

Sustainable Farming in Bonaire

AN EMPIRICAL STUDY TO DESIGN AN ECONOMICALLY VIABLE BUSINESS MODEL
FOR A SYNTROPIC AGRICULTURAL SYSTEM



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MSc. Thesis

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Preface

This research report presents the final product of a six-month process involving various research stages, from proposal development to data gathering and writing this final report. Throughout this journey, I have enhanced my research capabilities and deepened my understanding of farming practices on Bonaire. This valuable learning experience would not have been possible without the support of my supervisors, the organization Mangazina di Rei, and the participants in this research.

I would like to sincerely thank Jos Bijman, for his feedback, helpful advice, and pleasant interactions during the six months that I worked on my master's thesis. The conversation about the research process helped me think critically about the research. I would like to express my gratitude to Valentina Materia, my second supervisor, for her constructive feedback that enabled me to carry out my research in an efficient manner.

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Executive summary

The agroforestry systems are seen as potential systems that could reduce climate change while producing food for the world population. The syntropic farming system is one of the subcategories of the agroforestry systems. However, is a syntropic farming system economically viable? This question was raised by the organization Mangazina di Rei. They are interested in creating a commercial syntropic farming system on Bonaire. The starting point for this research is based on the initial idea of the Mangazina di Rei to start producing fruits and vegetables for home cooks and restaurants.

The main research question in this study was: What business model design would be economically viable for a syntropic farming system on Bonaire? The different elements of the business model: value proposition, value creation, and value capture were configured into the three sub-research questions in this study. This objective was to create an economically viable business. To gather information for the business model design explorative research was conducted. The research practices existed out of interviews with different stakeholders and experts and analysis of documents. One group of the stakeholders interviewed were the potential customers, these interviews gave insight into the value proposition element of the business model. Simultaneously, expert interviews concentrated on answering the other two business model elements about a syntropic farm's value creation and value capture.

The findings for the value proposition gave insight into what is valued by the potential customers. The potential customer groups interviewed were home cooks and restaurants. The home cooks value in general the social and especially environmental aspects of fruits and vegetables when buying them. So a farm that would contribute to the ecosystems and simultaneously contribute by providing education activities for school would be beneficial. The restaurants were divided into three groups; High segment, middle segment, and low segment. Because the value seen by the restaurants was different per segment, the low and middle segments preferred the most affordable product on the market, but it is essential to maintain the desired quality without compromise. Restaurants in the higher segment place more emphasis on quality, making the price less concern; however, consistent availability is important for all of the restaurants. The stakeholders interviewed, who aren't customers, place value on a balanced combination of social, environmental, and economic considerations in a farm producing fruits and vegetables.

The value creation for each value proposition is more or less the same. It is important to start with an infrastructural farm design because the syntropic farming system is not a system that you can alter every year. Based on this infrastructural design the right investment for land preparation, seeds, trees, machinery, buildings, and personnel are crucial for effective production of produce. To coordinate the farm's production, an experienced manager would be important. This is especially important when serving customer segments that ask for consistent delivery of products. By selling the products to the customers the farm can generate revenue streams. However, before the farm can reach its full yield potential, it can take four to ten years depending on the system design. Therefore potential additional financial resources need to be acquired from subsidies or loans to sustain the business for the first phase. To keep track of the finances, an income statement calculation model has been designed based on the findings to give the organization a tool to budget or keep track of their finances during the first phase.

Overall, this research contributed to the knowledge gap on the economic viability of a business model of a syntropic farming system. The business model designs and the income statement created in this explorative study provide tools that could guide Mangazina di Rei in the development process of a syntropic farming system on Bonaire.

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1. Introduction

Food security has become a larger topic of conversation in the past decades (Skaf et al., 2019). This results from the rapid growth of the world's population, which is expected to reach 9.7 billion people by 2050. The increasing world population causes a higher demand for food globally. Therefore, global food production should increase by almost 70 percent (Skaf et al., 2019). Mostly, the food production increase will occur in developing countries. Increasing food production is a logical step to solve the problem of global food insecurity in the future. However intensive agricultural systems use more chemicals, fossil fuels, and fertilizers leading to land degradation, loss of biodiversity, and subsequently global warming (Skaf et al., 2019). Climate change makes agricultural systems more vulnerable due to risks of flooding and droughts which could lead to food insecurity (Quandt, 2020).

Even if food production does not increase by 70%, as anticipated, global warming is already happening due to intensive agricultural techniques (Pawłowski et al., 2021; Skaf et al., 2019). This asks for alternative agricultural systems to reduce the impact of agricultural systems. Potentially, agricultural systems could be part of the solution to the global warming problem (Jinger et al., 2022). One of the systems that has the potential to reduce the global warming impact is an agroforestry farming system (Andrade et al., 2020). This farming system combines plants and trees in one system leading to more synergies. Synergies occur when the plants and trees together perform better than separately, due to biological characteristics that complement each other. Different studies have studied the potential of the interaction between trees and plants in one system (Jinger et al., 2022; Kumar et al., 2022). For example, agroforestry systems improve carbon sequestration and use resources such as water and nutrients more efficiently leading to improved nutrient cycling (Kumar et al., 2022). This improved nutrient cycling does not only benefit the agricultural plot but also the surrounding areas. A syntropic farming system is a subsystem of the broad spectrum of agroforestry systems; syntropic farming is specifically focused on soil regeneration and cooperation with nature (Andrade et al., 2020). Investments in time and money are required when building an agroforestry system. Subsequently, investments need to be made to keep the agroforestry system operational. However, is this system viable from a business point of view?

Rincon is one of the villages on the Island where most of the people are local inhabitants of Bonaire. Tourism is still limited in this village on Bonaire. The 'Rincon Regional Cooperative' is a cooperative that has a goal to make Rincon more attractive for tourism and conserve the surrounding nature by working together in the Rincon area with local organizations. One of the initiatives of the cooperative is to set up a syntropic farming system in Rincon, however, it is not clear whether a business based on a 1-hectare syntropic agricultural system would be viable. A member of the cooperative is the foundation 'Mangazina di Rei', which took responsibility for this syntropic agriculture initiative. The foundation 'Mangazina di Rei' has a goal to develop educate, and empower power people to become entrepreneurial. They are doing this by transferring knowledge to the younger generations. Next to that they value the cultural heritage of Bonaire and they are preserving it by transferring knowledge from the older generation to the younger generation. Therefore, they opened a cultural park and learning center where people learn about the heritage of Bonaire. On the property of Mangazina di Rei is 1 hectare available for the syntropic farm. The goal of 'Mangazina di Rei' with the 1-hectare syntropic farm is to have an economically viable business that delivers fruits and vegetables. Next to that they also want to contribute to the natural environment by regenerating the soil, which limits the erosion on the island, and creating a higher level of biodiversity. Furthermore, they want to contribute by organizing social activities, inviting schools to visit, and teaching the children about food production. Additionally, they want to help people with fewer opportunities on the job market by providing them with job opportunities on the farm.

The product idea of Mangazina di Rei is to cultivate a variety of fruits, vegetables, herbs, and spices which is in line with syntropic farming practices. They want to sell the fruits and vegetables in reusable

baskets to their customers. The products should be produced without the use of chemical fertilizers and pesticides to contribute to the natural environment. Preferably the customers pick up the products themselves at the farm to save time and money. The potential customers they intend to focus on are in the food service industry on Bonaire. To be more specific they want to focus on home cooks, which are people who cook and sell meals from home. Next to that, they want to focus on restaurants. The reason for these two groups is that Mangazina di Rei can sell the products in larger batches limiting the time spent on selling products to individual smaller customers. Next to that, they can create a steady customer base were they can rely on. However, a more in-depth study would give more insight to see if this business idea would be viable as a business model in the context of the island of Bonaire.

There are three different elements essential in the business model which are value proposition, value creation, and value capture (Johnson et al., 2018). These three elements are dependent on each other for the viability of a business. A **value proposition** describes the value a business creates for its customers and other stakeholders (Foss & Saebi, 2015). **Value creation** includes the resources and activities a business needs to create value. This also includes management models and how the organization is structured and coordinated. **Value capture** is about the cost structure and revenue streams. A business model is not economically viable in the long run and has little chance of surviving if the incoming revenue streams cannot cover the costs.

The business model is a tool to help visualize the value proposition, value creation, and value capture in one figure (Foss & Saebi, 2015). Over the last decade, literature has focused on the further development of the business model by looking beyond the financial viability of a business. One of the ways the business model has been adapted is by adding two additional aspects to the business model (Joyce & Paquin, 2016). One is a social aspect focused on the social impact the business has on the stakeholders and the second aspect is about the environmental sustainability of the business.

In the scientific literature there is a knowledge gap about the design of an economically viable business model of a syntropic farming system, let alone on an island with challenging dry climate conditions. Economic viability refers to a business model design that can fulfill an identified opportunity in the market and utilize this opportunity (Foss & Saebi, 2015). Utilizing the opportunity is done by managing the business activities and relationships with stakeholders, to contribute to the value creation and value capture of the business. This research aims to contribute to this knowledge gap by using the business model as a tool to create an overview of what is contributing to the economic viability of commercial syntropic farms. The research has been conducted on the island of Bonaire.

1.1 Research questions

To fill the scientific knowledge gap and answer the management question a central research question has been formulated. To answer this question a syntropic farming business model is designed that has the potential to be viable on the island of Bonaire.

Central research question

- What business model designs could be implemented to make syntropic agriculture economically viable on Bonaire?

To answer the central research question, three sub-research questions have been formulated. These questions are based on the three main elements of a business model namely, value proposition, value creation, and value capture.

Sub research questions

1. What value proposition would be valued by the customers and other stakeholders?
2. What is needed for the syntropic farm to create this value?
3. How can the syntropic farm capture value from the business activities?

1.2 Key Concepts

Within this chapter, various key concepts are explained to clarify their meaning within the context of this report.

1.2.1 Agroecology

Agroecology studies the entire food system while considering the ecological, economic, and social aspects (Kpienbaareh et al., 2022). It aims to create a food system that has environmental and social benefits. Two things can be distinguished within agroecology, first, 'agroecology that conforms' to existing agricultural systems (Giraldo & Rosset, 2017). This means adding a sustainable element to the intensive agricultural system while the functioning and productivity of the system remain the same. The second distinction is 'agroecology that transforms' by finding the right balance between human nature and transforming the agricultural system by replacing the current intensive system with a different system.

1.2.2 Agroforestry

Agroforestry is an agroecological practice that integrates trees and crops into one agricultural system (Nair et al., 2008). In some cases, animals are also integrated into the system. The agroforestry system is an ancient agricultural system that has gained more interest in the 21st century due to the environmental impact of the intensive monocultural system. Agroecological systems such as agroforestry are more environmentally sustainable because they mimic nature, however, it has scalability issues.

1.2.3 Syntropic Agriculture

Syntropic agriculture is a farming method developed by Swiss farmer Ernst Götsch (Andrade et al., 2020). He moved to Brazil to further implement and teach the system. The system has been widely adopted in Brazil. In this system there is no use of chemicals, only machinery with minimal impact or no impact are used. The focus of the design is on ecological succession of the agricultural system. The name syntropic is derived from syntropy which is about gathering and structuring energy to create complexity and differentiation. This is the opposite of entropy which is about releasing energy at the cost of complexity. Other terms for syntropic agriculture are (multistrata) successional agroforestry, and regenerative successional agriculture (Froufe et al., 2020).

1.2.4 Economic Viability

Economic viability in this study is about the economic viability of the business model of the syntropic farm. This is defined as the ability to cover all the operating costs and other financial obligations such as capital replacement costs (Barnes et al., 2020). While at the same time reaching the business objectives to create business growth possibilities (Barnes et al., 2015). Although factors such as environmental sustainability, and social factors have gained importance, economic viability remains the central aim and the bottom line for a viable agricultural business.

1.2.5. Business Model

A business model is a framework that helps capture how a business proposes value for its customers and other stakeholders (Johnson et al., 2018). Next to that, it helps to understand how the business is delivering this value. In addition, the business model explains how the business is capturing value to sustain financially viable. Lately, business models have been developed in multiple ways to capture social and environmental values in the business model framework (Cardeal et al., 2020).

1.2.6 Sustainability

Sustainability exists out of three pillars. These pillars are economic, social, and environmental. The bottom line in this study is economic sustainability and this is about the farm practices and whether they can be sustained (Wilczyński & Kołoszycz, 2021). Environmental sustainability is about the farm practices that lead to the conservation of the ecological elements on the planet, to preserve it for future generations. The social pillar refers to the social impact the farm has on its relationship with stakeholders (Joyce & Paquin, 2016). All three pillars are important for sustaining farm practices in the future.

2. Literature review

This chapter uses scientific literature to identify existing knowledge on the subject of the study. Based on the scientific literature, a conceptual framework was formulated that guided the field research.

2.1 Syntropic Agriculture Farming System

Syntropic agriculture is a specific type of agroforestry that is focused on the quick regeneration of the soil by active management (Andrade et al., 2020). This specific type of agroforestry has many benefits for the ecosystem such as biodiversity conservation, carbon storage, and regeneration of the soil. The systems use no chemicals, avoid tilling, and use only low-impact machinery (Andrade et al., 2020). These benefits can be found in most of the agroforestry systems. However, an aspect that makes syntropic farming different from other agroforestry systems is that it needs to be intensively managed (Von Cossel et al., 2020). A plantation strategy is used to integrate the plants and trees into one system. The plantation strategy is designed in such a way that the system delivers value from the first stage to the later growth stages. Subsequently, the trees need to be pruned regularly which provides litter for the system. Litter production and the decomposition of litter are the main drivers for this system and help to improve the nutrient and carbon cycles. These practices lead to the regeneration of the soil and therefore better soil properties for growing vegetables and fruits (Andrade et al., 2020). This is possible because the complex biological systems are not disturbed but enhanced. Therefore, plants, animals, and microorganisms can deliver a more diverse and complex environment for the subsequent generation of plants, animals, and microorganisms. This is also called natural succession, this is where syntropy strands form. The opposite is the case in intensive farming systems where the complexity of plants, animals, and microorganisms is declining (Andrade et al., 2020).

In the syntropic system, different layers of vegetation are used simultaneously to make optimal usage of the space (Andrade et al., 2020). This has multiple benefits such as the function of a heat sink which limits the evaporation and therefore maintains the moisture in the system. Because of the optimal space use, there is less space for invasive plant species. Next the diverse types of vegetation provide fertilizers for each other therefore the need for external fertilizers is low (Andrade et al., 2020).

The cost for inputs is lower compared to other conventional systems because the system aims to reduce or even ban external inputs such as fertilizers and pesticides in the system (Andrade et al., 2020; Von Cossel et al., 2020). However, the labor costs are in general higher because most tasks are performed manually. The system is not rejecting machinery, however, there are limited machines available on the market that are suitable for a syntropic farming system. Appropriate machinery could reduce manual labor and potentially increase the scalability of the syntropic farming system. Knowledge is required to create such a biodiverse system because planning and logistics are crucial for optimal performance of the system. Next to that, knowledge about the different vegetation species is needed to manage them well. However, when the resources are present, and the system is well-designed it is more resilient from an ecological perspective. Looking from an economic perspective there are some benefits and drawbacks compared to intensive farming systems. The system is designed to limit the use of external fertilizers and pesticides which saves costs, however, manual labor is higher in the syntropic farming system which will impact the labor costs. The study of Andrade et al. (2020) refers to multiple studies that have been conducted that show that a syntropic farming system could be viable (Hoffmann, 2013; Luz & Souza, 2015).

2.2 Agroforestry Business Success Factors

For the successful implementation of an agroforestry system, it is important to take into account several success factors (Albrecht & Wiek, 2021). Some of the main success factors that are described in the agroforestry literature are the professional infrastructural design of the farm, farm equipment, the availability of water, and good management practices. It is also important to have a large enough food

production site. However, an in-depth explanation of the specific details of the success factors is missing in the literature (Albrecht & Wiek, 2021). In Figure 1 Abbas et al. (2021) visualized the success factors for a better overview by categorizing them into different categories; infrastructure, behavioral, institutional, and economic.

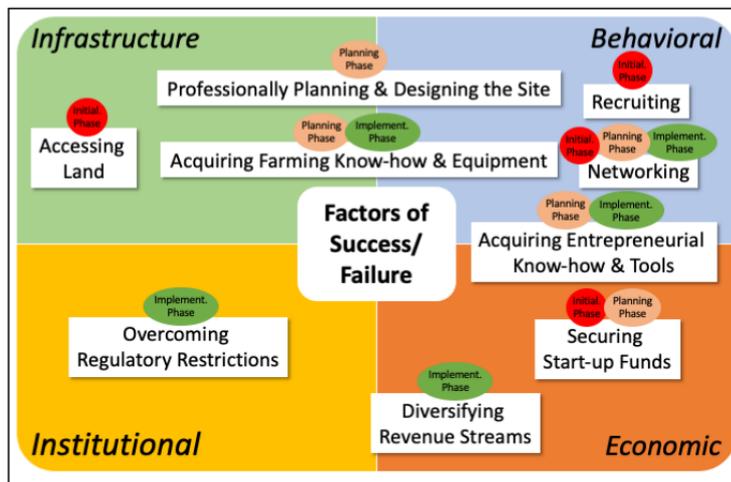


Figure 1: Categories with success factors for an agroforestry business (Abbas et al., 2021)

Design and planning of the farm are important in an agroforestry system because it can take time before tree species start producing (Abbas et al., 2021). This is very dependent on the tree species included in the system, according to Brian et al. (2005), it would be most interesting for commercial farms to use species that reach maturity and start producing between five and ten years. Another, important factor for the agroforestry system is to get organic certification (Abbas et al., 2021). This will help the farm to get higher revenues because they can sell their products with the organic label. This certification process can be a barrier due to the lengthy process of becoming a certified organic producer.

2.3 Business model development and innovation

Business models have been increasingly used and studied in more scientific literature in the last decade. Before that business models were used in the business world. However, more literature is using the business model for example in studies about strategy or innovation (Bucherer et al., 2012; Casadesus-Masanell & Zhu, 2013). The business model is especially useful to get a holistic overview of the business activities within a company that creates value for its customers but at the same time captures monetary value for the business itself. Scholars describe the business model concept in different ways, Drucker (1994) describes the business model as the assumptions of the organization's environment, the missions of the organization, and the competencies needed to accomplish this mission. Studies that followed covered the business model with three dependent main elements and found that business can become an economically viable business. These three concepts are value proposition, value creation, and value capture (Foss & Saebi, 2015). The value proposition is the value that will be delivered to the customers and stakeholders. Value creation explains how this value is created within the business and what is needed to create this value. The last concept is the value capture which explains the cost and revenues and preferably explains how profits are made by delivering and creating value for customers and stakeholders. This kind of business model presents the business choices in terms of "what" and "who" (Foss & Saebi, 2015). For example, "what" products are created, and "who" is the supplier?

Sustainability has increasingly become a central element within most businesses (Broccardo & Zicari, 2020). This focus on sustainability is due not only to the knowledge that being more sustainably is better for our society but also to companies realizing that their economic viability could be at risk if they do not move in a sustainable direction. This means that businesses see the urgency to innovate their business to remain competitive and profitable over time. In the business model literature, you see more focus on how to implement sustainability in the business model to create more value (Broccardo & Zicari, 2020). Different models are used to help companies integrate sustainability into their business models. For example, the extension of the business model canvas by Joyce et al. (2016) added two additional layers to the business models. One layer focused on the societal aspects of the business and the other layer for the environmental aspects.

2.4 Value proposition for customers and stakeholders in the agricultural sector

One of the elements of a business model is the value proposition (Johnson et al., 2018). If there is no value proposition, the product or service is not valuable to customers, and therefore the business cannot capture value. Value propositions are created and delivered through value chains, where different members of the chain work together to add more value for their customers (Sadovska et al., 2020). Therefore, it is important, especially for a start-up, to see what the business can offer its customers and stakeholders in this chain and what value will be created or added to a product or service in this value chain (Johnson et al., 2018). Proposing value to customers is important for the value capture of the business because customers generate the revenue streams for the business, which influences the economic viability of the business (Johnson et al., 2018). Therefore, proper customer segmentation is important to select the right customer segment that is willing to pay for the proposed value (Bocken et al., 2014).

Different value proposition strategies for business apply to agriculture. Providing products at a more affordable price than competitors can add value for customers and increase their willingness to pay (Kaczorowska et al., 2019). Another way for a farmer to propose value to their customers is by improving the quality of their product. Higher quality products can be the differentiating factor that leads to a higher valuation of products by the customers (Low et al., 2023). Higher valuation often leads to the possibility to increase the prices of the product on the market. These values are internalized in the product the customer is buying. Because the price of the product is lower, or the quality of the product is higher.

A customer that is willing to pay a higher price for a product that aligns with their norms and values can be another value proposition strategy for a company. This is the case with sustainable food products where customers are willing to pay a higher price for sustainably grown food. This may apply to agroforestry farms because they can charge prices that customers find reasonable because the customers value sustainably grown food (Low et al., 2023). The value proposition for sustainable food products is quite different because customers cannot check it in the store but must depend on the labeling of the product (Kaczorowska et al., 2019). So, value can be proposed in different ways and can be internalized using price or quality. However, externalities such as an environmentally sustainable growing process should be communicated to the customer via communication channels.

A value proposition framework in Figure 2 has been designed especially for agricultural businesses (Sadovska et al., 2020). This value proposition framework is based on an extensive literature study that identified different factors that could create value in agricultural businesses. Nine clusters with value-creating factors were identified. Examples of these clusters are diversification, collaboration, knowledge, and communication. This framework is unique and looks beyond financial benefits. The triple bottom line is embedded in this framework to create a value proposition that looks beyond economic value and includes environmental and social value. This framework shows where the value

proposition takes place, internally or externally, and whether the value proposition is aimed at the future or the present.

In brief, it can guide farmers in the process of value proposition on their farms because they can distinguish the different value proposition types and how the different types of value propositions apply to their agricultural business practices (Sadovska et al., 2020).

