

THE TRANSFORMATION OF A LOCAL FOODSCAPE DUE TO THE TRANSITION TO SHRIMP FARMING IN RURAL BANGLADESH

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Abstract

A blue revolution has taken place in most of the developing countries in Asia. This can also be seen back in Bangladesh with the rise of shrimp farming. The rise of shrimp farming had effects on the farming practices in Bangladesh, there was a transition from rice farming to rice-shrimp farming or monocultural shrimp farming. This research focuses on how the transition to shrimp farm transformed the foodscape of a local rural community in Bangladesh. There is a lot of literature on shrimp farming and the consequences of it, but there is none that focuses on food.

The data for this research is gathered by doing fieldwork in Bangladesh. In Bangladesh qualitative research methods such as interviews, observations and pictures were used to discover how the foodscape was changed.

The interviews gave a clear image on the transformation in the foodscape. Salt water is a requirement for shrimp farming, this salt water was let in the area via a switch gate. As a result the area became salinized. Because of this, other crops could not grow anymore or grow in less amounts and with less quality than before. A landscape that was green before shrimp farming, became a 'desert in the delta'. The local population got most food via self-consumption, but are now more dependent on the local markets. However this transformation in foodscape only happened for people who did not profit of shrimp farming. The profitters of shrimp farming had bigger lands for shrimp farming and also land outside the shrimp area. The area therefore has a two-sided foodscape. On the one hand, the people who lost their crops and became more dependent on the market and on the other hand, the people who made more profits than before and still could grow the crops that they grew before shrimp farming. The main driver of change for this transformation in foodscape is the salinization. The most important indirect driver of this change are political and economic factors.

Table of contents

Acknowledgements	1
Abstract	3
List of figures	6
1. Introduction.....	7
1.1 Research questions.....	8
1.2 Relevance	8
1.3 Structure of the thesis	9
2. Theoretical Framework	10
2.1 Foodscape.....	10
2.2 Globalization and food sovereignty	12
2.3 Environmental impacts.....	14
3. Regional context.....	15
3.1 Local food traditions.....	15
3.2 Shrimp farming.....	15
3.3 Climate change	18
4. Methods	19
4.1 Qualitative methods.....	19
4.2 Observations and visual methods	20
4.3 Research location	20
4.4 Interviews.....	21
4.5 Positionality as researcher	23
4.6 Limitations and risks.....	24
4.7. Ethics	25
4.8 Timeline	25
5. Results	26
5.1 The introduction of shrimp farming	26
5.1.1 Requiring salt water	27
5.1.2 A profiting business.....	27
5.2 Development of shrimp farming and the rice-shrimp model	28
5.2.1 Rice-shrimp model.....	28
5.2.2 Experiments.....	29
5.2.3 Shrimp virus.....	29
5.2.4 Domestic animals and other changes	30
5.3 Foodscape.....	31
5.3.1 Physical landscape	32

5.3.2 Food habits	34
5.3.3 Water availability.....	35
5.3.4 Economical context	36
5.3.5 Political context	37
5.3.6 Social-cultural context.....	39
5.4 Drivers of change.....	39
6. Discussion	41
6.1 A transformation in the foodscape	41
6.2 Food habits	42
6.3 Globalization and food sovereignty	42
6.4 Shrimp farming	43
6.5 Reflection.....	44
7. Conclusion	46
Literature.....	48
Appendix I: Interview guide	54
Appendix II: Codes.....	58
Appendix III: Informed consent form	60

List of figures

Figure 1: Map of Bangladesh with the research location.....	15
Figure 2: Hennink Cycle.....	19
Figure 3: Map of the research area.....	20
Figure 4: The research locations.....	26
Figure 5a: Switch gate from above.....	27
Figure 5b: Switch gate from below.....	27
Figure 6: Rice experiment in the World Bank area.....	29
Figure 7: Livestock feed.....	30
Figure 8: Landscape in a none-shrimp area.....	31
Figure 9: Death leaves in the World Bank area.....	32
Figure 10: Shrimp fields.....	33
Figure 11: A house in the shrimp area.....	33
Figure 12: Salt depositions in the ground.....	33
Figure 13: Roads in the shrimp area.....	33
Figure 14: Farmers working in their shrimp farm.....	33
Figure 15: Salt depositions.....	33
Figure 16: A typical meal with vegetables and fish.....	34
Figure 17: A typical meal with fish and potatoes.....	34
Figure 18: Consumed fried shrimps with rice.....	35
Figure 19: Safe drinking water supply system.....	36
Figure 20: Food at Dumuria market.....	36
Figure 21: Eating together at the Hindu festival.....	38
Figure 22: Snacks at the Hindu festival.....	38
Figure 23: Kitchuri at the Hindu festival.....	38
Table 1: List of participants.....	23

1. Introduction

Since the mid-twentieth century there has been several changes to coastal and marine environments all over the world. One of the biggest changes has been the rise of coastal shrimp and prawn aquaculture in many tropical and sub-tropical regions of the world (Pokrant, 2014). Shrimp and prawns are mostly used as export products. They have always been one of the most traded aquatic commodity, but in the last decades the export of shrimps and prawns increased by much. The share of shrimp and prawns of all the aquatic product in 2020. In 1976 the export was worth 1.2 billion US dollars, whereas in 2020, the export was worth 24.7 billion US dollars (FAO, 2022). This made up 16.4 percent of all the aquatic products in 2020. In 1976 the share was 15.4 percent. Shrimps and prawns therefore account for a relatively stable share of the total value of global exports of aquatic products, while exports have increased drastically (FAO, 2022).

This comes along with an increase in all aquatic products. This growth in aquatic products is called the 'blue revolution'. This blue revolution took mostly place in developing countries in Asia (Garlock et al., 2019). This caused that the production of aquatic animals in 2020 was more than 60 percent higher than the average in the 1990s, considerably outpacing world population growth. This is mainly caused by the rise of aquaculture and new technologies (FAO, 2022 & Anderson et al., 2018).

A driver for the growth of aquatic product and aquaculture is globalization. Whereas there were regional markets earlier, there is a global market now. This has allowed commodity markets to become a toolkit for the use of an increasing number of seafood products (Anderson et al., 2018). Anderson et al. (2018) predicts that the commodification of seafood will likely continue. However, there are some exceptions. Some producers will be too small or remote to be a part of the larger market, and some may succeed in differentiating themselves from the larger market (Anderson et al., 2018).

The global demand for seafood products can also be seen back Bangladesh with shrimp farming. Farmed shrimps became a high value commodity, which is mostly exported from the global south to the global north (Belton, 2016). The rise of shrimp farming started around the 1970s, after the independence of Bangladesh. The interest in shrimp farming was caused by rising values and demand from international markets. Shrimp farms were establishing in peripheral lands near the mouth of coastal rivers where inundation of saline water is possible (Rahman & Hossain, 2009).

This caused a shift from local agricultural practices to shrimp aquaculture. Therefore, local agricultural habitats disappeared and a new monoculture of shrimps farms replaced it. In 1970 Bangladesh was the 15th country in the production of aquaculture, while it has risen to the 5th in 2016 (Garlock et al., 2019).. By 2007, the shrimp farm area consisted out of nearly 2.17.877 hectors in Bangladesh. Approximately 80% of the shrimp farming areas are in the southwestern region of Bangladesh while the rest are in the southeastern part (Nupur, 2010).

The production of shrimp is not without problems. One of the main problems is the outbreak of shrimp diseases, which heavily affects the production of shrimp (Rahman & Hossain, 2009). There is also an occurrence of social problems, which were mostly created by a small group of more wealthy inhabitants of the shrimp areas. These social problems are for example caused by unplanned and rapid expansion of the shrimp area, which causes environmental problems (Rahman & Hossain, 2009). Other social problems related with shrimp farming are lack of monitoring, widespread corruption and the absence of an integrated policy for this industry (Nupur, 2010).

In literature, there is already a lot of research on the consequences and problems of shrimp farming, but there is a lack of the consequences on the local foodscape. This research focuses therefore on how this transition to shrimp farming affected the foodscape of a local rural community.

