯	◯	◯
Stimulate greater level of sustainability within the community	◯	◯	◯	◯	◯
Generate more employment	◯	◯	◯	◯	◯
Increase demand for technical skill set	◯	◯	◯	◯	◯

19. What do you envision for short crop production and agriculture through aquaponics facilities?

BARRIERS AND REGULATIONS

20. Do you think that the government should initially be a major investor in construction of a commercial aquaponics facility?

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

21. What is/are the reason/s for your answer given to the previous question?

_____

22. Would the implementation of commercial aquaponics need to be regulated by the government?

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

23. What level of involvement should educational institutions play in promoting sustainable agricultural practice like aquaponics?

Check all that apply.

- ☐ None
- ☐ Little involvement (Provision of knowledge)
- ☐ Heavy involvement (Collaborative efforts, provide training and specific courses etc.)

24. Which of the regulatory measures listed should be made mandatory?

Check all that apply.

- [ ] Registration and Licensing
- [ ] Regular testing and monitoring of water quality and food quality
- [ ] Standardized measures to control pathogens
- [ ] Environmental regulation, to manage waste and restrict chemical use
- [ ] Mandates to incorporate solar energy
- [ ] Regulate training for technical staff
- [ ] Mandatory partnership with educational institution on research initiatives

ADDITIONAL COMMENTS

25. Please provide any additional thoughts on the sustainable potential of aquaponics to increase short crop production in St. Vincent and the Grenadines

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Respondents Responses to Question 16

What potential benefits do you think can be derived from the commercial practice of aquaponics? (Please select your top three picks)

Encourage the utilization of renewable resources

Increase short crop production

Increase short crop production

Increase short crop production

Increase short crop production, producing healthier (organic) produce, Reduce environmental pollution from pesticides

Increase short crop production, producing healthier (organic) produce, Reduce environmental pollution from pesticides

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Increase short crop production, producing healthier (organic) produce, reduce environmental pollution from pesticides, Reducing the importation expenses

Increase short crop production, producing healthier (organic) produce, reduce environmental pollution from pesticides, Reducing the importation expenses, Encourage the utilization of renewable resources

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Increase short crop production, producing healthier (organic) produce, Reducing the importation expenses, Encourage the utilization of renewable resources

Increase short crop production, Reduce environmental pollution from pesticides

Increase short crop production, Reducing the importation expenses, Encourage the utilization of renewable resources

Producing healthier (organic) produce, reduce environmental pollution from pesticides, Encourage the utilization of renewable resources

Producing healthier (organic) produce, reduce environmental pollution from pesticides, Encourage the utilization of renewable resources

Reduce environmental pollution from pesticides, Reducing the importation expenses, Encourage the utilization of renewable resources

Respondents responses to, what do you envision for short crop production and agriculture through aquaponics facilities?

A new and exciting yet rewarding venture

A flourishing new farming method that will provide new employment, food, and more

" I envision a highly efficient, sustainable, and technology-driven system that enhances food security and economic opportunities.

"

N/A

The availability of fresh water fish for consumers as well as the constant production of organic vegetables

Greater economic impact, a healthier society, more young people becoming interested in farming

Maybe providing markets with fresh organic produce to try and lessen the dependence on produces with pesticides and so on.

Increase in production and an increase in the variety of short crops. Additional more affordable prices

Higher availability of short crops of better quality

Healthier produce

Better sustainability

If done right, more consistent and better quality

Healthy crops

Grapes

That it will be effective

Greater expansion

Short crop grown on the water used for fish pond

Healthier food and more economic growth for our people

It will increase...and possibly reduce price

A greater more valuable market

Large increase in short crop production and increase in profit for farmers

Respondents additional comments

Please provide any additional thoughts on the sustainable potential of aquaponics to increase short crop production in St. Vincent and the Grenadines

It has great potential, should be well managed and implemented on a national front

I have none

"Aquaponics has significant sustainable potential to increase short crop production in St. Vincent and the Grenadines, offering solutions to food security, climate resilience, and economic diversification. Here are some key considerations:

1. Maximized Land Use & Urban Integration

St. Vincent has limited arable land, and aquaponics allows high-density crop production in small spaces, including urban areas, rooftops, and underutilized lands.

It can be integrated into schools, communities, and resorts, promoting sustainable local food systems.

2. Water Conservation & Climate Resilience

Aquaponics uses 90% less water than traditional farming, which is crucial for an island nation where droughts can impact agriculture.

Since crops are grown in controlled environments, they are less vulnerable to hurricanes, soil erosion, and unpredictable weather patterns.

3. Year-Round Crop Production & Food Security

Traditional farming in St. Vincent is seasonal and climate-dependent, but aquaponics enables consistent, year-round production of short-cycle crops like lettuce, kale, basil, and microgreens.

This would stabilize food prices and reduce reliance on imported vegetables.

4. Organic & Chemical-Free Farming

Since fish waste provides natural nutrients, there is no need for synthetic fertilizers or pesticides, making aquaponics a fully organic, eco-friendly farming method.

This could create a premium market for organic local produce, benefiting both local consumers and the tourism industry.

5. Economic Diversification & Job Creation

Aquaponics can create jobs in agriculture, agribusiness, and agritech, supporting local entrepreneurs, youth, and small-scale farmers.

A commercial aquaponics sector could supply restaurants, hotels, supermarkets, and export markets, providing new income streams for the economy.

"

Opportunity for lands that is not rich in minerals to produce healthy agricultural produce

With the impact of climate change on traditional farming, aquaponics is one way of producing food sustainably.

No additional thoughts.

Would be a great investment with long term benefits

None at the time. Looking forward to visiting one such farm and perhaps for the exploration of apron of a tourism aspect to it

It will be successful

This new initiative will be even beneficial to persons in the grenadines so they can grow their own food.

I don't know about it, I've never heard of it, but we should give it a try.

The Netherlands NL have always been an inspiration for both hydroponics. The close knitted relationship between educational institutions and farmers open all the doors to innovation

I believe that it could be beneficial once all protocols are followed and the necessary steps are taken for it to be successful.

Educational institutions should teach this. Small business is important and as students venture out in life they need to be exposed to another way, Also, the World is our stage, all 21st century learning is necessary to participate in 21st century.

Efficient use of limited land and water resources

Questions and Answers to the Interview with a Senior Official from the Ministry of Agriculture

Interviewer: **Can you enlighten me on the government policies or incentives that are geared at promoting agriculture and possibly aquaponics farming?**

Official: There are a number of programs in place at the ministry of agriculture aimed at supporting agriculture in general; the Zero Hunger Trust Fund, the Farmers Support Program, Pryme Grants, and FAO assistance are all programs in place to benefit farmers. Some offer financial support while others give technical/ training support to farmers and potential farmers.

Interviewer: How can one who might be interested in starting an aquaponics farm, benefit from these programs?

Official: Well, the can benefit, through the accessing of low interest rate loans, or grants. Also, agriculture officers can share knowledge and training support where possible.

Interviewer: **How can the government work with farmers to implement commercial aquaponics farming?**

Official: The government, through the Ministry of Agriculture provides several support mechanisms,

1. Leasing agricultural lands
2. 2. Offering duty-free concessions on farming equipment
3. 3. Providing technical assistance through partnerships with international organizations like FAO.
   Like I said earlier, the most notable way maybe through financial assistance, which is often a huge cost to start. And with the reluctance of our banks and credits unions to invest in agriculture it is one of the ways farmers have been benefiting over the years.

Interviewer: Okay. Thank you.

Interviewer: **Last question, what is one major limitation affecting agricultural productivity, and how is the Ministry addressing it?**

Official: One of our biggest challenge in agriculture is labor shortages. If you take a drive to rural side, you would see a lot of unused agricultural land. Young persons are not moving into this field as before and it is a significant challenge. To address this, we, the government have been working at integrating agriculture into school curriculums and collaborating with NGOs to promote agricultural training and modernization. Also, through our technical center there is an agricultural program that a number of person have been trained in.