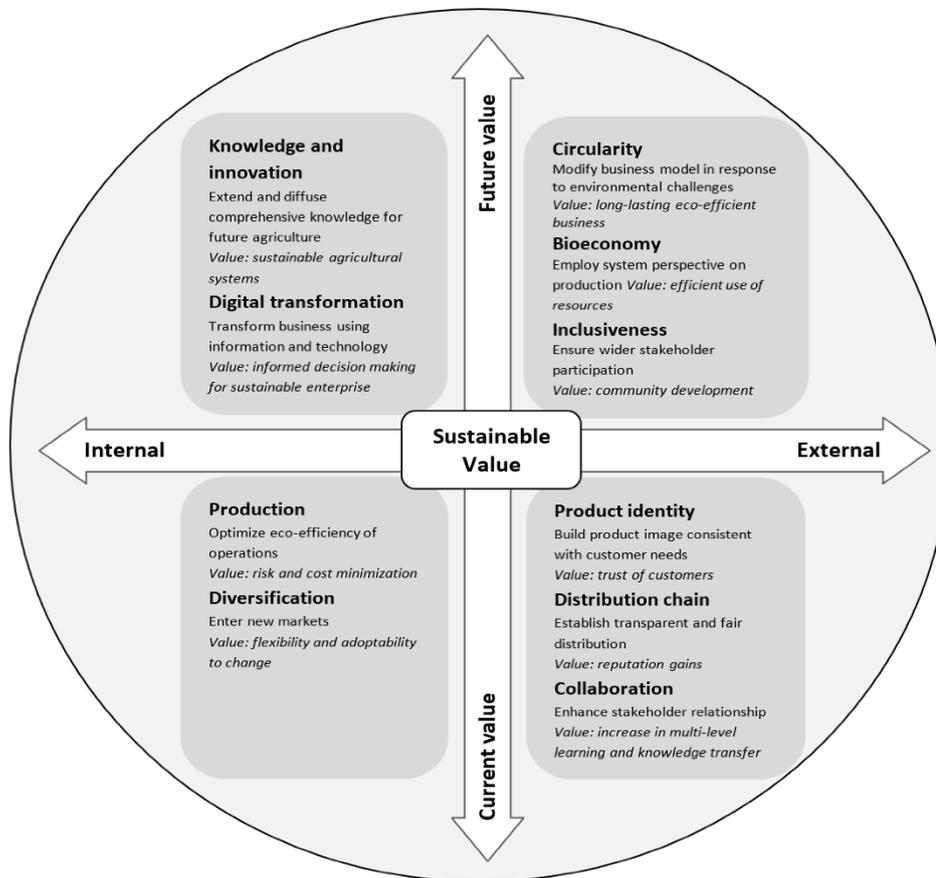


Figure 2 Framework for value creation in the agricultural sector (Sadovska, Ekelund Axelson, et al., 2020)

2.5 Value creation in agricultural business

A second element of the business model is value creation (Fernqvist et al., 2022). Value creation is the process that is needed to create the value that a business intends to offer its customers and stakeholders. In the value creation, all the activities and resources are incorporated to make an overview of what is needed. For example the materials, machinery, buildings, and land. Additional to that a description of the processes that are needed to create the product or the service. The link between these processes is described and included in the value creation. Usually, a business is dependent on external parties in the supply chain for certain services or resources, these external parties are described as being the key partners (Johnson et al., 2018). For a good overview of the value creation supply chain partners, activities and resources need to be identified.

Businesses are dependent on other members of the supply chain. Different firms in the supply chain are interdependent because they create value for each other. Collaboration in supply chains can make the production of products more efficient and reduce the cost (Barratt, 2004). However, another perspective is to look a horizontal way in the network of the business. Because there could be other

firms operating in the same layer of the supply chain. Network analysis is often used to study these horizontal relationships of firms.

Taking a netchain perspective gives insight into both the vertical relationships of the firm but also the horizontal relationships (Lazzarini et al., 2001). Most of the time the horizontal and vertical perspectives are separately studied. The netchain analysis is designed to map simultaneously the horizontal and vertical interdependencies an organization has with other organizations. This provides a total overview of horizontal and vertical ties. Analyzing these ties can help coordinate the relationships with these organizations and potential key partners, which could contribute to minimizing costs and optimizing the production flow, to capture more value.

Before a business can create value it is important to identify what is needed to create this value. Especially for agricultural businesses, practices, and activities have a high social impact because they are feeding society while at the same having an environmental impact (Fernqvist et al., 2022). However, nowadays value creation is often done through creating higher efficiency, emphasizing economies of scale which leads to cost reduction. This is negatively impacting the environmental sustainability of the farm (Fernqvist et al., 2022). Therefore, it is important to look critically into farming activities to see how the farm can create value without compromising environmental sustainability.

In each of these activities, there is a need for resources. The resources can be divided into three different categories (Johnson et al., 2018). The first category is physical resources. The physical resources as the name implies are resources such as machinery, raw materials, patents, and computer programs. The second category of resources is financial resources. Financial resources are needed to invest, maintain, and manage cashflows with debtors and creditors. The last category is human resources, which refers to human skills and knowledge. Qualified people with the right training are essential to make the business run (Boons & Lüdeke-Freund, 2013). Also, human resources like relationships with for example suppliers are important resources for a company to create value. These three categories are all three important for the company to sustain its practices (Johnson et al., 2018).

2.6 Value capture as an agricultural business

A third element of the business model is the 'value capture': this element is about the financial feasibility of the business model (Johnson et al., 2018). However, this is all dependent on the costs the company makes and the revenue streams that are entering the company. The value capture describes how the cash flows within the business are going to look. A for-profit organization aims to generate enough revenue to cover its costs and make a profit (Johnson et al., 2018). The revenue streams need to be sufficient to cover the costs. The revenue streams are influenced by the pricing strategy the business wants to use (Osterwalder & Pigneur, 2010). The business needs to apply a pricing strategy in such a way that the customer segment is willing to pay for the value that has been created. The company can decide to use different types of revenue streams. One example of this is the transaction-based type of revenue stream is based on a one-time purchase. The other pricing strategy is a recurring one; this means that the customer must pay regularly to get the product or service. However, the pricing strategy is dependent on the value proposition of the product or service the business wants to deliver to, its customers. The value proposition of the farm is often related to selling the produced products, for example, fruits, vegetables, or milk. For small-scale farmers, this could potentially lead to economic problems (Dhillon & Moncur, 2023; Glover & Reay, 2015).

Multiple revenue streams could be beneficial for the economic viability of a business model (Glover & Reay, 2015). Because creating multiple revenue streams could help mitigate risks when a revenue stream is disrupted. This has been proven by the study of Glover & Reay (2015). The diversification of the farm led to multiple revenue streams which resulted in more stability in the farm income. In this study also non-farm-related activities were part of the revenue stream, which led to different possibilities to capture value in the business which increased the economic viability of the model. One

example of these activities is agritourism (Ammirato et al., 2020). With agrotourism, the farm is open for tourism activities which could be related to education, leisure, or recreation. This potentially could also contribute to the development of rural communities and the preservation of cultural heritage. With the agritourism, the farm revenues can be increased. Another possibility to create more value from the product is by adding value to your produced products (Chen et al., 2021). Possibilities to add value to the product are making jams, and jellies from fruits, and fermenting or pickling certain vegetables. In this way, farmers can make more without losing money to retailers. Also unmarketable products can in this way still be sold.

So as an agricultural business, there are multiple ways value can be captured by diversifying the revenue streams. However, there are potentially extra costs that should be taken into account when diversifying farm activities (Chen et al., 2021).

2.7 Business models for sustainability

Nowadays, more appreciation is given to companies participating in corporate social responsibility (Broccardo & Zicari, 2020). Companies not only focus on maximizing profits but also consider the impacts they have regarding the environmental and social impact they have on their surroundings. Business models have been used to study the competitive advantages and in the past decades' sustainability aspects have entered the business model of companies to gain advantages over competitors to keep innovating and remain profitable. Businesses need to develop and innovate by experimenting with new ideas and with that changing their business model. Organizations depend on their stakeholders for their success. So, companies are involving the preferences of stakeholders. These groups are increasingly emphasizing a sustainable course of action (Horani, 2020).

However, sustainability is not always well embedded in the current business models (Bocken et al., 2018). For example, the value proposition in traditional business models starts often with defining what the customer needs. This is not wrong, however, the transition towards a more sustainable approach which includes among other circularity, asks companies to think not only about the product itself but also about the systems around the product and how to optimize them to maintain value creation over time (Bocken et al., 2018). A circular business model can help organizations move to so-called 'slow material loops' where materials and resources are managed more efficiently and sustainably. However, this requires more communication, collaboration, and coordination in the supply chain to make the circular business models work. The process of moving towards more circular and sustainable business models is a constant cycle of learning and adaptation. Therefore, it is important to have a business model that integrates sustainability in the design of the model. This is why Bocken et al. (2018) designed a circular model based on the traditional business model of Osterwalder & Pigneur, (2010). This model splits the value proposition into three different elements: social value, environmental value, and economic value. This triple bottom line approach looks at the value proposition from the perspective of the consumer, what is the direct benefit for them but this perspective also looks at how it can generate economic benefits for the company itself and other stakeholders. In addition, this approach examines the worth that it provides to the ecological environment and society. The goal of circular business modeling is to embed sustainable thinking into the companies (Bocken et al., 2018).

The triple-layered business model is also an example of an approach to designing sustainable business models (Joyce & Paquin, 2016). This model exists out of two additional layers like the business model canvas of Osterwalder et al. (2010). However, Joyce et al. (2016) designed two additional layers specifically for the impact on the environment and one layer specifically designed for the social impact of the business. These two layers together with the traditional more economically focused layer form the business model of an organization.

So, different business model visualizing tools have been designed. All these models emphasize the importance of looking at sustainability from the triple-bottom-line perspective, including economic value, environmental value, and social value.

2.8 Market for local and organic fruits and vegetables

The market for organically grown products has grown in the past decades (Hasselbach & Roosen, 2015). Therefore the amount of land used for organic production increased over the past years. Also, the amount of food forest businesses that are aiming to produce in an environmentally responsible way is growing (Albrecht & Wiek, 2021). However, organically grown food does not mean that it is also locally produced. There is a concern that organically produced food will lose its value because there are still environmental concerns related to the distribution of organic products. However, according to Hasselbach & Roosen (2015) is the market share for locally produced foods increasing. In a study, the customers even had a higher preference for locally-produced products over organic-produced products. The advantages seen by customers were more environmentally friendly because transportation distances are lower and beneficial for the local economy. Furthermore, the production from a local producer is more trustworthy, because there is direct contact between customers and producers. In the group of organic buyers, one of the nine motives to buy organic products is the fact that are locally produced. So local production is an important factor for people who buy organic products.

To optimally market vegetables and fruits multiple things could improve the purchase intention of the potential customers (Gázquez-Abad et al., 2012). One factor is that the consumers will be made aware of the origin of the product. According to this study, a higher awareness of the origin of the product creates a higher familiarity with the product which eventually could result in a higher buyer intention. Next to that communicating the benefits of the product that could be important for the target customer group is important to contribute to the familiarity of the product. Elements that could be communicated are related for example packaging, freshness, and healthiness of the products.

2.9 Market segmentation for fruits and vegetables.

The market segments are important to identify when selling the products of the land (Campbell et al., 2013). Different variables could describe a particular customer in a customer segment. The variables are related to demographics such as ethnicity, education, gender, place of residence, and income. With conjoint analysis, the specific consumer segments for a product could be identified to see what is important for different customer segments about the products (Campbell et al., 2013). In the study of Campbell et al. (2013) different market segments for peaches were identified. The following segments were named: price sensitive, location matters, non-discriminating, external feel and find their own. The “price sensitive” segment values a low price when buying fruit. People with higher incomes were mostly less present in the price-sensitive segment. Another study showed that the price of the product can be a barrier for people with a low income to buy fruits and vegetables (Dibsdall et al., 2003). Although this was the case two-thirds of the participants with a low income say that is not a reason not to buy fruits and vegetables. However, people with lower incomes still consume less fruits and vegetables compared to higher-income groups due to price barriers. The “location matter groups” had a higher preference for certain fruits from a certain region (Campbell et al., 2013). The “non-discriminating” segment was an in-between group without clear preferences for a specific product characteristic. The “external feel” segment preferred products looked at the color and the size of the product. This segment is often a regular buyer of the product. The “find their own” segment prefers to buy the fruits without packaging, this category exists out of people who have a higher income and prefer fruits that are local or organic. This was a specific study for a specific fruit in a certain region, however, it gives an example of the different customer segments that might exist when starting to sell produce on the market.

2.10 Conceptual Framework

A conceptual framework has been developed to capture the concepts that form the basis for this research. The business model is the overarching focus of this study and to see how this impacts the economic viability. However different elements in the business model are dependent on each other for success. These are the value proposition, value creation, and value capture. These three concepts are subsequently influencing the economic viability of the syntropic farm.

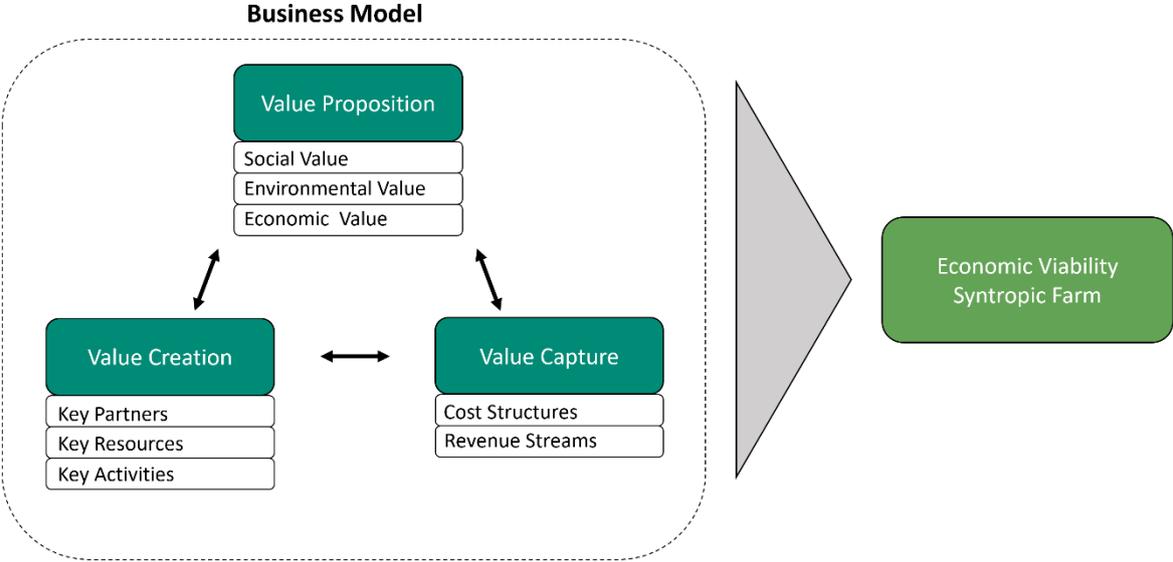


Figure 3: Conceptual framework

3. Methods of data collection and analysis

3.1 Research Design

This study aimed to research viable business models for a syntropic farming system on a small island like Bonaire. The focus was on the three main elements of the business model framework based on the business model literature. These three main elements are value proposition, value creation, and value capture. Subsequently based on the research different business models are designed to give insight into the possible viable business models that could be applied in the case of a syntropic farm on a small island. Another element in this research is the design of an income statement calculation model based on the findings of the value creation and value capture.

The research questions are answered utilizing the research methods of interviewing and literature. This approach is also known as explorative research with a focus on design. The study's foundation is established in the business model literature and concepts and models from the literature are used as starting points for the explorative research in the field. Based on that business models and a calculation model have been designed. Throughout this research project, the methodology of design-oriented research was leading the research (Verschuren & Hartog, 2005).

The research questions are answered utilizing two methods of data collection. The first method of data collection was interrogation. The method of interrogation is used for the interviews. The interviews gave the stakeholders perspective on the value proposition. Next to that interviews were conducted with experts in the field of syntropic farming or agroforestry to get valuable insights into the value creation and value capture aspects of a syntropic farm. Archives or financial budgets were used to get additional information on costs and revenues related to a syntropic farming system. This data was used for the development of the calculation model.

The data for this study is gathered in the field. The variables were not controlled or manipulated in this study. They solely are studied and reported. This study was a cross-sectional study because the data was collected at one point in time and provided a snapshot of that moment.

3.2 Operationalization of key concepts

In this chapter, the key concepts will be defined and operationalized. For each main concept of the business model, the elements will be operationalized. Table 1 shows an overview of the operationalized key concepts.

Table 1 Operationalization of key concepts

Criteria	Dimension	Indicator
Value proposition	Economic value	<ul style="list-style-type: none"> - Superior value offered to customers. - Travel distance - Willingness to pay.
	Social value	<ul style="list-style-type: none"> - Working conditions during production. - Employees salary. - Community involvement. - Transparency in production. - Contribution to diets. - Cultural conservation.
	Environmental value	<ul style="list-style-type: none"> - Usage of chemicals during production. - Impact of production on the environment. - Emissions in transportation. - Type of packaging
Value creation	Investing	<ul style="list-style-type: none"> - What activities? - What resources are needed (human, physical, or financial)? - What key partners?
	Operating	<ul style="list-style-type: none"> - What activities? - What resources are needed (human, physical, or financial)? - What key partners?
Value capture	Investment costs	<ul style="list-style-type: none"> - Costs of physical resources - Cost human resources - Costs financial resources
	Operating costs	<ul style="list-style-type: none"> - Costs during the season. - Costs op primary activities - Costs of support activities
	Revenue streams	<ul style="list-style-type: none"> - How much revenue is offered from products or services? - External streams of income.

3.2.1 Value Proposition

The value proposition consists of 3 elements in the conceptual framework. These three elements are social, environmental, and economic value. The participants are interviewed based on these three elements to see what they value most in the product or service. However, before the customers could answer what is important for them in a certain product or service, the product or service needed to be more clearly defined. Therefore, “Mangazina di Rei”, the project leader, defined in rough lines what the product or service will look like. The organization was also asked to identify the customer segment they want to focus on, such as business-to-business or business-to-consumer or the geographical area of the customer segment. This gave the first basic understanding of the value proposition the syntropic farm wants to offer and to which customer segment. This provided the foundation for the interviews with the potential customers.

‘Economic value’ is the first value proposition element to be operationalized. This concept defines why a product delivers superior value to the customer (Bocken et al., 2018). So, this is about the important characteristics of the product that convince the customer to buy the product (Sadovska et al., 2020). But also, the highest price the customer is willing to pay for the product. This economic part covers what superior value the syntropic farm could potentially offer their customers.

The second part of the value proposition is ‘social value’. This can be operationalized by asking the customer about what they think is important in terms of the company’s social impact. This considers

elements such as employees well-being, community involvement, transparency in production, improving diets, cultural conservation (Arslan, 2020; Atanda, 2019; Rutz et al., 2018). Knowing whether the potential customers value these elements will give direction to the design of the value proposition. During the interview, the participant could propose other social elements they value.

The third element of the value proposition is 'environmental values. This is about what the customer values in terms of environmental impact through the production of the product or service. Different questions were asked. For example, how important it is that the product is produced without polluting the land (Suhi et al., 2019). The importance of eco-friendly packaging is to limit waste streams (Dubey et al., 2017). These questions measure the value given towards environmental values by the participants.

Subsequently, the participants were asked to divide 12 points over the three different elements. Giving the most important aspect that influences their consumer behavior the most. Additionally, participants were asked if they would be willing to pay more for a product with higher economic, environmental, or social value. In this way, the interviews provided an insight into what element of the value proposition is valued most. And whether the customer is willing to pay extra for a certain product.

3.2.2 Value Creation

For the operationalization of value creation, we look at what the farm needs to produce the intended value for its customers. The four elements connected to this are the activities, resources, key partners, and organizational structure. For value creation, there is a need for investments to have the activities, resources, and key partners for value creation. However, to sustain value creation there are operating costs. Therefore, value creation is split up into an investment part and an operational part (Dickinson, 2011).

The investing part is related to all the activities for starting up the business. Such as business plans, legal intervention, marketing activities, and buying inventory and equipment. The expert was questioned about the activities that occurred in the startup phase to see if these activities were present or not and what this activity entailed. The follow-up questions that were asked were related to the resources bought or used during these activities. The resources were categorized into human, financial, or physical resources. Also, follow-up questions were asked about the key partners that were involved during the activities.

The next questions asked were about the activities related to the operation. This was to see what is needed to create value and sustain this value creation after the startup phase. The expert was asked about the various activities that take place on the farm. After the activities became clear the expert was asked to specify the resources needed for these activities and if there were any external parties involved in the operation activities.

3.2.3 Value Capture

The value capture is about the costs and the revenues generated with the syntropic farm. The costs are split up into the investment costs and the operational costs. Investment costs are about the investments before starting operation, for example, investment in human and physical resources. Operational costs are, for example, labor costs, energy costs, and the costs for machinery. A certain time frame will be set to include all the costs and compare this with the revenue stream. Revenues were computed by multiplying the market price of the cultivated product per volume by the volume generated in a specific location over a specific period.

3.3 Methods for Data Collection

Multiple methods are applied to collect data for this research. The first method used was interviews with different participants. The second method used is document analysis. The data collected was analyzed to see what business models are viable for a small syntropic farm on Bonaire. For the design of the business models, the methodology of design-oriented research by Verschuren et al. (2005) was used to guide the design process. This design-oriented research exists out of 6 stages. In this research, only 4 stages are included, because the implementation phase and evaluation phases are out of the scope of this research. The subsequent stages that will be included are the (1) first hunch, (2) requirements and assumptions, (3) structural specifications, and (4) prototype. By answering the research questions the information for the first three phases will be gathered to eventually answer the main research question with the design of different 'prototypes' of the business model.

The first hunch is the first step existing out of the goals and ideas that should be realized with the design of an object (Verschuren & Hartog, 2005). The second step is the requirements and assumptions. These are the functions of the design that should be in line with the goals set in the first hunch. First, the requirements of the main users of the designed object will be included and subsequently, the requirements of the surroundings, think about the political, economic, and social environment which might influence or constraint that might influence the requirement of the design. The third step is the structural specifications this is an overview of the different requirements and other assumptions related to the design. This can also be seen as the characteristics that the material or immaterial design should have. The structural specifications are often broken down into sub-systems that together form the design. The fourth step is the prototype, in this step, the design of the system is realized the different sub-systems with the characteristics are combined into one design. The subsequent steps that are not part of this study are the implementation of the design in a real-life situation to check the functioning of the design and the evaluation step to evaluate whether the prototype fits the design goals and expectations of the stakeholders.

