

Agroecology for Local Resilience:

can Food Forests bear the fruit for achieving Food Sovereignty in Curaçao?



Source: Samyama Transitie Advies, 2020

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Date: August 15th, 2022

Wordcount: 23435

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Abstract

The COVID-19 outbreak has brought to light major issues with the dominating food system. For Curaçao, it has revealed how the industrial agricultural paradigm has come with significant costs for society, the environment, and overall public health. The over-reliance on imports, driven by a mono-economy focused on tourism, is having a negative impact on the food security of the island. The challenge Curaçao faces is to increase local food production without harming the environment, society or health. In response to the exacerbated vulnerabilities, food sovereignty is proposed as a potential alternative paradigm, as it is based on sustainable local self-sufficient food systems. Many local food initiatives have emerged that challenge the current food system in order to improve the Island's resilience. Although research is emerging that examines the potential of these initiatives in the form of urban food forests to gain more food security, there is a scarcity of research that examines how food challenges can be overcome through food sovereignty. This study is based on a qualitative design with in-depth interviews involving eleven actors within the realm of food production and a review of policy documents regarding food policies. After providing a definition of food sovereignty, it investigates how this paradigm manifests in urban food forests in Curaçao and how the COVID-19 pandemic inspired these initiatives to improve food sovereignty. The strengths of these urban food forests are the effective use of resources, the variety of sustainable production techniques, self-sufficiency, and a foundation in traditional knowledge. Limitations to the development of a more sovereign food system include a paucity of knowledge exchange and dissemination, the inability to switch to renewable energy sources, and a lack of financial support and lack of recognition of social movements by the government. In conclusion, Curaçao would benefit from a shift away from the current industrial agriculture paradigm towards a sustainable agricultural strategy that emphasises food sovereignty. This research suggests that reaching that objective would be facilitated by recognising and supporting urban food forest initiatives.

Keywords: Curaçao, Small Island Developing State, COVID-19, Food Security and Resilience Challenges, Food Sovereignty, UFFs

Acknowledgements

Firstly, I would like to take the time to thank the people who were involved in making this research possible. In the uncertainty of being able to do the fieldwork, I would like to thank the coordination of the IDS master for providing us with as much clarity as possible. Then, even more importantly, I would like to thank my supervisors, Elisabeth Krueger and Nicky Pouw, for their guidance through motivational encounters and feedback during the research and thesis-writing process. I would also like to express my gratitude to Dr. Niels Beerepoot, for being the second reader of my thesis. Next, I would like to show my gratitude to my local supervisors, Juan-Carlos Goilo and Benjamin Visser, for sharing their knowledge, linking me to their network, and guiding me in the field. Of course, I'm also thankful to all the individuals who gave me their time and their honest answers in the interviews. Then, I want to thank Sophie Mossman for making my time in Curaçao memorable and for the mental support by repeatedly quoting, "*diamonds are made under pressure*" as a motivational speech. Lastly, I want to thank my roommates, friends, family, and colleagues for their endless support throughout my time in the field and writing process. All of you have contributed in your own way to the end result, and I cannot thank you enough for that.

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Abbreviations

AKV	= Agrarische Koöperatieve Vereniging (Agricultural Cooperative Society)
CBS	= Central Bureau of Statistics
CDE	= Curaçao Doughnut Economy
FAO	= Food and Agriculture Organisation
GMN	= Ministry of Health, Environment and Nature
LFIs	= Local Food Initiatives
LVC	= La Via Campesina
LVV	= Ministry of Agriculture, Livestock and Fisheries
MEO	= Ministry of Economic Development
SDGs	= Sustainable Development Goals
SIDS	= Small Island Developing State
Soltuna	= Stichting voor Ontwikkeling van Land en Tuinbouw Nederlandse Antillen
UFFs	= Urban Food Forests
WHO	= World Health Organisation

1. Introduction

1.1 Background and problem statement

Food is a fundamental aspect of human existence. However, in a continuously developing world with a global food system producing enough food to feed everyone, food insecurity remains an unresolved problem (Barrett, 2021). The rise in the population combined with the undesirable impacts of climate change increases the uncertainty concerning food production and equal access to food. Therefore, the magnitude of food security challenges is highlighted in Sustainable Development Goal 2 of Zero Hunger. Its targets and indicators all intend to “end hunger, achieve food security and improved nutrition, and promote sustainable agriculture” by the year 2030 (Dermody et al., 2018). Yet, significant disparities, evidenced by the fact that 828 million individuals are affected by hunger (FAO et al., 2022) and obesity rates above 1 billion (WHO, 2022), highlight an uneven distribution of progress regarding the alleviation of hunger and obesity. Additionally, according to the World Health Organisation (WHO) (2019), the existing food system contributes 25 to 30 percent of global CO₂ emissions. These numbers demonstrate the need for a rethinking of our global agricultural economy (WHO, 2019).

Rethinking the food system necessitates a change, moving away from the emphasis on food security towards a more sustainable approach to agriculture on both a national and international level. Food sovereignty embodies an alternative approach, promoted by La Via Campesina (LVC): a social movement that emerged in response to food scarcities, increased awareness of human rights violations in rural areas, a global food crisis, and climate change. The food sovereignty movement aims to create sustainable, just, safe, and nutritious food systems (Clapp, Desmarais & Margulis, 2015). Scholars, experts, and international organisations have been calling for the re-shaping of food systems and the boosting of sustainable and local agricultural production (Petetin, 2020). The need for the localization of sustainable food systems is further pressed by the COVID-19 pandemic, which painfully exposed the vulnerabilities of the current food system dominating food production, consumption, and trade globally (Clapp & Moseley, 2020). One of the main responses of nations worldwide to COVID-19 was a prioritisation of their own food supply. This disproportionately affected those dependent on food imports (Mardonnès et al., 2020).

This research focuses on Curaçao, a Small Island Developing State (SIDS) situated in the Lesser Antilles of the Caribbean and is a constituent country of the Kingdom of the Netherlands. Overall, SIDS face several unique social, economic, and environmental vulnerabilities (Briguglio, 1995; Julca & Paddison, 2010; Nel, Mearns, Jordaan & Goethals, 2021). Their remote geography

combined with a semi-arid climate makes them highly dependent on imports from external markets for many goods (Goede, 2020), including food. This is not different for Curaçao, as it relies on imports for 95% of its food (Goede, 2020). Curaçao imported over 266 million US dollars' worth of food and live animals in 2021 (CBS, 2022), accounting for almost 25% of all imports. The value of exported goods that year was a modest 12 million US dollars.

Curaçao's economy suffered a significant setback since the former operator of the Isla oil refinery left, leaving the island heavily reliant on the touristic sector (Scheyvens & Momsen, 2008). Additionally, an ongoing crisis in Venezuela leading to a trade embargo (Alonso-Gamo & Sommer, 2019) has left Curaçao exposed to external shocks on its food systems and an increased inability to deal with these shocks. These existing vulnerabilities were exacerbated by the emergence of the COVID-19 pandemic (Bishop et al., 2021). Travel restrictions due to the virus completely flattened the tourist sector, leaving many people without a job and income (CARICOM, 2020). As a result, hunger and malnutrition have made their incursions into daily life on even a larger scale than before the pandemic (Goede, 2020). The COVID-19 pandemic has highlighted long-standing patterns and institutions of social unfairness, inequality, and poverty, putting the most vulnerable members of society on the brink of survival. Therefore, the necessity for economic diversification to resist external shocks has become clearer than ever (ZonMw, 2020). Economic diversity is important for community resilience, as diversified economic and social infrastructures may better allow continuous socio-economic functioning in the face of large disruptions or (exogenous) shocks (Berks & Ross, 2013). Out of the urgent need for an economic review to cope with the specific socio-economic and environmental characteristics, the Ministry of Economics of Curaçao (MEO) calls for innovative approaches to diversify the economy and build resilience. Localisation of food systems would be a valuable step in the right direction (MEO, 2020). However, no specific official policy plans have been put into practice yet to support the localisation of food production.

Considering the need for innovative, sustainable approaches within agriculture, multiple self-employed individuals have set up local food producing initiatives in the form of Urban Food Forests (UFFs) in Curaçao (MEO, 2021). Most, if not all, of these initiatives' practices are based on the idea of agroecology: an umbrella term that covers a wide range of ecologically friendly agricultural practices (Wezel et al., 2020). Despite the successful implementation of these UFFs in Curaçao, through supporting poor families with fruits and vegetables during the pandemic, engaging in community-building and teaching locals how to produce and consume local products, opinions about the potential of these initiatives to provide Curaçao with more food self-sufficiency are divided. Therefore, this research aims to gain more insight into the potential of these local initiatives to contribute to the island's food sovereignty. This leads to the following

central question in this thesis: *“What is the potential of UFFs in Curaçao to gain more food sovereignty in response to food security and resilience challenges exacerbated by the COVID-19 pandemic?”*

1.2 Relevance

This research aims to make an academic contribution to larger-scale research conducted on Aruba, Curaçao, and St. Maarten, funded by ZonMW (a Dutch organisation for health research and care innovation). The objective of this research is to contribute to a better understanding of how the pandemic has affected local food systems and how local sustainable agricultural production may contribute to diversification strategies. The participation of local stakeholders and community members in the data collection and interpretation design is critical to the success of this effort (ZonMw, 2020). The study is also part of the process that is being initiated by the Curaçao Doughnut Economy(CDE) task force to develop a food strategy for the island.

Food sovereignty is of interest because it is not yet a widely researched concept regarding securing food for an entire local population. Within the research consortium described above, the focus is mainly on the effects of UFFs on food security. Additionally, despite the fact that local food production is assumed to be an important economic activity and there are signs that these local food producers already operate in a way that is traditionally in line with agroecology and food sovereignty, UFFs have not yet been studied in the context of agroecology and food sovereignty.

1.3 Thesis outline

This thesis begins with the literature review from which the theoretical framework emerges in Chapter 2. This will demonstrate why it was decided to investigate the potential of food sovereignty and which key ideas, such as agroecology and the centralization of farmers under new policy frameworks, are related to it. The chapter concludes with the conceptual scheme showing how all these theories and concepts relate to each other. Chapter 3 presents the methodological approach of the study. Chapter 4 presents the research location and its context, including Curaçao’s socio-economic characteristics, the influence of COVID-19 and actors and initiatives with a role in food production. The fifth, sixth, and seventh chapters address the data analysis, including theoretical implications. The main findings and theoretical contribution of this study are discussed in chapter 8, along with recommendations for policy and future research.

2.Theoretical Framework

2.1 Introduction

This chapter critically reviews the literature on food security as being the dominant model, the alternative movement of food sovereignty, and subsequent key concepts central to this research. The chapter begins by elaborating on the meaning of *food security* and its criticism as a dominant concept within policies (2.2). Section 2.3 describes the emergence of an alternative food movement in response to the shortcomings of food security, namely *food sovereignty*, including a description of its link with national food self-sufficiency. Section 2.4 presents a way of farming that underlies becoming food sovereign, namely agroecology. Finally, the chapter concludes in chapter 2.6.

2.2 Food Security

2.2.1 Definition

For centuries, food security has been defined in a variety of ways by different scholars. In 1789, academic Thomas Malthus popularised the food availability approach (Burchi & de Muro, 2012). His Malthusian approach focuses on the (im)balance of population and food, arguing that the pace of growth in food production may never be lower than the rate of population expansion. Otherwise, food insecurity will occur. According to this strategy, boosting the food supply is the solution to feeding everyone. However, with time, Western experts argue that enhanced food production is shown not to be synonymous with food security (Burchi & de Muro, 2012; 2016).

In 1981, Amartya Sen initiated a shift in the paradigm from availability towards the personal entitlement of food access (Sen, 1981). His entitlement approach describes how food insecurity affects people who cannot *access* adequate food, irrespective of whether food is available. In reaction to this shift in paradigm, the World Food Summit (1996) rewrote the definition to reinforce the multidimensional nature of food security, including four pillars: 1) availability, 2) access, 3) appropriate utilisation, and 4) the stability of the former (FAO, 2008; Capone et al., 2014). In short, food availability considers whether enough food is available, whereas food access evaluates whether all households and individuals have the means to produce or buy food. Food utilisation comprises the nutrient intake and the ability to meet daily nutrient requirements from food. Lastly, stability is about the guarantee that the three preceding characteristics persist. (FAO, 1996). For an overview of the pillars and their main characteristics, see Table 1 in Appendix (10.1). Together, this resulted in the following definition of food security: “*Food security exists when all people, at all times, have physical and economic access to sufficient,*

safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life." (FAO, 1996).

In more recent decades, unequal power dynamics and growing climatic and ecological tragedies have drawn more attention to food system inequities. These findings question the four-pillar food security plan. Clapp et al. (2021) suggest including broader processes of hunger and malnutrition in food security. As such, Clapp et al. (2021) believe adding agency and sustainability to food security frameworks may yield fresh insights. *Agency* is the ability of people and groups to influence governance processes. This is crucial to resolving food system disparities (Clapp et al., 2021). *Sustainability* refers to food-system solutions that meet present requirements without compromising future ones (Clapp et al., 2021). Food system quality affects food security, and a food system's sustainability may be assessed in a variety of ways, including soil health indices, agrobiodiversity indicators, water quality, market volatility, social conflict, supply networks, etc (FAO, 2008).

2.2.2 Food insecurity and related concepts

Food insecurity is defined as a lack of regular access to adequate, safe, and nourishing food for healthy growth and development, as well as an active and fulfilling life (FAO, 2022). This could be brought on by a lack of food or the means to get food. Though the focus of this study is mainly on the production side of food, it is important to indicate how the concepts of hunger, malnutrition, and poverty are related to food insecurity. *Hunger* is an unpleasant sensation caused by not eating enough to meet one's energy needs. In scientific terms, it is called food deprivation, which implies that all people who are food insecure are also hungry. However, since there are additional causes of food insecurity, such as those resulting from inadequate intake of micronutrients, this claim does not hold true. (FAO, 2008). *Malnutrition* is caused by nutrient deficiencies, excesses, or imbalances. Malnutrition can be caused by food poverty or non-food factors like poor child care, lack of healthcare, and an unhealthy environment (FAO, 2008). While poverty is unquestionably a source of hunger, inadequate and improper nutrition can also be a root cause of poverty. A prevalent and contemporary definition of poverty is: "*Poverty encompasses different dimensions of deprivation that relate to human capabilities, including consumption and food security, health, education, rights, voice, security, dignity, and decent work.*" (OECD, 2018). As such, a poverty alleviation plan combined with food-security policy gives the greatest chance of rapidly decreasing mass poverty and hunger. An overview of these interrelated phenomena can be found in figure 1 below.

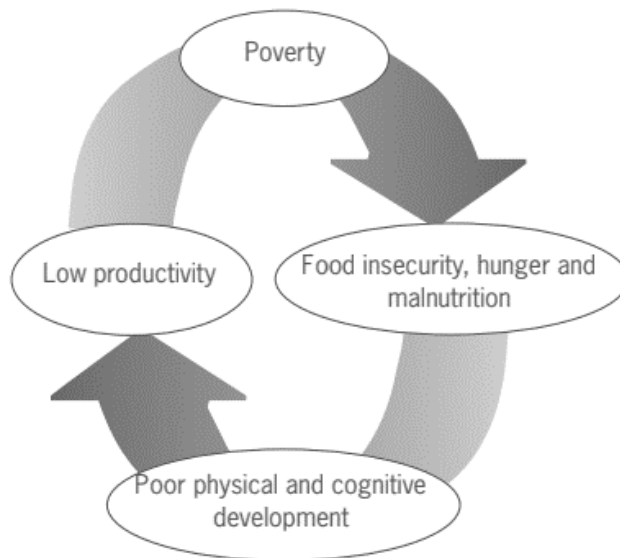


Figure 1. The interrelation of Hunger, Malnutrition and Poverty. Adapted from FAO (2008)

2.2.3 Food security as a contested dominant concept

Food security is the dominant paradigm within the existing food system. Windfuhr and Jonsén (2005) describe food security as a technical concept, implying a desirable situation which governments (cl)aim to work towards. In this way, the concept of food security prescribes policies and practices to provide healthy living conditions for all people (Schanbacher, 2010). However, the concept is not without some controversy.

Reducing poverty is a key element of food security policies (Rivera & Qamar, 2003). The majority of international organizations or national governments believe that economic growth, rising incomes, and poverty-focused measures are the key to guaranteeing food security (Babar & Kamrava, 2014). In this light, food security can be seen as a project of economic and developmental globalisation, intended to aid underdeveloped and poorer nations (FAO, 2004). The main argument advanced by proponents of trade liberalisation is that an open trading model improves food security because liberal trade policies ought to increase access to and decrease the cost of food (Clapp, 2014). The critique of this method is that, because the system is primarily controlled by industrialised nations who support trade liberalisation and the implementation of an agricultural export strategy, it works to benefit these nations. In that sense, critics argue that the dominant food security concept continues to support major corporation-controlled agriculture as the answer to food production issues in developing nations (Chaddad & Valentinov, 2017).