1.1 Research questions

This research has the following research question: **How did the transition from rice farming to rice-shrimp farming transform the foodscapes of farmers in subcoastal Bangladesh and how can this be explained?**

This research question is answered with the help of the following sub questions:

- **Why did shrimp farming get introduced in the research area?**
- **How did the introduction of shrimp farming result into the development of local rice-shrimp models?**
- **How did the foodscape of local farmers change since the start of shrimp farming?**
- **What are the direct and indirect drivers of change of local farmers' foodscapes in relation to rice-shrimp farming?**

1.2 Relevance

The production of shrimp often takes place in developing countries, while the consumption of shrimp mostly takes place in wealthier countries. Thereby the shrimp production shows similarities with other global luxury food commodity networks, which also have the production in developing countries (Kagawa & Bailey, 2006). This while the governance of the shrimp production is complex. The natural resources which are needed for farming shrimp, the power over shrimp farming, knowledge of shrimp farming and technologies, local networks and access to markets are often unevenly distributed and allocated, while the governance of the shrimp production is complex with the involvement of many actors (Lebel et al., 2008). The transition to shrimp farming has socio-economic effects such as a change in income, livelihood and job opportunities (Ahmed et al., 2009). This has effect on the foodscape. Understanding this changes therefore helps form policies and interventions. A change in the foodscape can impact the availability of food and the food habits (Cavaliere, 2017). By doing interviews it is made clear if the food needs of the local community are still met. In addition, food not only provides for nutritional needs, but also has a cultural significance (Murcott, 1982). Researching the foodscape provides an insight of how cultural traditions and behaviors are affected by shrimp farming.

This research focuses on a transformation of the local foodscape by using qualitative research methods. With the focus on foodscape this research provides insights on how cultural practices and traditions related to food and agriculture are transformed due shrimp farming. The role that food plays in the identity of the local community is highlighted by focusing on farming practices, local food traditions and the local diet. Understanding changes in the foodscape offers insights how the transition to shrimp farming is affecting the local way of life. This information helps in formulating policies in regards to shrimp farming.

Literature shows that the rise of shrimp farms affected the local food consumption and the social landscape in the local communities Bangladesh (Ahmed et al., 2009 & Swapan & Gavin, 2011). However, in the literature it is missing how the affects the local foodscape of communities. This research therefore fills in gap in literature by focusing on the local foodscape. In addition, this study addresses an important gap in knowledge in foodscape research. Much of the research on foodscapes has taken place in urban place, this research focuses on the rural foodscape.

Furthermore, Belton (2016) showed that the transition to commercial aquaculture resulted in the modification of class, gender, labor relations and resource access. This influenced the social well-being of the local population. The link between food transitions and social well-being is hardly mentioned in literature about Bangladesh. By linking social-wellbeing with foodscapes this research gives new insights to existing literature. This should provide an explanation how a food transition influence the local foodscape and well-being.

Much of the literature on shrimp and prawn farms is focusing on the ecological impacts of the aquaculture, on the scientific study of environmental change or on social conflicts created by commercial cultivation using quantitative research methods (Swapan & Gavin, 2011). While this research mostly focusses on the social consequences using qualitative methods to see and understand the foodscape of the community.

This research is conducted in a small area in sub-coastal Bangladesh. In this area the transition to shrimp farming happened, but this is not the only area. The blue revolution took places in a big part of Asia (Garlock et al., 2019). Therefore the results of this research could be relevant beyond rural Bangladesh. While this case focuses only on a small shrimp region, the findings from this research can be extended and applied on other regions facing similar transitions in the agricultural field.

1.3 Structure of the thesis

Chapter 2 gives an overview of academic literature. This chapter elaborates on the concept foodscape, which is the main concept of this research. It also elaborates on concept which are connected with the foodscape and the transition to shrimp farming. These concepts are globalization, food sovereignty, environmental impacts and networks and food chains. The following chapter provides a local background. It gives a description of the research location, it gives an overview of the local food traditions, gives an insight of the impacts of climate change on shrimp farming and dives deeper in the academic literature on shrimp farming.

Chapter 4 gives an explanation of the methods and explains how the data for this research is collected. It also discusses the limitations of this research. The next chapter gives an analysis of all the results that are gathered in the field. This chapter follows the research questions, but some of the sub-questions are intertwined. The following chapter discusses the results with the help of the literature and the research ends with a conclusion which includes policy and research recommendations.

2. Theoretical Framework

The theoretical framework gives an insight into the already existing literature on the topic. The main focus is the concept of foodscape. Other concepts that are highlighted in this part are concepts that are connected with foodscape such as globalization, food sovereignty, food chains, networks and environmental impacts.

2.1 Foodscape

Foodscape is the core concept of this research. A foodscape is the spatial manifestation of food distribution and eating habits. These are places where food has meaning for a person. These are the places where food is bought, where food is prepared, where food is consumed and where there is talked about food (MacKendrick, 2014 & Oranges, 2007). Adema (2009, p.5) describes foodscapes as a marriage between food and landscape, which includes both the physical landscape and the conceptual idea of landscape. This concept is extended with the inclusion of the institutional arrangements, cultural spaces, and discourses that mediate our relationship with our food (MacKendrick, 2014). A foodscape is not something that is fixed, but something that changes overtime depending on the boundaries of the food environment (MacKendrick, 2014). Research to food environments or foodscape is gaining prominence in developing countries. So are policy makers turning their attention to the role that food environments play in shaping diets, nutrition, and health in these settings (Turner et al., 2019).

There are different definitions for the concept foodscape and food environment. In this research the following definition from the High Level Panel of Experts on Food Security and Nutrition report from 2017 (p.28) is used: *'The physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food.'* This foodscape consists of the built environment which gives consumers access; the food entry points, where food is obtained or bought; personal determinants of food choices like income, skills, education and facilities etc.; and the local cultural, social and political norms and values that are underlying for the food-related actions (HLPE, 2017). Central in the idea of foodscape is the interaction between people, food and place, which intertwines the individual the surrounding materiality, environment, culture, and society (Sage, 2010).

The foodscape is always changing. So does Dolphijn (2004) argue that food functions in immanent structures that are always in the process of change. In Oranges (2007) it is outlined that foodscape is a dynamic culinary culture of a community, which is influenced by different range of factors such as place, religion, history, culture, technology, development and social organization. In other literature the foodscape is also described as a dynamic social construct which relates food with place, people and meaning (Johnston & Baumann, 2011). According to Garden et al. (2019) the changes in foodscape are caused by various local, national and global processes, which has effects on places, such as a shift in policies, migration and population growth.

These changes in foodscape are in how people access, prepare and consume food. An example are the food entry points, half a century ago it consisted mostly of local markets and self-consumption, but now it consist out small kiosks, corner stores, wet markets, urban gardens, food markets, formal and informal markets, supermarkets, restaurants, schools, hospitals, public canteens and vending machines (Herforth & Ahmed, 2015). The food choices in the foodscape are made on the base of availability, affordability, convenience and desirability of various food according to Herforth & Ahmed (2015). Availability and affordability are present in most definitions of foodscape and food environment, but convenience and desirability are new factors. Availability considers the food what is available in the area; affordability considers the costs of food; convenience considers the time

costs of food (Herforth & Ahmed 2015). This became more relevant in low-income settings because women are time constrained in most parts of the world. Low-income women are often not only poor money wise, but in time as well (Herfort & Ahmed, 2015). This time to get to food has changed over the years. In developing countries in Asia and Latin-America the number of supermarkets has grown exponentially. These supermarkets are a competition for small, local markets that sell local products instead of more imported products from elsewhere (Minten & Reardon, 2008). Desirability of food is made up of internal factors and external factors. Internal factors considers personal preferences such as the taste of food and external factors considers outside influence on food choices like the local culture, advertisement, status of food and the quality of food (Herfort & Ahmed, 2015). A product is more often bought if the quality is good, this is influenced by the visual appearance of food, the smell, the taste and the texture of the food. Lower quality food is mostly found in more disadvantaged areas of lower economic status (Glanz et al., 2005).

In addition, the foodscape is also under threat of external forces. One of these forces is climate change. An example is given by Orlandi et al. (2020), in which is described how climate change affected local olive farmers. Another external force which can have an effect on the foodscape is political and social influence. Examples of political influences are food safety and environmental regulations, rural development programs, changing food policies, commodity programs and influences from the food industry on policy, while examples of social influences are concerns of the environment, consumer demands such as low prices, convenience, the taste, variety and quality of the food, the concentration of markets, the development of the rural community, globalization and meeting the food and nutritional needs of the local population (Archer et al., 2008).