3.3.1 Interviews

Three types of interviews were conducted to collect information for this research. The first interview was with the organization "Mangazina di Rei" which is the project leader of the syntropic farm project. The interview gave insight into what they want to deliver to their customers, through the syntropic farm, and who they want to reach with their products, so the customer segment. Next to that, the interview is used to discover other potential stakeholders for the syntropic farm. This knowledge was the starting point for the value proposition of the syntropic farm. This relates to the 'first hunch' phase which is about the goals and what the design should aim for. Subsequently, this knowledge was used during the interviews with potential stakeholders to discover what is valued in these types of products and services.

The second type of interview was with potential stakeholders including potential customers on the island of Bonaire. This type of interview was to see in which direction the syntropic farm should design its value proposition. A selection of potential customers, based on the defined customer segment, were interviewed to see what they value in the proposed product or service. The product proposition that the organization 'Mangazina di Rei' wants to offer through syntropic farming is taken as a starting point for the interview. Based on this product proposition participants were asked questions to see what would add value to this product proposition. During this interview, the triple bottom line elements were used to see what elements of the value proposition are important for them. Semi-structured interviews were conducted with the different participants to gather information for the value proposition. These interviews answered sub-research question 1 and simultaneously covered part of the 'requirements and assumptions' phase. This phase is about what elements need to be embedded in the design to fulfill the set goals (Verschuren & Hartog, 2005).

The third type of interview was with experts. The interview with the expert covered the ‘structural specifications’ phase. This phase covers how the requirements can be embedded in the design and how this is configured. The first expert had known about the functioning of syntropic farming systems, in climatic conditions like the climate on Bonaire. Another expert was a local farmer with an agroforestry system on Bonaire. This gave more detailed information about what was needed to create and capture value with an agroforestry system on Bonaire. An additional interview was conducted with a commercial farmer on Bonaire to get a better understanding of the challenges of being a farmer and to get a better understanding of the market for fruits and vegetables on Bonaire. The interviews were conducted in a semi-structured way to cover all the concepts that are part of the value-creation process. The interview with the expert will answer sub-research questions 2, and 3.

For all the interview types, interview guides were created to structure the interviews and to collect suitable data to answer the research questions. The interview guides are included in Appendix 1. Semi-structured interviews offer the flexibility to ask follow-up questions, which were used to provide more information for answering the research questions. Next, the potential customers and stakeholders were asked to rank, on a scale from 1-10, how important they found certain elements of the product proposition. This is to get a better understanding of all the perspectives and to also compare perspectives among different stakeholders.

A distinction has been made between the different groups of stakeholders. This is because some stakeholders such as potential customers are more important in determining the value proposition than non-customer stakeholders.

Also, a distinction has been made between different customer groups, such as restaurants and home cooks. Below you can find a table with all the stakeholders and their categories (Table 2). In the third column of Table 2 (Details), an explanation of the stakeholder is given. The restaurants are divided into three segments based on the average money you would spend in the restaurant for a meal.

Table 2: The interviewees categorized in stakeholder category

Stakeholder category	Interviewee	Details
Restaurant	Restaurant 1	High segment (Meal \$20 or higher)
	Restaurant 2	Middle segment (Meal \$15-\$20)
	Restaurant 3	Low segment (Meal \$5-\$15)
	Restaurant 4	Middle segment (Meal \$15-\$20)
Home Cook	Home Cook 1	
	Home Cook 2	
	Home Cook 3	
Greengrocer	Greengrocer	
Other Stakeholder	Rincon Regional Cooperative	
	Greenpeace	International Environmental Organization
	Public Health Service	
	Public Centre for Agricultural	LVV (Landbouw, Veeteelt & Visserij)
Farmer	Farmer 1	Professional farmer
	Farmer 2	Hobbyist farmer
	Farmer 3	Syntropic farmer

3.3.2 Scientific Literature and Other Documentation

Scientific literature was used for the preliminary literature review and documents were used to fill potential gaps in the data collection. For example, archives were used to get a better insight into all the resources and activities conducted in agroforestry systems. These documents together with the interviews provided a good insight into the overall value creation of a syntropic farming system in Bonaire. The literature search and use of documents helped answer sub-research question 2.

To design a calculation model a budget plan from the syntropic expert and documents from the Public Centre for Agriculture of Bonaire and Curaçao have been used. These documents provided more

detailed information that complemented the information given during the interviews. Based on these documents an income statement calculation model was designed.

To find scientific literature, search engines like Scopus and the WUR library were used. Keywords together with Boolean operators were used to create search queries that can be entered into the search engines. In Table 3 an overview of the data collection is displayed.

Table 3: Research questions linked to data collection methods

Research question	Phase	Respondents / Data Source	Data collection method
SRQ 1: How can the syntropic farm produce value for customers and other stakeholders?	'First Hunch'	Mangazina di Rei	Semi-structured interview
	'Requirements and assumptions'	Stakeholders: <ul style="list-style-type: none"> - Customers (3 per segment) - Other stakeholders. 	Semi-structured interview
SRQ 2: What is needed for the syntropic farm to create this value?	'Structural specifications'	Main Source: <ul style="list-style-type: none"> - Syntropic farming expert - Agroforestry expert - Commercial farmer Bonaire 	Semi-structured interview
SRQ 3: What would be a suitable organizational structure for a syntropic farm?		Additional Sources: <ul style="list-style-type: none"> - Professional literature - Archives 	Semi-structured interview
SRQ 4: How can the syntropic farm capture value from the activities?		Main Source: <ul style="list-style-type: none"> - Budget of Syntropic farming system. - Interview Additional Sources: <ul style="list-style-type: none"> - Archives - Professional Literature - Experts 	Archives, professional literature, and Interviews
MRQ: What business models could be implemented to make syntropic agriculture economically viable on Bonaire?	'Prototype'	Answered sub-research questions.	Data Analysis

3.4 Methods for Data Analysis

3.4.1 Interview Analysis

The interviews are recorded and transcribed. This data is entered into the coding software ATLAS.ti. Subsequently, the interviews were coded based on the operationalization of the key concepts. The reason for coding the transcripts is to get a more in-depth understanding of the gathered data by critically assessing everything that has been said (Skjott Linneberg & Korsgaard, 2019). Moreover, the data could be more easily analyzed and subtracted from the data because it has been structured. The coding facilitated finding valuable information in the interviews to answer the sub-research questions 1,2, and 3. The analysis can subsequently be used in the "prototype" phase to design business models for the syntropic farm on Bonaire.

A deductive coding technique was used as a starting point for coding the transcripts (Skjott Linneberg & Korsgaard, 2019). A coding table was made beforehand based on the preliminary literature. This code table helped to structure the valuable elements in the transcripts that could contribute to answering the research questions. However, during the coding process, the coding table was extended with codes

that could help improve the structuring of the data. This type of coding is called inductive coding. The code table is added in the Appendix 2.

3.4.2 Document Analysis

For the value capture budget data of a syntropic farming system was used including documents from the Public Centre for Agriculture. With the program Microsoft Excel, all the collected data regarding the financial costs and revenues were entered into spreadsheets. This helped to create an overview of the cost and revenues. This data subsequently was used to see how the value capture of the business model will function and what is needed to be viable.

Once all the collected data was gathered and organized, the "prototype" phase was entered. This means that a blueprint of a calculation model was created. This blueprint can be used as an income statement for the syntropic farm.

4. Findings

4.1 Introduction

The research findings present the information gathered during the research process. The findings consist of information gathered during formal and informal interviews with potential stakeholders and experts in the field of farming or syntropic farming. Next to that observations on the island of Bonaire are used to complement the findings. The findings also consist of information gathered from documents that were obtained during the field research. The findings provide the first overview of information that will answer the sub-research questions. The value proposition (4.2) will be answering sub-research questions 1. The information to answer this question is gathered from the interviews with all the stakeholders. The majority of these stakeholders are potential customers. In these chapters, Dutch quotes will be used followed by an English translation to support the findings.

The value creation (4.3) will give insight into the key activities, key resources, and key partners. The findings are based on interviews with the farmers, syntropic farming experts, and the Public Centre for Agriculture. Provided documents by the interviewees are used to support the findings.

For the value capture (4.4) findings will be given about the potential cost structures and the potential revenue streams that will arise on the syntropic farm. The main sources for the findings in this chapter are the documents provided by the syntropic farming expert and the Public Centre for Agriculture. The interviewees were used to complement the findings.

The findings are presented in the structure of the conceptual framework. Every element of the conceptual framework will be covered. The three main elements of the conceptual framework form the business model: the value proposition, value creation, and value capture. These three elements are directly related to the three sub-questions of this research. The chapter numbers are added to the conceptual framework (Figure 4).

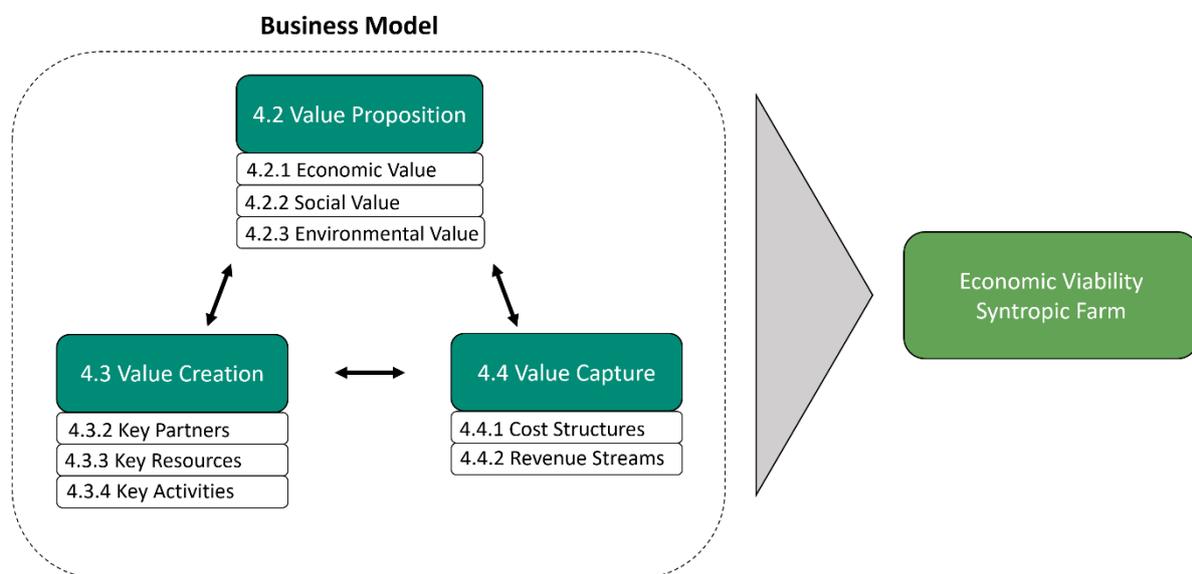


Figure 4: Conceptual framework with chapter numbers of the findings

4.2 Value proposition through the eyes of the stakeholders

Potential customers and stakeholders were interviewed to understand their perspective and to see if the intended value proposition idea of Mangazina di Rei is seen as valuable and also to improve the value proposition based on the perspective of the potential customers and stakeholders. The main three themes that were covered during the interviews were related to economic value, social value, and environmental value. These three elements originate from the literature about the value proposition. In the next sub-chapters, the three different themes of the value proposition will be covered independently to answer sub-research question 1 about what value proposition would be valued by customers and stakeholders.

4.2.1 Economic value of agricultural products on the market in Bonaire.

The economic value is one element of the value proposition that is covered during the interviews with the stakeholders and potential customers. The interviewees were asked several questions regarding the economic elements valued in agricultural products produced on a syntropic farm.

Product Price

One element of the economic value proposition is the sales price of the product. The sales price preferably needs to cover production costs, if these costs are high, the desired sales price could become too high for certain customers to be interested. In this situation, the syntropic farm either loses out on potential customers or has to find alternative revenue streams to cover production costs.

The majority of the potential customers saw the price as one of the most important aspects when buying agricultural products. This is because the fresh vegetables and fruits on the island are most of the time expensive for people to buy (Home Cook 2; Restaurant 2). According to Restaurant 1, the agricultural products on Bonaire are even more expensive compared to the other Dutch Caribbean islands. Restaurants and home cooks use agricultural products and add value to them by making meals and selling them to their customers. The price of the agricultural products therefore determines the costs of a meal and with that the profit the customers can make on a meal. One of the interviewed restaurants highlights the importance of the price of agricultural-produced fruits and vegetables.

“De prijs van je inkopen dat is het grootste aspect van wat jou prijs voor het product gaat worden. Dus het speelt een hele grote rol.”

"The price of your purchases that is the biggest aspect of what your price for the product is going to be. So, it plays a huge role." (Restaurant 4)

One of the home cooks mentioned that they are not willing to pay more for agricultural products than the price in the supermarket (Home Cook 1). The home cook expects the local products to be cheaper because they are produced on the island itself.

Within the group of potential customers, the interviewees charge various prices for the meals they sell. The interviewees who charged lower prices for a meal (around 10-15 dollars) placed more emphasis on the importance of lower prices of agricultural products than restaurants that charge around 25 dollars. One of the restaurants mentioned this about the prices of agricultural products during the interview.

“Dus er zijn restaurant die wat lager zitten in de prijs die zouden het misschien meer voelen. Maar over het algemeen restaurant die de gerechten prijzen op 25-dollar en hoger zal het niet zo zeer een punt zijn. Ik denk dat ze juist meer open zouden zijn voor producten die honderd procent lokaal zijn.”

"So, there are restaurants that are a little lower in price that might feel it more. But generally, in restaurants that price the dishes at \$25 and up, it won't be as much of an issue. I think they would be more open to products that are 100 percent local." (Restaurant 1)

So based on this quote the restaurants that price the dishes around 25 dollars are willing to buy local vegetables and fruits even if they have a higher price than similar fruits and vegetables on the market in Bonaire. So the localness of the fruits and vegetables makes the restaurants in the high segment more willing to pay a higher price.

Marketing Value

Another element valued by the restaurants and 'Rincon Regional Cooperative' is the marketing aspect of their meals. The 'Rincon Regional Cooperative sees local farming practices to attract tourism to the remote places on the island and to show how food has been produced on the island in the past centuries. This can create more awareness and appreciation for farming and the history of Bonaire (Rincon Regional Cooperative). The restaurants have curious customers, mainly tourists, who are interested in the origin of the products used in the meals. It would be valuable for them to market their restaurant by using locally produced products (Restaurant 1, 4). They mentioned the value they would see in using agricultural products that are locally produced.

"Als ik zou zeggen van: het vlees komt uit Bonaire en groentes komen uit Bonaire, dus weet je dan denken ze ook gelijk dat is dan weer een hele Bonairiaanse ervaring. Het is niet iets dat we dan overal kunnen krijgen, dus het wordt een beetje speciaal. Het is beter voor de voor de marketing."

"If I were to say: the meat comes from Bonaire and vegetables come from Bonaire, so you know then they also think right away that is then again a very Bonairean experience. It's not something we can get anywhere then, so it becomes a little bit special. It's better for the marketing." (Restaurant 4)

The marketing benefits are seen as valuable for the restaurants however, the price is according to Restaurant 4 still a more important factor than marketing value that determines the willingness to buy. The price is not a determining factor for Restaurant 1 in buying the products.

Product Delivery

Most of the people interviewed preferred delivery of agricultural products to their house or restaurant because this saves them time. Some extra costs for the delivery were in most cases not a problem (Home Cook 1, 2, 3; Restaurant 1, 2, 3, 4; Greengrocer). Otherwise, they had to pay for the fuel costs anyway (Home Cook 1).

Consistent Availability

Additionally, an important aspect of the economic value of the product is the consistent availability of agricultural products. This aspect was mentioned by most of the restaurants as being an important aspect (Restaurants 1, 2, 4). The reasoning behind this is that they have certain meals on the menu that need to be made with certain agricultural products. If they want to serve these meals throughout the week all the ingredients need to be available every week. One restaurant mentioned that it is possible to have an additional supplier that complements the local supplier of agricultural products (Restaurant 1). However, most of them prefer 1 supplier that consequently supplies their main agricultural products.

"Maar we willen liever die consistentie dat de producten goed en op tijd geleverd kunnen worden. Dus als ik het elke week bij jullie kan halen is het helemaal top. Ik wil liever niet om de week horen: 'Dat hebben we niet beschikbaar'."

"But we would rather have that consistency that the products can be delivered well and on time. So, if I can get it from you guys every week it's awesome. I would rather not hear every other week that: 'We don't have that available.'" (Restaurant 2)

Product Variety

Consistent product availability reduces the workload of restaurants in finding their ingredients every week. Producing a variety of agricultural products would be seen as another benefit that reduces time spent on the procurement of ingredients. This is the experience of one of the farmers on the Island (Farmer 1). Therefore, producing a variety of different agricultural products would be important for the value proposition. However, this means also a sufficient amount of the various products need to be produced according to this farmer. So, the demanded amount should preferably be met otherwise the customer still has to find another supplier of their desired products.

Demand for Vegetables and Fruits

The potential customers and local farmers were interviewed to get an idea of which agricultural products they often use. Multiple figures of the vegetables, fruit herbs, and spices have been generated based on interviews (Figure 5). Vegetables that were often mentioned during the interviews were bell pepper, lettuce, pumpkin, tomato, and unions. The number of vegetables used by the restaurants and home cooks was higher than the number of fruits, herbs, and spices. This is because the potential customers require more vegetables. After all, the majority of their menu consists of savory meals. Also, the budget spent on fruits was therefore lower, around 25% of the budget for vegetables and fruits was spent on fruit and 75% was spent on vegetables (Restaurant 2,4). So, this shows that there is a higher demand for vegetables among the home cooks and the restaurants interviewed.

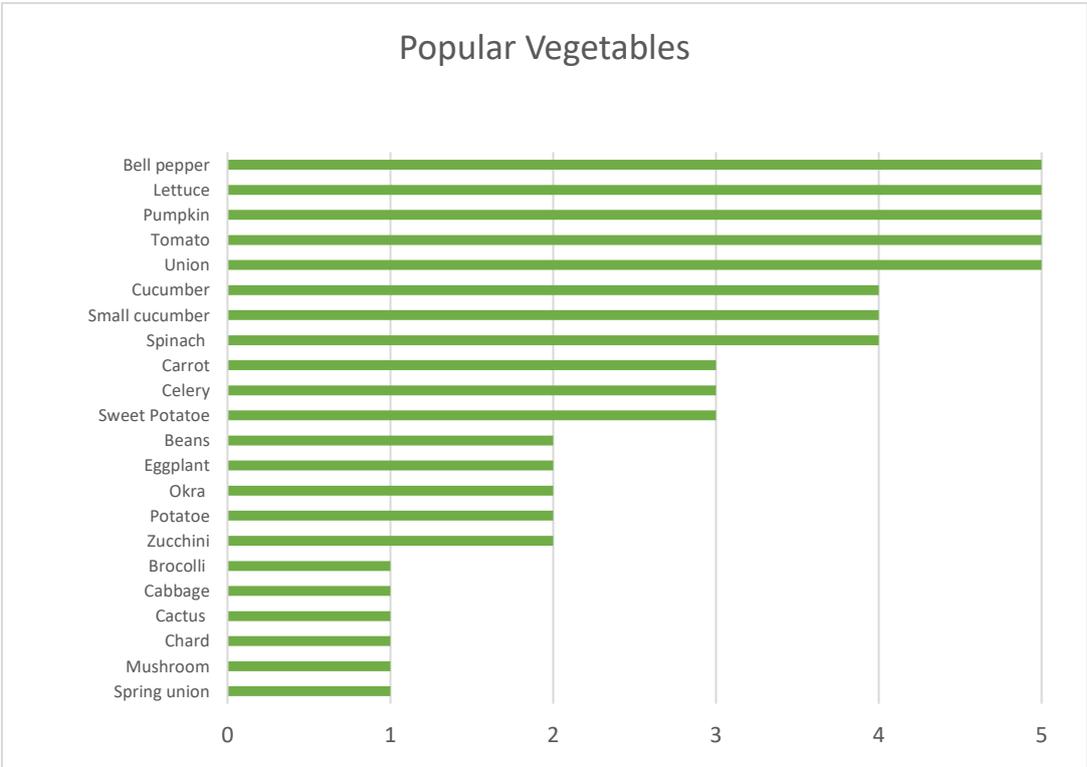


Figure 5: The number of times a vegetable was mentioned during all the interviews.

The fruits that were most often mentioned during the interviews were the watermelon and the papaya followed by the cooking out of banana passion fruit and lime (Appendix 4). Mint and basil were the

most mentioned herbs (Appendix 4). A local farmer confirmed that these were popular herbs because he grew a lot of these two herbs for the local market (Farmer 1).

4.2.2 Social value of agricultural products on the market in Bonaire.

The social value of agricultural products on the market relates to the impact the production process has on the social environment. Different perspectives from different stakeholders and potential customers have been gathered. The interviewees were asked to rank the importance of different social aspects.

Local Community

The value interviewees place on the organization's contribution to the local community through agricultural production varies. The interviewees who had the highest score on the organization's contribution toward the local community were the home cooks (Figure 6). They see the urgency to preserve the culture and to persevere in everything that is part of the culture they grew up in.

"Mijn ouders hadden vroeger ook twee kunukus (boerderijtjes). Daar hadden we heel veel watermeloenen en bonen. Maar tegenwoordig doen mensen niks meer op hun kunukus. Vroeger kreeg je alles van de kunukus. Terwijl je wel oud kan worden als je veel dingen eet die gezond zijn."

"My parents also used to have two kunukus¹ (small farms). There we had a lot of watermelons and beans. But nowadays people don't do anything on their kunukus. You used to get everything from the kunukus. While you can get old if you eat a lot of healthy things."

The restaurants mentioned that it would be positive when the syntropic farm potentially would contribute to the local community, however, they said that it would be more valuable for them to have a good quality product instead of an organization putting much effort to contribute to the local community (Restaurant 4). So, contributing to the community should not go at the cost of a good quality product. Another restaurant mentioned that the contribution of the community should not increase the price because it would make the products less interesting for them (Restaurant 2). Below is a citation from the interview about the importance of the organization contributing to the local community.

"Vanuit het restaurant gezien is dat wat minder belangrijker als burger is het wel belangrijk. Het is goed was ze doen om de geschiedenis van het eiland te laten zien. Als bedrijf als zij commercieel gaan starten heb ik liever dat ze goed starten en een goed producten bieden."