Paradoxically, free trade agreements do not necessarily enhance access to adequate food. In fact, Gonzales (2004) argues that it has negative consequences for the state of food security. For instance, he clarifies that free commerce is accompanied by double standards. On the one

hand, it encourages protectionism in wealthy nations while anticipating that emerging nations would open their markets to foreign competition that is heavily subsidised. As a result, pre-existing trade and production patterns threaten the lives of rural smallholders, deteriorate the base of natural resources required for food production, and obstruct the economic diversification required for food security on a national scale. Local (mostly small-scale) food producers suffer greatly from this issue. Due to importing cheap foods, these local producers receive too low a price for their products (Gonzales, 2004). Their already meagre income is steadily eroded, leaving them no choice but to subordinate concern for the environment to the need to survive. In that sense, the environmental effect of producing and delivering food is not adequately taken into account when discussing food security, as extractive production is still frequently used to meet food security goals.

To summarise, several issues arise with the technical concept of food security. It fails to consider the mechanisms put in place to guarantee food security and to prevent these from impoverishing, starving, and depriving local populations and the environment (Clapp, 2014). A sustainable, equitable, and biodiverse food system demands dramatic changes in the ecological, political, social, and economic domains that create the food system. Therefore, critics call for a new method of evaluating agricultural technology and the food system as a whole (ASEED, 2020).

2.3 Food sovereignty as an alternative movement to the food security concept

A fundamental shift away from the industrial and neoliberal food security concept is proposed by the food sovereignty movement. The term "food sovereignty" was coined by members of the LVC movement in 1996. Food sovereignty advocates for a food system in which the people who produce, distribute, and consume food also have authority over the related procedures and policies (Altieri & Nicholls, 2012). The movement is rooted in the broader issue of social justice and the rights of food producers and consumers to control their own futures and make their own decisions with regard to food. According to the Declaration of Nyéléni (2007), food sovereignty encompasses "the right of peoples, communities, and countries to define their own agricultural, labour, fishing, food, and land policies which are ecologically, socially, economically, and culturally appropriate to their unique circumstances." Including the right to food and to produce food implies that all people must have unrestricted access to safe, nutritious, and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies (Declaration of the International Forum for Agroecology, 2015). It is described as a right, as the movement believes the United Nations (UN) should expand the right to food to encompass autonomy over one's means of food production, acquisition, and distribution, as well as other agricultural and food market operations. They recognise that this would necessitate a complete

overhaul of existing systems and policies to make room for new forms of democratic decision-making in governments, as well as new forms of local to international market cooperation that prioritise fair prices for farmers and long-term land sustainability (Polzin, 2018).

Table 1. The differences in principles between food security and food sovereignty

	Food Security (Corporate Neoliberal Principle)	Food Sovereignty (Agroecological Principle)
<i>Towards SDG2: Zero Hunger worldwide</i>	Intensive production based on countries' comparative advantages	Local agriculture and protection of local markets, rejecting dumped or subsidised food
<i>Role of Agriculture in National Development</i>	Increase exports of agricultural commodities	Sustainable agriculture as part of a diversified economy
<i>Role of Technologies in Agricultural Development</i>	Increase productivity through scientific innovation, adoption of technology and modern management	Farmers must be competitive through product diversification, agroecology, and minimal use of external inputs
<i>Environment Management</i>	Protected areas, national parks, and regulations	Agriculture and the environment cannot be separated; sustainable agriculture allows for conservation

Note. Adapted from Wittman (2011).

2.3.1 The six pillars of food sovereignty

Food sovereignty is based on six pillars. The first pillar describes how food sovereignty focuses on *food for people* and sees food as a right, not a privilege (Nyéléni, 2007). Food is viewed as subsistence first, rather than a market commodity. It emphasises that all people and communities, especially those who are hungry or living under occupation, in war zones, or in marginalised groups, have the right to sufficient, healthy, and culturally acceptable food. The idea that food is merely another commodity for international agribusiness is rejected by the food sovereignty movement (Barkin, 2016).

Second, food sovereignty protects the rights of food producers to live and work with dignity (Nyéléni, 2007). It equally values and supports the contributions of every agricultural individual and respects their rights and rejects policies, actions, and programs that undervalue, threaten, and eliminate their livelihoods (Mulaney, 2007).

Third, local food systems are prioritised above large-scale commercial supplies (Nyéléni, 2007). In that sense, food sovereignty brings food providers and consumers together for a

common cause (Charlton, 2016). It places providers and consumers at the centre of food decision making and protects them from the dumping of food and food aid into local markets (Akram-Lohdi, 2015). Additionally, it protects consumers from poor quality and unhealthy food and aims to resist governance structures and practices that rely on and promote unhealthy and non-sustainably produced food (Mulvaney, 2017).

The fourth pillar of food sovereignty aims to provide *local control* to *producers with control* over and access to territory, land, pasture, water, seeds, cattle, and fish populations (Nyéléni, 2007). These resources should be used and shared in ways that are both socially and environmentally sustainable and preserve variety. Food sovereignty recognizes that local territories frequently cross geopolitical borders and advances local communities' rights to inhabit and use their own lands. Food sovereignty promotes positive interactions between food providers from various regions and sectors to resolve internal conflicts as well as conflicts with local and national authorities. It opposes the privatisation of natural resources through laws, commercial contracts, and intellectual property rights (Dekeyser, Korsten & Fiormanti, 2018).

Today, much of the cultural knowledge about food and farming is forgotten or rejected in policies. Therefore, the fifth pillar of food sovereignty promotes the *building of knowledge and skills* that are culturally relevant to the community (Nyéléni, 2007). It focuses on how food providers and their local organisations preserve, develop, and manage local food production and harvesting systems. Also, the development of appropriate research systems to support this culturally relevant knowledge in order to pass it on to future generations is central to the movement (Mulvaney, 2017).

Lastly, food sovereignty is about *working with nature*. It makes use of nature's contributions through a variety of low input agroecological production and harvesting methods that optimise ecosystem contribution while also improving resilience and adaptability, particularly in the face of climate change (Nyéléni, 2007). Food sovereignty attempts to "heal the planet so that the planet may heal us" (Nyéléni, 2007). Therefore, it rejects methods that harm beneficial ecosystem functions, such as monocultures, livestock factories, and other industrialised production methods that harm the environment and contribute to global warming (Mulvaney & Arce Moreira, 2009).

In short, at the heart of food sovereignty, it tends to give power back to the people and the community to self-determine their own just food system without ignoring the need to protect the environment and its natural resources. It is important to emphasise that these six pillars of food sovereignty are not a "one size fits all" solution (Rosset, 2008). It is highly dependent on the people, the space, and the willingness to move within this space (La Via Campesina, 2003).

2.3.2 The link with food self-sufficiency

The food question remains at the top of policy agendas. On a national level, food sovereignty may be seen in terms of increasing domestic food production to attain more food self-sufficiency and become less reliant on imports for products that can be produced locally (Vel, McCarthy & Zen, 2016). Given the fragility of the food system, the food sovereignty movement acknowledges that the desire of (developing) countries to pursue self-sufficiency is important (Agarwal, 2014). However, food self-sufficiency is frequently criticised by opponents as being an extreme policy stance that rejects all food commerce (Gorostiza, 2019). Therefore, in the sense of a political ideology, the term must not be confused with autarchy, meaning absolute self-sufficiency (Helleiner, 2021). Due to a lack of arable land, irrigation water, and other vital resources, not every country can simply produce all of its own food. Hence, trade cannot and therefore should not be eliminated. Consequently, food self-sufficiency is considered to be a more nuanced objective, namely that of nations aiming to increase food production to the extent of their greatest capability (Agarwal, 2014).

According to Clapp (2015), a more comprehensive view of food self-sufficiency might pave the way for a more effective policy debate about countries' aim to increase domestic food production. Here, food sovereignty may come into play as it advocates for governments and communities to have more control over their own food laws as well as a greater dependence on locally produced foods (Wittman et al., 2010). To accomplish more sustainable food self-sufficiency, a shift towards reduced chemical inputs and more environmentally sustainable agriculture is needed. These are both important cornerstones of the food sovereignty argument (Agarwal, 2014). A strategy of food sovereignty includes sustainable food self-sufficiency through the use of locally grown and processed products (Buheji et al., 2020).

2.4 Agroecology as an alternative to industrial agriculture

As described in the previous subsection, food sovereignty requires the use of sustainable agriculture. One of the industrial agriculture alternatives that relates to the idea of food sovereignty is agroecology. According to its definition, agroecology is "a dynamic concept that favours the use of natural processes, limit the use of purchased inputs, promote closed cycles with minimal negative externalities and stress the importance of local knowledge and participatory processes that develop knowledge and practice through experience, as well as more conventional scientific methods." (HLPE, 2019)

2.4.1 Diversity of agroecology

Over time, the definition of agroecology has expanded and deepened (Altieri, 1994; Wezel, Bellon, Francis & Vallod, 2009). Agroecology is the name given to the branch of science, the agricultural method, and the social and political movements that support this methodology (Wezel et al. 2009).

Agroecology as a scientific approach was initially defined by Altieri (1994) as the application of ecological concepts and principles to the planning and administration of sustainable agroecosystems. The definition provided by Francis et al. (2003) is more expansive and reads, "the integrated study of the ecology of the entire food system, encompassing all of its ecological, economic, and social elements." Additionally, Gliesmann (2015) recognises agroecology as the study of agroecosystems. It is characterised by the use of a comprehensive, interdisciplinary scientific approach, including components of agronomy, ecology, sociology, and economics (Dalgaard, Hutchings & Porter, 2003). Both expand their attention beyond the initial field or agroecosystem scales and place more emphasis on the complete food system (Gliesman, 2007). Agroecology as a scientific discipline is, however, not limited to academic circles as government agencies, farmers' cooperatives, and socially non-governmental organisations have also started to embrace this approach.

The main objective of *agroecology as an agricultural practice* include a lower use of fertilisers and pesticides, soil conservation, the diversification of growing methods, and a more responsible and sustainable management of water and other natural resources. However, Wezel et al. (2009) recognise that it can't be understood as an agricultural practice separate from science and the associated social movement because it frequently combines a political vision derived from the movement, the practical application of techniques, and the knowledge to comprehend and underpin both the vision and the practice (stemming from science and the social movement).

Agroecology as a social movement encompasses environmentalism, sustainable agriculture, and rural development. To take action and effect change, agroecological ideology is primarily used to attain objectives such as sustainable social development and agriculture (Wezel et al., 2009). The social movements are mostly founded by farmers, demonstrating the close connection between agroecology as an agricultural practice and agroecology as a social movement. These farmers work to broaden their influence by establishing initiatives in the areas of education, publicity, and information. Additionally, their influence is broadened via the forming of connections and networks, running for office, and mobilising the public (Rosset & Martínez Torres, 2019). A schematic representation of the different concepts linked to the agroecology approach can be found in Figure 2.

A strong link can be noted between agroecology as a social movement and the movement advocating food sovereignty. Assuming that the use of more sustainable production methods reduce the complexity of the global food system and the injustices within, the food sovereignty movement addresses these injustices through emphasizing local control. As localizing agriculture allows the application of regenerative practices to boost food production, this is typically where agroecology comes into play. For food sovereignty, agroecology goes beyond ecological-productive concepts. In addition, the food sovereignty movement blends social, cultural, and political concepts and objectives into agroecology. As such, the food sovereignty movement and agroecology as a social movement are intertwined. As such, one may even argue that food sovereignty is an inherent outcome of agroecology, because many aspects of agroecology precede aspects of food sovereignty such as local control over production and choice of used resources.

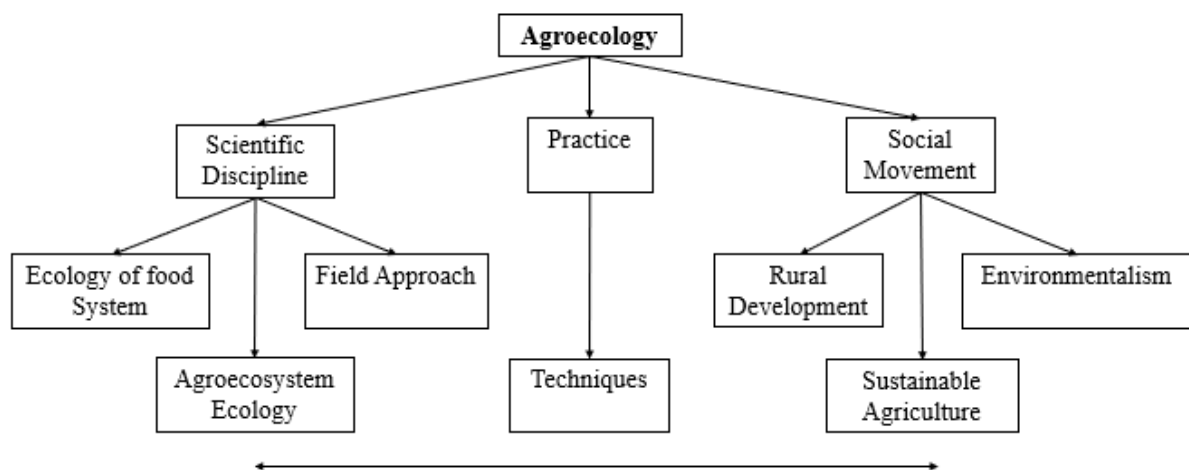


Figure 2. Diversity of current meanings of Agroecology. Adapted from Wezel et al. (2009)

2.4.2 Application of agroecology: agroforestry

As stated earlier, agroecology is an umbrella word for its diverse uses. An example is agroforestry. In recent years, there has been an increasing interest in the creation of food forests, an application that originated in Brazil (Tubenchlak, Badari & Stracuh, 2021). These food forests are developed through the agroecological approach of syntropic agroforestry. The term syntropy is derived from the Ancient Greek terms *syn* (which means converging) and *tropos* (which means predisposition). The term is used to describe the ever-increasing complexity of a healthy ecosystem under favourable conditions (Orenda Foundation, 2021). It mimics the structural and functional connections of natural ecosystems as well as the beneficial interactions that preserve and restore ecosystem services (Tubenchlak, Badari & Stracuh, 2021). In addition, food forests

are thought to be resilient because trees and perennials have stronger and deeper root systems than annuals, allowing them to survive and continue to produce in circumstances that would destroy many annual crops (Prosser, 2016). The development of an actual food forest takes time. In term of actual food production, it takes a minimum of three years for the trees and crops to grow and produce food (Bukowksi & Munsell, 2020). However, in terms of long-term sustainability and resilience, food forests are promising. Since the principles of subtropical agroforestry are based on principles of agroecology, it is assumed that these terms can be used interchangeably.

2.5 Conclusion

This chapter shows how several issues arise with the technical concept of food security. Therefore, researchers and decision-makers are looking for a replacement for the industrial agricultural paradigm. A sustainable, equitable, and biodiverse food system demands dramatic changes in the ecological, political, social, and economic domains. The food sovereignty movement proposes this alternative. Food security is giving way to food sovereignty within the theoretical framework of agroecology. The road to achieving food sovereignty depends heavily on small local farmers and the agroecological practices they adopt. Therefore, the emphasis will be on local food producers, their efforts, and how they support food sovereignty. The UFFs that emerged in response to increased food security and resilience issues will be further discussed in the research context.

3. Research Methodology

3.1 Introduction

This chapter covers the methodology of the research. It starts with a description of the ontological and epistemological position of the research in 3.2. Then the main concepts and operationalisation are set out in section 3.3. This is followed by a small elaboration on the units of analysis in section 3.4, followed by the research methodologies in section 3.5. This chapter closes with reflections on ethical issues (3.6) and concluding remarks in 3.7.

3.2 Research design

This research is a qualitative single case study on the perceived potential of UFFs that emerged during the COVID-19 pandemic to encounter food security and resilience challenges and how they

may lead to food sovereignty. Due to the intricacy and complexity of food sovereignty, the case study approach was best suited for this study. Furthermore, this design offers the chance to develop a thorough and comprehensive awareness of the potential to strive for food sovereignty. Due to the information vacuum in the academic literature on both UFFs and food sovereignty in Curaçao and the transformational potential of UFFs, I chose an exploratory study approach.