Food can play an important part in the identity of an individual. For instance, food can evoke feelings, emotions and connections with places and people (Johnston & Longhurst, 2012). This indicates that food became embodied in the geography. Scholars have adopted the term 'foodscape' to identify and analyze the socio-spatial manifestation of human–food activities, food culture and subsequent social or health implications (Panelli & Tipa, 2009). Goodman (2015) states that it is impossible to separate out the notions of culture, space, economy, politics, and materiality if do research on food. Cook et al. (2013) takes this a step further by arguing that the study of food offers '*rich, tangible entryways into almost any issue in which you might be interested*'. Research on the foodscape allows researchers to explore food production and food consumption without privileging one over the other (Goodman, 2015). In Murcott (1982) the cultural role of food is argued. Food choices are not random, but shows patterns and regularities, these choices are related to social status, ethnicity and wealth: '*Food has also to be seen as a cultural affair; people eat in a socially organized fashion. There are definite ideas about good and bad table-manners, right and wrong ways to present dishes, clear understandings about food appropriate to different occasions*' (Murcott, 1982).

In Coakly (2010) it is seen that the foodscape is a gendered landscape, in which men and women experience food differently. This can be explained by the preparing of food. For women is therefore not only the eating of food an important part of the identity, but also the preparing of the food (Sollund, 2012). The role of the persons who cooks in a family is often determined by the cultural background, in most cultures this is the female (D'Sylva & Beagan, 2011). This is also seen back in Bangladesh, where cleaning the house, childcare and cooking and preparation of the meal are seen as a task for women (Asaduzzaman et al., 2015).

In the literature is foodscape is mostly connected with an urban context (Coakley, 2010, MacKendrick, 2014 and Cretella & Buenger, 2016). This is because food has a big impact on the quality of life in a city (Pothukuchi & Kaufmann, 1999). However in rural and local areas food can also play an important role. This important role can be seen back in literature, but has changed over the

years. This can be seen back in Sonnino (2013). In the 1990s and start of the 2000s local food production was seen as sustainable solution against specialization and the industrialization of products. It was also assumed that local food chains were more socially embedded (Sonnino, 2013). Local food chains caused development of a local sustainable food system provides not only economic gains for a community but also fosters civic involvement, cooperation, and healthy social relations (Feenstra, 1997). It was also considered that local food was more fresh and more nutritious (Sonnino, 2013). This importance of the rural foodscape changed because of multiple factors. The most relevant factors for this research are a sharp rise in food insecurity, the effects of climate change on eco-systems and the emergence of new rich but food-stressed countries such as the Middle-Eastern countries which buy land in developing countries (Sonnino, 2013). From a research perspective that the focus should be on the role of the state, on which level the choices in food planning are made and the sustainability of the food systems. With this focus the role, the meaning and the potential development of local food systems can be understood (Sonnino, 2013). Rural areas faces challenges in accessing food, which includes higher distances to food suppliers, higher food prices and a lack of fresh food in the local food environment. However local households have developed strategies to adapt to this kind of challenges. Looking at this from a foodscape perspectives gives insights how households acquire sufficient food (McIntyre et al., 2011).

2.2 Globalization and food sovereignty

The rural foodscape is significantly changed by globalization processes such as the globalization of agricultural systems, which is further mediated by local factors such as rural decline, urban-rural migration and changes in rural values (Hjalanger & Kwiatkowski, 2023). Hawkes (2006) sees a food environment as more global, with more linkages to interconnected local, regional and global markets. Globalization and localization can therefore have an impact on the foodscape. Globalization lead to the intensification of social and geographical interconnectedness and an accelerated circulation of people, capital, information and cultural symbols on a worldwide scale (Wilhemina et al., 2010). The process of globalization causes national markets to integrate and a decrease of importance in borders concerning with social, economic and political activities (Friedman, 1990). As a result, people from all over the world could compete with each other for opportunities that are present in the market. A global market where everyone has chances (Friedman, 1990).

This globalization process has also caused a shift from local and differentiated food habits to a more globalized mass consumption pattern. This mass consumption is driven by widespread lobbying of large corporations, with the goal to achieve maximization of their profits (Wilhemina et al., 2010). It has led to a shift food production patterns in developing countries such as Bangladesh. The food systems focus less on production for the local inhabitants, but more on meeting global markets (Islam, 2008). Local agricultural systems are therefore increasingly linked to global commodity networks, which generates complex intersections and sometimes tensions (Islam, 2008).

Agro-food chains and networks play an increasingly important role in providing access to markets for producers in developing countries. Globalization of trade and integration of supply chains lead to new demands regarding food quality and safety (Ruben et al., 2006) For many of the world's population, the growing integration of the global economy has provided the opportunity for substantial economic and income growth. The fact that globalization in this new era has also come to include the production of manufactured components linked and coordinated on a global scale has opened significant opportunities for developing countries and regions (Ruben et al., 2006).

The performance of the entire food chain is shaped by four different dimensions according to (Trienekens (2011): The economic dimension, which is related to chain efficiency and consumer orientation; the environmental dimension, which refers to that the way production, trade and

distribution of food is embedded in its environment; the technological dimension, which is related to the application of technology, logistical systems, and information and communication technologies that improve quality performance and enhance innovation in food products; and the legal and social dimension, which are the norms and values related to societal constraints to production, distribution and trade of food, concerning criteria of human well-being, animal welfare and sustainable entrepreneurship (Trienekes, 2011).

The opposite of globalization is localization. This is a process which ensures that all goods and services that can reasonably be provided locally are done (Wilhemina et al., 2010). An important concept in localization is food sovereignty. This is the right of local people to control their own food systems, including markets, ecological resources, production modes and food cultures (Wittman, 2011). Food sovereignty works if there are clear public policies. In developing countries this is often not the case (Wilhemina et al., 2010).

Food sovereignty is the right of peoples to define their own food and agriculture; to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives; to determine the extent to which they want to be self-reliant; to restrict the dumping of products in their markets; and to provide local fisheries-based communities the priority in managing the use of and the rights to aquatic resources. Food sovereignty does not negate trade, but rather, it promotes the formulation of trade policies and practices that serve the rights of peoples to safe, healthy and ecologically sustainable production. (Peoples Food Sovereignty Network 2002).

The concept of food sovereignty was first discussed in the 1990s in a time where the free market became a sign of development and food transformed in a commercial product (Pachón-Ariza, 2013). The main point of food sovereignty is that local and rural people have a special relationship with their local land and food production. They often have a connection with the places where food is grown and know how the food is grown (Pachón-Ariza, 2013). Food sovereignty is something that is vibrant and politically, geographically, locally diverse. It focusses on local and regional autonomy of food systems but is also dependent on the national agricultural policies and trade rules (Wittman, 2011).

The literature of food sovereignty makes thus an argument for the self-determination in the production of food. This gives opportunities to have more choices in the production of food and have more diverse food locally available. This leads to a healthier food choices, making more independent economic choices and being able to make strategic decisions in the food system. However explorations of food sovereignty have often been overdetermined by the broader political projects. It reduces the complexities and vagaries of peasant politics to opposition to globalization (Akram-Lodhi, 2013).

Paprocki & Cons (2014) wrote about food sovereignty in shrimp regions in Bangladesh. They saw that a polder with relative autonomy from the neoliberal agro-industrial food systems and capitalist export markets had limited effects of the transition to export driven shrimp farming. In this polder original agriculture products survived, while that was not the case in all the other polders in the region. However there is still call inequality seen and the poorest have an instable livelihood (Paprocki & Cons, 2014). Most of the shrimp farming in Bangladesh is nevertheless connected to the neoliberal market and meant for export to foreign markets, this resulted in several environmental impacts (Islam, 2008).