"From the restaurant's point of view, this is less important, as a citizen it is good what they do to show the history of the island. As a company, if they are going to start commercially, I would prefer they start well and offer good products." (Restaurant 1)

Healthy Food

The home cooks see the importance of eating healthy food and the access they had to vegetables and fruits when they grew up in Bonaire. However, they see this become more and more challenging. One home cook said that her children are not eating many vegetables anymore (Home Cook 2). One of the main reasons for this is the high prices. A few decades ago, ships from Venezuela used to come to Bonaire to sell their products on the market for a more affordable price. However, these markets are no longer in existence. Therefore, the home cooks shared how important the agricultural projects are to make vegetables and fruits more available on the island and to create awareness among children on how to cultivate vegetables and fruits on Bonaire. Because farming practices in the so-called kunukus

¹ Kunuku: A plot of land in the urban area often used for agricultural practices.

are slowly becoming distinct on the island. Giving education on primary schools are a good place to educate (Home Cook 1).

Preserving Cultural Heritage

The stakeholders emphasized the importance of the social aspect. For example, the 'Rincon Regional Cooperative' mentioned that the syntropic farm could become a place where the farming history of Bonaire could be shared with locals and tourists. Additionally to the already existing museum about the history of Bonaire on Mangazina di Rei. In this way, knowledge and more awareness about the farming possibilities can be shared while supporting tourism in the Area of Rincon.

Working Conditions

The second part of the social-related questions were related to the working conditions within the organization. An important element was the salary of the workers. That should be in proportion to the harsh conditions in which they are working (Restaurant 3; Rincon Regional Cooperative) because the climate on Bonaire makes it physically more exhausting to work outside. Some compared the farming work with the work of a construction worker (Rincon Regional Cooperative). So, the employees should be rewarded accordingly. Some restaurants mentioned that they thought it was important, but they say that the minimum salary that will be introduced in 2024 will be a sufficient salary for employees. So, they do not require the farm to go above this minimum salary (Restaurant 1,2). The restaurants on average ranked the working conditions on average a bit lower than the other interviewees (Figure 6).

Proper clothing, good equipment, and working breaks are mentioned as being important (Home Cook 1). According to Restaurant 4, working conditions are very important for the production of good-quality fruits and vegetables. Because the working conditions determine also the amount of effort and good workmanship that will be delivered by the employees, the other stakeholders interviewed ranked the working conditions the highest of the three interviewed groups (Figure 6). The other stakeholders interviewed believe that to be economically sustainable you should provide good working conditions. So, the social aspect and the economic will interact with each other; for an organization to do well economically, it needs to also take care of its social surroundings. This means both the economic and social aspects should be taken into account, as suggested by different stakeholders. (Stakeholders 1,2).

Transparent Farm Operations

The interviewees were asked to rank the importance of transparent operation of the syntropic farm, which referred to the possibility of looking at the farm and seeing how the vegetables and fruits are produced and asking questions about the operations on the farm. Different responses were given to this question. The stakeholders and restaurants scored an average of 6.4 out of 10, see Figure 6. One stakeholder expressed their trust in the organization's initiative to produce fruits and vegetables on Bonaire, based on their belief that the organization, led by Mangazina di Rei, would prioritize social and environmental considerations in their production methods. (Greenpeace). However, they think it would be great if the organization would be open if questions were to be asked about the operations. Home cooks ranked the transparency of operation higher compared to the stakeholders and restaurants. However, one home cook did not think it would be healthy to constantly check the operations on the farm because the employees needed space to do their work (Home Cook 1).

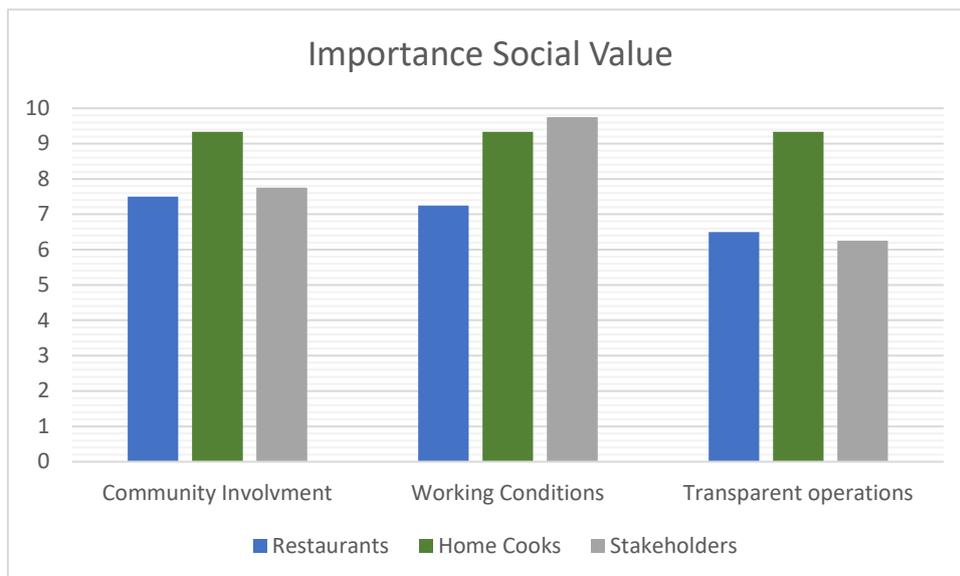


Figure 6: Ranking scores from 1-10 for three questions related to the social value the syntropic farm could offer.

4.2.3 Environmental value of agricultural products on the market in Bonaire.

The environmental value of agricultural products is the last part of the value proposition that was covered during the interviews. This is about how important the environmental aspect is of the produced vegetables and fruits. Multiple questions were asked to the interviewees; some questions were ranking questions to get a better idea of how important certain environmental aspects are for the interviewees.

Local Sustainable Production

First of all, the interviewees were asked to explain and rank how important sustainable production of fruits and vegetables is for them. When looking at Figure 7, the value given to the local sustainable production score is averaged at 8.6. This is because most of the interviewees know that most of the fruits and vegetables are imported from outside Bonaire and they would like a more environmentally sustainable alternative (Home Cook 1,2; Restaurant 2). At the same time, they are aware that it is very challenging to grow food in the climate conditions on the island. For this reason, some of the interviewees ranked the environmental value of local sustainable production not at the highest level because they say that you need a lot of irrigation water to produce fruits and vegetables on Bonaire (Restaurant 1). However, that would not be the reason for them to not buy the product (Home Cook 1). For multiple stakeholders, it was important that the system eventually would contribute to the natural environment on Bonaire and that it would provide a beneficial ecosystem service not only for animals but also for human beings (Rincon Regional Cooperative, Greenpeace). One of the stakeholders mentioned how important it was.

“Want je creëert eigenlijk een kleine ecosysteem door zo’n food forest te bouwen. Dat je niet alleen voor mensen eten maakt, maar ook voor de diersoorten die overal leven. Dus overal waar je een goede ecosysteem kan bouwen is belangrijk, want dan laat je in principe de natuur laten doen wat de natuur doet en dat beschermt ons.”

"Because you create a small ecosystem by building such a food forest. So that you make food not only for people but also for the animal species that live everywhere. So anywhere you can build a good ecosystem is important, because then you're letting nature do what nature does and that protects us." (Greenpeace)

For the restaurant, it was important to produce in an environmentally sustainable way because according to them it is aligned with product quality. If the fruits and vegetables are not produced sustainably the quality and the taste of the product are different according to them (Restaurant 4). This restaurant currently buys its products from Venezuela, and this is on purpose because they produce in a traditional old-school way and not in an industrial way of food production.

Chemical Usage

The use of chemical fertilizers and pesticides was another subject that was covered during the interviews. The importance of not using chemicals for fertilizers and pesticides was highly preferred by the interviewed home cooks and restaurants. All the stakeholders and all the home cooks ranked it at the maximum score (Figure 7). Home cooks express concerns about the lack of transparency regarding the farming practices used to grow imported vegetables and fruits (Home Cook 1). Another home cook thoroughly washed their imported fruits and vegetables with vinegar to get rid of any leftover pesticides or chemicals (Home Cook 2). It is for them very important to have vegetables and fruits available that are grown in an environment without chemicals.

The restaurants prefer to use ingredients that are produced as naturally as possible so without the use of external inputs. One of the restaurants mentioned that this would improve the quality and taste of the product (Restaurant 4). So, the restaurants prefer clean-produced products, however, one of the restaurants mentioned that although they prefer this product, they still need to have an affordable price. So, if the 'clean' produced product is more expensive they would more likely go for a cheaper alternative that is possibly produced with the use of chemicals (Restaurant 2). Another restaurant mentioned that they would be willing to pay more for vegetables and fruits that are produced without the use of chemicals (Restaurant 1). However, they mentioned that they are in a higher price category therefore they have room in the budget. So, the preference is to produce vegetables and fruit without the usage of chemicals, however, it is dependent on the restaurant segment whether the restaurant is willing and able to buy these vegetables and fruits.

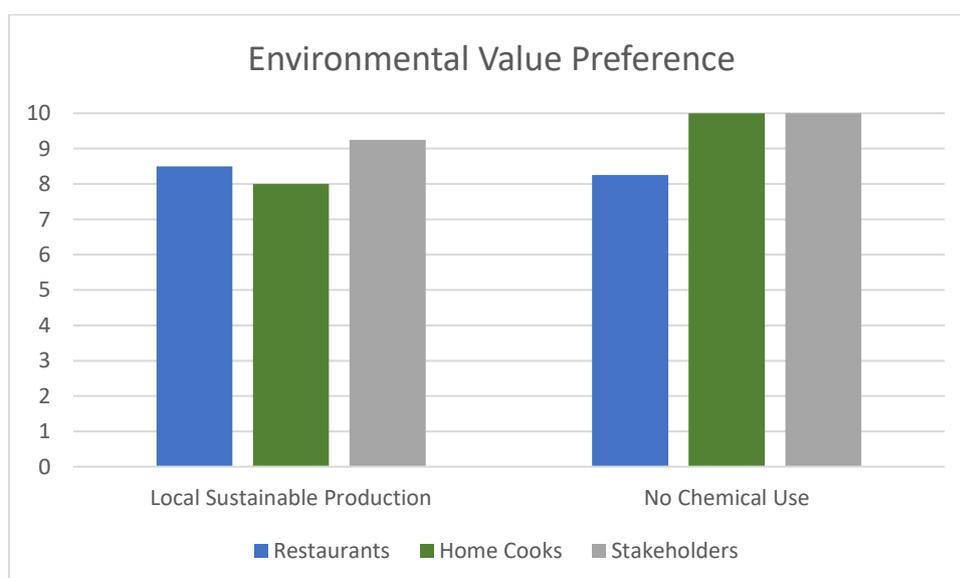


Figure 7: Averages of environmental value preferences given by the interviewees.

Packaging Material

The next element of sustainability is the packaging material that is preferred by the interviewees. The home cooks referred to the packaging in the supermarket as not being the optimal packing. Because it causes the product to get bad quality quickly (Home Cook 1), they preferred vegetables and fruits not to be packaged in plastic. They preferred paper bags to transport the fruits and vegetables. The restaurants mentioned the possibility of using plastic crates.

"Dus we kunnen het wekelijks her gebruiken omdat het hard plastic is, dan is het één keer geproduceerd en dan heeft het een lange levensduur."

"So, we can reuse it weekly because it's hard plastic, then it's produced once and then it has a long lifespan." (Restaurant 4)

The crates can be used for the transportation of fruits and vegetables and can subsequently be returned to the farm and reused for new transportation (Restaurant 1,2; Greengrocer). In this way, no packaging material is wasted, and the crates can be used for years. The potential customers were asked to rank the importance of reusable packaging material to both scored high with an 8 for the restaurant and a 9.7 for the home cooks (Figure 8).

Environmental Label

The perspective of labeling of the product was different per stakeholder. Home Cooks were in favor of the label, one of them said that it would be important for the organization to show that their products are for example organically produced (Home Cook 1). The majority of restaurants did not demand a label before they would buy the product (Restaurants 1,2,4). However, two of the restaurants mentioned if there was a label, they could use it for their marketing to show their customers they use certain products with an environmental label in their kitchen that could be valued by their customers (Restaurant 1,4). The greengrocer found it not necessary to have a label because their customers do not ask for a label. For the other stakeholders, it was different. One of the stakeholders did not think it was very valuable because a farm without an environmental label does not mean they are not an environmentally friendly farm (Greenpeace). Therefore, a label for them was unnecessary especially when certain costs were attached to obtaining the label. However, the public health service of Bonaire was much in favor of a label because if people were to buy products in the grocery store, they would have the opportunity to make a responsible choice. The following quote from the public health service expresses this point of view.

"Dat vind ik heel belangrijk! Zeker uit voedingsoogpunt dat je niet gaat zeggen van mensen hebben groente nodig hier heb je een hele hap groente en het zit vol met pesticiden. Wat heb ik daaraan? En ik vind dat het duidelijk moet zijn qua product wat kan ik verwachten van het product."

"I think that's very important! Especially from a nutritional standpoint you are not going to say people need vegetables here you have a whole bite of vegetables and it's full of pesticides. What good does that do me? And I think it should be clear in terms of the product what can I expect from the product"
(Public Health Service)

In the quote, the Public Health Service expresses that making people more aware of the food they consume is important. For example, they should be informed if the foods are produced with the use or without the use of pesticides. So, there are different perspectives on the usage of environmental labels the scores of the environmental label are visible in Figure 8.

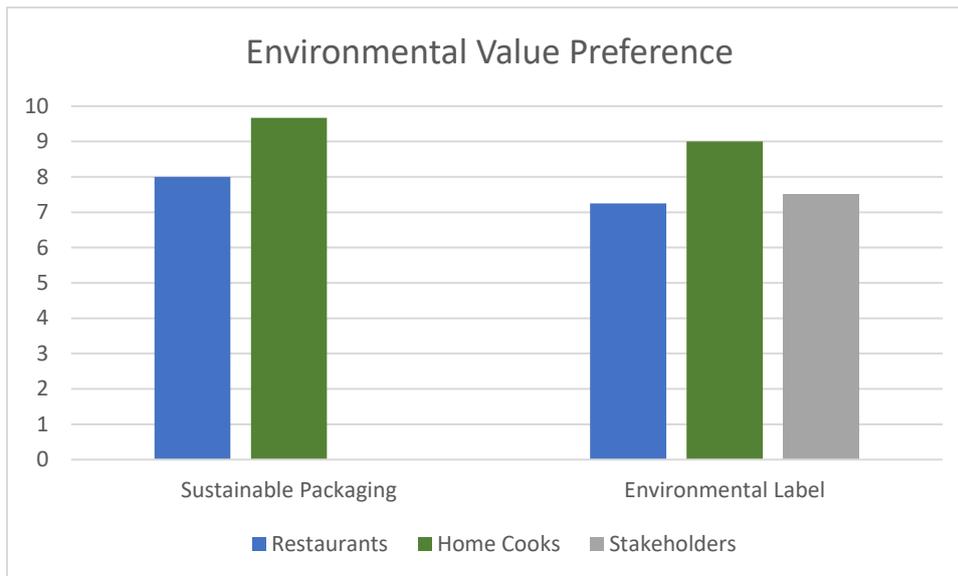


Figure 8: Environmental value for sustainable packaging and environmental label

4.2.4 Economic, Social, and Environmental Value

All three elements of the value proposition according to the literature are discussed in the previous sub-chapters. However, to see what element is valued more than the other elements the interviewees were asked to divide multiple points over the three value proposition elements; economic, social, and environmental value. Although the sample is small, a score difference can be spotted in the different groups. The restaurants have a preference for more economic value. So, this is mostly related to a good price for the products. One of the restaurants mentioned that if the price of the fruits and vegetables became higher than the prices on the market, they would not buy the products even if they are responsibly produced with attention to the social and environmental surroundings (Restaurant 2). This opinion differs per price segment in the restaurants. A restaurant from a higher segment would have fewer problems with higher prices for products if they were produced on the island with more attention to the social and environmental surroundings (Restaurant 1). The quality of the product is important which is another aspect of why potentially the economic value for the restaurants has a higher score (Restaurants 1,2,3,4). Some restaurants mention that the quality of the product increases when vegetables and fruits are produced outside the intensive farming systems which is beneficial, however, there needs to be a good balance between price and quality (Restaurant 2,4). This was the response of one of the restaurants on whether they would be willing to pay more for sustainably produced products.

"Ja we zijn altijd bereid om daarvoor te betalen, maar zoals ik ook al zei het gaat tot een bepaalde hoogte voor je eigen prijs, want anders moeten wij ook weer gaan schuiven met onze prijzen."

"Yes, we are always willing to pay for that, but as I also said it goes up to a certain level for your price because otherwise, we also have to start shifting our prices again." (Restaurant 4)

The next group of potential customers were the home cooks. In general, they find it more important to have a product that is produced in a way that takes care of the natural surroundings of Bonaire. Additionally, that also provides opportunities for the local community. The economic value is for them less valuable. The preference for social and environmental value is high among the home cooks because they see the urgency for more fruits and vegetables to be accessible for all people of all income groups

on the island. They refer multiple times to how it used to be when they were younger and how people used to grow food on their properties (Home Cook 1,2,3).

“Mijn ouders hadden vroeger ook twee kunukus. Daar hadden we heel veel watermeloenen en bonen. Maar tegenwoordig doen mensen niks meer op hun kunukus. Vroeger kreeg je alles van de kunukus. Terwijl je wel oud kan worden als je veel dingen eet die gezond zijn”.

“My parents also used to have two kunukus. There we had lots of watermelons and beans. But nowadays people don't put anything on their kunukus. You used to get everything from the kunukus. You can get old if you eat a lot of healthy things” (Home Cook 2)”

The shape and the size are not a huge aspect that is important for them because they mostly process the fruits and vegetables in their meals, so it is of less economic value for them. An important aspect to add is that multiple home cooks mentioned that they still expect locally produced fruits and vegetables to be more affordable than the local market price (Home Cook 1). However, overall, more emphasis was placed on environmental and social value than on economic value (Figure 9).

The last group of interviewees were the other stakeholders. The results were most balanced compared to the other interviewees. This is because multiple stakeholders think that it is important to balance out all the different elements. After all, that makes the organization at the end of the day the most sustainable according to them (Greenpeace, Public Health Centre). One of the stakeholders mentioned that for building something you need people so taking their needs into account is very important in the sustainability of an organization that might clarify why the social aspect scores slightly higher compared to the economic and social aspects of the value proposition (Greenpeace).

“Ik geef ze allemaal 4 punten omdat ik vind dat ze allemaal in balans moeten zijn. Ga je meer aandacht besteden aan de andere dan is de kans dat je het verliest. En dat is ook heel belangrijk hier op Bonaire want als je dingen niet in balans houdt hier dan verlies je het. Dus daarom geef ik ze gelijke punten.”

"I give them all 4 points because I think they should all be balanced. If you start paying more attention to the other one, then chances are you will lose it. And that's also very important here on Bonaire because if you don't keep things balanced here then you lose it. So that's why I give them equal points." (Public Health Service)

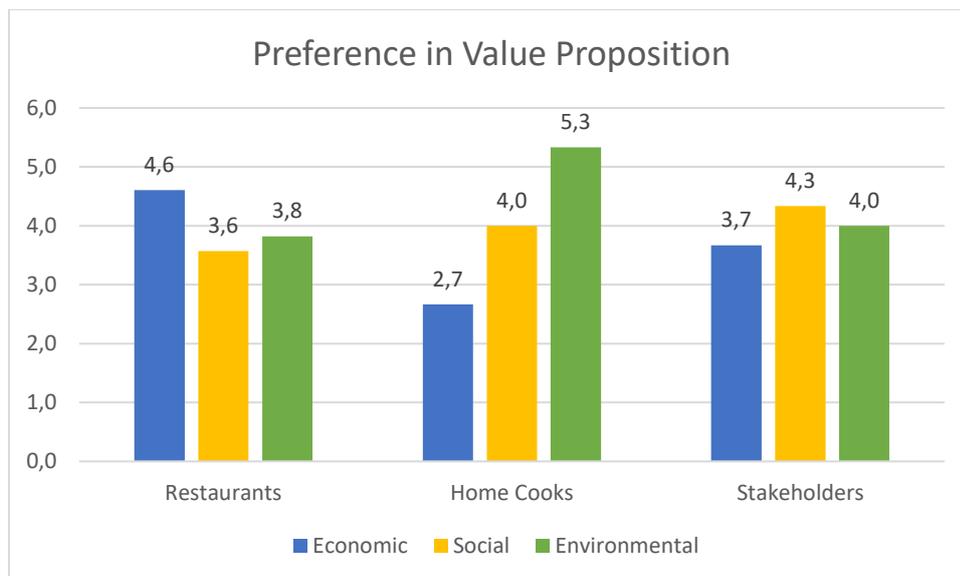


Figure 9: Preference of value proposition element per stakeholder group

So each stakeholder group showed a different preference about the elements of the value proposition.

4.3 Value Creation

In the value creation part, the activities, resources, and key partners of the business model are described. The findings in this chapter answer sub-research question 2 about what is needed for the syntropic farm to create value. The findings are gained from the interviews with the local farmers and the syntropic expert.

4.3.4 Activities

In this chapter, the main activities of a syntropic farm mentioned during the interviews are described. The activities are divided into two types of activities. The investment phase activities and the operational phase activities. Because the first type of activities are important before the operational phase can be entered.

Investment phase

The syntropic farming system is a system that mimics nature. With different layers of vegetation. The design of the system is therefore a crucial aspect before going into business. Designing the system is one of the first activities that needs to be done before the construction of the farm can be executed. The design depends on the value proposition. So it needs to be clear what fruits and vegetables are valued. The infrastructural design of the farm is important to think through because if trees are planted for several years it becomes challenging to change the design. According to the syntropic farming expert, the trees in the system need to mature and start producing after 4 years.

Subsequently, employees and an operational manager need to be hired by the organization to manage the on-farm practices. This requires someone who has experience with syntropic farming and can lead and manage hired employees. According to the syntropic farming expert, at least 9 employees are needed to manage one hectare of a syntropic farm year-round.

The following step creating all the needed infrastructure on the farm based on the design. Think about the greenhouse, swales, warehouses, roads, and irrigation system. For this phase, a lot of financial investments need to be made for materials. Farm operations require machinery and gardening tools to facilitate both the operational phase and the maintenance of the farm

If the infrastructure is ready the planting of the different vegetation layers can start. This requires investments in seeds, plants, and trees. Depending on the design and budget the right sizes of plants and trees need to be bought. Based on the design including the planting scheme the different vegetation layers and rows can be placed in the system.