3.2 Ontology and Epistemology

The ontology of this research was approached from a constructivist perspective, meaning social actors have a significant and active part in creating the dynamic and ever-changing social reality (Bryman, 2012). It suggests that there isn't just one reality or truth, but rather that reality can only be discovered and comprehended via interpretations and how these interpretations relate to one another. As such, food sovereignty is perceived as a context-specific notion in terms of its creation, meaning, and perception. This research aims to contribute to a deeper knowledge of Curaçao's specific context, related issues, and prospective solutions to achieve food sovereignty.

In terms of epistemology, an interpretivist perspective is adopted, which states that humanities and social sciences shouldn't be viewed in the same light as natural sciences. The researcher seeks to understand how an experience is lived through the perspective of an individual. According to Taylor (1985), individuals are in fact 'self-interpreting beings', which means that they actively interpret events, objects, and people. As such, the process of analysis is also described as the process of interpretation, because both the respondents and the researcher try to give meaning to their experiences (Smith & Osborn, 2008). By interviewing eleven actors in the food production field about the current food system and the potential of UFFs for positive changes, their specific realities served as the foundation for addressing the research questions.

3.3 Research questions, Conceptual Scheme and Operationalisation

The main question of the research is: *“What is the potential of UFFs in Curaçao to gain more food sovereignty in response to food security and resilience challenges exacerbated by the COVID-19 pandemic?”* To answer this question, the following subquestions are formulated:

SQ1: What are the current food security and resilience challenges for local food production in Curaçao?

SQ2: How do UFFs counter these food security and resilience challenges through the implementation of agroecology?

SQ3: How do UFFs in Curaçao incorporate the six food sovereignty pillars?

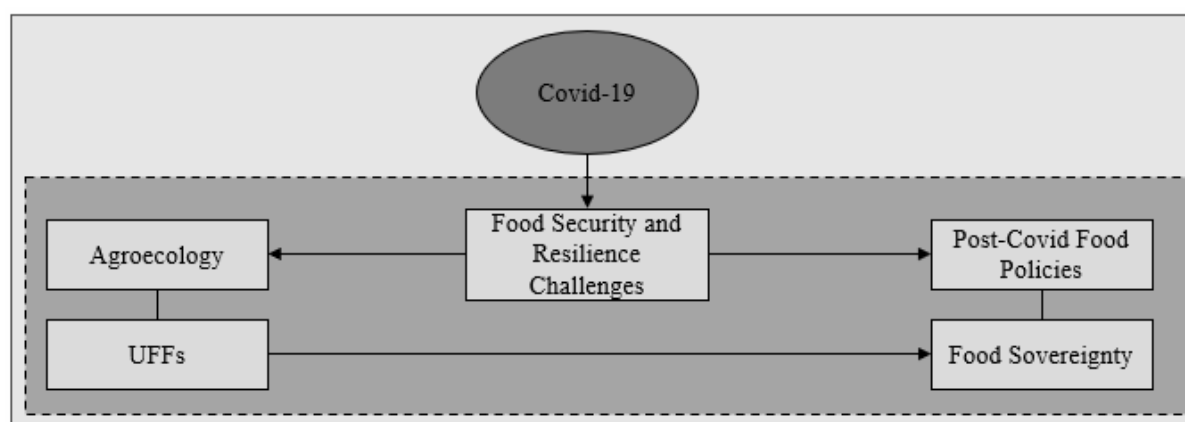


Figure 3. Conceptual scheme

The conceptual scheme in figure 3 gives an overview of the relationships between the variables and conceptions in this research. The key concepts that emerge from the conceptual model and research questions are UFFs, agroecology, and food sovereignty. Food security and resilience challenges has a central mediating role for all processes in the conceptual framework.

Central to subquestion 1 are existent food security and resilience challenges for local food production in Curaçao. This chapter is mainly descriptive, aligning and linking the various existing and new factors that hamper local food production. Central to subquestion 2 is the potential of LFI to counter food security and resilience challenges through the application of agroecology principles. Central to subquestion 3 is how these UFFs practices align with the pillars of food sovereignty.

3.4 Units of analysis and units of response

Following the research question, the perceived potential of UFFs that emerged during the COVID-19 pandemic is the main unit of analysis. This research aims to gain insight into their potential to provide Curaçao with more food sovereignty and counter food security and resilience challenges. The units of response are eleven key informants of experts on agriculture in Curaçao, local non-governmental organisations, and representatives of various ministries involved in health and agriculture. The description of the research methods of this study continues below.

3.5 Research methods

3.5.1 Data collection methods

This research used both primary and secondary data. Primary data was collected through the administration of stakeholder-informed interviews. It allowed asking general questions, guided by the theoretical framework and its indicators. Additionally, it gave latitude to ask further questions in response to significant replies (Bryman, 2012). Therefore, this research is qualitative. The (in-depth) interviews allowed for flexibility and responsiveness to the participant (Galetta, 2013). This approach was suitable for understanding the different stakeholders and thoroughly exploring relevant topics. The topics were discussed using a preconceived list of topics and pre-set questions (appendix 10.3). Simultaneously, there was room for interviewees to add their insights, which I could anticipate while proceeding with the research (Galetta, 2013). The in-depth interviews helped to understand the current realities and perceptions of the projects and their related actors (Miller & Glassner, 1997) in the context of the UFFs that emerged in response to food security and resilience challenges. The secondary data included newspaper stories and policy documents. Additionally, I used articles and studies on food security and resilience challenges and the implementation of the food sovereignty framework in other Caribbean islands or small island states because there is a dearth of information on these issues for Curaçao specifically. This secondary data was mainly used for analysing subquestions 1 (chapter 5).

3.5.2 Sampling

For selecting participants, two forms of purposive sampling have been utilised: criterion sampling and snowballing (Bryman, 2012). Using purposive sampling was practical to identify participants according to predetermined criteria (Morse, 2010). For this research, participants were selected based on being farmers or staff of UFFs or stakeholders otherwise engaged in agriculture (Lewis-Beck, Bryman & Liao, 2003).

During the first phase of fieldwork, I emphasised learning about the research context (described in section 4). Some of the interviews were already planned with pre-defined stakeholders, among whom were two researchers, two government officials, and two entrepreneurs in agriculture. These interviews provided an overview of the context and helped fine-tune further data collection (described in the next section). During this first phase, it was important to remain flexible in adding people if needed. After phase one, based on the conversations with members of respective institutions or communities, sampling continued by

snowballing. The approach of snowball sampling is to first engage with a relevant subject who may be able to indicate other individuals that fulfil the criteria (Lewis-Beck, Bryman & Laio, 2003). As a result of the snowballing process, a broader range of people within the realm of local food production was linked to me and interviewed. For an overview of the participants, see the table in appendix

3.5.3 Data analysis

All files are transcribed with the Sonix.ai tool. I used intelligent transcription. This is a form of clean transcription, providing the substance of a conversation in an intelligible manner. The content of a discussion is duplicated, but the way something is conveyed is secondary (Amberscript, 2022). For intelligent transcription to work, accuracy is essential. Intelligent transcription emphasises heavy audio or video file manipulation less than edited transcription (Walker, 2020). I removed filler words (such as “uhm”) or other disturbances of speech (like stuttering or coughing) from the transcripts as much as possible. The main goal was to eliminate any phrases that were not pertinent to the topic of the conversation or debate. The key to intelligent transcription is the capacity to extract the message's essence and maintain it in the transcribed text even after the source file's emotional content has been removed (Walker, 2020). However, in some cases, regarded as useful for context, accentuations or pronunciation of words of confirmation are included.

For coding and analysing the data, I used the Atlas T.I. software. It facilitated a coding process that allowed for mind-mapping. The initial part of the coding primarily consisted of open coding, which means that the data was approached without any preconceived thought. Some codes were pre-set codes aligned with the topic list. Also, the pillars of food sovereignty were pre-set codes and the codes of ‘positive’ and ‘negative’ attitudes. As such, these indicators emerged through an inductive approach from the data and the operationalisation of important concepts. This allowed for a thematic analysis. The purpose of the thematic analysis was to find and identify common themes that run across the different interviews. By grouping them together according to own interpretation, the most important themes emerged that provided a basis for answering the subquestions and thus the main question. An overview of the codes and groups can be found in appendix 10.4.

3.6 Positionality and ethical considerations

3.6.1 Positionality

As an *international development studies* master's student, it is important that the concept of *development* and everything related is never neutral (Holmen, 2020). How *development* is understood, implemented, and studied is continuously shaped by power dynamics. Our privileges, values, beliefs, interests, and experiences influence how we perceive reality and study it (Bilgen, 2020). Therefore, my positionality in the research context was a core issue that necessitated ongoing consideration throughout the research process. As a white female from the West, who has lived in the Netherlands (almost) my whole life and been able to enjoy an education, I am privileged. I have been able to benefit from the global food system and have never experienced any problems in obtaining food. On the other hand, my time as a resident of a community in Africa showed me the (im)possibilities concerning food self-sufficiency from the land. This, together with the theories and topics I have encountered during my (pre-) Masters in International Development Studies, has made me more aware of issues related to the current global food system. While I have been trying to become more mindful about my food purchases, there is no denying that I regularly benefit from the cheap food available. Knowing this mainly supports the structural force behind this cheaper, available food, mostly from conventional farmers. Moreover, as I am not from Curaçao myself, it was important to be respectful regarding the context of the local people, their cultures and norms. As a researcher in the field, I aimed to behave in a professional but friendly manner. This included adopting the role of a neutral researcher and respecting people's opinions. Whenever ethical dilemmas arose, I made sure to discuss them with my local contacts before acting. Regarding my own safety, there were no concerns. As for COVID-19, I made sure to behave according to the guidelines that applied to Curaçao and avoided jeopardising my own health as well as the health of my respondents.

3.6.2 Ethical Considerations

The main method of this research was the conduction of in-depth interviews. Due to the qualitative nature of the research, it was essential to keep reflecting on several ethical considerations as described in Bryman (2012), on which I will elaborate below. Ethical reflection is a vital component of the research process. Research ethics are moral principles that guide researchers to conduct and report research without deceiving or harming participants, knowingly or unknowingly (Bryman, 2012, p. 143).

First, it was essential to ensure the safety and privacy of participants. This principle is guided by the idea of "doing no harm" and provides adequate information for the participants to give their consent to take part in the research (Bryman, 2012). Therefore, consent remained an important topic throughout the interactions with my participants. I contacted potential participants through an email or WhatsApp message in which I introduced myself and explained how I got their contact information. Additionally, I elaborated on the nature and context of the research. I also mentioned that the data from the interviews served only for scientific purposes and that it would be processed anonymously and confidentially. Moreover, I emphasised that taking part was entirely voluntary and that there would always be the option to withdraw from the study without having to give a reason for doing so. The use of written communication allowed the respondents to consider whether they wanted to participate or not. Once the respondents agreed to do an interview, we arranged a date. I assured them that, in the meantime, they could always reach out to me with any questions.

As the research took place in the aftermath of the pandemic and some COVID measures and restrictions were still in effect during my stay, I gave the participants the option to meet in person or online. Conducting interviews online meant adapting ethical obligations towards the participants as the privacy of the conversation could no longer be guaranteed as I had no control over the location from which participants joined the interviews. Therefore, I conducted the interviews in a locked room with little noise and made it known to my housemates that they could not disturb me. For the interviews in person, I asked my participants if there was an available room near them where the interview could take place and where they felt comfortable speaking out. Most interviews took place in their offices or a quiet spot in a lunch court nearby.

Every interview started with a recap of the subject and purpose of the research before formal data collection began. Then, before starting the recording, I inquired whether the participants agreed to this, accompanied by a clarification that the recording would only serve as an adequate capture of the conversation for personal use. I also informed the participant that the transcripts would only be shared with my supervisors for grading purposes. Moreover, I assured them I was open to questions regarding the transcripts or my research. I also made it known that if there was any ambiguity about how the participant intended something, I would inquire about it.

All respondents' identities, recordings, and transcripts are kept confidential in an encoded map on OneDrive, which allowed me to access the data from different devices. Additionally, it prevents information from being lost in case of any inconvenience. Only my supervisors granted access to the transcripts stored on Google Drive. I ensured anonymity by using code names for every participant (except for the notes of the conversations with my local

guide). Everything discussed above was also part of gaining the trust of my participants. I am aware that, as a researcher, you cannot know whether participants fully trust you or not. Therefore, I tried to be as transparent as possible and keep my promises by making myself available for questions or comments and by asking for feedback on the notes I had made. All the participants were informed that they could read the final product.

3.7 Conclusion

An interpretive/constructivist method has been used in this study. Eleven actors within the field of food production were interviewed from an integrated viewpoint on UFFs, agroecology, and food sovereignty. Additional contextual information is also provided by observations, unstructured interviews, and informal talks. The limitations of the research, as well as ethical issues and challenges, were taken into consideration.

4. Research location and context: Curaçao

4.1 Introduction

This chapter elaborates on the contextual information in Curaçao. The opportunity for this research context was established via contact with acquaintances who provided various links in Curaçao through which this research could take place. As previously mentioned, this thesis is in line with and attempts to complement the ongoing ZonMw research on the islands of Curaçao, Aruba, and St. Maarten led by the University of Curaçao. This chapter starts with a global overview of the research location (4.2). Then the Curaçao context is described, beginning with the political state of Curaçao (4.3), followed by a comprehensive description of socio-economic factors (4.4). The following subsection provides an overview of governmental and non-governmental actors regarding agriculture (4.5), followed by a description of the UFFs in Curaçao in section 4.6. Finally, section 4.7 concludes.

4.2 Research location

The entire island of Curaçao was used as the study location. Curaçao is a Caribbean island in the Dutch Caribbean area, roughly 40 miles north of the Venezuelan shore (see figure 4). It is one of the Netherlands' component nations, with Dutch, Papiamentu, and English as official languages (World Population Review, 2022). It covers 444 square kilometres and is home to 165.529 people as of 2022 (World Population Review, 2022). The island has a diverse population. The majority, around 75%, are Creole, people of mixed African and European descent, and are considered indigenous. There are also minorities of various origins. Since 2007, Papiamentu and Dutch have become co-official languages. Most native Curaçaoans speak Papiamentu as their first language. In addition to these languages, Spanish and English are also often spoken.



Figure 4. Location of Curaçao. Adapted from: Voxeurop (2009)

Curaçao's climate is hot and semiarid, with a dry season from January to September and a rainy season from October to December (Meteorological Department Curaçao, n.d.). Curaçao does not have a particularly wet season. However, precipitation does change throughout the year. On average, December is the wettest month with 99 millimetres of precipitation - compared to the average annual precipitation of 552.0 millimetres. The driest periods are in March, April, May, and June. On average, March is the driest month, with 15 millimetres of precipitation (Weather & Climate, n.d.), especially on the island's north shore (Meteorological Department Curaçao, n.d.). This semi-arid climate comes with challenges regarding agricultural production. However, adaptive ways of farming have emerged over time in response to these challenging circumstances. A more detailed overview of the Curaçao context is discussed below.

4.3 Political (in)dependence

Curaçao is the biggest island of the Netherlands Antilles - a democratic federation previously formed by the islands of Curaçao, Bonaire, Sint Maarten, St. Eustatius, and Saba (Allen, 2010). Historically, the island of Curaçao was a colony of the Netherlands since it was founded as a vital centre of commerce for the Dutch West India Company during the Dutch Golden Age (Hillebrink, 2007). The VOC also established Curaçao as a base for the Atlantic slave trade, which oversaw transporting enslaved people to the island for sale elsewhere in the Caribbean or South America (van Welie, 2008). It was not until 1954 that Curaçao became a self-governing island state of the Netherlands Antilles (Harris, n.d.). In 2010, it obtained autonomy in internal affairs. Therefore, it is now an autonomous nation within the Kingdom of the Netherlands. However, the Dutch

Kingdom remains responsible for foreign affairs, defence, independence, and citizenship issues (Pereira, 2018).

4.4 Socio-economic factors

4.4.1 Economic trajectory: from smuggling port to the shutdown of the oil refinery

The Netherlands Antilles did not rely on the export of sugar or other plantation products. Instead, Curaçao used to be an attractive transit and smuggling port because of its convenient location offshore from South America and its natural harbour, the Schottegat (Ditzhuijzen, 2003). This resulted in Curaçao not developing a plantation economy. It rather engaged in trading both legitimate and illegal African enslaved people and tropical goods (Brito, 1989). Following the Dutch WIC's abandonment of its agricultural effort in Curaçao in the second part of the seventeenth century due to chronic crop failures, the land was given to private individuals (Ditzhuijzen, 2003). The slave trade peaked between 1685 and 1713, although slavery was not abolished until 1863. Formerly enslaved people had difficulty finding work outside the farm (Ditzhuijzen, 2003). A protracted period of economic stagnation followed.