2.3 Environmental impacts

An external threat that could influence the foodscape are changes in the environment. Shrimp farming has been facing a host of challenges. It has been associated with a number of negative environmental and social impacts, which hinder the sustainable development of this blooming sector (Islam & Bhuiyan, 2016). The continuous and unregulated shrimp farming has immense impacts on human, ecology, environment and sustainability through saline water intrusion, soil and water quality deterioration, mangrove destruction, pollution, sedimentation, disease outbreaks, loss of biodiversity and destruction of local ecosystem. traditional livelihood displacement, change in agricultural pattern, food insecurity, reduction social security, displacement and marginalization, social unrest and conflicts. Inappropriate management practices, lack of scientific knowledge, improper monitoring of legal aspects and inadequate plans regarding water quality, seed supply, irrigation facilities and fishery resources are the main reasons for these issues. So, proper implementation of the resilient strategies designed in conceptual ecological (Islam & Bhuiyan, 2016). For instance, extensive shrimp farming on the southwest coast of Bangladesh has created a direct conflict with crop agriculture. Shrimp farming has not only damaged agriculture but also agroforestry, fisheries, livestock, and physical infrastructures (Pokrant, 2014).

Saltwater intrusion has caused problems in terms of severely decreased supplies of potable freshwater, which again has led to increase of gastrointestinal infections as well as loss of diversified crops, poultry and fodders in southwestern Bangladesh (Hossain et al., 2013). This salt water intrusion is not only caused by shrimp farming, but also by climate change. Due to rising sea levels salt water is getting further and further inland (Dasgupta et al., 2017). Dasgupta et al. (2017) describes that mainly the poor households are affected by the salt water. Poor communities in Bangladesh mostly consume fish, however the salt water intrusion causes a decrease in fish species. This fish is mostly bought at the local market or self-caught (Roos et al, 2007). Other sources of animal protein such as chicken, beef, poultry, egg and milk are mostly unaffordable to eat on a regular basis (Dasgupta et al., 2017). Fish and fisheries are therefore important for the food habits of the local community, but also for the livelihood and income in rural Bangladesh. The disappearance of local fisheries causes loss of income and food deficiency as a result of the loss of local indigenous fish species (Roos et al., 2007).

3. Regional context

This research took place in Magurkhali which is small municipality in the South-western part of Bangladesh (Figure 1). The location is not the most logical one, because the Magurkhali region is located more than 100 kilometers from the sea. However the influence of the sea was still noticeable this far land inwards with the tides. Ecological characteristics of shrimp area are consisting of numerous rivers where river water contains salinity for 6 – 7 months of the year. Most of the land area is low lying and subjected to daily tidal inundation where tidal fluctuation varies between 2.25 – 0.75m. This tidal fluctuation along with salinity has major influences for the use of land (Rahman & Hossain, 2009). This is the case in Magurkhali, which makes the region suitable for shrimp farming which requires salt water to grow the shrimps. However shrimp farming requires an area that is salinized, which the area was not. To make the area suitable for shrimp farming, there must be salt water pumped into the area from the river. Which causes a change in the landscape of the area.



Figure 1: Map of Bangladesh with the research location (Google Maps, 2023)

3.1 Local food traditions

To understand the food culture of Bangladesh it is important to know the common food habits of Bangladesh. “Traditionally, cereals, largely rice, are the main food in Bangladesh. At present, nearly two-thirds of the daily diet consists of rice. The people of the country take rice along with some vegetables, a little amount of pulses and small quantities of fish if and when available. Dairy products and meat are consumed only occasionally and in very small amounts. Fruit consumption is seasonal and includes mainly papaya and banana which are cultivated round the year. The dietary intake of cooking oil and fat is sporadic. The typical rural diet in Bangladesh is, reportedly, not well balanced (Islam, 2012). The dietary habits often do not meet good nutritional requirements, with a preference for polished rice and leafy vegetables of poor nutritional quality. In addition, cultural norms dictate a better diet for males over females with the male head of the household getting the best meal portions. Persistent poverty, inadequate nutrition information and gender inequity cause pervasive malnutrition among women, especially pregnant women and lactating mothers” (Islam, 2012).

3.2 Shrimp farming

This transition to the mono-cultural form of shrimp production was supported by the government, business and international aid agencies, which were in favor of the expansion of mono-cultural forms of shrimp production. Because of that the shrimp production became integrated into global trading networks at the expense of local resource extraction activities such as artisanal fishing and forestry (Pokrant, 2014). Shrimp farming grew rapidly, because of suitable climatic conditions and the availability of resources such as feed, seed, water and a cheap labor force (Paul & Vogl, 2011). The high export value was besides the suitable conditions an important reason for the rise of shrimp cultivation in the South-Western part of Bangladesh. Because of this high export value, shrimps are also known as ‘white gold’ in Bangladesh (Islam, 2008). This resulted in the converting of rice fields into a field that is suitable for shrimp cultivation (Ahmed et al., 2009).

According to Ahmed et al. (2009) the cultivation of shrimps is done in *ghers*. These are modified rice fields with higher dykes and deeper canals to keep water in the fields during the dry season. Because of this a high value commodity as shrimps can be cultivated all year. However shrimps are mostly

cultivated in the dry season from January to July when the salinity is the highest and from August to December rice is mostly cultivated due to the monsoon rains, which makes the area less saline (Akber et al., 2017).

The transition to shrimp farming had different social impact on local communities. For instance, farmers got a better social status because they improved their economic capabilities and reduced food insecurities (Ahmed et al., 2009). However, the rise of shrimp agriculture also brought problems to South-Western Bangladesh. The high demand, poor use of land and large economic gains led to an uncontrollable growth of shrimp and prawn aquaculture. By the uncontrollable conversion of agricultural land into shrimp and prawn aquaculture, the region is being the prospect to turn into a desert in the delta, where agricultural crops can no longer grow (Swapan & Gavin, 2011).

Swapan & Gavin (2011) showed that the rise of the shrimp and prawn aquaculture caused big changes in the local landscape. Before the shrimp farms arrived in the South-Western part of Bangladesh, rice was the main agricultural product in the region (Pokrant, 2014 & Belton, 2016). The production of rice was supplemented by other vegetables and fruits. This production became less regular because of salinity caused by the new form of aquaculture. In addition, the intrusion of saline water destroyed local fish populations, which removed a protein source from the diets of the local communities (Swapan & Gavin, 2011). The fish capture in Bangladesh did not increase much throughout the years, while the aquaculture profit increased dramatically (FAO, 2022). The transition to shrimp farming also threatens local lives and livelihoods by agrarian dispossession. Livelihoods and communities that were dependent on rice agriculture changed to a shrimp aquaculture (Paprocki, 2018). It is seen as critical to the expansion of “noncrop agriculture,” which the World Bank regards as a more productive sector and therefore necessary to the growth of Bangladesh’s economy. This also set rural-urban migrant movements in motion (Paprocki, 2018).

Shrimps themselves are not eaten locally because of the high commodity value. The local population often buy cheaper fish (Islam, 2008). However shrimp also provided the local economy with new cash flows. This helped with incorporating local Bangladesh into the global economy (Belton, 2016). In the past, the majority of the food produced by Asian rural farmers was consumed in their households, while the surplus was sold in the market or exchanged locally. Since monoculture farming has been promoted, along with increases in scale, food has become a commodity for mass consumption, increasingly being sold in the market rather than being consumed in the household (Charoenratana et al., 2021). The study of Islam (2008) found an emerging middle class in the farms lands that incorporated shrimp, which are still minority however. This changed the power structure in the local villages. The traditional power structure changed. First big land-owners and village heads had power and control over the rest, but this declined because shrimp farms allowed entrepreneurs to break free from the regime (Islam, 2008). In addition, communities in Bangladesh became gradually more like urban landscapes. This is caused by increasingly more linkages with Western society as a result of global commodity networks. As a result the aquaculture has brought small supermarkets which are open all week to local communities. In addition, other buildings like shrimp depots, mobile-phone stores, electronics stores, grocery shops, vans, tailors, libraries, stationers, schools, mosques and tea-stalls, appeared in the social landscape of communities (Islam, 2008).

Furthermore, the transition also causes an increase in income inequality. This happened due to the conversion from agricultural land to shrimp farms, which resulted in reductions in other income-generating farming activities, resulting smaller livestock herds, particularly cattle and less crop production and sharecropping. Reduced livestock production was partly attributed to a lack of feed since the establishment of shrimp farming (Abdullah et al., 2016) Before shrimp farming, the paddy straw and the grass of the paddy fields had been the main feed for livestock. Also, most of

agricultural land was used to grow only one crop a year and so was available for common grazing for livestock for the rest of the year. However, when ponds and dikes were constructed for shrimp farming, access to this livestock feed was lost. Further loss of grazing land occurred when shrimp farming ponds were illegally established on state-owned land and the banks of canals. (Abdullah et al., 2016).