Operational phase

The syntropic farming expert explained the function of having a cash crop in the system. This is a crop that creates cashflows throughout the whole season and delivers value already after 7 weeks. These crops however need to be replanted every two months. So planting is one of the main activities in the operational phase.

In the operational phase, two main activities are crucial for a syntropic farm. These two activities are pruning and weeding. These two activities deliver the needed nutrients to the soil for the production of fruits and vegetables. Because they are placed on the beds against evaporation and logs and branches are placed in the walking paths.

Next to that harvesting is an operation activity. Per crop or three, the harvesting seasons are different. So according to the syntropic farming expert, there is always one day in the week that you need to harvest in the climate conditions of Bonaire. This is beneficial because the cashflows are therefore stable throughout the year.

When the products are harvested the products need to be marketed. So the syntropic expert mentioned that the local farmers used social media platforms for their marketing activities. Together with contacting restaurants in the area to sell their products.

Supporting activities that are important in finding new employees. Farmer 1 mentioned that throughout the year 40% percent of his employees quit to find another job. So recruiting employees is an important support activity to run the farm, because mechanization tools for syntropic farms are not developed to the level mechanization is developed for monoculture farms. Other support activities mentioned during the interviews with the farmer were financial administration and procurement of resources such as seeds and machinery (Farmer 1).

4.3.2 Key Partners

An organization is often dependent on key partners for the creation of value. This is also the case for a syntropic farm on Bonaire. The farmers and syntropic experts were questioned to get a better understanding of the different stakeholders that are important for an organization to be successful. Different key partners will be introduced in this chapter.

Mangazina di Rei

First of all, Mangazina di Rei is one of the most important key partners of the syntropic farm. This is because they are the leader of the project but at the same time they already have the resources available that can be used in the farm. Think about the land, water, and electricity but if necessary there is already some readily available personnel that can support the farm practices if needed. Next to that is the network of Mangazina di Rei also valuable. A lot of people know Mangazina di Rei and potentially are less reluctant to cooperate. Mangazina di Rei actively tries to make an impact in the social environment with apprenticeship programs and social activities and events for local people. The experience and the network can be used for the syntropic farm to involve the community in the farm. Magazine di Rei also gives tours and workshops for around 50 tourists a week. Potentially they can educate and inform the tourists about syntropic farming practices.

Suppliers

For the supply of resources, the farmers on Bonaire are mostly dependent on the import of products. So seeds, plants, trees, and materials are often imported from Europe, America, and China. The syntropic expert mentioned that they currently buy their seeds from a company in Ukraine. Unusual material such as large netting or machinery also has to be imported. The farmers often buy it online and ship it to their farms. This is costly but otherwise, the products are not available on the Island. One of the farmers mentioned that you have to be careful with cheaper products. Because the harsh climate conditions on Bonaire take a large toll on equipment. They had the experience that cheaper products need to be replaced very quickly. However, cheaper products are more appealing because of the high shipping costs to Bonaire. Small garden equipment is available on the Island in the construction market called 'Kooyman'.

Ministry of Agriculture Bonaire

The Public Centre for Agriculture is not yet convinced of the syntropic farming system. They say that success still has to be proven. However, they want to promote agricultural practices on the Island. So they were already planning on subsidizing local people to step into agricultural practices on the property of the Public Centre for Agricultural. And to the question of whether they want to financially

support the syntropic farm practices they said that they would be willing as long as there is a clear plan and that it will be managed properly. Additionally, they can deliver plants to grow on the farm.

Syntropic Farming Expert

Another key partner for the farm is a syntropic farming expert. The expert can help them to make a suitable design for the farm. This is crucial for the success of the farm. Additional knowledge should be gathered through courses from experts to understand the system in such a way that the farm managers can design the farm themselves. Either way, the expertise of a syntropic farming expert would be highly valuable in the successful implementation of a syntropic farming system.

Water and Power Company Bonaire

Bonaire has a very dry climate so you are dependent as a farmer on water. There are possibilities to drill a well, this is a quite a large investment, and the chances are that the water is too salty for irrigation practices (Farmer 1). Therefore, a good alternative used by the two interviewed farmers is to buy water from the water supplier on the Island called WEB (Water- en Energiebedrijf Bonaire). The best opportunity is to use the tap water if connected to the web and buy a water reservoir. Because you are not dependent on delivery by water trucks. With the irrigation system and a filled water reservoir, the land can be irrigated. Also, the electricity for machinery can be bought by WEB.

Rincon Regional Cooperative

The Rincon Regional Cooperative could be a valuable key partner for cooperation with other members in the region. The cooperative implied that for example products could be bought in large batches to save costs for farmers in the region. And they said that there could be other ways to help each other out whether it is with manpower or sharing equipment.

The Public Health Services would be another key partner especially related to the social impact the syntropic farm wants to make. Due to the need for more healthy diets according to the Public Health services, it would be a great opportunity to work together for education practices. They could host complementary workshops about using the fruits and vegetables grown in diets.

“Bijvoorbeeld in samenwerking met hun dat we samen kunnen kijken om cursussen te geven. Dat we schoolkinderen daar kunnen ontvangen maar ook de oudere actief houden dat ze mee doen en hun expertise gebruiken op die events”

"For example in cooperation with them, we can look together to give courses. We can host school children there but also keep the older ones active so that they participate and use their expertise at those events." (Public Health Service)

Farmers

Farmers in the area could be other key partners. Areas where they like to work together are to share knowledge and experiences on how to deal with certain challenges while farming. Currently, no knowledge institute can help out in certain situations (Farmer 2). Additionally, there would be potential to work together on the end of selling the products according to one farmer 1. Sharing machinery would be possible however, if the farming system differs too much it would be challenging to use the same machinery (Farmer 1).

4.3.3 Resources

Financial & Physical

Financial resources are needed before the business plan can be executed. With the financial resources, different physical resources need to be bought. After the design the lands need to be prepared to become a syntropic farm, and materials and machinery need to be bought the be able to plant, grow,

and harvest the crops. Based on a budget estimation from the syntropic farming expert the investment to make a 1-hectare syntropic farm operational is around 135.000 US dollars (Table 4). The budget was calculated in the Antillean Guilder (ANG) and is recalculated into US dollars because that is the currency used on Bonaire. Some initial investment costs could be reduced by for example renting a dump truck when needed instead of buying this would reduce the investment costs already with around 40.000 dollars. However, if all the elements in this budget are taken up in the syntropic farm it would be the most optimal situation. Because renting machinery over time could become more expensive according to the syntropic farming expert. However, it is estimated that for investments only there needs to be at least a budget of around 100.000 dollars. However, to sustain the practices and cover costs over a longer period more finances are required to bring the syntropic farm to its full potential. The syntropic farming expert said that it would take at least 4 years to get the farm to reach its potential but this is also very dependent on the plants and trees in the syntropic farming system.

Table 4: Investment costs based on budget plan expert in US Dollars

Investment	Cost
Dump truck	\$ 41,911.95
Irrigation system	\$ 23,197.87
Product handling facility	\$ 18,955.53
Operational expenses	\$ 13,970.65
Fences	\$ 10,519.40
Tools	\$ 6,455.13
Plants & trees	\$ 6,310.26
Land preparation	\$ 5,056.57
Water reservoir	\$ 4,265.25
Greenhouse	\$ 3,171.87
Legal actions	\$ 1,564.71
Total	\$135,379.19

Human

In a relatively small and complex farming system, you are dependent on employees working on the farm. Especially in a syntropic farm where it is difficult to use large machinery due to the variety of crops growing in one system. Therefore, it is important to find suitable employees who are willing to work on a farm. This can be challenging on Bonaire according to one of the farmers (Farmer 1). To retain good workmanship and motivated employees the primary and secondary employment conditions are important. One of the farmers mentioned that good employees are gone quickly. Because there are better-paid jobs elsewhere on the island. So as a farmer, you want to retain this employee, however, to remain profitable you have to be careful with the height of the salary (Farmer 1). Different people on the island have a hard time finding motivated employees who are suitable for the job (Restaurant 2, Farmer 1).

Finding suitable people for the syntropic farm would also be important. The Public Centre for Agriculture mentioned that you need an experienced person with knowledge of the agricultural system before you start working with the system. This person needs to be able to manage the farm with the employees.

"So the same goes for Mangazina di Rei. Know what you're getting into and make sure you have someone who is focused on it. Make sure you have a leader who organizes and coordinates everything, puts people to work, and organizes things. That is very important."

4.4 Value Capture

In this chapter, the goal is to describe the costs and the revenue that the syntropic farms potentially could have when being operational. Documents with the budgeted revenues and costs from the syntropic expert are used. The interviews with the local farmers and the syntropic farming expert are used to complement the information in the document to approach the costs and revenue of a real syntropic farm. The findings from this chapter provide an answer to sub-research question 3: How can the syntropic farm capture value from the activities?

4.4.1 Costs Structure

The costs related to a syntropic farm are divided into investment costs and operational costs. Below you can find a table with the most prevalent investment and operating costs (Table 5). The largest investments are buildings and the irrigation system. The higher operational costs are basic services such as water and electricity, the highest operational expenses are the employees on the farm according to the budget plan of the syntropic expert but also according to farmer 1.

Table 5: Investment costs and operating costs of syntropic farm

Investment costs	Operating costs
Land preparation	Marketing costs
Irrigation system	Water
Water reservoir	Electricity
Greenhouse	Salaries
Product handling facility	Insurances
Plants & trees	Fuel
Tools	Maintenance
Legal actions	Tools
Dump truck	Protected clothing
Fences	Sales expenses
	Training employees
	Transport costs
	Plants
	Accountant

4.4.2 Revenue Streams

The revenue streams around the syntropic farm potentially can take on different forms. Different opportunities sketched by the interviewees will be explained in this chapter.

Cash Crop

The cash crop will be a very important revenue flow in the first years of production to cover some of the cost according to the syntropic expert. The reason for this is some of the tree species that are most likely not able to produce fruit in the first few years after planting. The start of fruit production depends on the type of tree and the age of the tree. So incorporating a cash crop would be valuable according to the syntropic expert. Because this crop can be sold 7 weeks after planting.

Adding Value

Another option is to add more value to the product by making a new product (Farmer 3). Think for example of creating a meal or already pre-cut the vegetables to subsequently sell them to the customers. In this way, the revenue per unit of production could increase. Of course, more activities are needed to do this. Creating a farm experience can also add value to the product by inviting people on the farm to be educated and to get a farm experience where people can get to know farming on Bonaire. Subsequently, they can enjoy their time in the farm restaurant that provides freshly produced food and drinks with products from the farm (Public Centre for Agriculture).

Project Subsidy

Another opportunity is to attain subsidies for the social activities around the farm. For example, providing job opportunities for people at a distance from the job market or educating school children about the functioning of a farm. Mangazina di Rei has experience with obtaining project subsidies this could potentially be a revenue stream to cover costs in the first years of the syntropic farm. Also for initial investment subsidy could be a solution. According to the Public Centre for Agriculture, the Dutch government wants to support practices that stimulate agricultural production on Bonaire.

Product sales

Eventually, the goal is to have production of all the different fruits and vegetables produced. And sell them to customers such as restaurants. However, to complement the sales one of the farmers not only sold products directly to restaurants and grocery stores but also had one specific day in the week for selling products at the farm for interested people. This was beneficial if the amount of products was not sufficient enough to sell to the restaurants or stores.

To calculate the potential revenues documents of the Public Centre for Agricultural of Curacao can be used to estimate the yield per square meter for different crops in the climate conditions of Bonaire and Curacao. A tariff list of the local government of Bonaire for different fruits and vegetables can be used to estimate the revenue per kilogram. Both of the documents can be found in Appendix 5.

5. Discussion & Design

In this chapter, the findings will be discussed, and based on the discussion a design will be created. Multiple design suggestions for the business model will be shown. The business model merges the answers to the sub-research questions in a single design. Subsequently to support the execution of the business model a multiple-step income statement design has been created. This financial document can be filled during the first 7 years to get an insight into the yields, revenues, and costs. Potentially it can also be used as a budget plan before the execution of the business model. This tool has been designed based on information from the interviewees and gathered documents and can be used by a syntropic farm to measure the financial flows or see whether the system is profitable.

5.1 Discussion

These findings in the study give an insight into what is important when creating a syntropic farm. The three different elements that were covered in the findings are the value proposition, value creation, the value capture. As discussed in the preliminary literature review, the three elements are important for a successful business model (Foss & Saebi, 2015). The findings and the literature will be discussed in the following subchapters.

5.1.2 Discussion Value Proposition

The economic, environmental, and social elements make the value proposition of a company. Different customers value different attributes of a product. These different groups can be divided into different market segments according to (Campbell et al., 2013). When looking at the findings two potential customer groups were defined before the research, this were the home cooks and restaurants. However, the findings showed that within these pre-made groups, there are more customer segments present that have different preferences for products. The different home cooks showed similar results about how they valued the products. However, between the restaurants, there were different valuations of the product. Especially related to the pricing of the products, the high-segment restaurants were more willing to pay more for local and sustainably produced fruits and vegetables than comparable fruits and vegetables on the market. The low-segment restaurants were more focused on low prices. The literature explains that the price could be a barrier to buying fruits and vegetables (Dibsdall et al., 2003). This corresponds with the findings. There is a real problem on the Island related to the accessibility of healthy food. One of the home cooks referred to her children who hardly were eating any vegetables anymore due to the high prices. Next to that, the market for local fruits and vegetables is valued by as well the home cooks and the restaurants, they refer to it as being valuable. The valuation of local products is something that reappears in the literature (Hasselbach & Roosen, 2015). Another aspect that potentially can make a separate customer segment is the consistent availability of fruits and vegetables. Due to the small size of the farm, it would be a challenge to serve customers who value buying larger amounts of products consistently. This potentially would be a unique customer segment for the smaller farms because larger farms would have fewer challenges with consistent and larger availability of products. Quality is also important, for both restaurants and home cooks, this relates to the taste, color, and shape. So these groups would value the aspects of the external feel segment referred to by Campbell et al. (2013).

A positive impact on the environment is seen as important for both home cooks, restaurants, and also the other stakeholders. Sustainable production is aligned with the quality of the product according to the restaurants. Home cooks also prefer fruits and vegetables to be produced without the use of chemicals, and they would like to see the process firsthand. Sustainable packaging is important for both home cooks and restaurants this is linked to customers who have a higher preference for organic products according to Campbell et al. (2013). Next to the organic products are also locally produced fruits and vegetables valued by home cooks. Their childhood experiences cultivating and enjoying island-grown produce make these home cooks value local food production. The restaurants value local

production because this is good for the economy of the island, for example, they can use it in the marketing of their restaurant using locally sourced products. The literature explains that organically produced products are potentially losing their value because it is not produced locally (Hasselbach & Roosen, 2015). However, this was not clear from the findings of this study. Most of the interviewees prefer old-school and sustainable production methods over conventional systems. They preferred the organic products while they were being brought by small boats from Venezuela to Bonaire. So it seems that the potential customers still value organically produced products despite the distance of transportation.

The social value of the value proposition was most important for the home cooks and the other stakeholders compared to the restaurants. They see that the level of people eating healthy food has been decreasing on the island over the past decades so they express the importance of producing vegetables and fruits. Educational purposes on the farm are seen as valuable by the home cooks and other stakeholders because this potentially would help people to start eating and producing vegetables and fruits in their gardens and kunukus.

So, overall the restaurants favor the economic aspect the highest in the products either a good price or good quality product for their meals. The home cooks rather have a very environmentally sustainable product while also providing a social impact. The other stakeholders preferably see a good balance between the three aspects. So this results in different customer segments with different value propositions that potentially could be satisfied.

5.1.3 Discussion Value Creation

The value creation is about everything that needs to be done to deliver the value proposition. The scientific literature did not disclose very specific information about the implementation of a syntropic farm. However, the study from Abbas et al. (2021) is about the transition towards an agroforestry system, therefore this information is used to see whether the findings are in line with this study. The success factors of an agroforestry system are among other things professional planning and design of the farm (Abbas et al., 2021). The detailed farm design was crucial for a well-functioning system according to the syntropic experts. So in the case of the syntropic farm, it is important to have a very clear picture of what the farm wants to deliver. Based on that, the design should be made and because the design in the syntropic farm cannot be altered quickly and has to develop over the years, a clear value proposition is needed to optimally serve this proposition with the design. Next, the right plant and tree species need to be chosen according to the findings the expert referred to species that start to produce from around 4 years, this is somewhat in line with the literature that says for commercial production the trees need to start producing between five and ten years (Brian et al., 2005). The design rigidity in the system due to producing tree species can make it challenging to innovate which potentially could hinder competitiveness (Broccardo & Zicari, 2020). So business model innovation should be done around the existing trees in the design.

Subsequently, the farm design should be executed and the right investments in resources should be made. Finding the right employees and a manager with experience is crucial for the sustainability of the operational practices on the farm. However, finding motivated employees can be challenging due to the limited availability of workers on Bonaire and the declining popularity of agricultural practices on the island. Additionally, all the on-farm activities need to be done in the right syntropic way to get the most effective farm in terms of production and environmental results. This links to a success factor of an agroforestry farm where it is important to acquire farm knowledge and the right equipment for the farm (Abbas et al., 2021). Cooperation with other stakeholders is therefore important. Including a syntropic farming expert who has the human resources to operate a syntropic farm.

The expert is a key partner in the business to support the design and operational practices of the farm. Subsequently, financial support would be needed in the first years to give the farm the time to develop

and grow in terms of production. A suitable partner for this would be the Public Centre for Agriculture. They mentioned that with a good business plan, they are willing to give financial support. This is important because financial resources are needed to make the initial investment and support the farm in the first years; this confirms the fact that access to start-up funds is one of the success factors according to Abbas et al. (2021). Next to that public health services can help spread the message of eating healthy and support social activities such as educational activities. Another key partner is the cultural park Mangazina di Rei. Because the farm will be located on the same property, the tours and workshops on the park can be extended to the farm to educate visitors. Collaboration with other farmers is difficult due to the different types of farming systems sharing equipment or selling together is difficult due to the different systems and value propositions. However, sharing knowledge or information could have potential.

5.1.4 Discussion Value Capture

To capture the value created with all the activities, resources, and key partners the fruits and vegetables produced need to be sold to the customers. This would be a mainstream of revenue for the farm. However, depending on the customer segment sales prices need to be different. Low-segment restaurants and home cooks are not intending to pay more for fruits and vegetables than similar products available on the market. This could negatively affect the financial situation of the farm when the costs are relatively high, especially in the first years. The economic difficulties were also seen in the literature where small-scale farms are having more economic difficulties due to relatively high cost and lower efficiency compared to larger producers (Dhillon & Moncur, 2023). Focusing on the higher segment restaurants would create the possibility to increase the sales prices of the products. However, the consistent availability of all products is the biggest challenge on a 1-hectare syntropic farm with a high variety of products especially in the first years when the farm is not in a developed stage. The usage of a cash crop would be a suitable approach in both scenarios because it is easy to grow in a short amount of time and generates a continuous revenue stream for the farm. Potentially the visitors could provide an additional revenue stream for the farm. Diversifying revenue streams is important for the success of agroforestry systems and the potential direction for the farm could be agritourism (Abbas et al., 2021; Ammirato et al., 2020). For example, by creating a farm tour or opening a restaurant where people can enjoy the fresh produce of the land. An additional complementing revenue stream would be to add financial value to the fruits and vegetables by selling them to visitors as smoothies or pre-cut fruits as an on-the-go snack at the Cultural Park Mangazina di Rei. This are multiple ways to diversify the revenue streams. The interviewed syntropic experts did not have a commercial farm so real-life examples of the syntropic farming systems and their revenue streams could not be analyzed.

The highest costs on the farm in the initial investment phase are the costs of irrigation and the product handling building. According to the literature, the costs of external inputs are lower in a syntropic farming system compared to a conventional system, however, labor costs are higher (Andrade et al., 2020). This is in line with the findings because the highest operational costs are salaries because due to the complexity of the system machinery is not yet deployable in the systems. Additionally, agrotourism and fruit processing could result in higher costs of production and more labor costs.

So, it is important to map the costs and revenue flows to oversee how the value is captured on the farm. Due to limited insights from real syntropic farms, it would be valuable to map the costs and revenues of a syntropic farming system.

5.2 Business model design

In this chapter multiple business model designs have been created. According to the results of this study, different customer segments have different value preferences concerning vegetables and fruits. Next to that, it will be challenging for the syntropic farm to serve customers already in the first years due to the underdeveloped state of the farm. However, according to the literature is an innovation process of the business model important to keep moving forward (Broccardo & Zicari, 2020). So the different business models could be seen as independent models but also as a business model innovation opportunity over time to target new customer groups with a new value proposition.

The first business model design is focused on home cooks and potentially low-segment restaurants with lower demand for consistency (Figure 10). This allows the syntropic farm to develop its business without restaurants demanding consistent delivery of certain products. The usage of cash crops would be valuable to generate early on positive cash flows in the farm. This business model sets itself apart by balancing competitive pricing with a commitment to a positive environmental and community impact, attracting customers who seek both value and responsibility. Potentially additional subsidies could be requested to sustain the business in the first years because the syntropic farming practices are accompanied by positive social and environmental practices.

FIRST BUSINESS MODEL DESIGN SYNTROPIC FARM



Figure 10: First Business Model Design of the Syntropic Farm on Bonaire

The second business model is focused on high-segmented restaurants (Figure 11). Using this as a business model from the beginning would be challenging due to the high demand for consistency and the larger order sizes compared to home cooks. However, the benefit of this business model is that potentially higher prices could be charged leading to higher revenues for the farm. Environmental values are still important and having a label is not necessary but would be beneficial for the customer's marketing. Additional social practices such as education should not go at the cost of product quality. This business model potentially could fully rely on the revenue streams generated by the sales of the products to the restaurants.