From 1915, the economy of Curaçao improved marginally because of the arrival of Shell and the oil refinery on the Isla Peninsula (de Bruijn & do Rego, 2017). This came with plenty of work opportunities - so much that it had to look for competent workers in places overseas (Paap, 2014). In 1928, the firm employed about 8,000 people, up from less than 4,000 in 1926. Crude oil not only brought workers to Curaçao but wealth as well. In addition, the firm built new housing areas and provided social services such as clinics, schools, and sports facilities.

After WWII, the oil sector began to deteriorate. An increasing number of (mostly black) people lost their jobs, culminating in a 19% unemployment rate in 1982. Then, in 1985, Shell decided to withdraw from Curaçao. An economic disaster occurred because the island had become reliant on the refinery. The refinery was leased to the Venezuelan state oil company *Petróleos de Venezuela S.A. (PdVSA)*. After more than 30 years, the operating agreement with PdVSA was terminated at the end of 2019. To this day, negotiations for new acquisitions have come to nothing. The refinery has been idle all this time, leaving around 4,000 people without their primary source of income (Leidel-Schenk, 2019).

4.4.2. Tourism

After the oil refinery was shut down, the tourism industry took over as the main driver of the economy. The tourist surge began in the early twentieth century and took off around 1960

through cruise and stay-over tourism. After some stagnation during the 1980's, tourism took up again. According to the Central Bureau of Statistics (CBS) of the Netherlands Antilles, the number of tourists each year increased from 1.5 million in 1997 to over 2 million in September 2007 (Blokland, 2007). With this recovery and increase, environmental and local stakeholders became concerned about expanding tourism facilities and their socio-environmental impacts. Additionally, tourism influences not only the local environment but also worldwide linkages and homogeneity because of globalisation and trade agreements (Garcia and Albisu, 2001). As the gap between available domestic food supply and domestic consumption widens, the dietary changes that result significantly influence the food system's sustainability (Garcia and Albisu, 2001). As a result, the domestic food production sector's long-term expansion is threatened, and agricultural land is becoming scarce (Walters and Jones, 2006). The decline in local agricultural activity, and thus the production and availability of affordable fresh and healthy food, impacts food consumption patterns and, correspondingly, public health. For example, more sugar- and fat-rich foods are consumed on the islands. This increases welfare diseases such as obesity, cardiovascular disease, and diabetes (Bogaardt et al., 2015; Sociaal Cultureel Planbureau, 2015; UNICEF NL, 2019).

4.4.3 The effect of COVID-19

Many of Curaçao's difficulties have been compounded by the COVID-19 outbreak as it had a significant socioeconomic impact on Curaçao (CBS, 2021). The closing of the borders brought the tourism sector to a complete standstill, which had a major impact on Gross National Income (GNI). Figure 5 shows a sharp drop from 23.57% to around 11%. The crisis has revealed many inequalities, with the poorest in society being hit hardest by the economic crisis. Partly due to increased unemployment, many people's incomes fell rapidly. The Curaçaoan Food Bank claimed that the COVID-19 pandemic had caused an economic disaster on the island and would cause 50,000 people to fall below the poverty line (Voedselbank Curaçao, 2020). Although the government developed policies, initiatives, and safety nets for residents living on the margins unable to meet their basic needs, these welfare benefits were insufficient to meet food demands. As a result, many citizens became reliant on NGOs and their food aid programmes. According to Stichting Hulp aan Curaçao, at one point, almost half the population became dependent on the Voedselbank (Stichting Hulp aan Curaçao, 2020). According to research conducted by CARICOM (2020), a worrying state of food insecurity has emerged not only due to job-loss but also because of rising food prices and a lack of diversity of food because of the stagnation of imports. As a consequence, increasing numbers of citizens became reliant on food assistance programmes.

Since COVID-19, more than 18,000 new customers have applied for food packages (Voedselbank Curaçao, 2020). Throughout the first year of COVID-19, the Voedselbank provided weekly food parcels to between 4,000 and 6,000 families. Previously, the issue of malnutrition and associated issues like obesity and diabetes had been obvious, but the pandemic made it clear that the issue of hunger needed to be raised to a higher priority. As was already indicated, both are tied to poverty and the (irrational) decision to eat to obtain fuel fast and cheaply, regardless of whether it is healthy or not. The coordinated policy plans for reducing poverty are also challenged by this irrationality embedded in habits. Food policy is directly tied to reducing poverty as it is one of the social foundations of existence.

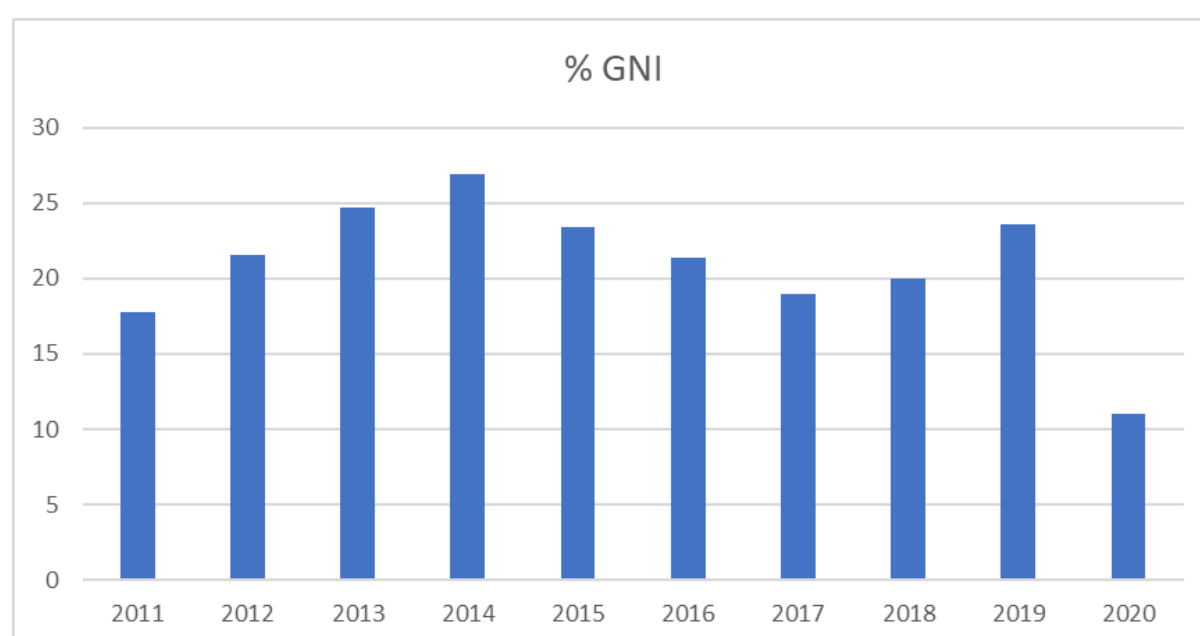


Figure 5. Revenues from tourism expressed in GNP-percentage. Note. The data was obtained from Worlddata.info and is based on World Trade Organisation numbers.

4.5 Actors with a central role in food production in Curaçao

Although Curaçao's pursuit of prosperity has been hampered by inflation, weak economic development, and, more recently, the COVID-19 pandemic, this does not imply that no efforts are being made to address food security challenges. Various actors involved in food production are each trying to counteract challenges related to food insecurity. The following subsections describe the actors and some of their initiatives that are perceived as important within the scope of this research. Section 4.3.1 starts with describing the governmental actors and their initiatives, followed by the description of actors and initiatives that exist without direct support from the governmental bodies.

4.5.1. Governmental actors and initiatives

In November 2012, the Ministry of Health, Environment and Nature (GMN) published the agricultural policy plan for 2013-2018. As part of the government's efforts to adjust previous policy concerning the sub-sectors of agriculture and livestock breeding, consultations were held with the target groups of the agricultural sector in previous years. During these consultations, the participants' concerns were inventoried to incorporate them into a policy plan for the coming years. In this way, a bottom-up approach was applied, which resulted in the following objectives: 1) increase food and income security in the sector, 2) maintain and create more jobs, 3) increase productivity, 4) expand the sales market, 5) ensure fair prices for producers and consumers, and 6) promote alternative income and employment opportunities for farmers and their families (Ministerie van Gezondheid, Milieu en Natuur, 2012). In 2016, a new policy plan from the same ministry concluded that there had not been much effective implementation of the previous policy plans. In addition, an assessment conducted in 2016 showed that the lack of a sustainable agricultural policy had led to an undesired decline in the sector (Ministerie van Gezondheid, Milieu en Natuur, n.d.). Therefore, the new policy plan for the years 2018-2023 placed more focus on modifying eating patterns and behaviours and eradicating food poverty by promoting horticulture and kitchen gardening as well as educating people about good nutrition and self-sufficient fruit and vegetable growing (Ministerie van Gezondheid, Milieu en Natuur, 2017). In the aftermath of the pandemic, efforts are made to pursue an environmentally conscious food system as a part of an overall sustainable economy.

An important sector within the ministry of GMN is that of Agriculture, Livestock and Fisheries (LVV). The LVV is tasked with promoting and developing agriculture, with a focus on horticulture, livestock, and fisheries, in order to make better use of financial and natural resources. The sector operates largely as a service organisation dedicated to promoting agriculture and fisheries. Its responsibilities also include environmental protection and management, conducting research, completing projects, giving information, and collecting data related to agriculture, nature, and the environment.

The shift towards more ecologically aware policy plans can also be observed in other ministries. To cope with socio-economic and environmental challenges, the MEO calls for innovative approaches to diversify the economy and build resilience. The CDE was established in response to the call for economic diversification and resilience building. The goal is to become the first doughnut-island in the world. A Doughnut Economy is based on seven principles relating to economic, ecological, and social aspects of society (Raworth, 2017). The name is attributable to

the shape of its visual framework. The doughnut consists of two concentric rings: an inner and an outer ring. The inner ring represents twelve social foundations derived from the Sustainable Development Goals (SDGs), which are needed for a society to develop prosperously (Raworth, 2017). In addition, the outer ring represents the nine ecological boundaries of the Earth (Rockström et al., 2009). According to the idea of the Doughnut Economy, an economy is prosperous when all twelve of life's essentials are met without exceeding the ecological ceiling. This requires a new economy that is regenerative and redistributive by design. Figure 6 shows a snapshot of the situation of the Curaçao Doughnut. This snapshot of the situation provides a socioeconomically and ecologically alarming image of the Curacao economy. The government of Curaçao aspires to embrace the Doughnut Economy as a foundational principle for a sustainable economy. It offers a set of tools for the design of change processes in society (MEO, 2020). The change the CDE wants to unleash is a transition from a linear economy to a circular economy, with a transition toward sustainable production processes (MEO, 2020).

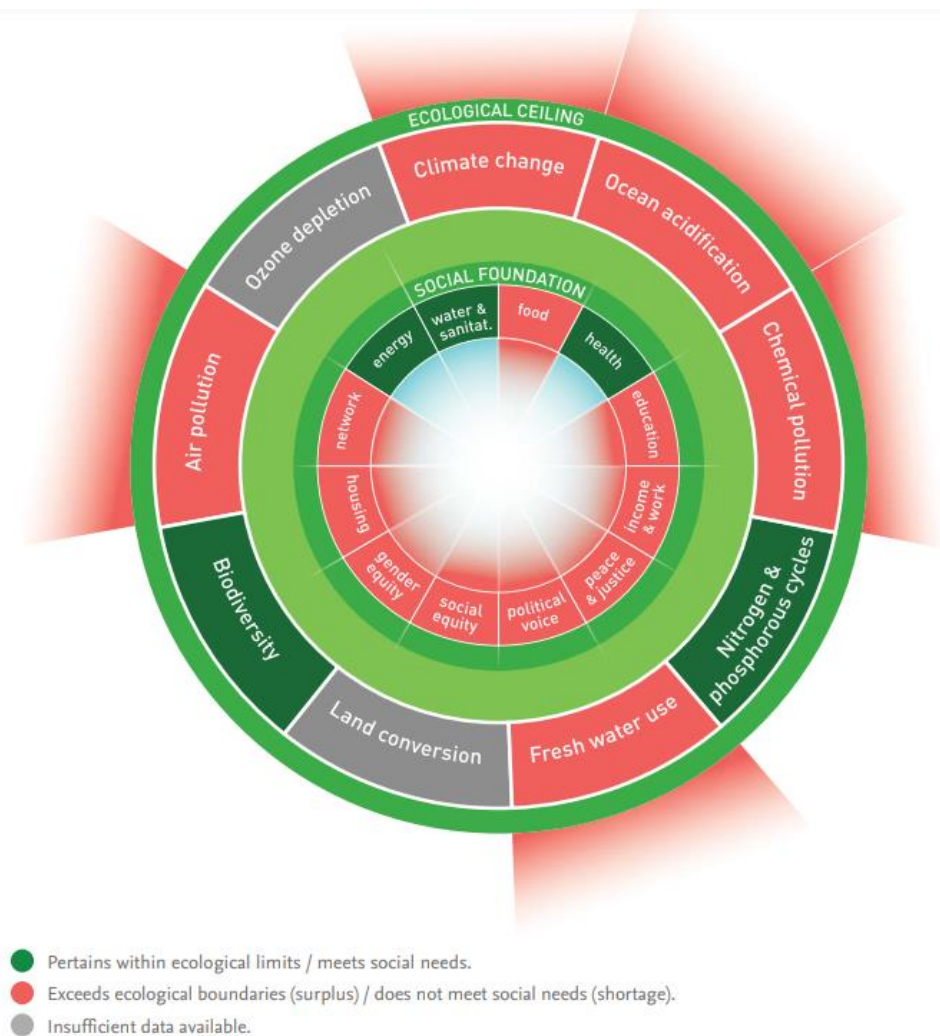


Figure 6. CDE Snapshot. Adapted from MEO (2020)

Food security and poverty reduction. In the National Development Plan Curaçao (NDP) 2015-2030 a framework was created to work on "the eradication of poverty and creation of shared prosperity, the promotion of health, free and accessible education, a clean environment, sustainable energy, water management, and safety for all citizens". As part of the process, a focus is placed on four of the seventeen SDGs: quality education (SDG 4), affordable clean energy (SDG 7), decent work and economic growth (SDG 8), and life below water (SDG 14). Consequently, the aim of ending hunger (SDG 2) is not a top priority. As far as is known, there are no policies that specifically target food security (van Werkhoven, 2022). However, through poverty alleviation, food security may be expected to increase.

Food security and health. Since food is strongly linked to health, there is an increased interest in getting involved by governmental and non-governmental bodies. From this position, the Ministry set up several educational initiatives. One of them is the Kunukito na Skol, implemented

in school gardens in different neighbourhoods. Within these school gardens, children and teenagers learn how to produce crops and use the yield to prepare meals. By doing this, greater awareness is fostered from a young age to be self-sufficient and support the local economy instead of importing local fruits and vegetables. This could encourage youth to pursue careers in agriculture. The report suggests that young individuals will eat healthier while growing up when seasonal cooking is taught to them (MEO, 2021). As such, they can pass this knowledge to younger generations.

4.5.2. Non-governmental actors and initiatives

In addition to ministries and agriculture-related sectors, there are also non-governmental bodies involved with agriculture in Curaçao. One of them is the Agricultural Cooperative Society (AKV). AKV seeks to represent and promote the interests of food production, agriculture, and animal husbandry. AKV has 420 members. Anyone can become a member free of charge and buy seeds, fodder, fertilisers, and pesticides at reduced prices. Additionally, AKV is actively involved in testing new seeds for agriculture. The cooperative association welcomes entrepreneurs engaged in processing abundant crops (cucumber, sweet potato, cassava, and mangos, for example) or low utilisation crops (tamarinde and kenepas) into shelf-stable products, such as chips or chutney, preventing the wastage of crops.

Another important actor within the field of food production and distribution is Soltuna. Soltuna stands for the Stichting voor Ontwikkeling van Land en Tuinbouw Nederlandse Antillen (english: Foundation for Development of Agriculture and Horticulture Netherlands Antilles). Soltuna proudly promotes agriculture and horticulture in Curaçao and has existed since 1973. They actively engage in gardening in the open air and in green and shaded houses. In addition, Soltuna coordinates deliveries to wholesale suppliers for supermarkets and the hospitality industry. Soltuna also purchases local vegetables and fruit and sells them the same day to several tokos (small supermarkets), supermarkets, and wholesalers. In this way, Soltuna supports the development of local horticulture and agriculture in Curaçao.