Also, the incentive listed above are also meant to help in this regard

Aquaponics Questionna˙re Form
31 responses

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Publish analytics

General Information

Select the appropriate age group.31 responses

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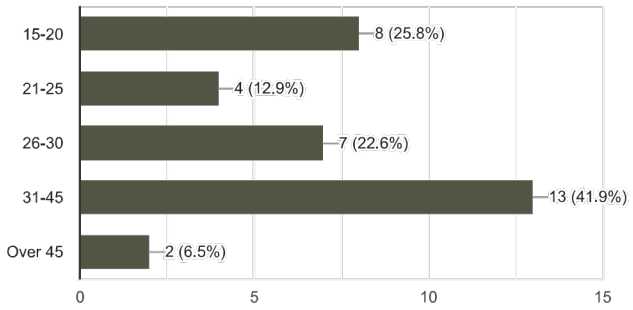
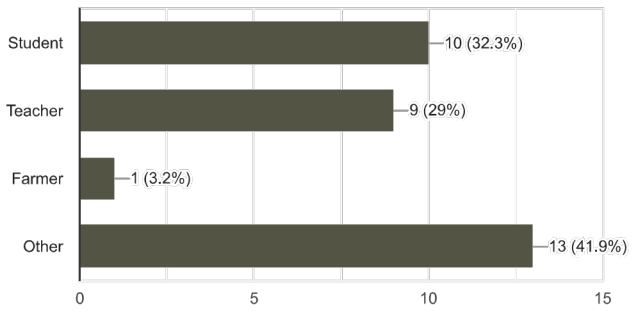


State your occupation31 responses



Experience and knowledge with Aquaponics.

Do you have interest in Agriculture?31 responses

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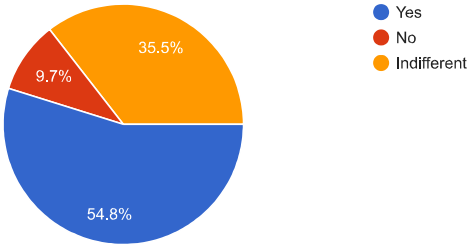

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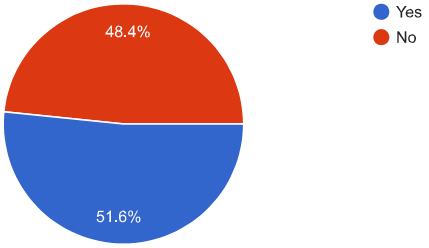
Have you heard of aquaponics before today?31 responses



How familiar are you w th short crops (example: lettuce, herbs etc.)?31 responses

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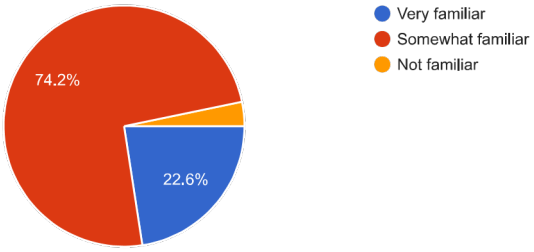
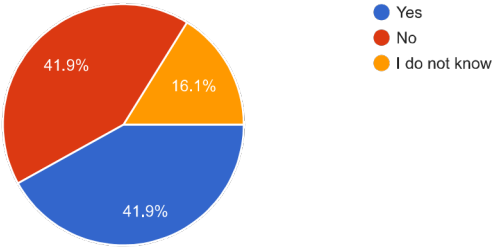


Are most short crops readily available in throughout the year?31 responses



Which short crop production would you like to see increase?27 responses

Aquaponics has the potential to complement, and in some cases, replace traditional farming, but its role depends on various factors like scale, purpose, and environmental conditions. Complement to Traditional Farming Aquaponics can serve as an efficient and sustainable addition to traditional farming, especially in areas with limited fertile soil or water resources. It provides an alternative for growing crops in urban settings, small spaces, or regions with extreme climates. Farmers can integrate aquaponics into their operations to diversify income, enhance sustainability, and reduce dependency on chemical fertilizers. Replacement of Traditional Farming While aquaponics offers numerous advantages—such as reduced water usage, year-round production, and elimination of synthetic fertilizers—it is unlikely to fully replace traditional farming on a large scale. Some challenges include high initial setup costs, technical knowledge requirements, and dependence on a controlled environment. Staple crops like wheat, corn, and rice, which require extensive land, are not well-suited for aquaponic systems. Conclusion Aquaponics is best viewed as a complement rather than a full replacement for traditional farming. It can enhance food security, especially in urban and arid areas, but traditional farming remains essential for large-scale staple crop production. The future likely involves a hybrid approach, integrating aquaponics with conventional agriculture for greater efficiency and sustainability.
More natural and nutrient rich
It will be more beneficial
If it aids with sustainabi ity, cost, production and delivery of nutrients. I see it as a more sustainable means of farming as it serves multipurposes
I really don't see a replacement but a complement. However, the traditional farming is necessary here in SVG. Too much lands with rich soil to be wasted.
It’s interesting but may have a good impact
It's very much more sustainable and produces less waste and also doubles the harvest size aswell and harvest time
I’m not sure how to answer but it seems like it would be great for increased food supply.
Do you believe that commercial aquaponics systems can be effective, at improve short crop production in St. Vincent and the Grenadines?31 responses

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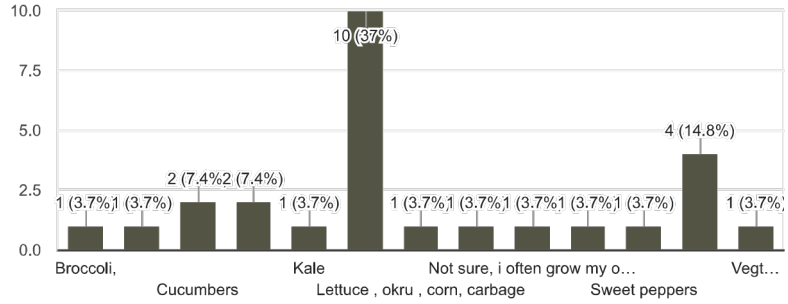

How do you perceive the replacement/complement of traditional farming with aquaponics?27 responses
It can help save land area
It will be a great boost for agriculture in svg
A great initiative
Copy
I don’t really have a opinion on it
Very good initiative
More organic food, more healthy population
I have no idea
Something I am opened to.
Viable
I think it is forward thinking and advantageous.
It should be beneficial to the economy especially farmers
Good
It takes up less land space therefore you do it in less time
It can be a useful compliment
There might be some merit this type of farming.
May increase crop production
Personally I dont think it’s a bad idea but St Vincent really can’t afford to implement it.
Not sure
Welcomed idea and eco friendly

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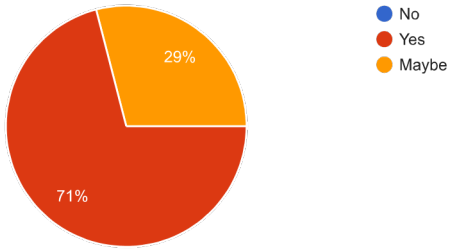
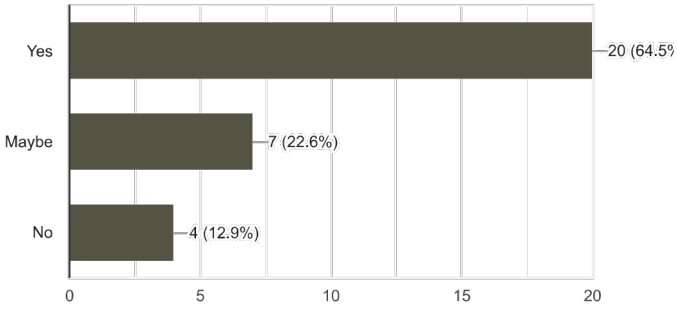
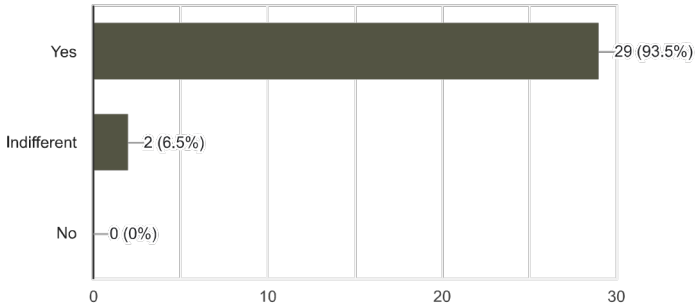


Would you be interested in farming, if it was less labor intensive31 responses

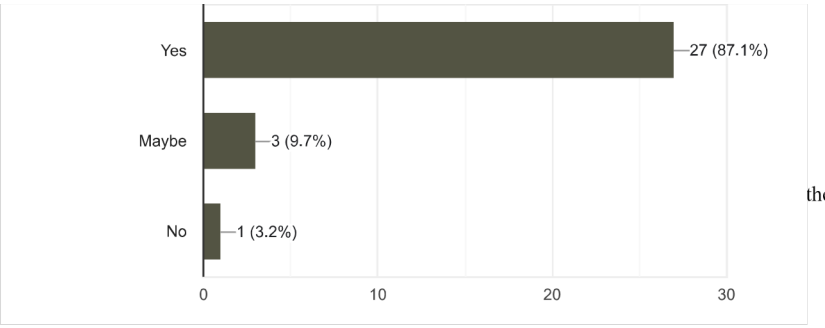


Are you more incline to purchase local, organic agricultural produce?31 responses



Aquaponics offer the advantage of producing 100% organic food, do you think this could create a viable niche market in St. Vincent and the Grenadines?