The crop most affected by the expansion of shrimp farming was rice because almost all shrimp farms were established on fields formerly used to grow rice. The agricultural land that remained had greatly reduced productivity because of increased soil and water salinity. In the initial years of shrimp aquaculture during the mid-1980s to early 1990s, farmers used to cultivate paddy in the same land immediately after the shrimp season ended, but this gradually stopped because the lands remained under saline water for nearly 8 months of the year for shrimp aquaculture and consequently became too saline for adequate rice yields (Abdullah et al., 2016). This salinity also caused the disappearance of fruit trees such as jackfruit, mango, banana and palm as well as vegetables that farmers used to grow in the land. Increased salinity due to shrimp aquaculture was also responsible for the loss of wild vegetation that grew naturally in the region (Abdullah et al., 2016).

Income from crops were exchanged for incomes coming from shrimp farming. Incomes from shrimp farming forms now an integral part of the higher-income and some middle-income households' income generation activities (Belton, 2014). The increased demand for shrimp exports has led to a reorganization of shrimp procurement and trade networks, which has led the higher- and middle-income households to establish shrimp depots and shrimp-related businesses in order to earn more income from shrimp activities. In addition, shrimp aquaculture helped some higher- and middle-income households to establish businesses or trading enterprises, which are not related to farming. Therefore, economic growth due to shrimp aquaculture has had a positive outcome for households with shrimp farms because shrimp farming increased their income-earning opportunities. Land is the most important driver of income in shrimp area. The capacity to profit from the shrimp industry is ultimately connected with the ability to own, lease or otherwise control land. Since land can be used as collateral to obtain loans from banks or other credit providing organizations, land-owning high- and middle-income households were able to access government support for diversification through the development of shrimp farming and related businesses that provided higher incomes (Abdullah et al., 2016).

On the other hand, lower-income households shrimp areas are increasingly marginalized and either driven into the mangroves to garner resources for sale or to sell their labor, often at very low rates (Swapan and Gavin 2011) They can no longer share-farm idle land to grow rice, their trees and household food crops were killed by shrimp-related salinization of the soils, and they had great difficulty obtaining water for their own small shrimp farms and were even denied access to the government owned canals and waterways. Other studies such as Datta et al. (2010) also describe that land in Bangladesh is scarce and inequitably distributed, which causes inequality with shrimp farming. Belton (2014) elaborates that the social-wellbeing worsened due to shrimp farming, which resulted in a greater food insecurity. Abdullah et al. (2016) states that the inequality is caused because of unfair share of the benefits of shrimp farming. As a result, the economic activities related to shrimp farming have made the income gap between high-income households and low-income households bigger.

3.3 Climate change

In Vietnam the livelihood transition to shrimp farming was used as response to changing climate conditions on governmental and household level. It was seen that the shrimp farmers were able to continue farming despite the changing climate conditions (Poelma et al., 2021). The southwestern coastal region of Bangladesh is also vulnerable to the changing climate due to climate change (Shamsuddoha, & Chowdhury, 2007). This region is characterized by a low laying deltaic environment. The region is especially vulnerable to sea level rise and could face serious consequences on the coast line (Shamsuddoha, & Chowdhury, 2007). On the contrary of the case of Vietnam are shrimp farms accelerating the impacts of climate change. This is caused by the destruction of coastal mangroves for space for shrimp farming, which resulted in more coastal erosion. An example is the destruction of the 'Chokoria Sundarban'. This was the second largest mangrove forest of Bangladesh, which was completely destroyed for shrimp farming with financial support of the world bank (Shamsuddoha, & Chowdhury, 2007).

Climate change has severe impact on the shrimp farming in the southwestern part of Bangladesh. Ahmed & Diana (2015) showed that shrimp farming is vulnerable to different climatic variables. In the region there are more and unexpected floodings, cyclones and heavy rainfalls. In addition, is the sea level rising and the sea surface temperature increasing. There are also more droughts and a higher level of salinity due to climate change. All these factors have severe effects on the shrimp farms and can endanger the production of shrimps in the future if climate change could become worse (Ahmed & Diana, 2015). In Dewan (2021) it is described how is thought about climate change and the transition to shrimp farming by a development professional: *'Climate change is a fact. Bangladesh will become saline; it is inevitable. Bangladesh should accept this and focus on cultivating saline-tolerant species such as tiger prawn and tilapia and export them. This is its comparative advantage. Why grow rice when Bangladesh can import rice from Myanmar? If you ask me, this is the future.'* This while there are a lot of harmful effects from salt water intrusion like vulnerability towards cyclones (Paprocki & Cons, 2014)

4. Methods

In this chapter the methodology of the research is described. First it is explained why the methods are chosen. Furthermore the use of the methods it is explained and this chapter ends with a reflection on the positionality as researcher and the limitations and risks and a time planning is provided.

4.1 Qualitative methods

This is a qualitative research and therefore uses qualitative methods. A qualitative research is a research approach in which experiences of individuals, groups and communities can be explored in depth with the help of different methods (Hennink et al., 2012). Qualitative research suits the research question: *'How does the rise shrimp and prawn farming impact the foodscape of local communities in the South-western coast region of Bangladesh?'*. This research question requires an understanding of the social landscape and foodscape of the local communities, this can be achieved with a qualitative research. Foodscape is a spatial concept which includes an understanding of the economical, physical, social-cultural and political context of a community (Vonthron et al., 2020). All these different context can be understood with qualitative research tools. The experiences of individuals and social structures are the fundamental issues to qualitative research (Hay, 2016). This is in line with the goal of this research.

This research follows the Hutter-Hennink qualitative research cycle as described in Hennink et al., (2012). The first part of this cycle is the design cycle. In this part the research questions are determined, literature and theory is reviewed and incorporated into the conceptual framework and finally the research methods are selected. This part took place in the Netherlands. There are different research methods that can be used in a qualitative research. Examples are interviews, focus group discussions, observations, visual methods and analyzing content and biographies (Hennink et al., 2012). This research uses observations, visual methods and interviews.

The second part of the qualitative research cycle is the data collection cycle. This part takes place on the field in Bangladesh and takes approximately two months. The first part is designing the research instruments. This is done before the field work, but the instruments can still be adjusted during the fieldwork. In Bangladesh participants for the research are recruited and data is collected. For this part a translator is used to help reach local people and to understand them. During the data collection inductive inferences are made, because local people can give new insight that are useful for the research. The research instruments start therefore deductive, but during the data collection it becomes more inductive (Hennink et al., 2012).

The last part of the qualitative research cycle is the analytic cycle. This took place in Bangladesh and the Netherlands. The qualitative research cycle is an iterative process, but after the field work is done, the data collection cycle is also done. The analytical cycle consists of developing codes, which

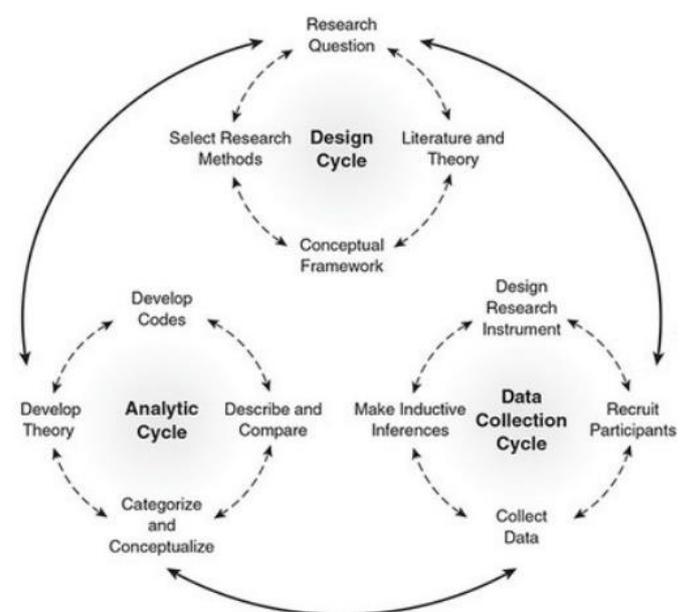


Figure 2: Hennink Cycle (Hennink et al., 2012).

can be inductive and deductive, description and comparison of data with the concepts, categorizing and conceptualizing of the data and finally developing new theory (Hennink et al., 2012). In the next part the research methods are explained.