4.5.3 The ZonMw research consortium

ZonMw is an organisation that funds health research. In the light of the pandemic, ZonMw acknowledges that there is a greater need for both economic diversification and bolstering food security because of the socioeconomic effects of the COVID-19 pandemic in Curaçao, Aruba and Sint Maarten. Therefore, it facilitates two local projects to cope with the effects of the COVID-19

pandemic. This includes the funding of an ongoing research project that explores the impact of the pandemic on regional food systems and how sustainable agricultural production might support diversification plans that can make the islands more tolerant of pandemics (ZonMw, 2020). The main objective of the research is to explore shifting patterns in community-centred LFIs and how they can contribute to innovative economic diversification strategies to increase pandemic resilience. The outcomes should then provide essential baseline information that can be used to guide evidence-based policy aimed at countering food security and resilience challenges (ZonMw, 2020).

4.6 The UFFs that emerged during COVID-19 and their characteristics

The emergence of COVID-19 has been accompanied by the emergence of new LFIs. Based on the conviction that things need to be done differently worldwide, including in Curaçao, these initiatives aim to grow food in an ecologically sustainable way. The initiatives central to this study have all taken a similar form, namely food forests, following agroforestry principles. These are mainly located in neighbourhoods. As such, these initiatives will be referred to as Urban Food Forests (UFFs). These UFFs are designed and managed using the same well-established agroecological concepts where natural processes substitute external inputs, which is a key factor for agroecology as described by Wezel et al. (2009). With sponsorship (via foundations, collaborations, and contributions), a number of individuals have been able to establish these UFFs in a number of poor communities (including Scharloo (for an example, see figure 7), Brievengat and Otrobanda). The objectives are to help Curaçao become more food self-sufficient, to regreen the island, and to support its ecosystems. In that sense, UFFs may increase local food security and nutrition, particularly in underprivileged areas, by producing fresh produce close to customers (Smit, Nasr, and Ratta 2001). As previously described (section 2.4.2) it takes a minimum of three years for the trees and crops to grow and produce food (Bukowski & Munsell, 2020). This, combined with the fact that these UFFs emerged during COVID-19, results in the food forests' overall harvest currently being relatively low. For this reason, they may be overlooked within policy reorganisations because they do not seem to contribute to food security yet. However, these UFFs appear to be naturally tapping into the pillars of food sovereignty through their use of agroecology, creating a more resilient local food system. This will be examined in the following chapter.



Figure 7. Hofi di bario Esperanza (Food Forests Scharloo). Note. Left picture: January 2020, right picture: March 2020. Adapted from Samyama Transitie Advies, 2020

4.7 Conclusion

In conclusion, the industrialisation of Curaçao has led it to become a mono-economy based on tourism and dependent on food imports. Agricultural policies so far have focused on large and industrial food producers, although a shift can be noticed in the new agricultural plans of governmental and non-governmental organisations. Numerous people in the agricultural industry have embraced this need for change. They are making an effort to contribute to localised and sustainable food systems through LFIs in the form of UFFs as they provide a variety of services: they produce food (primary production, processing, nurseries); they regulate and support the environment; and they provide social and cultural services (community building, education, recreation). Therefore, these UFFs may be promising for the achievement of food sovereignty.

5. Food security and resilience challenges for Curaçao's local food production

5.1 Introduction

This first analytical chapter answers subquestion 1: What are the food security and resilience challenges for local food production in Curaçao? The data used to answer this question are the answers of the participants, who all speak from their own expertise. Some of the answers are supported by legal publication sheets. The aim of this section is to provide an overview of the biggest challenges facing the island. The chapter starts with a description of the difficulties associated with achieving food self-sufficiency (5.2). The description of cultural-historical challenges follows in section 5.3. Section 5.4 covers further practical issues before moving on to a review of more recent sustainability challenges (5.5). In section 5.6, the chapter comes to a close with a summary and discussion.

5.2 The (im)possibilities for food self-sufficiency

As stated in the introduction, SIDS' food systems are growing more fragile as they depend increasingly on imported goods and are less self-sufficient. Even while the natural environment provides an exceptionally wide range of flora and animals that should generally form the basis for balanced meals, this heightened susceptibility is particularly true for the Caribbean islands like Curaçao. It is necessary to draw the immediate conclusion that total self-sufficiency is not attainable. This is also evident from the interviews, as none of the participants advocate total self-sufficiency. Instead, some discuss a scenario in which *“achieving a 50% level of food self-sufficiency is already a worthwhile objective”* (Participant 11).

The lack of subtlety utilised while discussing Curaçao's self-sufficiency during the interviews sometimes caused some aggravation, as emerges from the following quotation: *“Of course, we are only talking about fruit and vegetables, aren't we? And that's actually what sometimes irritates me a bit with all this stuff about self-sufficiency or food security: that's just a bit of fresh fruit and vegetables we're talking about. Go into any supermarket. All those shelves are full of preserves, cereals, flour, rice... All those things are imports. The only bit where we have some local production is in the vegetable section. And in terms of variety, quite a lot is local. In quantity, I think a lot is imported. But I mean: apples, pears, plums, grapes... That's just not going to do it. Potatoes? That's just not going to do it either. Starch: rice, maize, all simply cannot be produced locally. We do not have the climate or the hectares.”* (Participant 7)

This shows how different people may interpret the goal of greater self-sufficiency differently when it is discussed. However, as discussed in section 2.3.2, complete self-sufficiency is not the aim that should necessarily be pursued. Instead, the focus should be on an optimised self-sufficiency for the products that can be grown locally.

In two obtained publication papers by the national decree on general measures (Decree on import prohibition of fresh fruit and vegetables No. 77 from 1984 and Prohibition on import of cucumbers, peppers, aubergines, and hot peppers No. 79 from 1985) it becomes clear that at least 25 products can be produced locally to the extent of self-sufficiency in Curaçao. Therefore, these products may not be imported without the consent of the MEO. An overview of these protected fruits and vegetables which are included in the legislation can be found in appendix: 10.5. It must be noted that this list is not up to date as innovative ways of farming and new technologies are accompanied by an increase in possibilities. The latter, however, are not within the scope of this research and are therefore disregarded. The publication sheets of the national decree on general measures both describe legislation in which it is stated that a total of 25 fruit and vegetable crops may only be imported with authorization from the MEO. One of the problems mostly faced by smaller local food producers in Curaçao in particular is that the same products are still allowed through imports. Local farmers' inability to ensure ongoing mass production is the primary reason for allowing these imports.

"The reason why these imports are granted is simple: they ensure the continuity of supply to consumers. And when our local farmers produce, sometimes they can't guarantee the quantity to guarantee the continuity that the consumers can find their food." (Participant, 5) and *"What I do notice, for example, when I try to buy locally: they don't always have everything available. What you have one week, you don't have the next"* (Participant 9). As such, granting imports is very understandable from the standpoint of food security. As a government, you cannot afford to have a food shortage. These imports, however, significantly reduce the competitiveness of local farmers (Gonzales, 2004). Additionally, None this is not consistent with achieving as much food self-sufficiency as possible, undermining the resilience of local food systems. In turn, this weakens the resilience to deal with external stresses. It provides little security against prices that continually rise. Therefore, this strategy of import substitution has a detrimental influence on the island's food sovereignty and resilience (Buheji et al. 2020). A transition to a sustainable and just food system must begin with the identification of the barriers to local food production. The factors that negatively influence local food production and the actors involved is further elaborated on in the following section.

5.3 Socio-cultural challenges

Curaçao is a culturally and ethnically diverse society that has been shaped by colonisation and slavery throughout its history. This continues to have a lasting impact on the socio-cultural development of the respective societal groups, contributing to an enormous cultural resistance towards agriculture. Even with current practices, showing actual production is possible and agriculture can flourish, only a handful of locals are currently engaged in agriculture. This narrative has been persistent until today and is a significant problem for creating transformative policies, education, or daily habits.

"Something you often hear people say: yes, but agriculture, that is not something that Curaçao people do. That is something that poor people do. We don't do that anymore. That was in the time of slavery. That image is very prevalent here among people." (Participant 1). and *"When we were younger, I am sixty now, so when we were very young, we were always told "yes Curaçao people don't want to work in agriculture because of the slavery past and we have a kind of aversion to it." (Participant 3)*

This resistance towards agriculture could have an inhibiting effect on diversifying the economy, as people get stuck in casual jobs in, for example, the service sector. The fact that the recent Covid-19 pandemic has shown that it cannot provide stability in terms of income and therefore the ability to buy food, has had little or no influence on this. This becomes evident in the following citation, which was a response to the question of how Curaçao could benefit from the knowledge of the Covid-19 crisis and the instability of, for example, the touristic sector: *"The logical answer is to create jobs in other sectors, in this case, agriculture, which we are talking about. But there is also something culturally involved. In the past, all those slaves worked as farmers, so working in the fields is a bit of slave work. So you'd rather sit in a nice office. So, a lot of local people don't want to do work in agriculture, because it is perceived as slave work."* (Participant 9)

The negative image of working in agriculture is also reinforced by the various migration movements that come to Curaçao from outside. *"The image of farmers is very low in Curaçao. There is a stigma that it is something you can do when, for example, everything else fails. It is considered the lowest layer of society, but they are so important."* (Participant 7) and *"one development that I have always seen here is that the group of people who come to the island are actually a bit at the bottom of the social ladder. Or economically also at the bottom of the ladder who do horticulture. Portuguese then. At one point we had a lot of Dominicans. And I sometimes joke that we get everything from the surrounding republics where things are not going so well. They are*

looking for a better life. Come to Curaçao and end up at the bottom of the ladder in horticulture. Whether they have the knowledge or not.” (Participant 8)

The idea of rational choice (being reflective and conscious) is lacking, mostly among marginalised producers and consumers. This has a negative impact on the long-term vision, which is very important for structural changes. However, this lack of long-term vision is also embedded in history. *“What many Curaçaoans have: no long-term vision. And yes, that is also culturally linked. In the past, as a slave, you had no future. You didn't know if you were going to survive tomorrow. Maybe you were whipped to death or something. You had no possessions. Everything was still about survival. People just look at their situation now, or in a week, or in a month at the most. They don't think about climate change twenty years from now or something like that. Sea level rise? That is all too far in the future for them.” (Participant 3).*

This affects both the producer and the consumer. The producer wants the certainty of a harvest, regardless of whether it is sustainable or efficient. The consumer prefers the certainty of consuming as much and as cheaply as possible, regardless of whether this is healthy or unhealthy, local or imported. The biggest challenge here is changing this mindset. Assuming that changing people's habits and attitudes is tough in and of itself, there are additional factors at play that make this an extremely challenging endeavour. The agriculture industry faces several obstacles that make farming in Curaçao less appealing. The next section will elaborate on these obstacles.

5.4 Technical factors challenging local food production

In general, most practical challenges related to producing food and ensuring food security are known to most actors in the field. Traditionally, which also became evident in the previous section and Chapter 4, Curaçao is not a food-producing area because of its semi-arid climate. Agricultural resources are scarce and do not lend themselves to growing a rich variety of fruit and vegetables

5.4.1 Water availability

Water is a major challenge. This became evident in all of the interviews. Without good water availability, the possibilities for sustainable growth of agriculture or cattle breeding are very limited. Rainwater may be suitable. However, due to its ineffective management, it is not sufficiently available to meet the demand of the farmers across the island. This makes them dependent on the use of groundwater from wells or water from the Aquaelectra water purification plant, which supplies high quality water all over Curaçao. However, the high cost of water makes it infeasible to use it for agriculture. In the past, policies have been made, for example, to make water cheaper for agriculture. *"A nice initiative, but it does not necessarily address the underlying cause as it does not make more water available."* (Participant 9).

However, without denying the increasing scarcity of water, the scarcity itself is not the foremost reason that the demand cannot be met. A recurring issue is the insufficient management of water, leading to significant evaporation and a lack of adequate infrastructure to collect and distribute precipitation to crops. *"Water is one of the main reasons why agriculture in Curaçao has no right to exist. The island is built so that all the rain that falls is drained into the sea as quickly as possible. This water should be collected for the agricultural sector."* (Participant 3).

Besides, it is not clear from the interviews whether this reduced water price scheme for local farmers is still in operation. What did emerge from the conversations, however, is that this water regulation does not apply to the UFFs central to this research. This brings some challenges and also noticeable indignation among different interviewees. The UFF practitioners believe that because they are new initiatives, they are not regarded seriously enough and so they do not receive adequate recognition. This is recognised by other people who are not actively involved in the projects. Prioritisation still favours the tourism industry above the food sector.

"Tap water is expensive, incredibly expensive, and the more you use, the more expensive it gets instead of the other way around... Besides, to qualify for cheaper farm water: the person who deals with this already didn't think we were serious enough. And that while I have shown that I can deliver more than 700 food parcels." (Participant 2). and

"We have a water purification plant at Piscadera and they produce purified water there, which you can use well for irrigation. However, more than half is given to the golf course at Bluebay for a very low price. Because, you need to have a nice golf course for the tourists. You can certainly use that for the local farmers. There have been conferences about this, and the question always comes up: why

do the tourist products, the cheap recycling, always get irrigation water? The answer is always: a contract has been signed." (Participant 9)

In some cases, this has resulted in farmers, who may or may not qualify for this water scheme, being forced to stop farming. However, even if this water was made available for local farmers, it does not automatically mean that the practical inconveniences would decrease. It would only provide a short-term solution. One of the reasons for this, as indicated earlier, is that these schemes tend to apply only to large-scale producers. The vast majority of the population in Curaçao that is engaged in mass production uses the methods of conventional agriculture. This agriculture is very water-intensive, which cannot guarantee long-term sustainability and therefore does not fall within the ecological boundaries. Only on a small scale do the islanders grow food crops on fields that are not irrigated. These crops on fields deliver products which, at lower than the real local production costs, can be imported from countries where these crops are grown on a large scale and therefore cheaper. The current local agricultural infrastructure is too small scale and too fragmented to compete with foreign countries with arable crops,

5.4.2 Land

In addition to water scarcity, the issue of the availability of cultivable land is often mentioned as a challenge for local food production. The climate is semi-arid and the soil type is hard. However, according to the report from the Ministry of traffic, transport, and Urban Planning (2019) around 12 to 13% (i.e., 5,000 ha) of the island is available for agriculture. It is estimated that in 2019, approximately 2,000 ha were in use. It is not clear whether arable lots in city areas or conservation areas are included in this estimation. If not, this would mean that more land could be cultivated than this estimate shows.

Overall, farmers are willing to cultivate more fresh fruits and vegetables, but they say obtaining property is practically impossible. The main problem is not the availability of land, but its accessibility. As such, this technical challenge made room for a more institutional challenge. The waiting time for a piece of cultivable land is overlong, which causes a lot of dissatisfaction among those who are willing to start or scale-up their agricultural initiatives. Additionally, even individuals who have managed to obtain a piece of arable land do not automatically obtain assurance of being able to carry on their farm. Various reasons are given for this, as the following answers make clear. *"There is currently a waiting list of about thirty years. I myself am in the syntropic sector, in which I and many young farmers want to start, but no land is made available for us, and it seems that the government is more interested in people who want to buy land. We are*

referred from the Ministry of Health, Environment and Nature (GMN) to Domain Management and back again. You just don't get anywhere." (Participant 11),

"What about land? If the government had given me a five-year lease on where I am now, I would have been very happy. Instead, we have been fighting over that piece of land for 40 years because it has been inherited by innumerable entangled family relationships. And now I have to leave, and it will probably be empty for another 20 years. Just because they can't agree on it. But I now have whole trees that I have to pull out of the ground because nobody has the balls to say: you don't use it, you lose it and it is now forgiven for temporarily farming on." (Participant 2),

"Private land on the North-East side, near Koraal Tabak, the people there are exploring a bit of what could be done with farming. But you will notice that this is ultimately used for other purposes. Houses are built, or worse: waste is simply dumped there. So, it's quite intense what happens then when a piece of land like that stands still." (Participant 3), and

"There are so many local entrepreneurs who would love to work on a piece of land, but the process of getting such a site really needs to be much faster. Now it is very bureaucratic and difficult." (Participant 4).

These examples clearly show that there are various interests at stake in the relinquishment of a piece of land, often negating the willingness of new farmers. Regarding the current small scale of the local initiatives, it does not seem to have a major impact because they can thrive in small urban areas as well. Nonetheless, they also have to deal with this issue (Participant 2 & Participant 11, p. 44). On a national level, these consequences of difficulties in obtaining land may not be overlooked. Due to the difficulty of formal farming, many individuals engage in informal farming. This way, production itself is not the main issue, but rather the mapping of it.