31 responses



the Grenadines?23 responses

More sales for the local farmers
Sorry I can't answer this
A healthier society
Fish farming
Agro processing
Agricultural tourism
Fish
Maybe medicinal plants
I'm not sure
Entertainment and educational content for farmers who can make content on their process and can activate other parallel or secondary production processes like the dang from other animals become a valuable which can give income to people with animal for such organic manure and trade for distributors
Aquaponics can support the cultivation of high-value herbs like basil, mint, rosemary, and lemongrass, as well as medicinal plants like moringa and neem, which have growing demand in health-conscious and natural remedy markets.
Better quality foods
Job opportunities
Fertilizer? Fish?
Employment, more use of technology in farming.
Employment
The need for less fertilizer since it uses fish maure it also encourages soil conservation practices since the land is able to rest
I'm not sure. I'm not very knowledgeable about farming.

Environemtal Impacts of Aquaponics

Of the following factors listed which do you think may promote the effectiveness of this type of farming in SVG? (**Please arrange in order of most effective to least effective, where 1 is most effective and 6 the least**)

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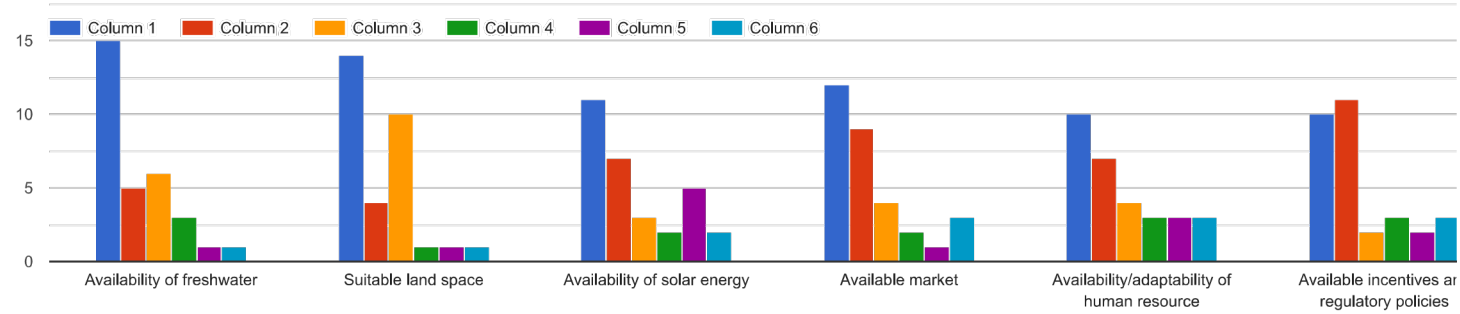

What factors do you think will limit the effectiveness of aquaponics in SVG? (**Please arrange in order of most effective to least effective, where 1 is most effective and 6 the least effective)**

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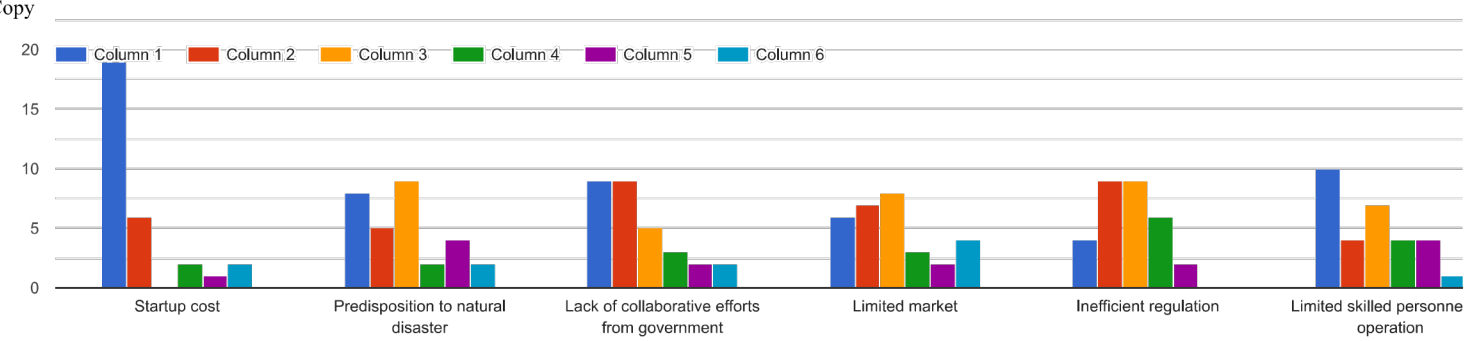
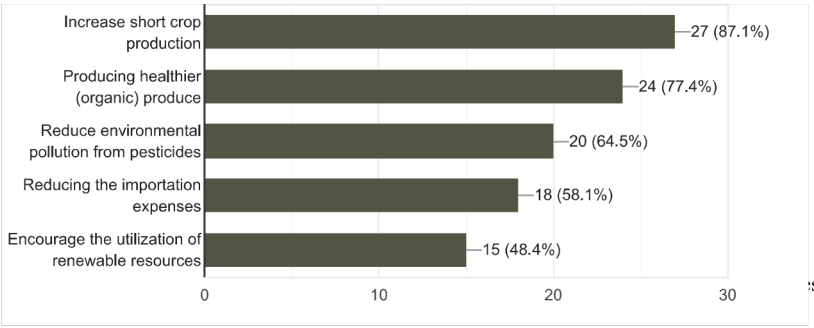


What potential benefits do you think can be derived from the commercial practice of aquaponics? (**Please select your top three picks**)31 responses



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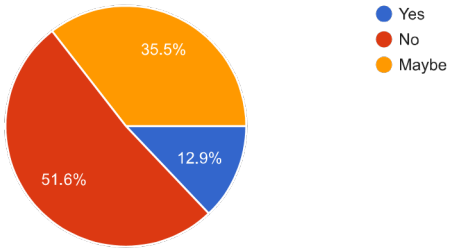

How might the development of commercial aquaponics farm affect traditional farming communities? (**Please arrange in order of most probable to least probable, where 1 is most probable and 6 the least probable)**

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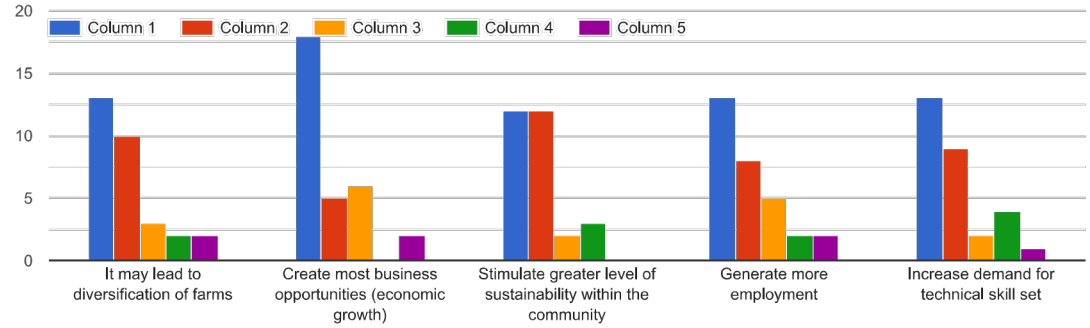