4.2 Observations and visual methods

This research uses ethnographic methods. The goal of ethnography is describing a culture with the aim to understand the way of life from the viewpoint of the researched culture (Spradley, 1979). Ethnography is suitable for this research because the viewpoint from the local community in Bangladesh should be understood to give an answer to the research question.

Observations allow the behavior and social reality of individuals and groups to be directly observed, documented and analyzed by the researcher. This allows researchers to understand contexts within which activities and certain events take place (Clark et al., 2009). In this research observations helped to describe the local community, the available food in the community, the location of shrimp farms and popular places.

Observations can also complement interviews. Observations give the opportunity to reveal daily routines. That is something an interview can (Clark et al., 2009). Because of the language barrier it may be hard to understand everything and things can be missed. Observations can show food habits and help to understand food habits of the community. Observations can further assist in understanding individuals who are unable or unwilling to share experiences verbally (Clark et al., 2009). In the case of this research thus with a language barrier.

In addition to observations, visual methods are used. Observations help with describing situations, while visual methods can show them. The visual methods that are used for this research are self-made pictures which are significant to the research question. These help in understanding the physical context of the foodscape, such as understanding the effects of salinization on the landscape.

4.3 Research location

The data collection took part in two places in Maghurkali (figure 3). The first area switched to shrimp farming because of the local political leader let saltwater in for shrimp farming and the other area switched to shrimp farming due to an initiative from the World Bank. These areas were chosen because both areas made a switch to shrimp farming in the past and were therefore suitable for the research. Both of the areas were found with the help of locals, but it took a while to find a suitable area for the research. The first shrimp area was located approximately one hour from the research

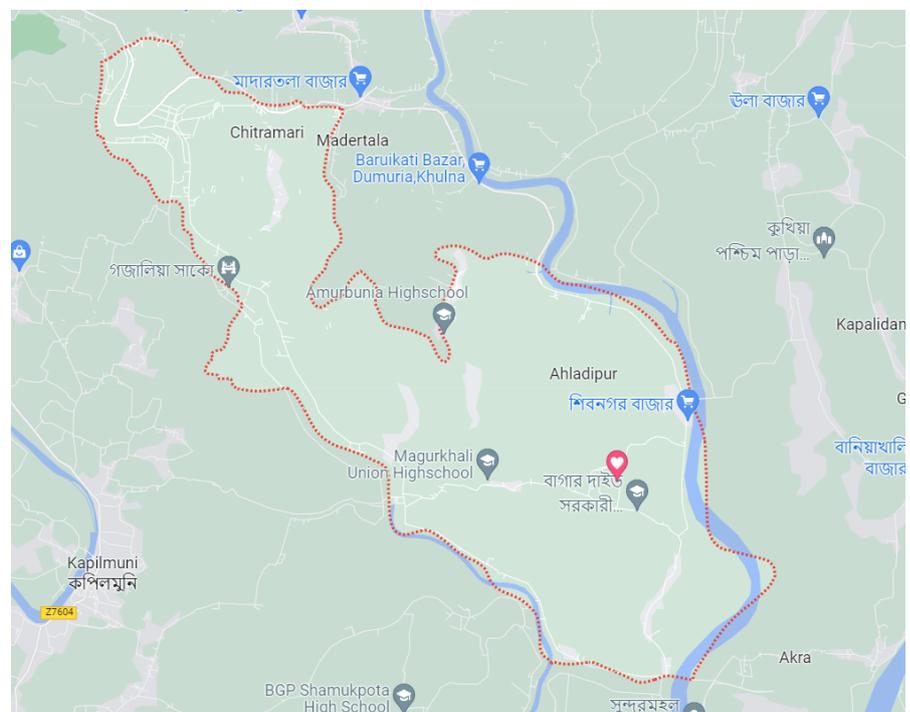


Figure 3: Map of the research area (Google maps, 2023)

base in Shovna and the second shrimp area had a travel time of one and a half hour. To reach the research areas different modes of transport needed to be used. The first area could be reached with a van, a boat and an easybike. For the second area an additional motorbike was necessary for the last part of the journey. In the last weeks of the data collection it was more difficult to reach the research areas due to a low water level in the river.

4.4 Interviews

Interviews provide information and expressions of opinions or beliefs of individuals. It can help to close a gap in knowledge that other research methods cannot provide. This is because an interview tries to find out the personal experiences of a respondent. An interview thus ensures that the researcher comes close to the respondent. For example, a quantitative research method or observations may less highlight events, opinions, and experiences than interviews. Interviews therefore help to investigate complex behaviors and motivations. An interview can thus help answer complex issues such as the question of this research. The questions of an interview are open, allowing the respondent to answer in his or her own words (Hay, 2016). Because of the openness of the interview the effects of shrimp farms on the foodscape and social landscape can be explored for the local community.

These questions are initially deductive and are based on the theories and literature in the theoretical framework and the research questions. During the fieldwork inductive questions were added based on the experiences on the field. The interviews helped to understand the viewpoint of local people and therefore help in answering the main research questions.

There are different ways how an interview can be conducted: structured, semi-structured or unstructured interviews (DiCicco-Bloom & Crabtree, 2006). In a structured interview, each interviewee is questioned with exactly the same questions that have already been determined before the interview (Hancock et al., 2001). This type of interviews are not used for this research. Semi-structured interviews are the most suitable for this research. In this type of interview, the interviewee himself is a participant of the aim that is being explored and not merely a source from which information is extracted (Hancock et al., 2001). Each participant can be asked approximately the same questions with a certain freedom of movement. The open-ended nature of the questions ensures that the interview is lively and can go in-depth, revealing new concepts and insights that may be of interest to the research. The flexibility of this type of interview encourages participants to engage in conversation (Dearnly, 2005).

During the interviews an interview guide was used as support. This was used as a guideline during the interview, but this was not necessarily followed during the interview. Every interview had a different context in which questions were added or not asked. The interview guide is displayed in appendix I. Before the interviews the informed consent form was explained and the participants accepted this without any question. It is not clear if the participants understood the informed consent form completely, therefore all the participants are anonymous. Because of that personal data, such as names of the participants are not mentioned. All the participants accepted to be recorded. The informed consent form is displayed in appendix III. The participants seemed happy to talk, but it is more ethical to translate the form to the local language, so that there are no misunderstandings.

In total 21 in-depth interviews were conducted in the field. From this 21 interviews, 10 interviews were used for this research. All the interviews are related to shrimp farming, but the 10 interviews used for this research took place in the two shrimp areas that are used for this research. The understanding of place is an important factor for writing on the transformation in foodscape as a result of the transition to shrimp farming. This was best shown in the 10 interviews that are used and

took place in areas that underwent the transition. 2 other interviews could not be used, because the sound quality of the recording was not great. The participants of the interviews and their codes are visualized in table 1. In interview 1, 2 and 5, the participants had big shrimp farms (bigger than 20 acres), the others had small shrimp farms (less than 10 acres). Interviews have a different code than the other participants, because they also had different roles next to shrimp farming, which are elaborated on in the results chapter.

The participants were selected by walking through the shrimp areas and stopping by each house to ask if people want to take part in the research. After doing an interview at least two houses were skipped to prevent neighbors to take part in the research. These participants were chosen on the basis of quota sampling. Quota sampling means that the participants of the research are chosen on the basis of specific criteria (Taherdoost, 2006). The criteria were living in one of the shrimp areas and being the owner of farmland or formerly being the owner of farmland. These participants were randomly selected with this quota with the exception of one participant. The political leader of the area was mentioned in all the interviews, therefore it was important to include him in the interviews, in order to understand the political dimension of the foodscape better and to explore the reasons why shrimp farming was established in the area. The interview with the political leader was arranged with snowball sampling. Snowball sampling means that other participants help in connecting with potential other participants for the research (Taherdoost, 2006). There was also an attempt done to do expert interviews to get more context on shrimp farming and its effects, but this did not work out.