"Production is possible. The production is there, but it is never properly mapped out. It is also impossible to map it from the informal sector. The informal sector that is under the radar is now about 60%. Reasons for growing informally include that you have your own responsibility, you don't have someone else's advice on what to do. The downside in the informal sector is that you have no guarantees, because you are not known. Formally, you don't exist. And so your production and your risks don't exist either." (Participant 7).

As a result, there are no official figures on the total volume of food production in Curaçao over time till today. Here we can refer back to what is described in section 5.2. This lack of understanding of the island's production leads the government to issue permits for import

anyway to ensure consistency, even for products that are cultivated locally. Again, this undermines the competitiveness of local producers as their crops are imported at lower prices than the local production costs, coming from countries where these crops are grown on a large scale and therefore cheaper. Additionally, they are likely to be subsidised, leading to unfair competition. Local food producers become discouraged as a result, and some may end up being driven out of the agriculture industry. Due to insufficient local production to ensure local food supply, this may ultimately pose significant problems for food security and resilience.

5.5 Sustainability challenges

Even though there are certain barriers to food production present, Curaçao must also take the environment into account. Overall, the attention to sustainable alternatives is very low in Curaçao. On the one hand, this may result from a certain, fixed mindset about local food production and the lack of a long-term vision (described in 5.3.1). On the other hand, it is often mentioned that the developmental status of the island is a big obstacle. To recap, Curaçao lacks the development necessary to undertake these significant investments on its own. However, because it does not qualify as a developing nation, it is ineligible for development aid. This is accompanied by a great deal of uncertainty about feasibility and, as a result, the decisiveness to act on stated plans has so far been lacking. The attention to sustainability appears to be poor. It is ostensibly frequently placed on the agenda. But, efforts are not always as robust because the improvements "cost too much money" or because they "do not appear to work" (Participant 5).

The Covid-19 outbreak demonstrated the necessity for a fundamental shift. This, together with the introduction of the COHO, adds to the urgency. As a result, there is now an understanding that the sustainability component should be prioritised, and that sustainable and local food agriculture is critical in this regard. However, opinions differ on the best way to tackle this. Some (Participant 3 & Participant 5) passionately urge further modernization, whereas others say everything can and should be natural (participant 10 & participant 11). Others think the focus on sustainability is just rhetoric. Curaçao's agriculture is organic by nature.

"You may expand from the fundamentals, your foundations, when you go back to them. Large investments are not yet feasible in the agriculture system." (Participant 7)

Moreover, wanting to take too many big steps at once, together with the current bottlenecks, makes ambitious plans unmanageable. As such, innovation and contemporary methods are not the solutions to the underlying problems.

5.6 Conclusion

To summarise, achieving the goal of full food self-sufficiency is not possible for Curaçao. A nuanced goal of food self-sufficiency to the maximum achievable capacity is more desirable. The current local food system in Curaçao is unstable and non-resilient. To make up for this instability, permits for the import of products for which Curaçao can be self-sufficient are issued, undermining the competitiveness of local food producers.

The food security and resilience challenges are due to several factors. Foremost is the fact that local agriculture in Curaçao has never (yet) flourished. The image of farming is low, due to a cultural background in which slavery has left its imprint and only those who cannot achieve anything else end up in farming. However, entering the agriculture business is fraught with several hurdles. On the one hand, this maintains the current image. On the other hand, it makes it extremely challenging for individuals who want to enter agriculture. Due to the climate, precipitation is rare and the cost of tap water is prohibitive. As far as is known, no viable solution exists yet. In addition, acquiring and managing a piece of property is a hard process. These obstacles persist in establishing plans for sustainable food alternatives. Though it is generally acknowledged that traditional agriculture is not ecologically sound, consensus on alternatives has not yet been reached. Priority still seems to be given to developments for the tourism sector to boost the economy. This is in line with the concept of food security, which assumes that economic growth generates income and thus combats poverty, which in turn is a key component of food security (Babar & Kamrava, 2014). However, due to the fact that farmers are sometimes pushed out of agriculture as a result of being outcompeted, local food production diminishes. This does not add to the food system or the environment's resilience. In turn, this reduces the resilience of the food system and the environment as a whole. If a resistant mindset permeates in the people of Curaçao, it can have a great impact on the potential to look further into the future of food production and access that is environmentally stable. Therefore, it is important to come up with initiatives and policies that make it more attractive to enter or persist in farming practices. From there, it will be possible to work towards a food system based on sustainable practices.

6. Countering food security and resilience challenges through UFFs

6.1 Introduction

This section answers subquestion 2: *How do UFFs counter food security and resilience challenges through the implementation of agroecology?* It examines the driving forces behind the various food projects in Curaçao, as well as how they aim to solve issues of resilience and food insecurity. Section 6.2 starts with an elaboration on how sustainability challenges are countered through the adoption of agroecological practices. In section 6.3 a description follows on how more social embedded challenges are countered through these agroecological practices. The chapter concludes in section 6.4.

6.2 Overcoming sustainability challenges through agroecological practices

Sustainable food production initiatives have existed in Curaçao for many years. Their characteristics, origins, and ways of farming may vary, though they share one common motive: to produce food in an ecologically responsible way. Since the emergence of Covid-19, awareness regarding the production of local food has increased. As previously described in the research context, most of the new initiatives that emerged during the pandemic have adopted the form of an UFF.

As aligned with Koofahankan et al. (2011) agroecological production systems include four elements. The first element describes how, to increase genetic variety and better adaptability to shifting biotic and environmental circumstances, it is crucial to adopt locally developed agricultural varieties. The second criterion deals with avoiding the needless use of agrochemicals and other technologies that have a negative influence on the environment and human health. Regarding the third criterion that focuses on the rejection of technologies that might unnecessarily harm the environment, it cannot be stated with certainty whether this is the case. Tractors were used for the establishment of the food forests. However, given the underlying objectives of these initiatives, it is assumed that unnecessary harm to the environment is not an issue. The final criterion is the necessity to utilise agroecological principles and processes that encompass nutrient recycling and diversified farming.

"With our food forests, we plant them in ways that nature itself does as well. So nobody has to come from outside with pesticides, vitamins, etc. So the way we make a food forest is called the syntropic way. Syntropic, from syntropy. The meaning of syntropy is that everything grows in cycles and everything is in succession. I was thinking all the time, "How can I grow food without always going

back to doing nothing?" With monoculture, every time you go to nothing by harvesting. And then I thought, okay, I need to plant the land in sections. But then it would be monoculture because if you plant, for example, one section of pepper, one section of tomato, it will be the same, the same type of monoculture, the same type of soil, the same type of everything they do in monoculture. And when I went to the course of syntropic farming, I understood immediately that there is a way we can do it without degrading the soil, without killing the soil, etc." (Participant 10)

Avoiding the use of pesticides, minimising waste, scheduling their production around the weather, and maintaining or even improving the local biodiversity are also applied practices within the UFFs. The practitioners employ agroecological principles themselves as much as they can. Their secondary objective is to involve as many locals as they can. They aim to share the information they have acquired with the community through seminars and gardening days to contribute to a long-term reform of the understanding of agriculture. This is not necessarily intended to get them into the field of agriculture, but it shows them how they themselves can engage in subsistence farming (meaning for their own use) in a sustainable way, which will have a positive impact on their own food. Producers even argue that they would not pollute in any way, either because they utilised extremely few resources or because they produced and provided carbon credits back to the environment. In that sense, in UFFs, a number of sustainable local cycles ought to be closed, i.e., the own water supply, compost processing with biodegradable waste from the neighbourhood, and fertilisation (application of compost) to support the garden. This also becomes evident when speaking to a spokesman for Selikor, as he notices that "*there is an increasing demand for chippers for agricultural waste so that this can be reused as mulch on their lands.*" (Participant 9). For a sustainable transformation, it is important to comprehend your sources better and understand the potential for circular food chains. This is also in line with the aim of closing the food loop in the CDE taskforce.

Regarding *resource efficiency*, all UFF practitioners used their resources extremely effectively. For example, they show notably responsible water management, like the collection of rainwater and waste water as much as possible. Other examples of appropriate water management include the use of drip irrigation rather than sprinklers (all three UFFs). The data study also revealed that the UFFs considered their ecological footprint, associated greenhouse gas emissions, and soil and water contamination, which they tried to reduce wherever possible. All three UFF practitioners also take conservation of soil and water into account. It did not come out explicitly in the interviews about the use of -renewable energy, although it does come out implicitly that there is still little possibility for this as "*Solar panels have been resisted for a very long time. But I think now*

the point is going to come that you can just put solar panels on the land. Fortunately, that is now starting to happen, but the government and Aqualectra have also worked against that for a long time. So, there are certain things that the government could theoretically provide solutions for farmers to be able to farm better." (Participant 2). Based on this quotation it is therefore assumed that here still lies an obstacle for the UFFs. Since more inexpensive and accessible renewable energy options will certainly lead to a further decrease in the use of non-renewable energy, this is an objective worth working toward.

The concepts of *resilience* and *adaptability* assume that food producers that adopt agroecology are more resistant to environmental changes (Koohafkan et al. , 2012). The supportive reactive role played by food forests and their staff demonstrates their ability to adapt to situations in the short term. *"We made a commitment to provide vegetables to 50 families every month. This we did. We stopped counting at about 700 food parcels, because it just seemed to work."* (Participant 2).

In terms of long-term resilience the practices of the UFFs seem promising as *" the ultimate goal is to plant mainly local fruit varieties that are drought- and climate-resistant. Fruit trees will last longer and do not need to be replanted, like with monocropping. Food forests produce natural ecosystems in which tree roots help store carbon in the soil and promote nutrient circulation while also keeping the soil covered, preventing water loss and erosion. Food forests, with healthy soil as their foundation, require minimal or no artificial fertilisation and help reduce CO2 emissions, thereby mitigating the consequences of climate change. They also develop new nature, fauna and biodiversity. These are all positive long-term side effects"* (Participant 11).

Though the adoption of short-term reactivity and long-term sustainable practices, opens promising scenarios for a flourishing agriculture sector in Curaçao, there are still some limitations. The bottom-up and step-by-step approach and adopting innovative technical practices (such as carbon sequestration or nitrogen fixation) requires money, time, and patience. It is a long-term investment, which cannot always be made with the available funds. Also, taking this step is complicated by the irrational decision making impeding a lack of long term-vision that underlie the mindset of Curaçaoans (section 5.3). As long as these initiatives continue to literally put bread on the table, they will retain support and be able to continue to develop. Only in this way can they contribute to a sustainable food system. This requires adherence to the principles that underpin the success of a food forest, as *"fiddling with these principles will result probably result in failure. Therefore, we need to share knowledge and skills of our successes and create one big success together"* (Participant 10). Sharing knowledge and skills will be further examined in light of the related food sovereignty pillar in the following chapter.

Another recurring term for the emergence of these is that they are honourable, especially regarding ecological aspects. Local initiatives are keen to make food production more sustainable by working with nature, instead of against it. That takes time and effort. Although this may be perceived negatively by some (the stigma of slavery), on the other hand it may increase the appreciation of the food production process.

6.3 Overcoming societal challenges through agroecological practices

Apart from directly preventing people from going hungry or being unable to afford nutritious food, showing their reactive potential, UFFs also aim to resist food insecurity and resilience challenges in the long term. In the aftermath of Covid-19, they continue to promote greater self-sufficiency through sustainable food production through social mobilisation. The implementation of the farming initiatives has been very contagious. Initiatives were picked up by locals, governmental and non-governmental institutions. In that sense, the food initiatives did create awareness for their forests and their agroecological practices.

When aligning this with Koohafkan, Altieri and Gimenez (2012), the criteria *human capital and knowledge preservation* is somewhat complied with. First, the people who work with or within UFFs use human capital by combining traditional and modern scientific knowledge and skills to come up with new ideas. They also use social capital by recognising cultural identity, using participatory methods, and creating farmer networks within marginalized neighbourhoods to increase solidarity. Second, the practices UFFs relate to the criterion for recognising and dynamically conserving agricultural heritage systems, which allows for societal cohesiveness, a sense of pride, and promotes a sense of belonging. The latter may be a significant opportunity for cultural change. For example, *"operating through participatory mobilisation, involving people in food production. There I see enormous potential for raising awareness."* (Participant 1). This ties in with an earlier statement that local initiatives are changing the narrative around agriculture. *"It shows how working the land is not 'dirty' and 'only for the poor'. Rather, people may see how it helps with reducing poverty and is also a bit hip and cool in itself"* (Participant 8). In that sense, it is acknowledged how these local food initiatives will above all help to increase involvement in one's own food and thus respect for and familiarity with the local product, and perhaps influence the food habit. The need for this appreciation is reinforced by respondents recognising the importance of making people proud of their own food and that it should not be taken for granted.

“In this way, you create a new story, as it were, and you can hopefully take off the “yoke of slavery”. With this revised story and people seeing with their own eyes how they can achieve self-sufficiency through bottom-up initiatives on a small scale, the government may at some point no longer close its eyes to this, because they too will see with their own eyes that it works, which will hopefully make them less reluctant to support it. So, I think if we keep this up and make it a little bit bigger and manage to accentuate a little bit of the power of local people in this as well and show that it really comes from the bottom-up, that it can really have an impact. This can have important implications for countering the sustainability challenges.” (Participant 1)

In this sense, it may have the long-term potential to counter the challenge of the historical narrative and engage more people in agriculture. It could be said that these local-social initiatives contribute to a stronger social foundation, which is important (CDE, 2020).

6.4 Conclusion

This chapter described how UFFs may overcome existing food security and resilience challenges through applying agroecological principles. As a practice, it can be said with some caution that UFFs manage to deal with several bottlenecks, at least at the micro level, in a sustainable way. Since the production scale is currently insufficient to feed the population of Curaçao, the potential at the macro level is more readily seen in the shape of a social movement. However, recognising that food is not a given and appreciating the process can result in required sustainable structural transformations. The absence of short-term memory and the mindset are particularly impacted by this, opening scenarios for a transformative movement.

Table 2. Adoption of UFFs practices aligned with Koohafkan et al. (2012)

	Yes	Partially	No
Production processes	✓		
Resource efficiency	✓		
Resilience and adaptability	✓		
Human capital and knowledge conservation	✓		

7. UFFs and the pillars of food sovereignty

7.1 Introduction

This chapter answers subquestion 3: *How do UFFs in Curaçao incorporate the six food sovereignty pillars?* It examines the perceived contribution of the UFFs to food sovereignty through the alignment with the six pillars (7.2) and concludes in section 7.3.

7.2 Contribution of UFFs to food sovereignty

7.2.1 Focus on food for people

UFFs have emerged as a response to countering food insecurity through sustainable farming. These are, at least initially, voluntary and achieved through sponsorships. As such, the UFFs were not created with a profitable motive. The intention is to provide fruit and vegetables to those who cannot afford them. Through a reciprocal dependency of the initiative supporting these people with food provision and these people supporting the initiatives through help, mutual benefits are derived from within, regardless of profitable purposes. This is in line with the idea that food is seen as a right. Food is produced to be a source of nutrition for the community rather than as a commodity to be exchanged. This is in line with the meaning of the first pillar of food sovereignty, in which food is not seen as a commodity but as a right. As such, food is produced locally or regionally for its own consumption (subsistence).

"Ultimately, I aim for a self-sustaining food/ecosystem, in which people work for their food and thus also learn the value of food." (Participant 11)

As such, export-oriented agriculture is discouraged within the UFFs. This is in line with the related food sovereignty pillar. Additionally, the reciprocal interaction under the guise of "people who cooperate may reap what they have sown" brings the consumer closer to the process of food production, which has a positive influence on value awareness. In this way, it also responds to the next pillar, which is described below.

7.2.2 Values food and their providers

"If you value the products you consume and use, but not their origin, then something is going wrong." (Participant 11)

The potential for UFFs to increase the appreciation of the food production process is perceived as very strong. By motivating locals to engage in their own food production, it may positively

increase the valuation of the production process, and thus a greater appreciation of food as such can be gained. Great value can be found in this development.

"I think that these small initiatives mainly contribute to increasing the involvement in one's own food. And with that comes respect and familiarity with the local product. That development of making people aware that food and the environment in which it is grown cannot be taken for granted, is so important! What you hear from everybody, and that's what makes me laugh so hard, is that they are really convinced that the local cucumber from their own soil is way tastier and better! Understandable, because that is your pride, the love with which you have grown it. The appreciation that it happened. And then nobody bothers to buy a local cucumber that is crooked or has a lump."
(Participant 8)

In that sense, it makes people more aware of the process behind the products they consume. Therefore, its significance lies in the encouragement of locals to engage in more sustainable livelihoods regardless of the ostensible quality of products. Additionally, it helps to recognise that different species are more readily available at different times of the year. This increases public awareness of the prices being offered. Additionally, with appreciation for the process, comes appreciation for the product and the producer. As such, it naturally taps into the underlying key concept of 'supporting sustainable livelihoods'.