What do you envision for short crop production and agriculture through aquaponics facilities?21 responses
Large increase in short crop production and increase in profit for farmers
More healthy food and more economic growth for our people
N/A
A flourishing new farming method that will provide new employment, food, and more
Grapes
Greater expansion
Greater economic impact, a healthier society, more young people becoming interested in farming
It will increase...and possibly reduce price
A new and exciting yet rewarding venture
Increase in production and an increase in the variety of short crops. Additional more affordable prices
Better sustainability
Maybe providing markets with fresh organic produce to try and lessen the dependence on produces with pesticides and so on.
That it will be effective
Short crop grown on the water used for fish pond
I envision a highly efficient, sustainable, and technology-driven system that enhances food security and economic opportunities.
Higher availability of short crops of better quality
Healthy crops
If done right, more consistent and better quality
A greater more valuable market
The availability of fresh water fish for consumers aswell as the constant production of organic vegetables
Healthier produce

Barriers and Regulations

Do you think that the government should initially be a major investor in construction of a commercial aquaponics facility?31 responses

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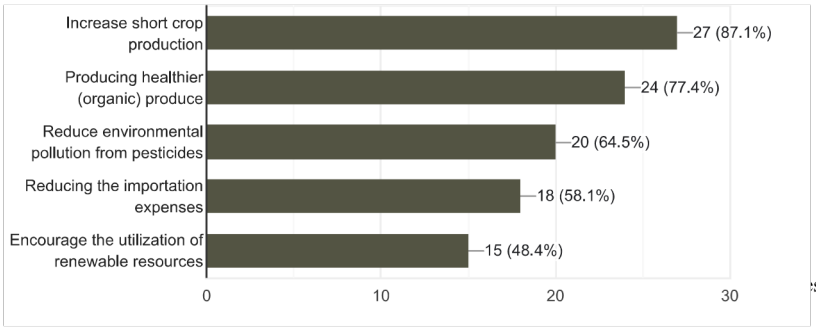

esponses

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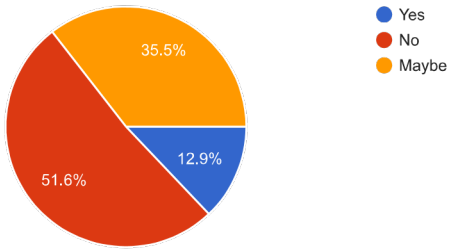

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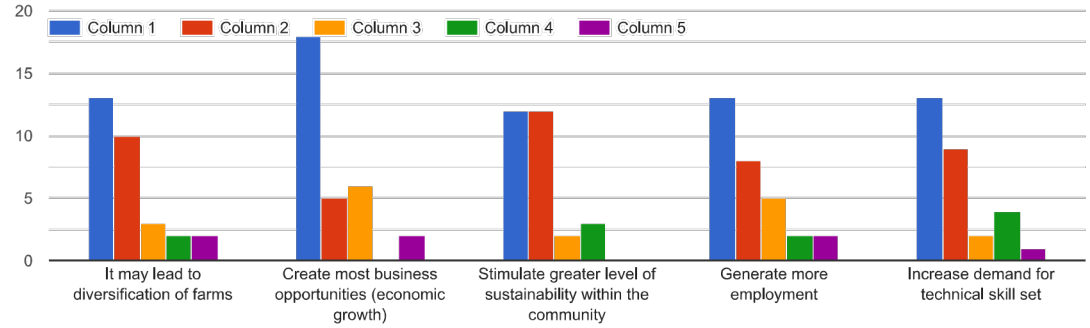

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Barriers and Regulations

Do you think that the government should initially be a major investor in construction of a commercial aquaponics facility?31 responses

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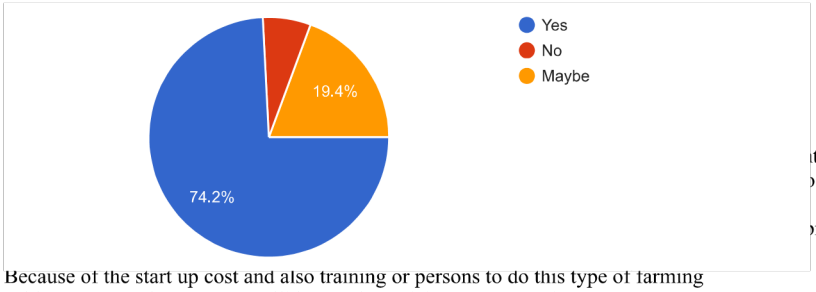

ities agricultural tourism
be a part of this type of farming .

oment

Because of the start up cost and also training or persons to do this type of farming
With more organic crops, we will import less of these same produce.
I see this as a holistic country involvement for it to thrive effectively
It would be a good investment economically for the government to be a major investor. The benefits to the country outweighs the risks.
Start up costs will be high
Its revenue increasing for the individuals but also ror the country as more goods csn also he exported.
Because the start up is expensive...any government subsidy will improve the success of the business
Depending on how the idea is developed and presented to the farmers
It will create awareness for farmers who are not familiar with this method of farming
They hold a majority of finance
Most farmers won't have the money needed to start this type of farming, so the government should at least provide a grant or invest as it could help to lessen the dependence on imported produce.
With the help of the government, the chances of being successful is 10/10
I am indifferent. Market or need driven commercial initiatives are more resilient and innovative than government driven. Gov should regulate and incentivize through research and info and maybe other forms of economic production
1. Food Security & Reduced Imports St. Vincent and the Grenadines imports a significant amount of produce. A government-backed aquaponics facility could enhance local food production, reduce dependency on imports, and stabilize food prices. 2. Economic Growth & Job Creation A large-scale aquaponics facility would create employment opportunities in agriculture, technology, and agribusiness, supporting both urban and rural communities. 3. Support for Farmers & Small Businesses The government can use the facility as a training and research center, allowing local farmers to learn aquaponic techniques and adopt them on their own farms. This would empower small-scale producers and encourage innovation in agriculture.
It will be difficult to get capital for such activities so the government can help by sponsoring the motion
Because the government has the biggest influence on the society, it will be able to promote aquaponics
Other forms of funding can be sourced. Govt doesn't always have to get involved in the beginning stages financially, sometimes it makes some
Water consumption: water shortage in dry seasons
Helps to raise capital in starting the business
The government has more capital for the Creation of markets as well as incentives for farmers to start up and be successful
I think the Government should sponsor the start up but allow someone else to be responsible for the operations of the facility. It would ensure that a fair employment is
Copygiven to those who actually want to engage in this venture.
Would the implementation of commercial aquaponics need to be regulated by the government?30 responses

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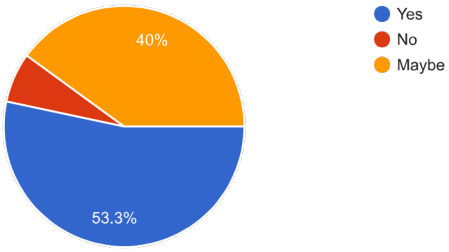
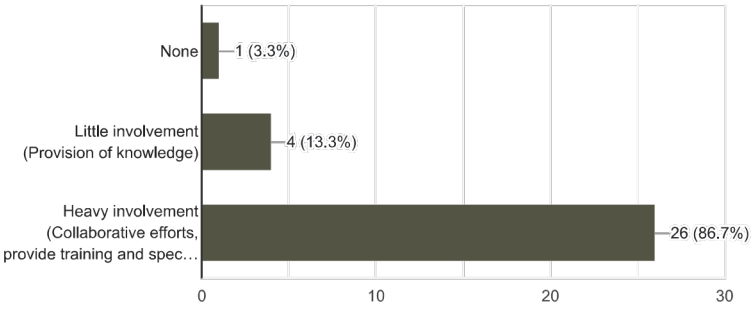


What level of involvement should educational institutions play in promoting sustainable agricultural practice like aquaponics?30 responses



Which of the regulatory measures listed should be made mandatory?