SECOND BUSINESS MODEL DESIGN SYNTROPIC FARM



Figure 11: Second Business Model Design of the Syntropic Farm on Bonaire

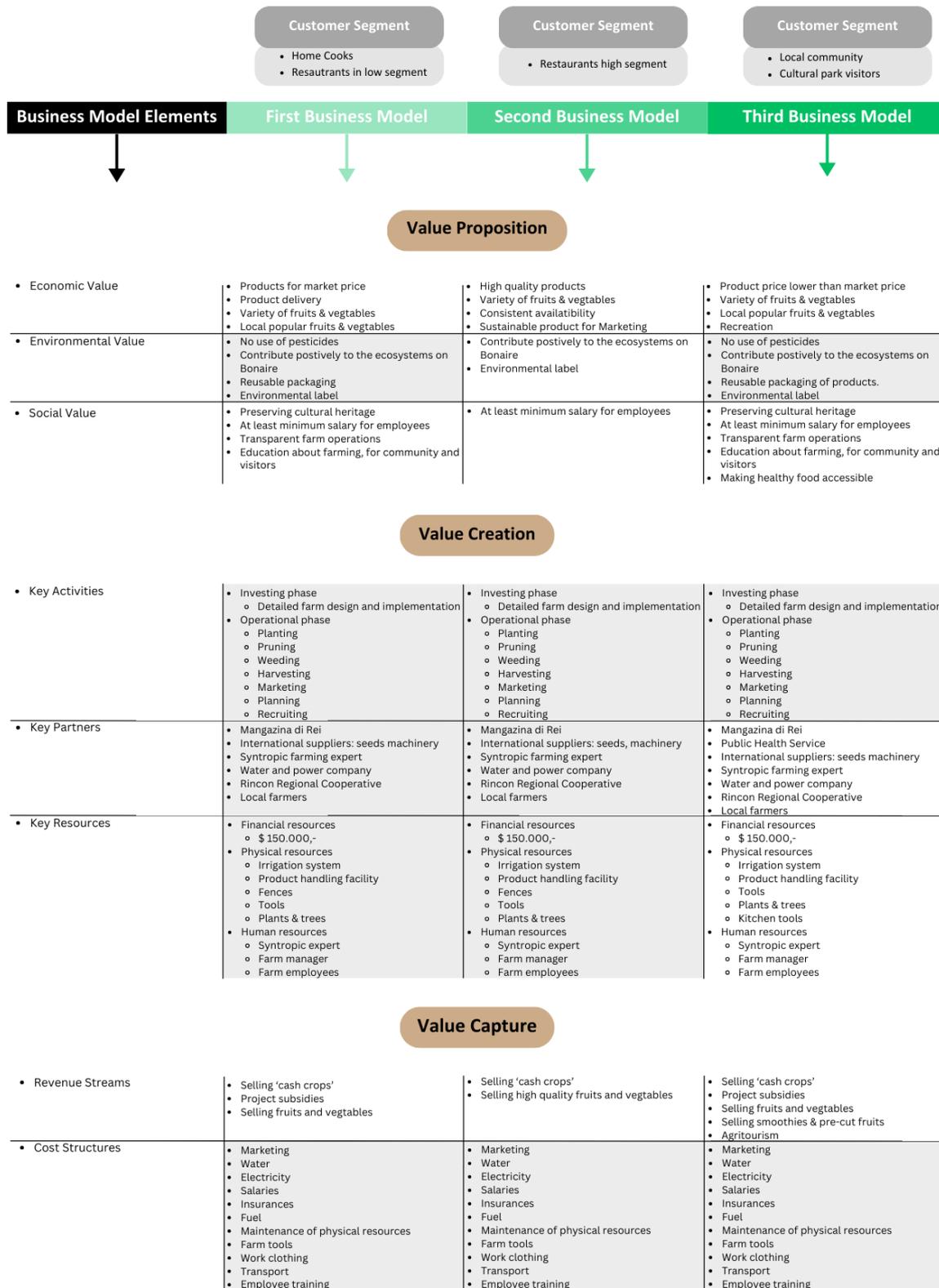
The third and last business model design is a design that is more focused on the local community and visitors of the cultural park Mangazina di Rei (Figure 12). This is a business model that builds more on the preferences of the other stakeholders. By creating a value proposition that focuses more on the social aspect but without compromising the environmental and economic value. The focus is on contributing to healthier diets by working with the public health service. And creating a higher accessibility of healthy food for locals by having a sales price that is lower than similar products on the market. However, an additional revenue stream is created by selling products to the visitors at the cultural park Mangazina di Rei. For example smoothies, or pre-cut fruits as refreshments during the visit. This increases the financial value of fruit or vegetables and therefore increases the revenue stream. Another complementary revenue stream is related to on-farm activities such as farm tours.

THIRD BUSINESS MODEL DESIGN SYNTROPIC FARM



In Figure 13 all the different models are combined in one model to make comparing the business models more convenient.

ALL BUSINESSMODELS COMBINED SYNTROPIC FARM



*Fields highlighted in grey indicate components that are identical across different business models.

Figure 13: All business model for the syntropic farm combined.

5.3 Calculation Model

The purpose of this chapter is to explain the income statement calculation model that has been designed for the syntropic farm. Due to the limited availability of financial data, it would be beneficial for syntropic research but also for science to map the revenues and costs of a syntropic farming system. The syntropic farm can utilize this calculation model to monitor their investments, income, expenses, and potential profitability. This model can also serve as a budget plan to predetermine what the profitability will be in certain scenarios. This model has been designed in Microsoft Excel and exists out of 4 overlapping spreadsheets. The data in the spreadsheets is dummy data, however, part of the data is based on documents from the syntropic farming expert and the Public Centre for Agriculture of Curaçao to give a more realistic inside in the functioning of the model (Appendix 5).

The first spreadsheet within the calculation model is for tracking the investment (Figure 14). The investments have been divided into 6 categories. For each category, there is a separate table. In this figure only two are visible. In the category 'Plants & Trees' the vegetation layers are separately presented to give more insight into the investment of each layer. An overview of the total investment costs is given in the small table complemented by a pie chart showing the contribution of each category to the investment costs.

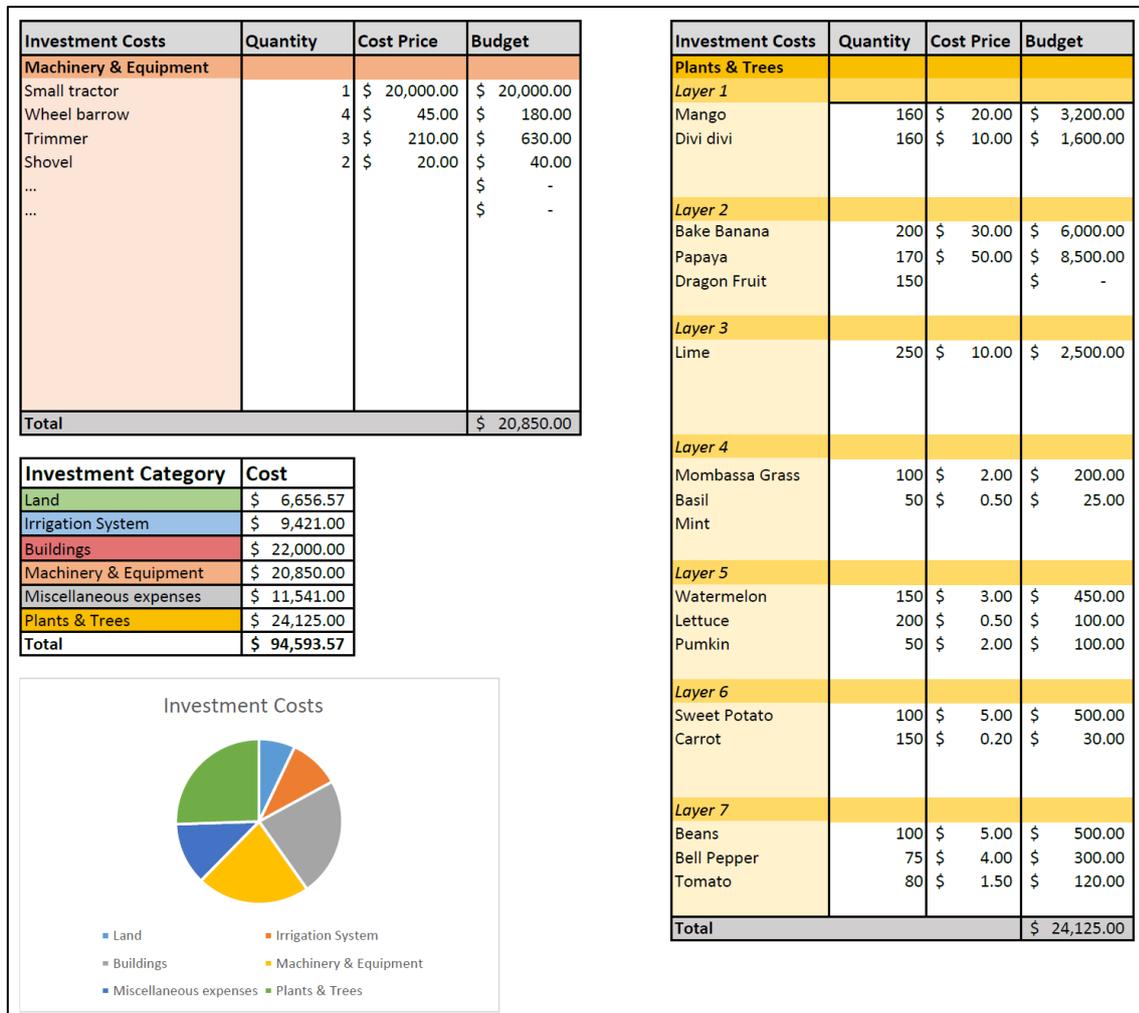


Figure 14: Calculation model spreadsheet 1 – Investment costs

The second spreadsheet exists out of 3 different tables with an additional column representing the summed revenue. The first table on the second spreadsheet presents the yields in kilograms per vegetation layer. The average yield per square meter and the square meters of the planted crops are used to calculate the yields for each quartile this calculation is for budgeting (Table 6). However, for monitoring the real yields need to be entered in the yellow boxes. For the tree species also the number of trees can be entered to potentially calculate the average yield per tree. The total sum of the yields per year is also calculated. The model is designed for 7 years but can easily be extended.

Table 6: Calculation model spreadsheet 2 – Yields in Kilograms

Yield in Kilograms				Year 1				Total year
Vegetation Layer	Avg. Yield kg/m ²	M ² planted	Nr of trees	Q1	Q2	Q3	Q4	
Layer 1								
Mango	2	500	160					0
Divi divi		500	160					0
Layer 2								
Bake Banana	5	500	200				2500	2500
Papaya	3	250	170				750	750
Dragon Fruit	5	250	150					0
Layer 3								
Lime	2	500	250				1000	1000
								0
								0
Layer 4								
Mombassa Grass	2	1000			2000	2000	2000	6000
Basil	2	200		400	400	400	400	1600
Mint	2	300		600				600
Layer 5								
Watermelon	3	400				1200		1200
Lettuce	2.5	600		1500	1500	1500	1500	6000
Pumkin	4	600			2400		2400	4800
Layer 6								
Sweet Potato	4	400				1600		1600
Carrot	3.5	400				1400		1400
								0
Layer 7								
Beans	0.85	700			595		595	1190
Bell Pepper	3	500						0
Tomato	3	500				1500		1500
Total		8,100		2,500	6,895	9,600	11,145	30,140

The next table presents the revenue in dollars (Table 7). This table is linked with the table of the yields in kilograms. However, the yields are multiplied by the average price per kilogram. The distribution key can be used to use the actual amount of yields sold for the revenue calculation. Because some yields could be lost or are used to support another revenue stream for example making fruit smoothies. Again the revenue is given per quartile and the total sum of revenues over the year is given.

Table 7: Calculation model spreadsheet 2 – Revenues in Dollars

Revenues in Dollars					Year 1				
	Price/Kg	Distribution key		Q1	Q2	Q3	Q4	Total year	
Layer 1									
Mango	4	100%		\$ -	\$ -	\$ -	\$ -	\$ -	
Divi divi	3	100%		\$ -	\$ -	\$ -	\$ -	\$ -	
				\$ -	\$ -	\$ -	\$ -	\$ -	
Layer 2									
Bake Banana	2	100%		\$ -	\$ -	\$ -	\$ 5,000	\$ 5,000	
Papaya	2	100%		\$ -	\$ -	\$ -	\$ 1,500	\$ 1,500	
	4	100%		\$ -	\$ -	\$ -	\$ -	\$ -	
Layer 3									
Lime	7	100%		\$ -	\$ -	\$ -	\$ 7,000	\$ 7,000	
				\$ -	\$ -	\$ -	\$ -	\$ -	
				\$ -	\$ -	\$ -	\$ -	\$ -	
Layer 4									
Mombassa Grass	0	100%		\$ -	\$ -	\$ -	\$ -	\$ -	
Basil	2	100%		\$ 800	\$ 800	\$ 800	\$ 800	\$ 3,200	
Mint	2	100%		\$ 1,200	\$ -	\$ -	\$ -	\$ 1,200	
Layer 5									
Watermelon	2	100%		\$ -	\$ -	\$ 2,400	\$ -	\$ 2,400	
Lettuce	2	100%		\$ 3,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ 12,000	
Pumkin	2	100%		\$ -	\$ 4,800	\$ -	\$ 4,800	\$ 9,600	
Layer 6									
Sweet Potato	3	100%		\$ -	\$ -	\$ 4,800	\$ -	\$ 4,800	
Carrot	2	100%		\$ -	\$ -	\$ 2,800	\$ -	\$ 2,800	
				\$ -	\$ -	\$ -	\$ -	\$ -	
Layer 7									
Beans	3	100%		\$ -	\$ 1,785	\$ -	\$ 1,785	\$ 3,570	
Bell Pepper	4	100%		\$ -	\$ -	\$ -	\$ -	\$ -	
Tomato	3	100%		\$ -	\$ -	\$ 4,500	\$ -	\$ 4,500	
Total				\$ 5,000	\$ 10,385	\$ 18,300	\$ 23,885	\$ 57,570	

Other revenues are represented in Table 8. This table can be used when other revenues enter the organization. Think about subsidies and loans. Potentially tours around the farm or selling the fruits and vegetables pre-processed as cut fruit or smoothies could generate another source of income. In the orange 'Total revenues' row the overview of all the revenues including the revenues from Table 7 can be found.

Table 8: Calculation model spreadsheet 2 – Other Revenues and Total Revenues

Other Revenues					Year 1				
	Price	Needed Qty.		Q1	Q2	Q3	Q4	Total year	
Farm Tour									
Tour	\$ 10							\$ -	
Smoothies									
Fresh smoothie	\$ 7	\$ 100					\$ 650	\$ 650	
Subsidy									
Farm Education						\$ 500		\$ 500	
Delivery									
Truck delivery				\$ 300	\$ 500	\$ 500	\$ 500	\$ 1,800	
Total				\$ 300	\$ 500	\$ 1,000	\$ 1,150	\$ 2,950	
Total Revenues					\$ 5,300	\$ 10,885	\$ 19,300	\$ 25,035	\$ 60,520

The costs are in the third spreadsheet which contains Table 9. In this table, the costs are divided into categories. If accessible the costs per unit were represented and the quantities were used to give more insight into the origin of the costs. The costs are represented per quartile and additionally, a cost overview of the whole year is presented

Table 9: Calculation model spreadsheet 3 – Operational Costs

Category	Costs	Unit	Quantity	Year 1				Total year
				Q1	Q2	Q3	Q4	
Basic services								
Water	\$ 4.17	m3	800	\$ 3,332.00	\$ 3,332.00	\$ 3,332.00	\$ 3,332.00	\$ 13,328.00
Electricity	\$ 0.36	kWh	4000	\$ 1,430.00	\$ 1,430.00	\$ 1,430.00	\$ 1,430.00	\$ 5,720.00
								\$ -
Employee								
Salary Farm personell	\$ 16.00	Hour	3	\$ 23,040.00	\$ 23,040.00	\$ 23,040.00	\$ 23,040.00	\$ 92,160.00
Salary Other Personell	\$ 16.00	Hour						\$ -
Training								\$ -
Sales								
Marketing					\$ 150.00		\$ 150.00	\$ 300.00
Telephone				\$ 30.00	\$ 30.00	\$ 30.00	\$ 30.00	\$ 120.00
								\$ -
Transport costs								
Fuel	\$ 1.53	Liter		\$ 200.00	\$ 200.00	\$ 200.00	\$ 200.00	\$ 800.00
Car insurance				\$ 123.00	\$ 123.00	\$ 123.00	\$ 123.00	\$ 492.00
Car mainenance						\$ 50.00		\$ 50.00
Other costs								
Insurances								\$ -
Accountant				\$ 200.00	\$ 200.00	\$ 200.00	\$ 200.00	\$ 800.00
Annuity Loan Bank 2%				\$ 2,276.49	\$ 2,276.49	\$ 2,276.49	\$ 2,276.49	\$ 9,105.96
Equipment								
Farm tools						\$ 100.00	\$ 23.00	\$ 123.00
Machinery					\$ 45.00		\$ 875.00	\$ 920.00
Depreciation						\$ 2,000.00		\$ -
Maintance								\$ -
Total Costs				\$ 30,631	\$ 30,826	\$ 32,781	\$ 31,679	\$ 123,919

The last fourth and last spreadsheet shows the profits. This is calculated by extracting the total revenues minus the total cost and investments. The profits are calculated per quartile and are also calculated for the full year. The number in red represents a negative profit the numbers in black are positive profits. Figure 15 below represents the evolution of the profits for each year for seven years.

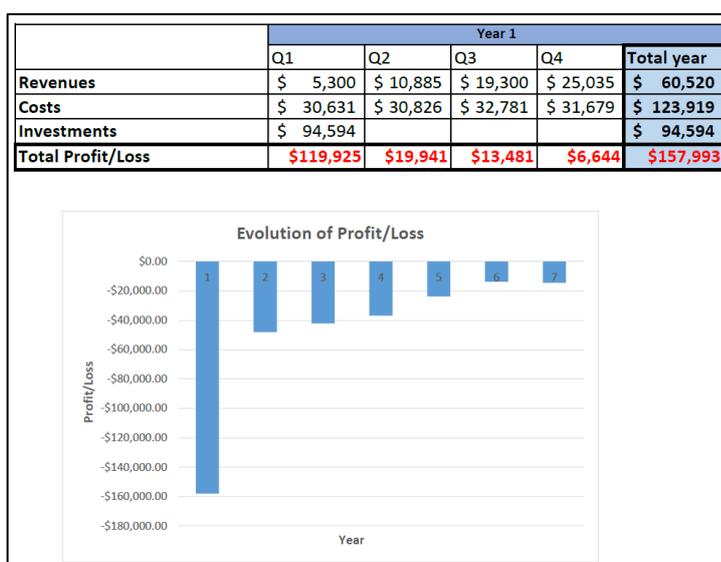


Figure 15: Calculation model spreadsheet 4 – Total Profit/Loss

6. Conclusion

6.1 Answer Research Question

In this research, the focus has been on designing business models for a syntropic farm that could have the potential to be economically viable on Bonaire. Based on the findings multiple designs are made to show the different possibilities.

As a syntropic farm, it is important to focus on a certain customer segment and create a value proposition that is valuable for them. For example, there is a demand for accessible local fruits and vegetables among home cooks. This customer segment values an affordable product that preferably is produced in an environmental friendly way. It would be valuable for them if the community could be involved in the form of farm education and job opportunities. To capture the value the farm should sell the vegetables and fruits for market price while contributing to the community. Another option is to create a value proposition for the higher-segmented restaurants as a customer segment. They are willing to buy locally produced vegetables and fruits for prices higher than the supermarket because sustainably and locally produced products are valued more. However, consistent availability of products is important. Serving this customer segment could generate higher revenues because products can be sold above market prices however consistent production is important. The last developed value proposition is focused on the local community and visitors of the cultural park. The value proposition is focused on providing farm education to the community and visitors. Next to that, the production of the farm will be sold for accessible prices to enhance accessibility to healthy foods. Diversification, for example with agritourism, could support the economic viability of the syntropic farm by generating more revenue streams.

Different value propositions are possible that could serve customer segments on Bonaire. To create this value proposition finances are needed for an initial investment in resources, such as an irrigation system, employees, and farm tools. Additionally, a syntropic farmer should be hired to manage the farm activities. It may take several years for the system to achieve optimal production, depending on the design of the farm system. Therefore, revenue streams are not optimal in the first years. So a good farm design needs to be made to see what value proposition could be offered in each phase and how much finances are needed in each phase. Because the revenue streams most likely are also limited in the starting phase.

So overall there are different opportunities to design a business model that has the potential to be economically viable over the years. However, it can take multiple years till the system is mature. Therefore, potentially, a loan or subsidies are needed to make the initial investment and support the business model in the starting phase. The designed calculation model can help to map the costs and revenues. Potentially, the business model can be innovated over the years based on the maturity of the system to keep satisfying customers and improve the farm's revenue streams.

6.2 Research Contribution

This research looked into the different possibilities of business models for a syntropic farming system in Bonaire. The literature with regard the syntropic farming systems was very limited. Syntropic farming is a sub-category of agroforestry systems, literature related to agroforestry systems was used to get a better impression of the function of these types of farming systems.

This research is therefore one of the studies that is aimed to start to cover this scientific knowledge gap. In the research, a better understanding is created of the economic viability of the syntropic farming systems. The findings present potential customer segments that could be served with a specific value proposition. Next to that also the literature was limited concerning the implementation of commercial

agroforestry systems let alone syntropic farming systems. The findings provide insight into what is needed in a syntropic farm to be able to create value on Bonaire.

Based on these findings different business models for the syntropic farming system have been designed in this research. The value proposition, value creation, and value capture as explained in this report are the first steps toward the implementation of a syntropic farm. Limited information was available about the financial viability of a syntropic farm in the literature and also during the data collection process. Therefore, A calculation model was designed specifically for the syntropic farm. This model can contribute to providing more information about the value capture of a syntropic farm. The calculation model is an income statement including investment costs and can be used to create a better insight into the financial status of the syntropic farm before or during operations. This income statement is based on the findings of this research. This income statement can be used by the farm or in future research to map the costs and revenues.

6.3 Limitations

This chapter will explain some limitations concerning the conducted research. business model viability is dependent on all the aspects mentioned in the conceptual framework. The goal of this research was to get an overview of all the different aspects and see what business model would be economically viable. However, due to time constraints, it was impossible to study all the elements in depth. For example, extensive market research is beneficial for more in-depth knowledge of customer needs and to determine the customer segments. So, the small sample size of potential customers limits the generalizability of the findings regarding the value proposition.

Interviewing the syntropic farming expert also had some limitations. For example, the expert did not have commercial syntropic farm data. Therefore there was no detailed description of costs and revenue streams. This means that it was difficult to assess the value capture of a syntropic farming system. For that reason, a calculation model has been designed to have a model available that could help to map cost structures and revenue streams. However, for a full financial overview additional elements, such as a balance sheet, should be included. Additionally, the syntropic farming expert has experience on the island of Curaçao. The growth conditions are similar to Bonaire, however, the market and access to certain resources might be different compared to Bonaire. So, the findings related to the syntropic farm could have limited external validity.