Table 1: List of participants

Interview	Date	Translator	Location	Participants	Code	Particularities
1.	30-3	Sharia	World Bank area	2 men	1	1 of the men did not live in the area, but only came there for shrimp farming.
2.	30-3	Sharia	World Bank area	1 man	2	This participants lived in the first house when entering the World Bank area.
3.	28-3	Sharia	Switch gate area	1 man	3	The participant could not offer food.
4.	31-3	Sharia	World bank area	2 men	Experimenter	The participant experimented with rice farming in the shrimp area.
5.	12-4	Shovon	Switch gate area	1 man	Political leader	The interview was in a room with approx. 20 other men, whom sometimes interfered in the conversation
6.	29-3	Sharia	Switch gate area	1 man	6	This interview took place in the shrimp farm itself.
7.	29-3	Sharia	Switch gate area	3 women	7	All 3 women gave contributions.
8.	31-3	Sharia	World Bank area	2 men and 2 women	8	This interview started with only one men, but the women joined the interview and gave important contributions.
9.	9-4	Shovon	Switch gate area	1 woman and 1 man	9	The interview was mostly with the woman, but her father in law sometimes interfered and had some important contributions.
10.	9-4	Shovon	Switch gate area	2 women	10	At the end of this interview, the son in law of one of the participant gave also some contributions.

4.5 Positionality as researcher

As a Western researcher doing research in Bangladesh it is important to consider the positionality as researcher. Firstly, there is a difference in cultural background, which could affect the interpretation and understanding of the results. To prevent this the local habits and culture was learned during the data collection, so the culture could be better understood. The research base was in the middle of a rural village, this gave the opportunity to participate in the community and learn from them.

Secondly, there was a language barrier with the participants of the research. To solve this issue translators were used during the interviews and some Bengali words were learned. However, there was a reliance on the translations of the translators. As a results some of the answers of the participants could be misinterpreted, misunderstood or wrongly translated, which could give different results than the intended meaning.

Thirdly, as a researcher you are an outsider in the research area. Most of the community never had met someone from a western country before, so it seemed that it was a special experience for them.

For example, after some interviews pictures were taken and many people of the local population wanted pictures and show all the places of the community. This helped in understanding the local culture, but was exhausting at the same time. Due to the status as a Western researcher it was not difficult to find participants for the research, because everyone wanted to talk. There were some cases where possible participants expected to get a lot of money for doing an interview, these possible participants were not interviewed for the research. As a result of the positionality as researcher the local people could see the interviews as a possibility to exaggerate the impacts of shrimp farming on their foodscape. Some interviews had a really positive view on shrimp farming, while others were really negative. The participants could also have expectations that there will be something done with their problems as a result of the interview, that's why the translator explained the purpose of the research at the start of the interview to avoid a misunderstanding on the purpose of the research.

Lastly, there could be a researcher bias. This bias could have influenced the data collection and the analysis of the research data. To prevent a bias this research tried to show both sides of shrimp farming and to analyze both viewpoints as objective as possible. To achieve this participants were randomly selected, except for one local political leader, whom was mentioned in each interview.

4.6 Limitations and risks

The data collection took place in Bangladesh. This brought opportunities and benefits for the data collection, but is also brought limitations and risks.

The data collection happened with the help of two translators. One of them were locals and knew the shrimp area a little bit. He had the same cultural background as the participants and knew how to approach them. The other translator was an university student from the city and had another cultural and religious background than the participants. Most of the interviews that are used for this research are with the third translator. Because his different background he responses could be a bit biased. An example is when the translator told: *'This people are not that educated so they mess up when they answer.'* The other translator showed biases as well, during the interviews he added own thoughts with the responses of the participants because he had knowledge about it. The answers of the participants could also be mistranslated or be misunderstood. In the recordings of the interviews there is often a lot of noise in the background as well, which could have led to missed data. Both translators have different backgrounds, therefore they could have different views on the same response from participants.

The participants could also have a bit biased. The results show that there were two groups. The people who don't profit from shrimp farmer and the people who do profit or people with small farms and big farms. There was a clear difference in responses of these two groups. The people who are profiting mostly mentioned the benefits of shrimp farming and the people who didn't mentioned mostly the downsides of shrimp farming. A clear difference were questions about the community. The one side said that most people are happy with shrimp farming, while the other side said that most people were unhappy with shrimp farming. This research tried to highlight both viewpoints and tell all the stories of the participants and they had not only completely opposite viewpoint, but also similarities like the stories about the shrimp virus.

Another limitation was finding the a suitable research area, this took longer than expected beforehand. During the interview period there was a heat wave in Bangladesh. Because of that it was difficult to do multiple interviews in a day, especially in the research area, where there are no trees. Another limitation was that there was only one local translator, while there were tree foreign researchers active in the same period, this made it sometimes difficult to do interviews. To solve this

the translator from the university was arranged, but he was only available for a limited time. Another limitation was health complications due to food poisoning, which caused some interview plans to be cancelled and it resulted in changes in the original planned timeline for the research.

Food poisoning was a risk that was known before going to Bangladesh, however it is still unexpected when it happens. This was not only risk and challenge in Bangladesh. So did the traffic not feel safe most of the time when using one of the many modes of transport such as a rickshaw, a van, an easybike, a boat, a motorbike, a car and a bus. In the research base there sometimes problems with electricity and internet connectivity with limited the options to work sometimes. Another risk was walking around in the cities of Bangladesh such as Khulna and Dhaka. Foreigners are perceived as someone with more wealth, as a result there were a lot of people begging for money in these cities.

4.7. Ethics

This is a scientific research, therefore scientific integrity must be met. The guiding principles of scientific integrity are: honesty, due care, transparency, independence and responsibility (UU, 2022). When recruiting participants, it was important to make it clear what the research is about and what the research was for, so that participants got a good idea of what they are participating in. The participants did the interviews anonymously. In order to transcribe the interviews, the interviews were recorded. This was made clear to the participants and only happened with the participant's consent. These recordings were only used for the research and for nothing else. The privacy of the respondent is thus guaranteed. The research also use self-made pictures, which are taken with permission.

4.8 Timeline

To understand how this research came to be it is useful to have a timeline. This research started in December with the writing of the research proposal. The idea was to look how a transition to a monoculture caused by demand from the Western World changed the foodscape in the rural area of a development country. This idea was worked out to shrimp farming in Bangladesh by 7 February. After this the field work in Bangladesh took place from the 20 February to 20 April. In Bangladesh the data was collected with observations, pictures and interviews. With the data collected the final thesis is finished in the beginning of August.

5. Results

'A beautiful area full with green and trees.' This was how the participants described the area before shrimp farming took place. This area is now completely different because of the transition to shrimp farming. In this chapter the main results from the interviews with local farmers are described with the help of the research questions. Some of the quotes are changed a bit to make them grammatically correct.