30 responses

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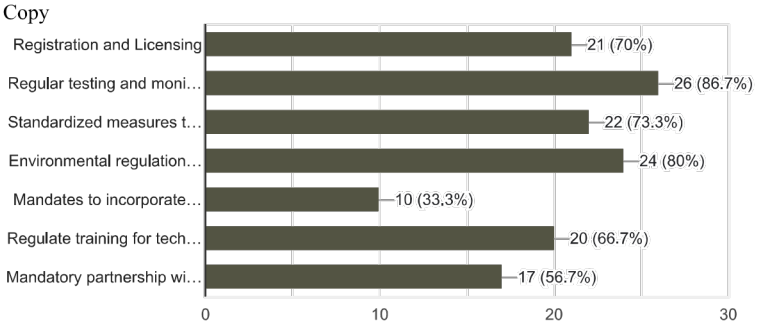

Additional Comments

Please provide any additional thoughts on the sustainable potential of aquaponics to increase short crop production in St. Vincent and the Grenadines15 responses
Efficient use of limited land and water resources
I have none
This new initiative will be eve beneficial to persons in the grenadines so they can grow their own food .
With the impact of climate change on traditional farming, aquaponics is one way of producing food sustainably.
It has great potential, should be well managed and implemented on a national front
Would be a great investment with long term benefits
I don't know about it, I've never heard of it, but we should give it a try.
The Netherlands NL have always been an inspiration for both hydroponics. The close knitted relationship between educational institutions and farmers open all the doors to innovation
Aquaponics has significant sustainable potential to increase short crop production in St. Vincent and the Grenadines, offering solutions to food security, climate resilience, and economic diversification. Here are some key considerations: 1. Maximized Land Use & Urban Integration St. Vincent has limited arable land, and aquaponics allows high-density crop production in small spaces, including urban areas, rooftops, and underutilized lands. It can be integrated into schools, communities, and resorts, promoting sustainable local food systems. 2. Water Conservation & Climate Resilience Aquaponics uses 90% less water than traditional farming, which is crucial for an island nation where droughts can impact agriculture. Since crops are grown in controlled environments, they are less vulnerable to hurricanes, soil erosion, and unpredictable weather patterns. 3. Year-Round Crop Production & Food Security Traditional farming in St. Vincent is seasonal and climate-dependent, but aquaponics enables consistent, year-round production of short-cycle crops like lettuce, kale, basil, and microgreens. This would stabilize food prices and reduce reliance on imported vegetables. 4. Organic & Chemical-Free Farming Since fish waste provides natural nutrients, there is no need for synthetic fertilizers or pesticides, making aquaponics a fully organic, eco-friendly farming method. This could create a premium market for organic local produce, benefiting both local consumers and the tourism industry. 5. Economic Diversification & Job Creation Aquaponics can create jobs in agriculture, agribusiness, and agritech, supporting local entrepreneurs, youth, and small-scale farmers. A commercial aquaponics sector could supply restaurants, hotels, supermarkets, and export markets, providing new income streams for the economy.
It will be successful
None at the time. Looking forward to visiting one such farm and perhaps for the exploration of apron of a tourism aspect to it
Educational institutions should teach this. Small business is important and as students venture out in life they need to be exposed to another way,. Also, the World is our stage, all 21st century learning is necessary to participate in 21st century.
I believe that it could be beneficial once all protocols are followed and the necessary steps are taken for it to be successful.
Opportunity for lands that is not rich in minerals to produce healthy agricultural produce
No additional thoughts.

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APPLICATION FOR ETHICAL APPROVAL

In order for research to result in benefit and minimise risk of harm, it must be conducted ethically. A researcher may not be covered by the University's insurance if ethical approval has not been obtained prior to commencement.

The University follows the OECD Frascati manual definition of **research activity**: "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications". As such this covers activities undertaken by members of staff, postgraduate research students, and both taught postgraduate and undergraduate students working on dissertations/projects.

The individual undertaking the research activity is known as the "principal researcher".

Ethical approval is not required for routine audits, performance reviews, quality assurance studies, testing within normal educational requirements, and literary or artistic criticism.

Please read the notes for guidance before completing ALL sections of the form.

This form must be completed and approved prior to undertaking any research activity. Please see Checklist for details of process for different categories of application.

Delete the Guidance Notes at the end of the form BEFORE submitting your application

SECTION A: ABOUT YOU (PRINCIPAL RESEARCHER)

1	Full Name:		Marcella S. Dublin			
2	Tick all boxes which apply:		Member of staff:	☐	Honorary research fellow:	☐
3	Undergraduate Student	☐	Taught Postgraduate Student	☒	Postgraduate Research Student	☐

4	Institute/Academic Discipline/Centre:	University of Wales Saint Trinity David
5	Campus:	Carmarthen
6	E-mail address:	2114025@student.uwtsd.ac.uk

7	Contact Telephone Number:	
	For students:	
8	Student Number:	2114025
9	Programme of Study:	Sustainability Leadership
10	Director of Studies/Supervisor:	Roisin Mullins

SECTION B: APPROVAL FOR RESEARCH ACTIVITY

1	Has the research activity received approval in principle? (please check the Guidance Notes as to the appropriate approval process for different levels of research by different categories of individual)	**YES**	☐	**NO**	☐
				Date	
2	If Yes, please indicate source of approval (and date where known): ***Approval in principle must be obtained from the relevant source prior to seeking ethical approval***	Research Degrees Committee	☐		
3		Institute Research Committee	☐		
4		Other (write in)	☐		

SECTION C: INTERNAL AND EXTERNAL ETHICAL GUIDANCE MATERIALS

	Please list the core ethical guidance documents that have been referred to during the completion of this form (including any discipline-specific codes of research ethics, and also any specific ethical guidance relating to the proposed methodology). Please tick to confirm that your research proposal adheres to these codes and guidelines.	
1	**UWTSD Research Ethics & Integrity Code of Practice**	☒
2	**UWTSD Research Data Management Policy**	☒
3	UK data Protection Act (DPA) 1998	☒

SECTION D: EXTERNAL COLLABORATIVE RESEARCH ACTIVITY

1	Does the research activity involve collaborators outside of the University?	**YES**	☐	**NO**	☒

2	If Yes, please provide the name of the external organisation and name and contact details for the main contact person and confirmation this person has consented to their personal data being shared.as part of this collaboration.					
3	Institution					
4	Contact person name					
5	Contact person e-mail address					
6	Has this individual consented to sharing their details on this form?		**YES**	☐	**NO**	☐
7	Are you in receipt of a KESS scholarship?		**YES**	☐	**NO**	☐
8	Is your research externally funded		**YES**	☐	**NO**	☐
9	Are you specifically employed to undertake this research in either a paid or voluntary capacity?	Voluntary	**YES**	☐	**NO**	☐
10		Employed	**YES**	☐	**NO**	☐
11	Is the research being undertaken within an existing UWTSD Athrofa Professional Learning Partnership (APLP)	If YES then the permission question below does not need to be answered.	**YES**	☐	**NO**	☐
12	Permission to undertake the research has been provided by the partner organisation	(If YES attach copy) If NO the application cannot continue	**YES**	☐	**NO**	☐

WHERE RESEARCH ACTIVITY IS CARRIED OUT IN COLLABORATION WITH AN EXTERNAL ORGANISATION

13	Does this organisation have its own ethics approval system?	**YES**	☐	**NO**	☐
14	If Yes, please attach a copy of any final approval (or interim approval) from the organisation				

SECTION E: DETAILS OF RESEARCH ACTIVITY

1	Indicative title:	The sustainable potential of using aquaponics to scale up short crop production in St. Vincent and the Grenadines		
2	Proposed start date:	30/10/2023	Proposed end date:	1/5/2024

3	**Introduction to the Research (maximum 300 words)** **Ensure that you write for a <u>Non-Specialist Audience</u> when outlining your response to the three points below:** • *Purpose of Research Activity* • *Proposed Research Question* • *Aims of Research Activity* • *Objectives of Research Activity* Demonstrate, briefly, how **<u>Existing Research</u>** has informed the proposed activity and explain • *What the research activity will add to the body of knowledge* • *How it addresses an area of importance.*
4	**Purpose of Research Activity** Residing in a developing country, where the negative effects of climate change are more severe and the agricultural and tourism sector are major stimulus for economic activities, it is paramount that such sustainable practices are embedded within all sectors from policies to application, through innovative ideas and practices, so that production activities are aligned with the relevant 2030 sustainable goals. It is for this reason my 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. 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 through 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.
5	**Research Question** What policy implementation, innovative development and or collaborative efforts is required to construct large scale aquaponics systems to selectively maximize on short crop production in St. Vincent and the Grenadines to promote profitable and sustainable agricultural and economic growth and development?
6	**Aims of Research Activity**
	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.