"For example, I once heard someone complain that, well, I was in the supermarket and the chicory was so ridiculously expensive. Normally, I buy it for a lot less. And then I think to myself, have you ever thought that chicory has seasons? Where it comes from? And that this is apparently not the climate or season for chicory, so you're probably going to pay a high price. No, we are so used to it, it is always there. And that might change if you, as a consumer, come closer to the production."
(Participant 8)

"You learn to appreciate it as a producer and hopefully as a consumer. And no matter how you grow it, in my view, it is always more sustainable than unnecessary imports. And, not unimportantly, you know where it comes from." (Participant 4)

This pillar is further supported by the idea that all food providers are regarded equally, regardless of their race, age, colour, or gender. Everyone's contribution is regarded equally, notwithstanding the fact that the UFFs are set-up by the local population or Curaçao's diaspora. This is because appreciation is shown for the activity, the person performing it, and the result of the activity. Though not explicitly expressed during the interviews, it became evident that, within the UFFs,

as none of the interviewees expressed specific preferences with regards to gender or age. As such, it is assumed that no distinction is made between men and women in terms of work and valuation.

“Everyone is free to participate. In my food forest, local residents eventually dropped in naturally, from a group of five to ten children who regularly hung around the garden, to drug addicts. Now everyone lends a hand. That's what I like about the approachability of this project!” (Participant 11)

The embodiment of this pillar is very valuable for an island like Curaçao, where the competitiveness of local food producers is greatly undermined by cheap imports. By valuing local products and their producers, farming power can be gained at both the national and the individual farmer level.

7.2.3 Localises food systems

The practitioners within UFFs see food primarily as a source of sustenance for the community and region. With the promotion of local food production, the distance between producer and consumer is reduced considerably. The fruit and vegetables for which this is possible will then no longer have to be flown in or shipped from overseas. This also has a positive impact on the prevention of dumping because an import tax can be actively placed on these products. In that sense, UFFs resist dependency on remote food providers who sometimes cannot be trusted for the ostensible quality of the food. Through local production, it is clear where the food comes from, how it is produced, and what is used to produce it. By organising and promoting markets where locally produced fruit and vegetables are sold, various initiatives are aimed at increasing the awareness of local products. This allows for direct interaction between the producer and the consumer, which may enhance transparency (of the production process as well as of the perseverance of quality). Moreover, it conveys a picture of the person who feeds you, which in turn may have a favourable impact on the pillar of 'values food and their supplier'.

“With local production, you can simply guarantee better quality. There is more control. You can say 'no, I don't want certain insecticides to be used', for example.” (Participant 4)

7.2.4 Puts control locally

As for this pillar, the assessment of its embodiment is somewhat more complicated. Because the farmers operate within a larger web in which there is a great deal of uncertainty about their right to exist and operate, some aspects of this pillar do not fully apply.

Control over resources refers to whether communities oversee the productive resources or have ownership over the land. Even though the UFF practitioners operate autonomously, regardless of the government, they are nevertheless dependent on availability of water truck or being allowed to use land. The following example shows this: *“Water supplied by the government is often insufficient because the trucks are broken most of the time. I have the added problem that only one of those trucks can pass through my street. So, when it breaks down, I can't do anything for a long time. You can buy water and they come the next day. You can also buy water and it will come in three months. You really can't rely on it at all.”* (Participant 2).

As such, it can be argued that these UFFs only partially have control. However, through the agroecological practices UFFs practitioners adopt, for example by participating in collecting rainwater, they can still influence this through their own ingenuity. In that sense, the ability to choose their own procedures and practises is not completely interfered with. This also applies to the contention that, as a (conventional) farmer, you continue to rely on imported fertilizers and chemicals. Since UFFs emphasize the application of agroecological principles, they work as little as possible with external inputs (Wittman, 2011) and so retain as much control as possible.

Another sub definition of this pillar describes how food sovereignty means that the resources are used and shared in socially and environmentally sustainable ways, which has a positive impact on diversity. The need to inhabit and to share territories is recognised. However, the interviews strongly suggest that this is not put into practice enough as *“everybody is working from his or her own bubble, because it seems like everybody is very protective about their own things”* (Participant 2). The examples that follow in the next pillar will give more substantiation to this finding.

7.2.5 Builds Knowledge and Skills

Food sovereignty requires both the progress of existing agricultural knowledge and its supplementation with new abilities and beneficial technologies. As such, priority is not given to technologies that limit the capacity of food producers to acquire and transmit the knowledge and skills required for localised food systems.

The practitioners of the UFFs use a combination of traditional and modern practices. In doing so, they attempt to build on conventional knowledge. They truly go "back to the roots" since they work with nature as much as possible. They learned from traditional farmers that there are certain forgotten crops that can be cultivated on Curaçao.

"What I have seen, for example, is that it is mainly the traditional farmers themselves who indicate that there are 'forgotten vegetables', or fruit and vegetables. And certain innovative farmers have picked up on that. Like "oh yes, we can plant or grow that in a different way that is ecologically friendly." (Participant 6)

This is supplemented with agroecological principles that take ecological boundaries into account as much as feasible. This is done as efficiently and innovatively as possible. In this way, UFFs practitioners seek a balance between the practices imparted to them by the elderly and knowledge gained through university exchanges, workshops, or the Internet. As such, the UFFs practitioners move away from the idea that the role of technologies lies in the increase of productivity through scientific innovation and the adoption of modernisation practices (Wittman, 2011). Through their own set-up workshops, the practitioners share this knowledge and skills with the co-producers and consumers on how to produce and cook nutrient meals with these fruits and vegetables.

But some challenges emerged regarding sharing of knowledge. This somewhat contradicts the finding that the criteria of human and capital knowledge conservation are met. Within the initiatives, knowledge is enthusiastically shared with those who join the workshops or meetings. However, it is noted that there is competitiveness among the UFFs or other agroecological practitioners. This may correlate with the difficulties described in the previous pillar about sharing territories and resources. It became evident from the interviews that there is a lot of tension between the UFFs practitioners. Being protective about their own things (Participant 2) lurks in the reluctance to share knowledge.

"It looks like everybody is working on their own. It looks like. And with the experience I have, I felt a lot of... Well, I don't want to be negative, but I feel, I don't want to say a lot, but I feel some ego in people's ways of working together. For example, if someone thinks they know how it has to be done, they will not work with someone who also thinks they know how it must be done. And yeah, I think that someone has to plant a good syntropic agroforest based on all the syntropic principles. And if everybody can see that this works with their own eyes, maybe then they understand that "OK, this is the way that works and the only way to achieve that is by working together." I try to work together. With everyone. But it seems like not everyone wants to work together with everyone." (Participant 10)

The continuous reinvention of practices consumes unnecessary time and resources. Additionally, it doesn't help certain efforts' reputation much. Before deciding to participate in something,

individuals want to determine its viability. If the food forest concept fails because the principles are not followed appropriately and promises are not kept, the perceived potential will inevitably shrink. In light of this, the ego must be set aside. Therefore, competitiveness and the desire to develop an unproven solution are not consistent with the pillar in question. Therefore, it can be concluded that there is still progress to be made on this pillar in order to make a real contribution to food sovereignty.

7.2.6 Works with Nature

Although the different UFF practitioners may differ in their methods of planting, maintenance, and harvesting, they all adopt practices that seek to maximise and optimise ecosystem contribution. For example, while some stick to the permaculture principles and just want to let nature do its work, others see no harm in intervening with nature when necessary. As long as it happens organically and within ecological limits.

“So yes, we plant it in ways that nature itself does. [...] As little as possible must come from outside. Not with pesticides, vitamins etc. So the way we use to make a food forest is called the syntropic way and the meaning of syntropy is, growing in cycles, and everything is succession.” (Participant 10)

7.3 Conclusion

In this section, the contribution of UFFs to food sovereignty was examined. Based in the alignment of the six pillars and their key concept, it can be concluded, that they have a high potential to contribute to achieving food sovereignty. At least on a micro-scale. This conclusion has the indication that UFFs also fit within the larger concept of food sovereignty, which includes all the environmentally friendly options to food security. The UFFs contribute to food sovereignty in multiple ways. Their production mainly for domestic and local markets, helping to support regional food systems that are self-sufficient. This is in line with the pillar of “food for people” and “localizes food systems”. One pillar that is largely embodied by the implementation of agroecology in UFFs is that of appreciation for food producers. It can also be noted that this correlates strongly with the pillars discussed above, because as a consumer you are brought closer to the producer. The practitioners of the UFFs maintain partial control over their productive resources because the majority of producers work on their own fields. Only some difficulties regarding water availability, land accessibility, and lack of tax exemption—because of lacking public investment—somewhat prevent compliance with food sovereignty. However, they strive to retain as much control as possible over ecologically friendly agricultural applications. This is also in line with the pillar of ‘work with nature’.

There is one pillar where a remarkable number of difficulties emerge from the data. Although diverse practitioners of different UFFs do get together to exchange information, egos often tend to get in the way, and knowledge is often imposed rather than used collaboratively. There is considerable competition among the many projects. From an agroecological perspective, this impedes with food sovereignty. As a socio-political movement, to press the need for a stronger position of local food product and their producers and reject policies that lead to undervaluation of these, you have to join forces by working together and not trying to do better than someone else. Therefore, there is potential for improvement here. Apart from this, UFFs show to be naturally tapping into the pillars of food sovereignty to great extent through their use of agroecology.

Table 3. Alignment of UFFs practices with the six pillars food sovereignty

	Yes	Partially	No
Food for people	✓		
Valuation of food providers	✓		
Localises food system	✓		
Puts control locally		✓	
Builds knowledge and skills		✓	
Works with Nature	✓		

8. Conclusion and Recommendations

8.1 Introduction

This chapter gives an answer to the main research question, based on the previous data analyses. This is followed by a reflection on considerations and limitations. Then, a methodological reflection is provided. The chapter concludes with recommendations for further research and policies.

8.2 A synthesis of research findings

The main question was: *“What is the potential of UFFs in Curaçao to gain more food sovereignty in response to food security and resilience challenges exacerbated by the Covid-19 pandemic?”*

To answer the question, it has been divided into three sub-questions. The first question was: *What are the current food security and resilience challenges for local food production in Curaçao?* Today, multiple variables contribute to food security and resilience issues. Priority one is the fact that Curacao's native agriculture has never (yet) thrived. This, together with a cultural backdrop marked by the legacy of slavery, has resulted in a poor reputation for farming. Climate-related challenges and issues related to the continuation of other economic development prioritisation, brings many obstacles regarding persistence of current farmers. In addition, these factors also make it difficult for new farmers to enter the agricultural industry. These barriers continue to impede the development of strategies for sustainable food alternatives. Although it is widely known that traditional agriculture is not ecologically sound, no consensus has yet been established about viable alternatives. In general, the primary focus remains on economic development. This is consistent with the food security idea, which posits that economic growth provides money and hence combats poverty, a major component of food security (Babar & Kamrava, 2014). However, local food production declines because farmers are occasionally forced out of agriculture as a result of being outcompeted. As a result, the local resilience of the food system or the ecosystem is weakened. Thus, food security and resilience challenges are not adequately addressed.

The importance of sustainable alternatives for food production has been noted by local residents in Curaçao. This, together with the momentum of the Covid-19 pandemic, has made them take matters into their own hands and set up food forests in disadvantaged neighbourhoods, despite little support from the government. This brings us to the subquestion 2: *How do UFFs counter food security and resilience challenges through the implementation of agroecology?* The

bottom-up approach of UFFs is a response to show the consequences of an unsustainable globalised top down approach that enforces power structures in the realm of food and agriculture.. Through the adoption of agroecological practices challenges regarding sustainability are countered through the focus on local suitable production techniques and soil care. For example, the use of agrochemicals is rejected, which is also advantageous for the objective of food sovereignty. Additionally, resource efficiency has a favourable impact on local food systems because local food systems have low levels of distribution and transportation, which results in a reduction in their ecological footprint. Also, access to resources is positively correlated with resource efficiency because using resources well might subtly reduce the requirement for less useful resources. Through the implementation of agroecological practices, UFFs practitioners integrate conventional knowledge with the opportunities presented by nature. These activities refuse the notion that food security can be attained solely through intense production based on scientifically modernising advancements or the deployment of possibly environmentally damaging technology. Agriculture is embedded in the environment. Consequently, it is argued that sustainable agriculture promotes conservation. In doing so, UFFs practitioners are opposing the prevailing neo-liberal corporation principle that underlies the current concept of food security.

The third and last subquestion was: *How do UFFs in Curaçao incorporate the six food sovereignty pillars?* Based on the data it could be concluded that UFFs have a great potential to for achieving food sovereignty on Curaçao, as they naturally tap into the six pillar through the agroecological practices they adopt. The UFFs contribute to food sovereignty in multiple ways. Their production is mainly for domestic and local markets, helping regional food systems become self-sufficient. This is in line with "food for people" and "localises food systems." Implementing agroecology in UFFs shows appreciation for food producers. This correlates strongly with the pillars discussed above, because as a consumer you are brought closer to the producer. UFF practitioners maintain partial control over their productive resources because most producers work their own fields. Water availability, land accessibility, and lack of tax exemption due to lack of public investment somewhat preventing food sovereignty. They try to retain as much control as possible over eco-friendly agricultural applications. This, then, is in line with the pillar 'work with nature'. Only the alignment with one pilar (building knowledges and skills) had some difficulties. Diverse UFF practitioners do exchange information, but egos get in the way and knowledge is often rather imposed rather than used collaboratively, despite the importance of collaborating to press for structural changes. However, overall, it can be concluded that food sovereignty is positively impacted by UFFs. Since the production processes promote resource management, individual freedom of choice, and the right to food. The production of native crops

strengthens control over local resources, and has the potential to become less dependent on imports. UFFs demonstrate that a more sustainable food system supported by food sovereignty, requires reinvesting our energy and creativity not only in resisting and deconstructing global hegemonic structures but also in proposing and securing alternative, socially-just and ecologically balanced structures. Given that agroecology and food sovereignty are inextricably linked, it may be concluded that the solution to food insecurity rests in the use of an agroecological approach.

8.3 Theoretical reflection

In this section, I discuss my addition to the existing literature and how my prior conceptual model influenced my research. In the beginning, I indicated that an alternative to the industrial agriculture paradigm is desired since the present paradigm has negative consequences for local food producers, society, public health, and the environment in Curacao. I explained that this alternative paradigm may be found in agroecology and food sovereignty, as well as the potential contribution of UFFs to this objective.

Within this research food security and food sovereignty have been used as two entirely different concepts. Even if they emerge as separate terms and seem to describe two different extremes they are not entirely irreconcilable. Food security is concept describing a condition regarding the accessibility to adequate healthy food, food sovereignty refers rather to a political agenda on how to address inadequate access to food (Clapp, 2014). The pursuit of food security is therefore not a counterpart to food sovereignty. Indeed, there are many similarities between Clapp et al. (2021) most recent definition of food security based on the six pillars of availability, accessibility, utilization, stability, agency and sustainability. Here, the newly added pillar of agency and sustainability strongly relate to the concept embedded in the food sovereignty movement. However, the criticism concerns the underlying mechanisms. Whereas food security does not have an underlying mechanism to achieve it, food sovereignty does: namely agroecology. In that sense the bottom-up approach adopted by agroecology is a precondition of “genuine” food security, filling in a gap conceptually between food sovereignty and food security. As such, food insecurity challenges are more about how security is interpreted and what aspect of food security must be emphasized when promoting measures to achieve ‘real’ food security without undermining the local food producers.

8.4 Methodological reflection and limitations

This section addresses the methodological reflection and limitations of the study. For establishing and assessing the quality, I will reflect on the criteria of *trustworthiness* (section 8.4.1) and *authenticity* (section 8.4.2). The criteria are all aligned with Guba and Lincoln (cited in Bryman, 2016). Section 8.4.3 elaborates specifically on the limitations of this research.