With a few interviewees, there was a language barrier present. Therefore translations were needed for the interview. This potentially could have resulted in valuable information being lost in the translation. Next to that, the interviewees that were interviewed might have given socially desirable answers due to interview bias, this is also the case for the ranking questions. Another reason for potential socially desirable answers is the fact that Bonaire is a relatively small community where a lot of people know each other, and therefore are less likely to give their own opinion, although they are made aware of the anonymous processing of the data.

This is a cross-sectional study, so the data is gathered at one point in time. However, the situation can change rapidly because climate conditions are changing and markets are constantly developing and changing, which potentially could change the situation for a syntropic farm. So over time, the findings with the data-gathering methods might be different.

6.4 Suggestions For Future Research

In this research, the focus was on designing a viable business that could be implemented on Bonaire. However, a business model is very extensive with a lot of elements. Further research about the business model would be valuable. It would be valuable to do specific market research where the focus is

checking whether the proposed value proposition design would be viable and to quantitatively support these results.

Subsequently, another future research could be related to the ecosystem design of the syntropic farming system. A design is important because the different plants and trees in the ecosystem need to support each other. Next to that, the design should be suitable for the climatic and soil conditions. And last but not least the design should take into account the business model to eventually become economically viable.

Next to that, it would be very valuable to study a commercial syntropic farming system. The system potentially should be monitored and studied over multiple years. The study preferably should focus on the yields and linked cashflows of the syntropic farm. In this way, the syntropic farm design can be tested and after a certain period, the results should be evaluated to see if a commercial syntropic farm is economically viable. Therefore, the calculation model should be extended to also incorporate the balance sheet of the company and financial ratios to keep track of the financial position of the syntropic farm.

References

- Abbas, G., Ali, A., Khan, M., Mahmood, H. Z., Wahab, S. A., & Amir-ud-Din, R. (2021). The Transition from Arid Farming Systems to Agroforestry Systems in Pakistan: A Comparison of Monetary Returns. *Small-Scale Forestry*, 20(3), 325–350. <https://doi.org/10.1007/S11842-020-09470-5/TABLES/6>
- Albrecht, S., & Wiek, A. (2021). Implementing sustainable food forests: Extracting success factors through a cross-case comparison. *Journal of Agriculture, Food Systems, and Community Development*, 11(1), 183–200. <https://doi.org/10.5304/jafscd.2021.111.019>
- Ammirato, S., Felicetti, A. M., Raso, C., Pansera, B. A., & Violi, A. (2020). Agritourism and Sustainability: What We Can Learn from a Systematic Literature Review. *Sustainability*, 12(22), 9575. <https://doi.org/10.3390/su12229575>
- Andrade, D., Pasini, F., & Scarano, F. R. (2020). Syntropy and innovation in agriculture. *Current Opinion in Environmental Sustainability*, 45, 20–24. <https://doi.org/10.1016/J.COSUST.2020.08.003>
- Arslan, M. (2020). Corporate social sustainability in supply chain management: a literature review. *Journal of Global Responsibility*, 11(3), 233–255. <https://doi.org/10.1108/JGR-11-2019-0108>
- Atanda, J. O. (2019). Developing a social sustainability assessment framework. *Sustainable Cities and Society*, 44, 237–252. <https://doi.org/10.1016/J.SCS.2018.09.023>
- Barnes, A. P., Hansson, H., Manevska-Tasevska, G., Shrestha, S. S., & Thomson, S. G. (2015). The influence of diversification on long-term viability of the agricultural sector. *Land Use Policy*, 49, 404–412. <https://doi.org/10.1016/J.LANDUSEPOL.2015.08.023>
- Barnes, A. P., Thomson, S. G., & Ferreira, J. (2020). Disadvantage and economic viability: characterising vulnerabilities and resilience in upland farming systems. *Land Use Policy*, 96, 104698. <https://doi.org/10.1016/j.landusepol.2020.104698>
- Barratt, M. (2004). Understanding the meaning of collaboration in the supply chain. *Supply Chain Management*, 9(1), 30–42. <https://doi.org/10.1108/13598540410517566>
- Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions*, 28, 79–95. <https://doi.org/10.1016/J.EIST.2018.02.001>
- Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42–56. <https://doi.org/10.1016/J.JCLEPRO.2013.11.039>
- Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. *Journal of Cleaner Production*, 45, 9–19. <https://doi.org/10.1016/j.jclepro.2012.07.007>
- Brian, B., Genevieve, M., Arild, A., Manuel, R. P., & Heidi, A. (2005). The Socioeconomic Conditions Determining the Development, Persistence, and Decline of Forest Garden Systems. *Economic Botany*, 59(3), 345–253.
- Broccardo, L., & Zicari, A. (2020). Sustainability as a driver for value creation: A business model analysis of small and medium enterprises in the Italian wine sector. *Journal of Cleaner Production*, 259, 120852. <https://doi.org/10.1016/j.jclepro.2020.120852>

- Bucherer, E., Eisert, U., & Gassmann, O. (2012). Towards Systematic Business Model Innovation: Lessons from Product Innovation Management. *Creativity and Innovation Management*, 21(2), 183–198. <https://doi.org/10.1111/J.1467-8691.2012.00637.X>
- Campbell, B. L., Mhlanga, S., & Lesschaeve, I. (2013). Consumer Preferences for Peach Attributes: Market Segmentation Analysis and Implications for New Marketing Strategies. *Agricultural and Resource Economics Review*, 42(3), 518–541. <https://doi.org/10.1017/S1068280500004974>
- Cardeal, G., Höse, K., Ribeiro, I., & Götze, U. (2020). Sustainable Business Models—Canvas for Sustainability, Evaluation Method, and Their Application to Additive Manufacturing in Aircraft Maintenance. *Sustainability 2020, Vol. 12, Page 9130*, 12(21), 9130. <https://doi.org/10.3390/SU12219130>
- Casadesus-Masanell, R., & Zhu, F. (2013). Business model innovation and competitive imitation: The case of sponsor-based business models. *Strategic Management Journal*, 34(4), 464–482. <https://doi.org/10.1002/SMJ.2022>
- Chen, H., Ellett, J. K., Phillips, R., & Feng, Y. (2021). NC-ND license Small-scale produce growers' barriers and motivators to value-added business: Food safety and beyond. *Food Control*, 130, 108192. <https://doi.org/10.1016/j.foodcont.2021.108192>
- Dhillon, R., & Moncur, Q. (2023). Small-Scale Farming: A Review of Challenges and Potential Opportunities Offered by Technological Advancements. *Sustainability 2023, Vol. 15, Page 15478*, 15(21), 15478. <https://doi.org/10.3390/SU152115478>
- Dibsdall, L., Lambert, N., Bobbin, R., & Frewer, L. (2003). Low-income consumers' attitudes and behaviour towards access, availability and motivation to eat fruit and vegetables. *Public Health Nutrition*, 6(2), 159–168. <https://doi.org/10.1079/PHN2002412>
- Dickinson, V. (2011). Cash Flow Patterns as a Proxy for Firm Life Cycle. *The Accounting Review*, 86(6), 1969–1994. <https://doi.org/10.2308/accr-10130>
- Drucker, P. F. (1994, September). The Theory of the Business. *Harvard Business Review*.
- Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., & Fosso Wamba, S. (2017). World class sustainable supply chain management: critical review and further research directions. *The International Journal of Logistics Management*, 28(2), 332–362. <https://doi.org/10.1108/IJLM-07-2015-0112>
- Fernqvist, F., Sadvoska, V., & Langendahl, P.-A. (2022). Sustainable value creation – a farm case on business model innovation. *International Food and Agribusiness Management Review*, 25(4), 543–554. <https://doi.org/10.22434/IFAMR2021.0114>
- Foss, N. J., & Saebi, T. (2015). *Business Model Innovation : The Organizational Dimension* (N. J. Foss & T. Saebi, Eds.; First edition.). Oxford University Press, Incorporated.
- Froufe, L. C. M., Schwiderke, D. K., Castilhano, A. C., Cezar, R. M., Steenbock, W., Seoane, C. E. S., Bognola, I. A., & Vezzani, F. M. (2020). Nutrient cycling from leaf litter in multistrata successional agroforestry systems and natural regeneration at Brazilian Atlantic Rainforest Biome. *Agroforestry Systems*, 94(1), 159–171. <https://doi.org/10.1007/S10457-019-00377-5/TABLES/5>
- Gázquez-Abad, J. C., Jiménez-Castillo, D., & Marín-Carrillo, G. M. (2012). Differences in Perceived Image of Fruit and Vegetables from a Specific Origin: The Moderating Role of Familiarity. *Journal of Food Products Marketing*, 18(5), 397–416. <https://doi.org/10.1080/10454446.2012.685034>

- Giraldo, O. F., & Rosset, P. M. (2017). Agroecology as a territory in dispute: between institutionality and social movements. *The Journal of Peasant Studies*, 45(3).
<https://doi.org/10.1080/03066150.2017.1353496>
- Glover, J. L., & Reay, T. (2015). Sustaining the Family Business With Minimal Financial Rewards: How Do Family Farms Continue? *Family Business Review*, 28(2), 163–177.
<https://doi.org/10.1177/0894486513511814>
- Hasselbach, J. L., & Roosen, J. (2015). Consumer Heterogeneity in the Willingness to Pay for Local and Organic Food. *Journal of Food Products Marketing*, 21(6), 608–625.
<https://doi.org/10.1080/10454446.2014.885866>
- Hoffmann, M. R. M. (2013). *Sistemas agroflorestais para agricultura familiar: Análise econômica*. Universidade de Brasília.
- Jinger, D., Kumar, R., Kakade, V., Dinesh, D., Singh, G., Pande, V. C., Bhatnagar, P. R., Rao, B. K., Vishwakarma, A. K., Kumar, D., & Singhal, V. (2022). Agroforestry for controlling soil erosion and enhancing system productivity in ravine lands of Western India under climate change scenario. *Environmental Monitoring and Assessment*, 194(4), 1–17. <https://doi.org/10.1007/S10661-022-09910-Z/FIGURES/7>
- Johnson, G., Wittington, R., Scholes, K., Angwin, D., & Regné, P. (2018). *Fundamentals of strategy*. Pearson Education Limited.
- Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, 135, 1474–1486.
<https://doi.org/10.1016/j.jclepro.2016.06.067>
- Kaczorowska, J., Rejman, K., Halicka, E., Szczybyło, A., & Górka-Warsewicz, H. (2019). *Impact of Food Sustainability Labels on the Perceived Product Value and Price Expectations of Urban Consumers*. <https://doi.org/10.3390/su11247240>
- Kpienbaareh, D., Bezner Kerr, R., Nyantakyi-Frimpong, H., Amoak, D., Poveda, K., Nagothu, U. S., Vogel, C., Iverson, A., Mehreteab, T., Luginaah, I., Steffan-Dewenter, I., Wang, J., Küstner, G., Enloe, S., Mayer, V., Dakishoni, L., Lupafya, E., Shumba, L., Chunga, T., ... Tembo, Y. (2022). Transdisciplinary agroecological research on biodiversity and ecosystem services for sustainable and climate resilient farming systems in Malawi. *Advances in Ecological Research*, 66, 3–35.
<https://doi.org/10.1016/bs.aecr.2022.04.001>
- Kumar, R. V., Roy, A. K., Kumar, S., Gautam, K., Singh, A. K., Ghosh, A., Singh, H. V., & Koli, P. (2022). Silvopasture systems for restoration of degraded lands in a semiarid region of India. *Land Degradation & Development*, 33(15), 2843–2854. <https://doi.org/10.1002/LDR.4359>
- Lazzarini, S., Chaddad, F., & Cook, M. (2001). Integrating supply chain and network analyses: The study of netchains. *Journal on Chain and Network Science*, 1(1), 7–22.
<https://doi.org/10.3920/JCNS2001.x002>
- Low, G., Dalhaus, T., & Meuwissen, M. P. M. (2023). Mixed farming and agroforestry systems: A systematic review on value chain implications. *Agricultural Systems*, 206.
<https://doi.org/10.1016/j.agsy.2023.103606>
- Luz, I. de S. B., & Souza, Á. N. de. (2015). *Sistemas agroflorestais sucessionais: viabilidade financeira para a agricultura familiar* [Universidade de Brasília]. <https://bdm.unb.br/handle/10483/11231>

- Nair, P. K. R., Gordon, A. M., & Rosa Mosquera-Losada, M. (2008). Agroforestry. In *Encyclopedia of Ecology, Five-Volume Set* (pp. 101–110). Elsevier Inc. <https://doi.org/10.1016/B978-008045405-4.00038-0>
- Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley & Sons.
- Pawłowski, L., Pawłowska, M., Kwiatkowski, C. A., & Harasim, E. (2021). The Role of Agriculture in Climate Change Mitigation—A Polish Example. *Energies 2021, Vol. 14, Page 3657, 14(12)*, 3657. <https://doi.org/10.3390/EN14123657>
- Quandt, A. (2020). Contribution of agroforestry trees for climate change adaptation: narratives from smallholder farmers in Isiolo, Kenya. *Agroforestry Systems, 94(6)*, 2125–2136. <https://doi.org/10.1007/S10457-020-00535-0/TABLES/2>
- Rutz, J. C., Bloom, J. D., Schroeder-Moreno, M., & Gunter, C. (2018). Farm to Childcare: An Analysis of Social and Economic Values in Local Food Systems. *Journal of Agriculture, Food Systems, and Community Development, 8(3)*, 23–39. <https://doi.org/10.5304/jafscd.2018.083.004>
- Sadovska, V., Axelson, L. E., & Mark-Herbert, C. (2020). Reviewing Value Creation in Agriculture—A Conceptual Analysis and a New Framework. *Sustainability 2020, Vol. 12, Page 5021, 12(12)*, 5021. <https://doi.org/10.3390/SU12125021>
- Skaf, L., Buonocore, E., Dumontet, S., Capone, R., & Franzese, P. P. (2019). Food security and sustainable agriculture in Lebanon: An environmental accounting framework. *Journal of Cleaner Production, 209*, 1025–1032. <https://doi.org/10.1016/J.JCLEPRO.2018.10.301>
- Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. *Qualitative Research Journal, 19(3)*, 259–270. <https://doi.org/10.1108/QRJ-12-2018-0012>
- Suhi, S. A., Enayet, R., Haque, T., Ali, S. M., Muktadir, Md. A., & Paul, S. K. (2019). Environmental sustainability assessment in supply chain: An emerging economy context. *Environmental Impact Assessment Review, 79*, 106306. <https://doi.org/10.1016/j.eiar.2019.106306>
- Verschuren, P., & Hartog, R. (2005). Evaluation in Design-Oriented Research. *Quality & Quantity, 39(6)*, 733–762. <https://doi.org/10.1007/s11135-005-3150-6>
- Von Cossel, M., Ludwig, H., Cichocki, J., Fesani, S., Guenther, R., Thormaehlen, M., Angenendt, J., Braunstein, I., Buck, M. L., Kunle, M., Bihlmeier, M., Cutura, D., Bernhard, A., Ow-wachendorf, F., Erpenbach, F., Melder, S., Boob, M., & Winkler, B. (2020). Adapting Syntropic Permaculture for Renaturation of a Former Quarry Area in the Temperate Zone. *Agriculture 2020, Vol. 10, Page 603, 10(12)*, 603. <https://doi.org/10.3390/AGRICULTURE10120603>
- Wilczyński, A., & Kołoszycz, E. (2021). Economic Resilience of EU Dairy Farms: An Evaluation of Economic Viability. *Agriculture 2021, Vol. 11, Page 510, 11(6)*, 510. <https://doi.org/10.3390/AGRICULTURE11060510>

Appendix 1

Interview guide Mangazina di Rei

- Pen en papier
- Interview guide
- Laptop voor opnames + Oplader
- Mobiel voor opnames + Oplader
- Cadeau voor geïnterviewde (na het interview)

Toestemming:

- Deelnemer wordt gewezen op het toestemmingsformulier.
- Deelnemer gevraagd om toestemming voor het opnemen van het interview.

Introductie:

Fijn dat we hier zo aan de start van het onderzoek om tafel kunnen zitten. In dit eerste interview is het de bedoeling dat we me meer duidelijkheid gaan creëren wat precies het product en/of dienst is die jullie willen gaan leveren met de 'syntropic farm'. Dit is belangrijk voor de volgende interviews om de mensen duidelijk te kunnen vertellen wat de mensen belangrijk vinden in dit product of deze dienst. Daarnaast is dit interview ook om helder te krijgen of er al een doelgroep is die jullie willen bereiken met dit product. Dit is belangrijk om de juiste doelgroep te interviewen. Deze twee onderdelen zullen de basis vormen voor het verdere onderzoek.

Questions value product or service:

1. Wat is het product of de dienst die je aan je klanten wilt leveren?
2. Wat maakt dit product en/of deze dienst uniek?

Uitleg van de drie elementen van de waarde propositie: Economische, sociale en milieuwaarde.

Gebaseerd op deze kennis:

3. Welke economische waarde wil je de klanten bieden met het product/de dienst?
4. Welke sociale waarde bent u van plan te bieden aan de klanten van het product/de dienst?
5. Welke milieuwaarde ben je van plan te bieden aan de klanten van het product/de dienst?

Questions customer segment

1. Welk klanten segment zou u willen bedienen met het product/service?
 - a. *Vervolg vraag om verder te verduidelijken wat het klant segment is*
 - i. Op welk geografisch gebied wil je je richten?
 - ii. Wat zijn de demografische gegevens waar je naar op zoek bent?
 1. Wat is de leeftijd van het klanten segment?
 2. Wat is het inkomens niveau van het klanten segment?
 - iii. Wat is de levensstijl van het klanten segment?
 - iv. Wat is de interesse van het klanten segment?
 - v. Wat is uw perspectief op het verkopen van producten aan bedrijven?
 1. Aan wat voor soort bedrijf zou je producten willen verkopen?

Conclusie:

Bedankt voor uw tijd! Dit geeft een duidelijker beeld van wat uw potentiële klantsegment is waar u zich op wilt richten en wat u hen wilt bieden. Dit helpt me om het volgende interview goed te kunnen inrichten.

Interview guide potential customers**Materiaal:**

- Pen en papier
- Interview guide
- Laptop voor opnames + Oplader
- Mobiel voor opnames + Oplader
- Cadeau voor geïnterviewde (na het interview)

Toestemming:

- Deelnemer wordt gewezen op het toestemmingsformulier.
- Deelnemer gevraagd om toestemming voor het opnemen van het interview.

Introductie

Goedendag, mijn naam is Josia Veenvliet. Ik ben een student van de Wageningen Universiteit. En ik ben bezig met een onderzoek dat is bedoeld om een economische haalbaar bedrijfsmodel op te zetten voor een syntropische boerderij. Een syntropische boerderij heeft als doel om de samenwerkingen in de natuur te versterken en zo min mogelijk negatieve effecten achter te laten. Dit landbouwsysteem bestaat al enige tijd en is op sommige plekken al succesvol geïmplementeerd. Alleen is het de vraag of dat ook het geval is in Rincon. Daarom doe ik onderzoek om te kijken of vraag is naar producten en diensten die geleverd worden door deze boerderij maar ook om uit te zoeken wat vinden mensen belangrijk in dit type product. Vandaar dat ik verschillende mensen wil interviewen om daar een beter beeld van te krijgen.

De syntropische boerderij is van plan product type (X,Y,Z) te gaan produceren. En ik zou u graag wat vragen willen stellen omtrent dit product. Dit interview zal ongeveer een 25-30 minuten in beslag nemen.

Intro vragen:

1. Koopt u lokale groente voor uw (kook) activiteiten?
 - a. Wat voor lokale groente koopt u?
 - b. Hoeveel lokale groente koopt uw per week voor uw (kook) activiteiten?
 - c. Waar koopt u momenteel de lokale groente?
 - d. Hoeveel geld bent u nu wekelijks kwijt aan groente?
2. Koopt u lokaal fruit voor uw (kook) activiteiten?
 - a. Wat voor vers fruit koopt u?
 - b. Hoeveel vers fruit koopt uw per week voor uw (kook) activiteiten?
 - c. Waar koopt u momenteel de lokaal fruit?
 - d. Hoeveel geld bent u nu wekelijks kwijt aan fruit?
3. Hoe vaak koopt u lokale groente en fruit?

Antwoord: geen verse groente/fruit → vervolg vraag:

- a. Zou u bereid zijn het product te kopen wanneer er iets verandert?

Antwoord: wel vers fruit/groente → vervolg: 'Vragen belang economische waarden'.

Voor nu wil ik focussen op de lokale groente en fruit.

Vragen belang economische waarden

4. Wie zijn de klanten aan wie u verkoopt?
5. Welke eigenschappen van het groente en fruit zijn belangrijk voor u?
6. Zou u meer lokale groente en fruit af willen nemen als ze lokaal consistent beschikbaar zijn?
7. Wat is de maximale afstand dat u wilt afleggen om het groente en fruit te kopen?
8. Zou u gebruik maken van een bezorgservice van lokale groente of fruit of bent u bereid zelf naar Rincon te reizen?
9. Zou u bereid zijn extra kosten te betalen voor een bezorgservice?
10. Hoe belangrijk is het voor u dat er een bezorgservice is die de lokale geteelde groente en fruit uit Rincon bezorgt?
11. Wat is de invloed van de prijs op de aankoop van dit groente en fruit?
12. Zou u bereid zijn een box met lokaal geteelde groente en fruit te kopen?

Vragen belang van milieuwaarden:

13. In hoeverre vind u het belangrijk dat de lokale groente en fruit duurzaam geproduceerd zijn?
 - a. Wanneer niet belangrijk vervolgvraag → ga naar vragen "sociale waarden"
 - b. Wanneer belangrijk vervolg vragen →
14. Wat is volgens u een duurzaam product?
 - a. Welke duurzaamheid aspecten zijn voor u belangrijk bij het kopen van een product?
15. Hoe belangrijk is het dat de groente en fruit geproduceerd zijn zonder het gebruik van chemische gewasbescherming en kunstmest?
16. Hoe belangrijk is het voor u dat het verpakkingsmateriaal van dit product herbruikbaar is?
17. Hoe belangrijk is het voor u dat een product een milieu keurmerk heeft?
18. Bent u bereid meer te betalen voor een product wanneer het een positieve impact heeft op het milieu?
 - a. Antwoord: Ja →
 1. Hoeveel procent meer bent u bereid te betalen als het product milieu vriendelijk is geproduceerd?
 - b. Antwoord: nee → Geen vervolg vraag

Vragen belang van sociale waarden

19. Hoe belangrijk dat de organisatie bijdraagt aan de gemeenschap die betrokken is bij de organisatie?

Ter verduidelijking: het ondersteunen van lokale projecten, banen creëren, educatieve activiteiten organiseert?