7	**Objectives of Research Activity** To highlight and analyse the role/s of policy makers, educational institutions and other relevant stakeholders in the successful implementation of commercial aquaponics farms To investigate which aquaponics system and business model will be best suited to maximize profitability and promote long-term productivity and sustainability To create a niche market, that will foster investment opportunities that can stimulate partnership amongst creative and passionate youths in the agricultural sector
8	**Proposed methods (maximum 600 words)** Provide a brief summary of all the methods that **may** be used in the research activity, making it clear what specific techniques may be used. If methods other than those listed in this section are deemed appropriate later, additional ethical approval for those methods will be needed.
9	Data will be collected by both quantitative and qualitative means. These will include; interviews, questionnaires, focus groups and first hand observation. Small samples of some potential stakeholders, such as authoritative figures in the agriculture ministry, business owners, farmers and relevant educators would play a vital role in producing in-depth insight for critical analysis in the given area. While the younger section of the populace will play an important part innovative imagination and possibility implementation. Interviews will be conducted one on one and in small groups, mainly with authoritative figures listed above. The number of interviews will be limited to between 10-15 persons. This because of the magnitude of the research, it will help to reduce the emotional and physical demand to processing data collected. Boddy, C.R. (2016) states that the risk for distress must be outweighed by the benefits to participants to rend a larger sample size ethical, in this research the benefits to participant is projected to be very low in the short term and thus using a smaller sample size will increase the ethical viability of the method. Marshall, Bryan & Cardon et al (2013) and Bacchetti 2005 highlight that a sample size is contextual and dependent on the research making it somewhat subjective and dependent of the factors that will impact the collection and analytical processing of data. Bearing that in mind, the sample size for questionnaires will be between 100-150 participants to increase the diversity of participants, allowing for different perspectives to be understood. In addition to interviews and questionnaire, there will be first hand observation, of a focus group, at a technical institution that employs an aquaponics system for crop production. This will allow researcher to identify strengths and limitations of the system thus stimulating the creative faculties and gather information from experts on alternatives to improves the efficiency of this system and its application in the local environment.

10	**Location of research activity** Identify all locations where research activity will take place.
11	St. Vincent and the Grenadines
12	**Research activity outside of the UK** If research activity will take place overseas, you are responsible for ensuring that local ethical considerations are complied with and that the relevant permissions are sought. Specify any local guidelines (e.g. from local professional associations/learned societies/universities) that exist and whether these involve any ethical stipulations beyond those usual in the UK (provide details of any licenses or permissions required). Also specify whether there are any specific ethical issues raised by the local context in which the research activity is taking place, for example, particular cultural and/or legal sensitivities or vulnerabilities of participants.
13	N/A

14	Use of documentation not in the public domain: Are any documents **NOT** publicly available?	**NO**	☒
		YES	☐
15	If Yes, please provide details here of how you will gain access to specific documentation that is not in the public domain and that this is in accordance with prevailing data protection law of the country in question and England and Wales.		

SECTION F: SCOPE OF RESEARCH ACTIVITY

	Will the research activity include:	**YES**	**NO**
2	Use of a questionnaire or similar research instrument?	☒	☐
3	Use of interviews?	☒	☐
4	Use of diaries?	☒	☐
5	Participant observation with their knowledge?	☒	☐
6	Participant observation without their knowledge?	☐	☒
7	Use of video or audio recording?	☒	☐
8	Access to personal or confidential information without the participants' specific consent?	☐	☒
9	Administration of any questions, test stimuli, presentation that may be experienced as physically, mentally or emotionally harmful / offensive?	☐	☒
10	Performance of any acts which may cause embarrassment or affect self-esteem?	☐	☒

11	Investigation of participants involved in illegal activities?	☐	☒
12	Use of procedures that involve deception?	☐	☒
13	Administration of any substance, agent or placebo?	☐	☒
14	Working with live vertebrate animals?	☐	☒
15	Other primary data collection methods, please explain in this box For example, 'focus groups'. Please indicate the type of data collection method(s) in this box and tick the accompany box.	☒	☐
16	The research will also employ the use of survey and focus group to collect data and insight. These quantitative research methods will allow for larger quantity of information to be collected from a diverse pool of participation, thought they share similar profession (farming). Similarly, the research will utilize observation as a research method, this will be valuable in developing links for explanation and exploration of the proposed topic. (this box should expand as you type)		

If NO to every question, then the research activity is (ethically) low risk and **may** be exempt from **some** of the following sections (please refer to Guidance Notes).

If YES to any question, then no research activity should be undertaken until full ethical approval has been obtained.

SECTION G: INTENDED PARTICIPANTS

1	**Who are the intended participants:**	**YES**	**NO**
2	Students or staff at the University?	☐	☒
3	Adults (over the age of 18 and competent to give consent)?	☒	☐
4	Vulnerable adults?	☐	☒
5	Children and Young People under the age of 18? (Consent from Parent, Carer or Guardian will be required)	☒	☐
6	Prisoners?	☐	☒
7	Young offenders?	☐	☒
8	Those who could be considered to have a particularly dependent relationship with the investigator or a gatekeeper?	☐	☒
9	People engaged in illegal activities?	☐	☒
10	Others (please identify specifically any group who may be unable to give consent) please indicate here and tick the appropriate box.	☐	☒

11	Other – please indicate here:		

12	**Participant numbers and source** Provide an estimate of the expected number of participants. How will you identify participants and how will they be recruited?	
13	How many participants are expected?	100-200
14	Who will the participants be?	Participants includes: Science teachers at top secondary schools and college Senior workers at the Ministry of Agriculture Agriculture Students (access via teachers) Students at a Technical institution Farmers Personal from Fisheries Researchers
15	How will you identify the participants?	Some participants will be randomly selected (Farmers and students) this is to reduce biasness Some will be selected for their expert knowledge and experiences through their ties with - Educational institutions - Government Ministries - Business entities

16	**Information for participants:**	**YES**	**NO**	**N/A**
17	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	☒	☐	☐
18	Will you tell participants that their participation is voluntary?	☒	☐	☐
19	Will you obtain written consent for participation?	☒	☐	☐
20	Will you explain to participants that refusal to participate in the research will not affect their treatment or education (if relevant)?	☒	☐	☐
21	If the research is observational, will you ask participants for their consent to being observed?	☒	☐	☐
22	Will you tell participants that they may withdraw from the research at any time and for any reason?	☒	☐	☐
23	With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☒	☐	☐
24	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☒	☐	☐
25	Will you debrief participants at the end of their participation, in a way appropriate to the type of research undertaken?	☒	☐	☐
26	If NO to any of above questions, please give an explanation			
27				

28	**Information for participants:**	**YES**	**NO**	**N/A**
29	Will participants be paid?	☐	☒	☐
30	Is specialist electrical or other equipment to be used with participants?	☐	☒	☐
31	Are there any financial or other interests to the investigator or University arising from this study?	☐	☒	☐
32	Will the research activity involve deliberately misleading participants in any way, or the partial or full concealment of the specific study aims?	☐	☒	☐
33	If YES to any question, please provide full details			
34				

SECTION H: ANTICIPATED RISKS

1	**Outline any anticipated risks that may adversely affect any of the participants, the researchers and/or the University, and the steps that will be taken to address them.** If you have completed a full risk assessment (for example as required by a laboratory, or external research collaborator) you may append that to this form.		
2	**Full risk assessment completed and appended?**	**Yes**	

		No
3	**Risks to participants** For example: emotional distress, financial disclosure, physical harm, transfer of personal data, sensitive organisational information	
4	Risk to Participant: Transfer of persona data, sensitive organisational information	All information received will be confidential and only shared to necessary third parties (supervisor and examiner/s). Information received will be secure through the use of password on electronics. Also, the researcher is obligated to follow ethical policies for data management stipulated by her academic institution
5	If research activity may include sensitive, embarrassing or upsetting topics (e.g. sexual activity, drug use) or issues likely to disclose information requiring further action (e.g. criminal activity), give details of the procedures to deal with these issues, including any support/advice (e.g. helpline numbers) to be offered to participants. Note that where applicable, consent procedures should make it clear that if something potentially or actually illegal is discovered in the course of a project, it may need to be disclosed to the proper authorities	
	NA	
6	**Risks to investigator** For example: personal safety, physical harm, emotional distress, risk of accusation of harm/impropriety, conflict of interest	
	Risk to Investigator: Investigator will face low level of emotional distress and physical harm traveling to and from varying establishment and farm to collect data and observed operation of an aquaponics system respectively.	To mitigate these risk, the use of a personal trusted driver will be used to travel to and from, also the investigator will employ the use of electronic methods to communicate and collect data where possible
7	**University/institutional risks** For example: adverse publicity, financial loss, data protection	
	Risk to University: The university faces low risk of data protection	The University reduced this by storing data on secured and encrypted platform accessible only to members bound by ethics and regulations that if breached carried severe penalties.