8.4.1 Trustworthiness

The key criteria in evaluating the *trustworthiness* of qualitative research are *credibility*, *dependability*, *confirmability*. The first criterion, *credibility*, means that research findings are plausible and trustworthy. I took quite some time to become familiar with the island and get interview appointments after my introductory round, as I wanted to explain my intentions thoroughly. Therefore, I made a few appointments with my local councillors in order to get to know them and gain a better understanding of Curaçao based on their expertise. As food security is a sensitive subject, discussed within a small community, in which everyone knows each other, this may have been of any influence, did not want to put anyone in an awkward position. I also think I somewhat influenced them or got carried away by the opinions of the participants. I have tried to counteract this as much as possible by covering all sides as much as possible. In addition, triangulation was used to improve the trustworthiness of the research by synthesising secondary and primary research sources. In order to prepare for the interviews, I made use of reported data through multiple data sources such as policy documents, press reports, and blogs. Also, because the interviews were conducted with people in different settings (private vs. public), as well as with different perspectives, I intended the use of triangulation of sources. The second key criterion for trustworthiness is *transferability*, meaning the transferability of findings to other contexts. Given the study's context-specific nature, the findings are only partially transferable. In order to enhance the transferability, for at least similar contexts, I tried to keep a document with notes of the research context, the things I encountered in that context, and (random) questions that came to my mind. Also, I tried to make some links between the contexts of Curaçao, Aruba through the consultation of a PhD-student and a bachelor's student who are conducting research on similar topics. This complemented my description of the context. *Dependability* encompasses the question of whether someone else would come to a similar conclusion while doing the same research. During my time in the field, I mostly tried to audit with my local supervisor. My Dutch supervisors were consulted in order to keep sight of the academic relevance before conducting the interviews. The last criterion, *confirmability*, means that although total neutrality is unachievable in social research, it is important to ensure that the researcher can be proved to

have operated in good faith. In all honesty, I do think that sometimes my objectivity was out of sight for a bit. During the interviews, I have encountered some strong personalities with particular ideas on how some things must be handled concerning local food production and ways of farming, sometimes directly opposing others. During the interviews, it was sometimes hard not to go along with them. I have tried to counter this as much as possible by falling back on my topic list and pre-set questions.

8.4.2 Authenticity

The second criterion for assessing the quality of qualitative research is *authenticity*, which raises a wider set of issues concerning the political impact of research. The most prominent criteria for this research during the collection of data is *catalytic authenticity*. Catalytic authenticity means that the research stimulated the participants to engage in action to change the circumstances of the local food production in Curaçao. In order to achieve this, the criteria of *fairness* were at the centre of the research, which encompasses “the fair representation of different viewpoints among members of the social setting”. Fairness is here complied with by elaborating on different attitudes towards the food initiatives throughout the description of the results.

8.4.3 Other limitations

Another limitations is that the scope of my thesis is both too broad in the sense that I concentrated on too many themes. Gathering this information via in-depth interviews, made it challenging to distinguish between primary and secondary concerns. It would have been preferable to conduct a semi-structured interview, which would have facilitated coding and analysis and enabled more persuasive findings to be formed.

Maybe the most important limitation of this study is attributable to the time and period in which the research was conducted. In my opinion, the chosen topic is subject to the preference for a longitudinal study. A longer study period would have been preferable in order to acquire a more complete grasp of the entire situation and to meet with more urban agriculture players, for example, with practitioners of already fully established food forests. With regard to the moment, the UFFs included in the study were really still in their development phase. Thus, a longitudinal study could have better highlighted their development.

8.5 Research recommendations

Following the methodological limitations and findings of this research, interesting avenues for further research are the following. More research is needed on the developments of these UFFs in the longer run as their implementation is relatively new. In fact, at the moment of departure, some UFFs practitioners realised that, while complying to the agroecological principles, they had encountered some possibilities. This might serve as the impetus for focus groups with diverse agroecology practitioners to examine the obstacles in information sharing shown by this research. Additionally, follow-up research must involve focus groups to which all relevant parties are included. In this study, they were interviewed individually; however, focus groups would likely yield greater results. In addition, as it becomes evident that it is necessary for all stakeholder to become involved and participate, communicate and collaborate, more research is needed it is strongly recommended to make a comprehensive stakeholder mapping in which the different responsibilities per actor are mapped.

8.6 Policy recommendations

With Covid-19 still vivid in our minds and the increasing threat of significant price increases as a result of the war in Ukraine, among other, now is the momentum to implement significant structural changes to policies relevant to securing local food production. Given that The Curacao government has mostly prioritised industrial agriculture and favoured large farmers over smallholder farmers. However this research this study shows how smaller initiatives based on agroecological principles are valuable for ensuring local food resilience to overcome food security challenges. Through a reduction in farmers' reliance on external inputs, subsidies, and the unpredictability of market prices, agroecology helps family farmers improve their standard of living and alleviate rural poverty. When public policy provides support, access to money, and stable markets, agroecology may develop increased economic resilience, provide year-round income stability, and connect consumers and producers, therefore increasing bargaining power and reducing profit loss. In general, barriers to farmers and others seeking to transition to an agroecological system must be removed, including obstacles to obtaining access to land, water, and crop seed. By including agroecology, obtaining a CDE is made more likely. It can be noted that these are strongly linked to the SDGs. By focusing on agroecology, even more than the four pillars of the NDP are addressed. Thus, agroecology can have an additional positive impact on: SDG2 (Zero Hunger), SDG1 (No Poverty), SDG13 (Climate Action), SDG15 (Life on Land), SDG5 (Gender Equality), SDG10 (Reduced Inequalities).

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10. Appendices

Appendix 10.1 Operationalisation table

KEY CONCEPTS

	Dimension	Variable	Indicators/Question	Contributes to SQ
FOOD SECURITY CHALLENGES	Resilience	Self-sufficiency	How would you describe the resilience of the economy of Curaçao?	SQ1
		Local Food Production	How would you describe the reliability of the food supply? Is the provided food locally produced? And consumed?	SQ1
AGROECOLOGY	Practical	Production processes <ul style="list-style-type: none"> Local crop varieties Rejection of harming technologies Nutrient recycling	How would you describe the potential of the UFFs?	SQ2
		Resource efficiency <ul style="list-style-type: none"> Minimal external input Reduce ecological footprint Conservation of biodiversity, soil and water 	"	SQ2
		Resilience and adaptability <ul style="list-style-type: none"> Balance between long-term adaptability and short- 	"	SQ2

		term efficiency		
	Social	Human Capital and Knowledge Conservation <ul style="list-style-type: none"> • Conservation of agricultural heritage systems • Social Cohesion 	"	SQ2
FOOD SOVEREIGNTY	Food for People	<ul style="list-style-type: none"> • Puts people's need for food at the centre of policies • Insists that food is more than just a commodity • 	<p>Are there existent food / agricultural policies in Curaçao? If yes, what do they look like?</p> <p>Are people at centre of food policies?</p> <p>Is food seen as more than just a commodity?</p>	SQ3
	Value of provider	<ul style="list-style-type: none"> • Supports sustainable livelihoods • Respects the work of all food providers 	<p>Does the current food system support sustainable livelihoods?</p> <p>Does the current food system respect the work of all food provider?</p>	SQ3
	Localises Food System	<ul style="list-style-type: none"> • Reduces distance between food providers and consumers • Rejects dumping and inappropriate food aid • Resists dependency on remote and unaccountable corporations 	<p>How do you experience the distance between food providers and consumers? Too what extent you think that UFF's can remove this distance?</p> <p>How is dumping managed in Curaçao?</p> <p>How is food aid managed in Curaçao?</p> <p>To what extent do you experience dependency on remote corporations? Should they be accountable? If no, who do you think is accountable?</p>	SQ3

	Local Control	<ul style="list-style-type: none"> Places control in the hands of local food providers Recognizes the need to inhabit and to share territories Rejects the privatization of natural resources 	<p>Are neighborhoods in control of their own food provision?</p> <p>What is the difference between neighborhoods with / without an UFF? How do UFF's reject the privatization of 'natural resources?</p>	SQ3
	Builds Knowledge and Skills	<ul style="list-style-type: none"> Builds on traditional knowledge Uses research to support and pass this knowledge to future generations Rejects technologies that undermine or contaminate local food systems 	<p>Do you feel that being active within an UFF builds useful knowledge? What means useful to you?</p> <p>Where does the knowledge come from?</p> <p>How does the knowledge cope with future tens in order to transmit dependable to future generations?</p> <p>Will UFF's remain suitable to continue rejecting technologies that undermine or contaminate local food systems?</p>	SQ3
	Works with Nature	<ul style="list-style-type: none"> Optimizes the contributions of ecosystems Improves resilience 	<p>Do UFF's have the potential to maintain their stated contributions of ecosystems?</p> <p>On a bigger scale, can UFF's improves resilience towards exogenous shocks?</p> <p>Will UFF's remain suitable to reject energy intensive, monocultural, industrialized, destructive methods in providing sufficient amounts of food?</p>	SQ3

Appendix 10.2 List of participants and characteristics

Participant number	Actor type/field of occupation	Date of interview	Duration of interview
Participant 1	Researcher	14-03-2022	47 min. 26 sec.
Participant 2	Owner LFI (UFF)	21-03-2022	47 min. 02 sec.
Participant 3	Food production and distribution expert	21-03-2022	1 hour 18 min. 11 sec.
Participant 4	Intermediary for (food) entrepreneurs	22-03-2022	39 min. 34 sec.
Participant 5	Governance	23-03-2022	36 min. 56 sec.
Participant 6	Governance	24-03-2022	1 hour 6 min. 14 sec.
Participant 7	Economist	24-03-2022	Unknown (no recording)
Participant 8	Food production and distribution expert	28-03-2022	1 hour 36 min. 24 sec.
Participant 9	Selikor (waste recycling)	31-03-2022	58 min. 25 sec.
Participant 10	Owner LFI (UFF)	17-05-2022	39 min. 46 sec.
Participant 11	Owner LFI (UFF)	n.d.	Unknown, multiple encounters

Note. The designation in the participant number column is also the designation of the responses in the analytical chapters. To ensure privacy, the specific function of the participant is not mentioned.

Appendix 10.3 List of topics and pre-set questions

Topic list

- 1) The current food system
 - State local production
 - Self-sufficiency and its potential
- 2) The current food policies and their impact on local food production
 - Effects on diet & health
- 3) The impact of Covid-19
- 4) Towards more self-sufficiency through more local production of food
 - Bottlenecks
 - Opportunities
- 5) The potential for sustainable alternatives in agriculture

Standard Opening Questions

How would you describe the resilience of the economy of Curaçao?

What do you think are the five most important problems that influence economic resilience?

And what are the most important factors underlying these problems?

What impact did Covid-19 have on the economy?

The Current Food System

What do the people in your community eat?

How do they get their food?

How would you describe the reliability of the food supply?

Is the provided food healthy, nutritious, and suited to the people in Curaçao?

Is the provided food locally produced? And consumed?

Food Policies and Local Production

Are there existent food / agricultural policies in Curaçao? If yes, what do they look like?

What are the considerations in decision-making about these policies?

How do these current policies affect the control over the local food system?

What policies can be developed to increase local-food system control?

What is needed for these policy/policies to be passed?

Opportunities/obstacles for UFFs?

How would you describe the potential of the UFFs that started or gained more attention due to Covid-19?

Can they provide more food self-sufficiency?

Appendix 10.4 List of codes and code groups

NAME	CODEGROUP 1
ACTOR: AVB	Actors
ACTOR: GMN	Actors
ACTOR: GOVERNMENT	Actors
ACTOR: LVV	Actors
ACTOR: OBNA (BANK)	Actors
ACTOR: SUPERMARKETS	Actors
ACTORS: PERCEIVED ROLE(S)	Actors
BG: SEMI-ARIDE	Bottlenecks (generic) = BG
BG: WATER	Bottlenecks (generic) = BG
BS: FRAGMENTATION	Bottlenecks (society) = BS
BS: HABITS	Bottlenecks (society) = BS
BS: HISTORICAL LABEL	Bottlenecks (society) = BS
BS: INEQUALITIES	Bottlenecks (society) = BS
BS: LONGTERMVISION	Bottlenecks (society) = BS
BS: MINDSET	Bottlenecks (society) = BS
CHALLENGES	Challenges
COSTS	Economical challenges = EC
EC: IMPORT	Economical challenges = EC
EC: PRICE ADVANTAGE IMPORT	Economical challenges = EC
EC: PRICE DISADVANTAGE LOCAL PRODUCTION	Economical challenges = EC
EC: SID	Economical challenges = EC
EDUCATION: APPLIED	Knowledge challenges
EDUCATION: DILUTED	Knowledge challenges
FSP: BUILDING AND PASSING KNOWLEDGE	Food Sovereignty Pillars = FSP
FSP: CHANGE OF CULTURAL NARRATIVE	Food Sovereignty Pillars = FSP
FSP: CONTRIBUTION OF ECOSYSTEM	Food Sovereignty Pillars = FSP
FSP: FREE CHOICE	Food Sovereignty Pillars = FSP
FSP: IMPROVED RESILIENCE	Food Sovereignty Pillars = FSP
FSP: INHABIT AND SHARE OF TERRITORIES	Food Sovereignty Pillars = FSP
FSP: LOCAL CONTROL	Food Sovereignty Pillars = FSP
FSP: NO PRIVATIZATION OF 'NATURAL RESOURCES'	Food Sovereignty Pillars = FSP
FSP: REDUCED DISTANCE	Food Sovereignty Pillars = FSP
FSP: REJECTION OF MONOCULTURAL DESTRUCTIVE MEASURES	Food Sovereignty Pillars = FSP

FSP: REJECTION OF UNDERMINING TECHNOLOGIES

FSP: REJECTS DUMPING

FSP: RESISTANCE OF DEPENDENCY REMOTE CORPORATIONS

FSP: VALUATION OF FOOD PROVIDERS

FUTURE CHALLENGES

HEALTH

INSUFFICIENT KNOWLEDGE

LACK OF AVAILABLE DATA

LACK OF COMMERCIAL KNOWLEDGE

LFI BENEFIT: APPRECIATION

LFI BENEFIT: AWARENESS

LFI BENEFIT: BOTTOM-UP INTERVENTION

LFI BENEFIT: CULTURAL ASPECT

LFI BENEFIT: LOCAL CONTROL

LFI BENEFIT: SEXINESS

LFI BENEFIT: SUSTAINABLE

LFI BENEFITS: CULTURAL APPROPRIATE FOOD

LFI DOWNSIDE: COMPETITIVENESS

LFI DOWNSIDE: CONSISTENCY

LFI DOWNSIDE: SCALE

NEGATIVE ATTITUDE

OIL REFINERY

OPPORTUNITY FOR (LOCAL) MARKET

PERCEPTION POTENTIAL (OVERALL)

PERCEPTION POTENTIAL (SELF-SUFFICIENCY)

PERCEPTION POTENTIAL (WATER)

POLICIES: EXISTENT

POLICIES: LACK OF FOLLOW-UP

POLICIES: LAND TENURE

POLICIES: NONEXISTENT / UNKNOWN

POLICIES: PROTECTIVE MEASURES

POSITIVE ATTITUDE

POTENTIAL (NEW TECHNOLOGIES)

POWER IMBALANCES

RETENTION: NEGATIVE

RETENTION: POSITIVE

RETENTION: URGENCY FOR MORE SELF-SUFFICIENCY

RISE IN FOOD PRICES

SCEPTIBILITY

SUSTAINABILITY

Food Sovereignty Pillars = FSP

Food Sovereignty Pillars = FSP

Food Sovereignty Pillars = FSP

Food Sovereignty Pillars = FSP

Challenges

Challenges

Challenges

Knowledge challenges

Knowledge challenges

LFI benefits

LFI benefits

LFI benefits

LFI benefits

LFI benefits

LFI benefits

LFI benefits

LFI benefits

LFI downsides

LFI downsides

LFI downsides

Perceptions about potential

Challenges

Perceptions about potential

Perceptions about potential

Perceptions about potential

Perceptions about potential

Policies

Policies

Policies

Policies

Policies

Perceptions about potential

Perceptions about potential

Challenges

Retention Covid-19

Retention Covid-19

Retention Covid-19

Challenges

Perceptions about potential

Challenges

Import prohibited without MEO exemption (Publicationpaper N77, 1984 & Publicationpaper N79, 1985)

Celery (seldu)
Radish (Konòltji)
Corn salad (salada)
Salad onion (sibojo largu)
Spinach (spinasi)
Amsoy
Beetroot (roibiet)
Courgette (squash) (kalabasin)
Squash (pampuna)
Calabash (kalbas làrgu)
Curaçao cucumber (kòmkommer-chiki)
Long beans (bónchi largu)
Curacao beans (bónchi kunuku)
Green beans (bónchi)
Ochre (giambo)
Cassava (yuka)
Sweet potato (batata dushi)
Coconut (coco)
Lime (lamunchi)
Cucumber (kokomber salada)
Pepper (promenton)
Aubergine (berehein)
Hot peppers (promente)

Possibility for self-sufficiency, but no import prohibition

Tomato
Melon
Watermelon
Paksoi
Mamotika (bitter melon)
Antrea
Peanut
Chinese Cabbage