 - a. Welke vormen van betrokkenheid zijn belangrijk voor u?
20. Wat is belangrijk voor u wat betreft het salaris van werknemers die op de boerderij werken?

21. Hoe belangrijk zijn de arbeidsomstandigheden voor de werknemers die de productie van de groente en fruit hebben mogelijk gemaakt?
22. Hoe belangrijk is het dat u als klant mee kan kijken in het productie proces?
23. Zijn er nog andere sociale aspecten die belangrijk zijn voor u waar de boerderij aan bijdraagt?
24. Bent u bereid meer te betalen voor een product waarvan de boerderij zich actief inzet voor de sociale waarden?
 - a. Antwoord: Ja →
 1. Hoeveel procent meer bent u bereid te betalen als het product
 - b. Antwoord: nee → Geen vervolgvraag

25. Zou u 12 punten willen verdelen over de economische, sociale, en milieu waarden, om aan te geven wat u het belangrijkste vindt?
26. Wat is de reden dat u een box zou afnemen met groente en fruit?

Conclusie:

Hartelijk bedankt voor uw deelname aan dit onderzoek. In de komende maanden zal ik aan de slag gaan met het verwerken van de data en dit omzetten tot een onderzoek document. Zoals aan gegeven in de 'Code of Conduct' mag u altijd terugkomen op de gegeven antwoorden. Daarnaast als u interesse heeft kan ik u het onderzoeksresultaat opsturen zodra het afgerond is zodat u kan zien waar u aan mee gewerkt hebt.

Interview guide Other stakeholders

Materiaal:

- Pen en papier
- Interview guide
- Laptop voor opnames + Oplader
- Mobiel voor opnames + Oplader
- Cadeau voor geïnterviewde (na het interview)

Toestemming:

- Deelnemer wordt gewezen op het toestemmingsformulier.
- Deelnemer gevraagd om toestemming voor het opnemen van het interview.

Introductie

Goedendag, mijn naam is Josia Veenliet. Ik ben een student van de Wageningen Universiteit. En ik ben bezig met een onderzoek dat is bedoeld om een economisch haalbaar bedrijfsmodel op te zetten voor een syntropische boerderij. Een syntropische boerderij heeft als doel om de samenwerkingen in de natuur te versterken en zo min mogelijk negatieve effecten achter te laten. Dit landbouwsysteem bestaat al enige tijd en is op sommige plekken al succesvol geïmplementeerd. Alleen is het de vraag of dat ook voor Rincon het geval kan zijn. Daarom doe ik onderzoek om te kijken of er vraag is naar producten die geleverd worden door deze boerderij en ook om uit te zoeken wat potentiële klanten en stakeholders belangrijk vinden in dit type product. Vandaar dat ik verschillende mensen wil gaan interviewen om daar een beter beeld van te krijgen.

Vragen belang economische waarden

1. Wat is vanuit uw positie gekeken belangrijk op de syntropische boerderij?
2. Op welke manier kan het landbouwproject een positieve bijdragen leveren vanuit uw positie gezien?
3. Op welke manier zou een samenwerking kunnen plaatsvinden?
4. Is de economische gezondheid van de syntropische boerderij van belang voor u?
 - a. Zo ja → welke belang heeft u bij de economische gezondheid van de boerderij?

Vragen belang van milieuwaarden:

5. Hoe belangrijk is voor u de impact van het product op het milieu?
 - a. Wanneer niet belangrijk vervolg vraag →
 1. Wat is de reden dat het niet belangrijk voor u is?
 - b. Wanneer belangrijk vervolg vragen →
6. Welke duurzaamheid aspecten zijn voor u belangrijk?
7. Hoe belangrijk is het dat er geproduceerd wordt zonder het gebruik van chemicaliën?
8. Hoe belangrijk is het voor u dat het product een officieel milieu gerelateerd duurzaamheidslabel krijgt?

Vragen belang van sociale waarden

9. Hoe belangrijk is het dat de organisatie bijdraagt aan in de lokale gemeenschap?
Ter verduidelijking: het ondersteunen van lokale projecten, banen creëren, educatieve activiteiten organiseert?
 - a. Welke vormen van betrokkenheid zijn belangrijk voor u?
10. Wat is belangrijk voor u als het aankomt het salaris van werknemers?
11. Hoe belangrijk zijn de arbeidsomstandigheden voor de werknemers op het landbouwproject?
12. Hoe belangrijk is het dat u als stakeholder mee kan kijken in het productieproces?
13. Zijn er nog andere sociale aspecten die belangrijk vindt bij het kopen van een product?

14. Zijn er nog meer dingen die vanuit uw positie belangrijk zijn die nog niet te spraken zijn gekomen?

15. Zou u 12 punten willen verdelen over de economische, sociale, en milieu waarden, om aan te geven wat u het belangrijkste vindt?

Conclusie:

Hartelijk bedankt voor uw deelname aan dit onderzoek. In de komende maanden zal ik aan de slag gaan met het verwerken van de data en dit omzetten in een onderzoekverslag. Zoals aangegeven in de 'Code of Conduct' mag u altijd terugkomen op de gegeven antwoorden. Daarnaast als u interesse heeft kan ik u het onderzoeksresultaat opsturen zodra het afgerond is zodat u kan zien waar u aan mee gewerkt hebt.

Interview guide Expert

Materiaal:

- Pen en papier
- Interview guide
- Laptop voor opnames + Oplader
- Mobiel voor opnames + Oplader
- Cadeau voor geïnterviewde (na het interview)

Toestemming:

- Deelnemer wordt gewezen op het toestemmingsformulier.
- Deelnemer gevraagd om toestemming voor het opnemen van het interview.

Introductie

Bedankt voor de mogelijkheid om u te interviewen. Zoals u misschien al begrepen had is dit interview voor onderzoek naar de haalbaarheid van een syntropic farm op Bonaire. En aangezien jullie hier kennis van hebben en onder dezelfde condities werken is het erg interessant om meer over jullie business model te weten te komen. In dit interview wil ik voornamelijk ingaan op de activiteiten, benodigdheden en partners die nodig zijn (geweest) om het bedrijf economisch haalbaar te maken. Dit interview zal ongeveer een uur duren.

Intro vragen:

1. Waarom zijn jullie begonnen met het bedrijf?
2. Hoe groot is de syntropic farm?
 - a. Hectare/ afmetingen land?
3. Hoeveel mensen werken er op de farm?
 - a. Hoeveel mensen vast in dienst?
 - b. Hoeveel mensen zijn alleen parttime in dienst/ seizoenarbeiders?
4. Wat zijn de producten die jullie produceren?
 - a. Wat zijn de producten die jullie verbouwen op het land?
5. Wat is het product dat jullie verkopen aan de klant?
 - a. Welke dienst leveren jullie aan de klant?
6. Hoe zou u jullie klanten segment omschrijven?
 - a. Waar komen ze vandaan
 - b. Welke leeftijd
 - c. Wat waarderen jullie klanten in jullie product?
7. Is het bedrijf financieel gezond?
Ofwel is het bedrijf in staat alle kosten te dekken met de inkomsten.
8. Op welke manier proberen jullie jezelf te onderscheiden op de markt?
 - a. Op economische waarden?
 - b. Op sociale waarden?
 - c. Milieuwaarden?

Vragen investering fase:

9. Hoe zijn jullie aan de benodigde kennis gekomen?
10. Wat was er nodig voor het opstellen van de business plan?
11. Wat kwam er kijken bij het inrichten van de gewassen op de boerderij?
12. Welke juridische zaken hebben jullie moeten afhandelen?
13. Welk materieel hebben jullie aangekocht?
14. Wat was er nodig om de infrastructuur op te zetten (irrigatie, wegen/paden)?

15. Wat kwam er kijken bij het aankopen van gewassen/ bomen?
16. Wat kwam er kijken bij het aannemen van personeel?

Per vraag naar de volgende onderdelen doorvragen:

- i. Welke kosten kwamen hierbij kijken?
- ii. Welke vaardigheden en kennis waren hiervoor nodig?
- iii. Welke spullen en of materieel was hiervoor nodig?
- iv. Welke personen/ partners zijn waren hiervoor belangrijk?

17. Welke activiteiten hebben jullie nog meer doorlopen bij het opzetten van de boerderij?
 - a. *Stel vragen i, ii, iii, iv*
18. Waar kwamen de financiële middelen vandaan voor het opzetten van de boerderij?

Vragen operationele fase:

Nu is de opzet/investering fase voorbij en dan ga je naar de operationele fase. Over deze operationele fase wil ik graag vragen stellen over de activiteiten, middelen en partners die jullie nodig hebben om het bedrijf financieel gezond te houden.

19. Wat is er nodig voor het zaaien en planten van bomen en gewassen?
20. Wat is er nodig voor het oogsten van de vruchten en gewassen?
21. Wat is er nodig om de gewassen te verwerken in het eindproduct?
22. Wat is er nodig voor het onderhouden van materieel en machines?
23. Wat is er nodig voor de administratieve activiteiten?
 - a. E.g. Financiële administratie, verzekeringen, etc.
24. Wat is er nodig voor de marketing/ promotie van producten?
25. Wat is er nodig voor de teelt van de gewassen en het verzorgen van de grond?
 - a. Maken jullie gebruik van pesticiden/ (kunst) mest?
26. Wat is er nodig voor de educatieve activiteiten die jullie hebben?
27. Welke activiteiten vinden er nog meer plaats in een productie jaar/seizoen?

Per vraag naar de volgende onderdelen doorvragen:

- i. Welke kosten komen hierbij kijken?
- ii. Welke vaardigheden en kennis zijn hiervoor nodig?
- iii. Welke spullen en of materieel is hiervoor nodig?
- iv. Welke personen/ partners zijn hiervoor belangrijk?

28. Welke activiteiten vinden er nog meer plaats in een productie jaar/ seizoen?
 - a. *Stel vragen i, ii, iii, iv*

Vragen inkomsten

(Voor verduidelijking en voorbereiding op de analyse van financiële documenten)

29. Wat zijn jullie inkomstenbronnen?
30. Wat zijn de opbrengsten van de boerderij per hectare per seizoen/jaar?
31. Hebben jullie een recent overzicht van de oogst per product/ opbrengsten?
32. Hoe verhouden de prijzen die jullie vragen zich tot concurrenten?
33. Is costleadership echt een haalbare strategy?

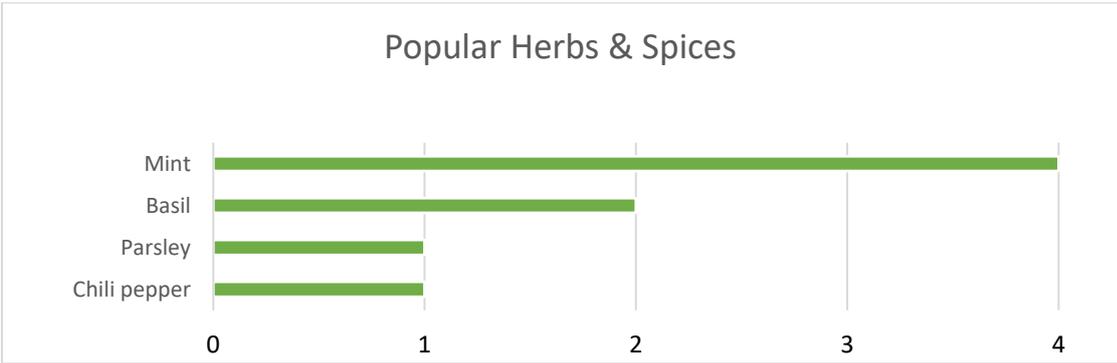
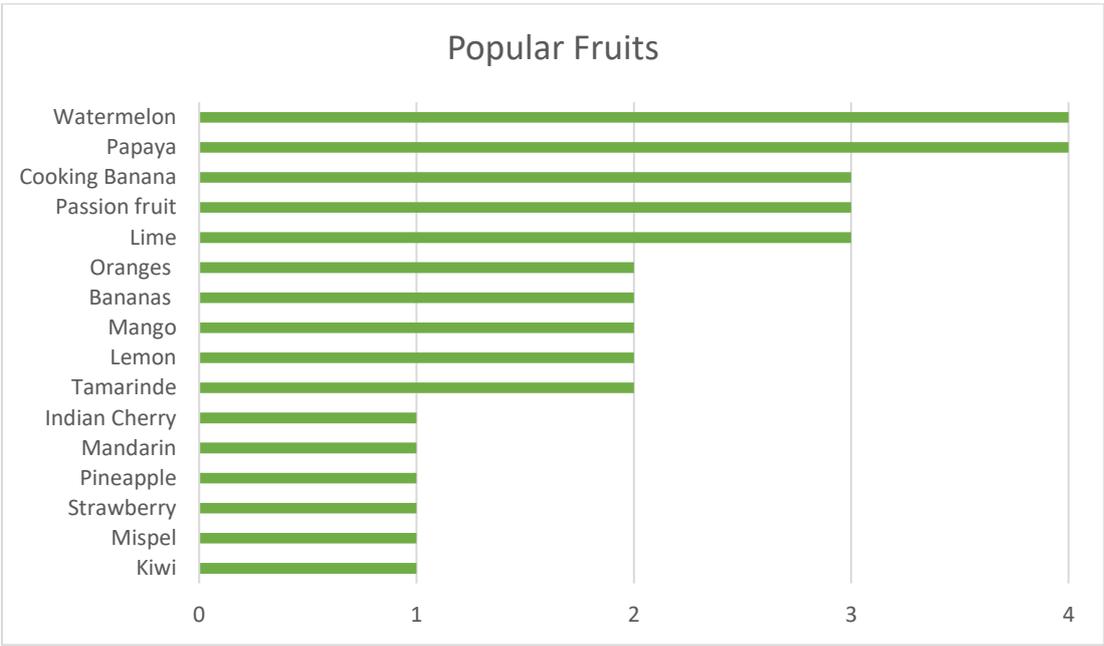
Conclusie

Hartelijk bedankt voor uw deelname aan dit onderzoek. In de komende maanden zal ik aan de slag gaan met het verwerken van de data en dit omzetten tot een onderzoek document. Zoals aan gegeven in de 'Code of Conduct' mag u altijd terugkomen op de gegeven antwoorden. Daarnaast als u interesse heeft kan ik u het onderzoeksresultaat opsturen zodra het afgerond is zodat u kan zien waar u aan mee gewerkt hebt.

Appendix 2

Theme	Code	Deductive/Inductive
Value proposition	Economic value	Deductive
	Social value	Deductive
	Environmental value	Deductive
	Product	Inductive
	Customer segment	Inductive
Value creation	Activities Inv (Investing)	Deductive
	Activities Opr (Operationalization)	Deductive
	Key Partners Inv (Investing)	Deductive
	Key Partners Opr (Operationalization)	Deductive
	Resources Opr (Operationalization)	Deductive
	Resources Inv (Investing)	Deductive
	Investment costs	Deductive
	Challenges	Inductive
Value capture	Operating costs	Deductive
	Revenue streams	Deductive
Business environment	Competitors	Inductive
	Local Knowledge	Inductive

Appendix 4



Appendix 5

L.V.V. Code	Gewas Nederlands naam	Kultivo Nomber na papiamentu	Aantal dg van zaaien tot kiemen Kantidat di dianan pa germina	Aantal dg tot uitplanten Kantidat di dia prome ku planta den veld	Aantal dg van af tot begin Oogst Kantidat di dia pa kuminsa kosecha despues di planta	Aantal dg op het veld Kantidat di dia riba veld	Gem. Opbrengst Produksjon aver: (kg / m ²)
AM	Amsoi	Amsoy	5 t / m 10	24 - 28	47 - 66	71 - 88	2.00
AN	Antroewa	Antrua	10 t / m 12	8 - 12	50 - 56	296	1.85
AU	Aubergine	Berehein	10 t / m 12	8 - 12	50 - 56	296	4.00
BK	Bloemkool	Blumkol	5 t / m 10	28 - 35	48 - 71	48 - 71	1.60
BS	Bladsla	Salada	7 t / m 10	21 - 28	42 - 56	42 - 56	2.50
CA	Cassave	Yuka	-----	-----	90 - 210	210 - 240	3.50
CB	Curaçaose bonen	Bonchi kunuku	7 t / m 10	0 - 10	45 - 55	100	0.95
CG	Courgette	Squash	7 t / m 14	28 - 35	42 - 49	87 - 132	2.50
CK	Chinesekool	Kolo chines	4 t / m 14	28 - 35	60 - 90	60 - 90	2.00
CO	Coriander	Silantro	7 t / m 10	-----	50 - 55	50 - 55	2.70
FK	Fles kalabas	Kalbas Largu	3 t / m 21	28 - 49	110 - 180	141 - 229	4.50
HP	Hete peper	Promente Pika	8 t / m 12	35 - 56	90 - 120	356	2.00
KK	Kleine Komkommer	Konkõnber Chiki	10 t / m 20	35 - 55	60 - 65	105 - 120	1.75
KO	Kouseband	Bonchi largu	6 t / m 10	0 - 10	45 - 55	90 - 100	1.00
KS	Kropsla	Krõpsla	4 t / m 8	21 - 28	45 - 65	45 - 65	1.00
ME	Meloen	Melon	4 t / m 10	14 - 28	78 - 86	96 - 124	2.50
OK	Okra	Yambo	7 t / m 14	21 - 24	56 - 60	206 - 210	2.00
PA	Paprika	Promentõn	10 t / m 14	30 - 40	56 - 60	236 - 240	3.00
PE	Peterselie	Peterseli	10 t / m 28	28 - 35	70 - 90	90 - 110	1.80
PI	Pinda	Pinda	7 t / m 14	28 - 35	90 - 110	92 - 112	0.25
PK	Paksoy	Paksoi	4 t / m 7	21 - 28	46 - 53	50 - 60	2.00
PO	Pompoen	Pampuna	7 t / m 10	21 - 28	70 - 85	190 - 205	4.00
PR	Prei	Prei	5 t / m 7	56 - 70	50 - 100	50 - 100	1.00
PY	Papaya	Papaya	10 t / m 21	60 - 80	150 - 360	12.787	3.5 j 1.00 - 4.00
RA	Radis	Radeis	5 t / m 7	-----	25 - 30	31 - 35	1.00
RO	Rodebieten	Roibit	7 t / m 14	21 - 28	60 - 65	81 - 85	2.00
SB	Snijbonen	Sneibonchi	6 t / m 12	21 - 48	50 - 60	90 - 100	0.85
SE	Selderij	Seldu	10 t / m 14	28 - 35	50 - 60	180 - 200	2.00
SK	Slakomkommer	Konkõnber di salada	7 t / m 10	42 - 48	42 - 48	80 - 90	3.00
SO	Sopropo	Mamotica	2 t / m 3	28 - 35	56 - 60	296	3.00
SP	Spinazi	Spinazi	10 t / m 21	70 - 80	30 - 45	135 - 150	3.00
SU	Stengelui	Siboyo largu	10 t / m 14	28 - 35	60 - 70	60 - 70	2.00
TB	Tayerblad	Tayerblad	-----	-----	-----	-----	-----
TO	Tomaat	Tomati	7 t / m 14	35 - 40	56 - 60	236 - 240	3.00
WA	Snijbieten	Warmoes	7 t / m 14	21 - 30	40 - 50	160 - 170	2.50
WK	Wittekool	Kolo Blancu	5 t / m 10	28 - 35	48 - 71	48 - 71	2.6
WM	Watermeloen	Patia	7 t / m 14	21 - 28	75 - 100	80 - 100	3.00
WN	Wandu	Bonchi Wandu	14 t / m 21	21 - 28	80 - 250	3650 - 4380	10 - 12j 0.50
ZA	Zoete Aardappel	Batata Dushi	-----	-----	90 - 180	110 - 200	4.00

Servisio di Agrikultura, Krio di bestia i Peska
Produksi dor di C.Johanns

Average yields of various vegetables and fruits from the Public Centre for Agriculture on Curaçao. These numbers are gathered with research in agricultural settings in Curaçao. The document below gives an overview of the tariffs for selling fruits and vegetables in 2021 to indicate the revenue streams.

OVERZICHT VAN DE TARIEVEN VOOR VERKOOP GEOOGSTE GROENTEN 2021

AMSOY	2.00 USD /BOS
BEREHEIN	2.50 USD /KG
BONCHI KUNUKU	2.50 USD /KG
BROKOLI	2.50 USD /KG
'CHINEZE KOOL'	2.00 USD /BOS
'DAGOEBLAD''	2.00 USD /BOS (400 gr.)
GIAMBO	3.00 USD /KG
KALALÚ/Klaroen	2.00 USD /BOS (400 gr.)
KALBAS LARGU	3.00 USD /KG
KÒMKÒMER CHIKÍ	5.00 USD /KG
KÒMKÒMER SALADA	2.00 USD /KG
KOLO	2.50 USD /KG
KONOFLÓ	2.00 USD /KG
'KOUSEBAND'	3.00 USD /KG
MILON	2.50 USD /KG
MAISHI GRANDI	2.50 USD /KG
PAPRIKA	3.00 USD /KG
PAMPUNA	2.00 USD /KG
PAPAYA	2.00 USD /KG
PATIA (CHARLESTON GRAY)	2.00 USD /KG
PATIA (DESSERT KING)	2.00 USD /KG
PATIA (SUGAR BABY)	2.00 USD /KG
PIKA	6.00 USD /KG
PIKA DUSHI	3.00 USD /KG
PETERSELI	2.00 USD /BOS
PREI	2.00 USD /BOS
RADEIS	2.00 USD /KG
ROIBIT	2.00 USD /KG
SELDER	2.00 USD /BOS
SIBOYO	2.50 USD /KG
SIBOYO LARGU	2.00 USD /BOS
SILANTRO	2.00 USD /BOS
SPINASI	3.00 USD /KG
TAYERBLAD	2,00 USD /BOS
TOMATI	3.00 USD /KG
WARMUS	2.00 USD /BOS
WÖRTEL	2.00 USD /KG
FLOR DI JAMAICA	2,00 USD/400gr.