8	**Disclosure and Barring Service**			
9	If the research activity involves children or vulnerable adults, a Disclosure and Barring Service (DBS) certificate must be obtained before any contact with such participants.	**YES**	**NO**	**N/A**
10	Does your research require you to hold a current DBS Certificate?	☐	☒	☐

SECTION I: FEEDBACK, CONSENT AND CONFIDENTIALITY

1	**Feedback** What de-briefing and feedback will be provided to participants, how will this be done and when?
	Researcher will set up an email address that they will be able to contact for further details or results.
2	**Informed consent** Describe the arrangements to inform potential participants, before providing consent, of what is involved in participating. Describe the arrangements for participants to provide full consent before data collection begins. If gaining consent in this way is inappropriate, explain how consent will be obtained and recorded in accordance with prevailing data protection legislation.
	For participants responded via questionnaires an appropriate consent form will be made mandatory and thus will be treated with confidentiality as they are personal data. For questionnaires that will be administered online, the consent form will be shown before participant proceed, proceeding to the form will indicate their consent. Interviews and observation, consent will be required before the start of the process, orally.
3	**Confidentiality / Anonymity** Set out how anonymity of participants and confidentiality will be ensured in any outputs. If anonymity is not being offered, explain why this is the case.
	The name of participants and their organisation will not be collected unless needed, where it is necessary to do such explicit permission will be requested to do so.

SECTION J: DATA PROTECTION AND STORAGE

In completing this section refer to the University's Research Data Management Policy and the extensive resources on the University's Research Data Management web pages (http://uwtsd.ac.uk/library/research-data-management/).

1	Does the research activity involve personal data (as defined by the General Data Protection Regulation 2016 "GDPR" and the Data Protection Act 2018 "DPA")?	**YES**	**NO**
	"Personal data" *means any information relating to an identified or identifiable natural person ('data subject'). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.*	☐	☐
2	If YES, provide a description of the data and explain why this data needs to be collected:		
	No		
3	Does it involve special category data (as defined by the GDPR)?	**YES**	**NO**

	"Special category data" *means sensitive personal data consisting of information as to the data subjects' – (a) racial or ethnic origin,* *(b) political opinions,* *(c) religious beliefs or other beliefs of a similar nature,* *(d) membership of a trade union (within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992),* *(e) physical or mental health or condition,* *(f) sexual life,* *(g) genetics,* *(h) biometric data (as used for ID purposes),*	☐	☐
4	If YES, provide a description of the special category data and explain why this data needs to be collected:		
	NO		

5	Will the research activity involve storing personal data and/or special category data on one of the following:	**YES**	**NO**
6	Manual files (i.e. in paper form)?	☐	☒
7	University computers?	☐	☒
8	Private company computers?	☐	☒
9	Home or other personal computers?	☐	☒
10	Laptop computers/ CDs/ Portable disk-drives/ memory sticks?	☒	☐
11	"Cloud" storage or websites?	☒	☐
12	Other – specify:	☐	☐
13	For all stored data, explain the measures in place to ensure the security of the data collected, data confidentiality, including details of password protection, encryption, anonymisation and pseudonymisation:		
	All data will be kept in password protected cloud storage on the University Office 365 system which will not be shared. Audio/visual data will be transcribed and would be shown to participants to		

	check accuracy of reporting. Any USB sticks used to store or transfer data will be password protected. All participants will be given a unique identifier to ensure confidentiality and this list will be kept securely in the password protected folder.		
14	**All Data Storage**		
15	Will the research activity involve any of the following activities:	**YES**	**NO**
16	Electronic transfer of data in any form?	☒	☐
17	Sharing of data with others at the University?	☒	☐

18	Sharing of data with other organisations?	☒	☐
19	Export of data outside the European Union or importing of data from outside the UK?	☒	☐
20	Use of personal addresses, postcodes, faxes, emails or telephone numbers?	☒	☐
21	Publication of data that might allow identification of individuals?	☒	☐
22	Use of data management system?	☒	☐
23	Data archiving?	☒	☐
24	If YES to any question, please provide full details, explaining how this will be conducted in accordance with the GDPR and DPA (and/or any international equivalent):		
	All data will be encrypted and kept in password protected cloud storage on the University Office 365 system which will not be shared. Any USB sticks used to store or transfer data will be password protected. All data transfers will be encrypted and password protected. All participants will be given a unique identifier to ensure confidentiality and this list will be kept securely in the password protected folder. The data will be stored until the completion of the project and then deleted. In accordance with the DPA2018, participants will have the right to ask to see what data is held relating to them, and this data will be deleted immediately if the participant requests this, in which case the data will not be used in the project.		
25	List all who will have access to the data generated by the research activity:		
	The researcher Researcher's supervisor External examiner UWTSD students and members that have access to the library platform		
26	List who will have control of, and act as custodian(s) for, data generated by the research activity:		
	The Researcher The UWTSD for the stipulated period of which the research paper will be available in the library system		
27	Give details of data storage arrangements, including security measures in place to protect the data, where data will be stored, how long for, and in what form. Will data be archived – if so how and if not why not.		
	All data will be encrypted and kept in password protected cloud storage on the University Office 365 system which will not be shared. Any USB sticks used to store or transfer data will be password protected, and will be reformatted at the end of the project in order to destroy the data. The data will be stored until the completion of the project and then deleted.		
28	Please indicate if your data will be stored in the UWTSD Research Data Repository (see https://researchdata.uwtsd.ac.uk/). If so please explain. (*Most relevant to academic staff)*		

	Yes, data collected that will be documented in the research paper will be stored via the University library and the British Library system, making it accessible to all that has access to these platforms. In addition, data will share with relevant stakeholders in the form of findings and recommendations for practical application of research topic and for further research in the future and publications.		
29	Confirm that you have read the UWTSD guidance on data management (see https://www.uwtsd.ac.uk/library/research-data-management/)	**YES**	☒
		NO	☐
30	Confirm that you are aware that you need to keep all data until after your research has completed or the end of your funding	**YES**	☒
		NO	☐

SECTION K: DECLARATION

31	The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants. In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice which is published on the website: https://www.uwtsd.ac.uk/research/research-ethics/		
	Signature of applicant:	Marcella Dublin	**Date:** 13.01.2024

For STUDENT Submissions:

32	Director of Studies/Supervisor:	Roisin Mullins	**Date:**
33	Signature:		

For STAFF Submissions:

34	Academic Director/ Assistant Dean:		**Date:**
35	Signature:		

Checklist: Please complete the checklist below to ensure that you have completed the form according to the guidelines and attached any required documentation:

☒	I have read the guidance notes supplied before completing the form.
☐	I have completed **ALL RELEVANT** sections of the form in full.
☒	I confirm that the research activity has received approval in principle
☒	I have attached a copy of final/interim approval from external organisation (**where appropriate**)
☐	I have attached a full risk assessment (and have NOT completed Section H of this form) (where appropriate) *ONLY TICK IF YOU HAVE **ATTACHED A FULL RISK ASSESSMENT***
☒	I understand that it is my responsibility to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice.
☒	I understand that before commencing data collection all documents aimed at respondents (including information sheets, consent forms, questionnaires, interview schedules etc.) must be confirmed by the DoS/Supervisor, module tutor or Academic Director.
☒	I have deleted the guidance notes before submitting the PG2 for consideration

RESEARCH STUDENTS AND STAFF ONLY
All communications relating to this application during its processing must be in writing and emailed to pgresearch@uwtsd.ac.uk , with the title 'Ethical Approval' followed by your name.
You will be informed of the outcome of your claim by email; therefore it is important that you check your University and personal email accounts regularly**.**

STUDENTS ON UNDERGRADUATE OR TAUGHT MASTERS PROGRAMMES should submit this form (and receive the outcome) via systems explained to you by the supervisor/module leader.

This form is available electronically from the Academic Office web pages:
https://www.uwtsd.ac.uk/academic-office/appendices-and-forms/

APPLICATION PROCESS

All staff research projects and all research students must submit the Ethical Approval Form to the **University Research Ethics Committee** via the Academic Office (pgresearch@uwtsd.ac.uk). Staff research directly in relation to personal study for taught undergraduate or Masters programmes should be submitted via the Institute procedures explained below.

TAUGHT MASTERS AND TAUGHT UNDERGRADUATE RESEARCH ETHICAL APPROVAL FORMS ARE CONSIDERED WITHIN
Institutes. Institutes will provide details of the specific processes for this. Where the Ethical issues within any single ethical application are of particular concern the Institute will refer these to the University Research Ethics Committee. Any student activity that involves the collection of primary data needs to undergo Ethical approval, this includes assignment work as well as dissertations.

NOTES FOR GUIDANCE IN COMPLETION OF THIS FORM

Section A: About You
Please complete all relevant sections

SECTION B: APPROVAL FOR RESEARCH ACTIVITY
Research proposals must be approved in principle before applying for Ethical Approval. The proposal approval only becomes final when the ethical approval is received.

The process for proposal approval varies according the individual and programme of study:

- Research students, by application on form PG1 to the Research Degrees Committee
- Taught students by review of research proposal within Institutes (Institutes provide specific details of these processes)
- Staff, by agreement by the Academic Director/Assistant Dean

SECTION C: EXTERNAL ETHICAL GUIDANCE MATERIALS
Many discipline areas are required to operate with the discipline specific codes of research ethics (for example health, psychology, education etc.), any such codes must be listed and you must tick to confirm that you have consulted with these.

SECTION D: EXTERNAL COLLABORATIVE RESEARCH ACTIVITY
Provide details of the external collaborative partners, where appropriate you might want to submit a copy of the external collaboration agreement with the Ethical Approval Form. If the partner requires the research to be subject to its own internal Ethical approval process then please provide details of that process and a copy of any final (or interim) approvals received from the organisation.

SECTION E: DETAILS OF RESEARCH ACTIVITY
Remember that the individuals reviewing this Ethical Approval Form may not have seen your research proposal, and also may not be experts in the specific area of your research. The information provided should therefore be jargon free and clearly stated.

Indicative Title: please use the same title as used on the research proposal.

Purpose: the Ethical approval process will want to ensure that the methods you propose are adequate and appropriate to address the research aims and objectives. Excessive additional data collection can be seen as unethical.

Proposed Methods: the Ethical approval process seeks to ensure that you understand the methods that are intended, and that the implementation of those methods will be appropriate and without unnecessary impact on respondents. This section must explain how the methods described will lead to the collection of necessary and sufficient data, but not excessive data. Please be specific.

Location: this needs to mention geographical location and also local situation (for example, within Local Authority Offices in Cardiff, using a private room but close to other individuals). If you are collecting data within an organisational setting then you need to explain the permissions that you have obtained to do this.

Research Activity outside of the UK: please complete this section in detail, and note any guidance you have received. Also describe your own familiarity (or not) with the location that you will be utilising.

SECTION F: SCOPE OF RESEARCH ACTIVITY
Please tick ALL of the research activities that might be undertaken. If any additional types of activity are intended then please add an extra box and describe these.

If you have answered no to all questions in F then sections G and I do not need to be completed. . Signatures are still required in section K.

SECTION G: INTENDED PARTICIPANTS
Please tick all categories that might apply.

Numbers & Source: if you are using a series of different methods or research activities please list numbers for each stage/phase. Be clear about how you will find respondents. Will you use intermediaries, and if so how? How will you ensure compliance with your sampling strategy?

Information for participants: all participants should be appropriately informed about the research, what is expected of them and what will happen to the information that they provide. The Ethical review process does not ask to see this documentation, but requires this to be reviewed and approved by the Director of Studies in the case of research students, the supervisor/module tutor in relation to students on taught programmes and the Academic Director/Assistant Dean in relation to staff research.

SECTION H: ANTICIPATE RISKS
All research carries some level of risk. The answers you provide to questions in this section will be reviewed to ensure that you have an appropriate understanding of the type of risks involved and how you can mitigate against these risks. If you have completed a full risk assessment, as required for example for laboratory work, field work, clinical tests, diving operations, or by a collaborative partner, you may append that to this form. In that case, please tick the box indicating this has been provided. You will not then be required to complete Section H.

Risk to participants Think very carefully about how your actions/questions/discussions might affect the people you are involving as participants. You might identify the risk as small but it would still be a risk. Many types of question have the potential to make respondents less content with their life / job; you need to recognise and try to ameliorate any such effects

If these are business owners, time with you may reduce profit.

In some locations physical risk is very real to both participants and yourself, please consider this.

Risk to you, the researcher Think about where you will meet people, if there are any dangers involved in the location. If you are meeting people as individuals think about using a public place. In general do not visit people in their own homes or remote locations. If you are talking to individuals about certain issues think about how their responses might affect you emotionally. What about the risk of collecting insufficient data?

Risk to the University When undertaking your research, you are acting as a member of the University (student or staff). Professionalism is important, so it is important to be well organised and well prepared. Punctuality, clarity etc. are all part of this. What will you do to ensure this? You must ensure you do not harm the good name of the University in any way and do nothing to undermine the reputation of the research it conducts and sponsors. Upholding high standards of conduct and integrity are vital in this regard. You must also conduct the research in such a way to minimise the potential for claims of negligence made against the University, its researchers and any collaborating individual or organisation. In this respect you should always comply with ethical, legal and professional frameworks, obligations and standards as required by statutory and regulatory authorities, as well as the university's Research Integrity and Ethics Code of Practice. Research misconduct in this respect can take many forms, including:

- fabrication: making up results or other outputs (eg, artefacts) and presenting them as if they were real
- falsification: manipulating research processes or changing or omitting data without good cause
- plagiarism: using other people's material without giving proper credit
- failure to meet ethical, legal and professional obligations: for example failure to declare competing interests; misrepresentation of involvement or authorship; misrepresentation of interests; breach of confidentiality; lack of informed consent; misuse of personal data; and abuse of research subjects or material
- improper dealing with allegations of misconduct: failing to address possible infringements such as attempts to cover up misconduct and reprisals against whistle-blowers

Adverse Outcomes. Think carefully about the possibilities, and cover here

SECTION I: FEEDBACK, CONSENT AND CONFIDENTIALITY

Feedback to participants: outline your approach. Will interview transcripts be shared with respondents to check accuracy? Will summaries of questionnaire analysis

be made available to respondents in some way? Will an overview report be provided? How and when?

Informed consent: Draft letter / e-mail / or heading (or footer) section of questionnaire must be approved by Do's/supervisor (if research student), supervisor/module tutor if taught student, or Academic Director / Assistant Dean if a member of staff.

Confidentiality/Anonymity. Explain clearly how you will ensure confidentiality and anonymity.

SECTION J: DATA PROTECTION AND STORAGE
Before completing this section, it is necessary to read the University's Research Data Management information. The questions that follow are designed to ensure compliance with the Data Protection Act as well as established research protocols.

Many research activities will involve electronic transfer of data and use of data management systems in the summarization and analysis of data. You will need to explain these in relation to compliance with the Data Protection Act.

Think carefully about who will have access to your data, this will include supervisors and examiners. Also that a thesis will be made available via the University library and the British Library system. If you are seeking an access bar for a period of time after completion, then mention it here. If you will provide a copy of your findings, or intend to give a presentation, to a facilitating/ supporting/accessing organization then explain that in this section. But also think about the general principle of data sharing, as explained in the Research Data Management information.

In terms of storage of data please ensure security, and also mitigate against loss of data.

SECTION K: DECLARATION
Ensure the appropriate countersignatures have been provided

Look carefully at the checklist and ensure that you comply with and tick all that are relevant to your research.