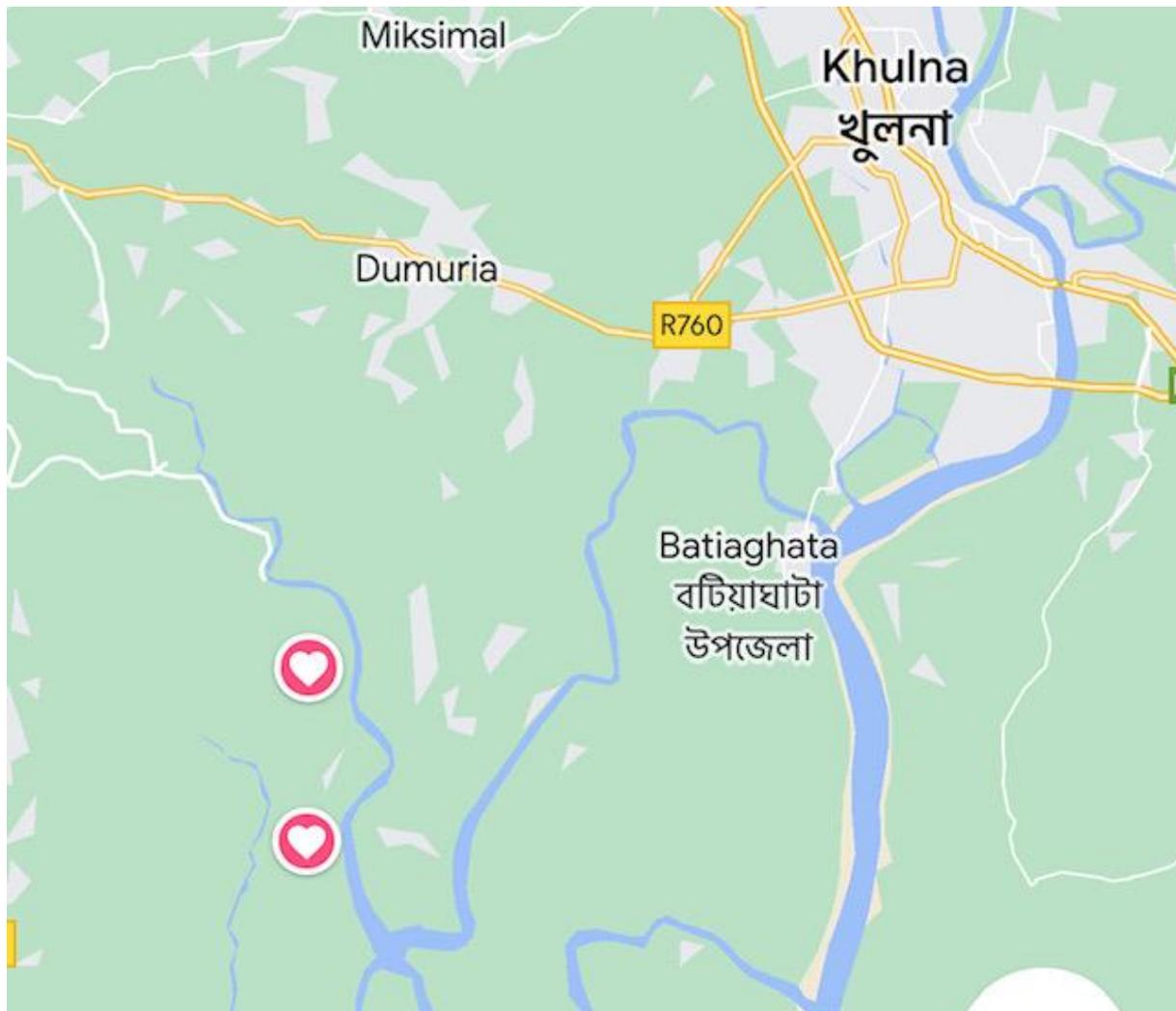


Figure 4: The research locations (Google maps, 2023)

5.1 The introduction of shrimp farming

The data collection took place in two different areas in the Magurkhali region (figure 4), they are a couple kilometers apart from each other and both areas were dependent on rice farming, but made the transition to shrimp farming. Both places are situated to the same river, which is connected to the Bay of Bengal. To successfully shrimp farm, there is a need of saltwater. The Magurkhali region is located more than 100 kilometers from the Gulf of Bengal, but still there is saltwater coming in with the influence of the tides. With high tide the local river was full of saltwater from the Gulf of Bengal and with low tide the river had freshwater originating from the Himalayas. With the influx of saltwater, the region is suitable for shrimp farming.

5.1.1 Requiring salt water

However to do shrimp farming the saltwater that is required needed to go from the river into the land. In the first part of Magurkhali this was done around 1989 with the help of the World Bank. In interview 1 a shrimp farmer explained: *'There is shrimp farming due to the salt water. It's an IDO project founded by the World Bank and they visited here and they planned for it and took the lands and made canals to do it. Since then they doing shrimp farming in this area.'* In interview 2 it was explained better what the

World Bank exactly did: *'So what the World Bank did is that they created an outlet and an inlet, there is also a switch gate. So when the water comes in their land, they switch off the gate, so they can hold the water and they can cultivate shrimp. Since they have this facility, shrimp farming became very popular here.'* So in this area the World Bank helped with facilitating shrimp farming with creating ways to get saltwater in the area and to keep it. In the other area the World Bank was not involved in the transition to shrimp farming. It was the choice of the political leader of the area to make a switch gate to get saltwater into the land. A



Figure 5a: Switch gate from above



Figure 5b: Switch gate from below

participant who was working in his shrimp farm explained it: *'The political leader of this area has his own land besides the river, so it easy to get access of collecting saltwater from the river here rather than that side and the chairman asked people if he could do it and they agreed and he did it.'* Not every participant agreed with this. In interview 7 the participants said: *'The political leader brought the saline water and we did not want it.'* In the end the saltwater came through the switch gate which resulted in saltwater intrusion for the area surrounding the big farm of the political leader: *This land is just close to the switch gate and that's why it is affected by the saltwater* (interview 10)

Figure 5a and 5b show the switch gate from above and below. The switch gate allowed a constant flow of salt water to enter the shrimp area. This is located close to the biggest shrimp farm of the area, which is in the possession of the political leader.

5.1.2 A profiting business

In both areas were three different reasons told why the transition to shrimp farming happened. The first reason that was told by participants is that the area was very poor and shrimp farming could help against this poverty. This can be seen back in the responses from the participants who are still profiting from shrimp farming and made more profits than with rice farming. In interview 1 the

participant explained: *'This area was like very poor, very very poor. Since the shrimp farming started, people started to make a lot of money.'* This can also be seen back in the responses of the political leader of the area: *'Before shrimp farming most people here were poor, they didn't have enough money for buying food, but now people are more well off.'* The reason for the transition to shrimp farming in their eyes was thus the profitable side of shrimp farming. It was more profitable to do shrimp farming than only do paddy farming.

This can also be seen back in the responses from participants that are currently not profiting from shrimp farming. In interview 8 it was explained: *'Salt water would be better, economically for them. If they create some canals around the area then it would be very beneficial for them to do the farm and get financially benefited and instantly they agreed.'* This is a similar response to from interview 1, but he added a note to this explanation: *'They did not know that this salt water would be so much toxic and get into their lands and everywhere, like environment and everywhere. They were not aware of it. Now that they have experience, now they realize it was the wrong decision. He is saying that it was a mistake for us with salt water.'* This was seen with multiple participants who said that they initially agreed for the benefits of shrimp farming, but that they did not know about the effect of the saltwater that was required for the shrimp farming on their land.

The last reason for the change to shrimp farming is that it happened by force. In interview 2 it was explained: *'they were kind of forced to do it, because of the government had already done it. Then after making some profit, they started loving it.'* In the other area people also did not know the consequences of shrimp farming, in interview 7 it was told that they were forced due to the saline water in the area. They had no other choice than switch to shrimp farming. Another shrimp farmer with his land next to the land of the political leader of the area told in his interview what happened: *'The political leader called everybody and showed the profitable side of this business. It started with few people and when he found that it was very much profitable he cut out the other people and started doing it alone in his areas and since the water has come to the area, people also switched their land.'*

These three reasons have all one thing in common: shrimp farming is or was profitable. That was at least the reason for the people that had some power to choose to let saltwater in and transition to shrimp farming. In interview 8 a participant explained *'Rich people were really supporting this thing, because they thought that they can get so much profit from it.'* According to him the reason that World Bank got involved because: *'The rich men and the political leaders arranged something for them.'* The local community did not realize what the effects of shrimp farming would be and only saw the profiting side of it. The next parts describe how shrimp farming transformed the area and developed the rice-shrimp model.

5.2 Development of shrimp farming and the rice-shrimp model

5.2.1 Rice-shrimp model

The research area changed significantly due to the introduction of shrimp farming. The World Bank made a plan to prevent this, however this plan was not followed. In interview 8 it is explained what happened: *'Their intention was good and for the first few years the farmers could make profit out of it, but after that it didn't happen and the reasons are the guideline they had provided was not implemented by the local people. When the engineers of the World Bank left from the area, the local people started doing the farming without following the engineers guideline.'* The engineers of the World Bank planned to have an area where people could still farm with freshwater for the whole year. Rice and vegetables could be cultivated there, trees could grow there and domestic animals could be kept there. To do this the World Bank made two different canals: one for the low tide with

freshwater and one for high tide with saltwater. When the World Bank left the low tide canal was blocked, which resulted that the entire area had saltwater intrusion and freshwater farming was not possible anymore during the shrimp season. The participant explained: *'The engineers from World Bank had a very effective plan for this area, but after leaving when local people started doing with their own wishes it brought the loss in this area, otherwise they could go very far like they could make very much profit from the lands, but the locals people intention was to make more profit, so they let the saltwater intrusion in their forbidden area, the area that was only selected for freshwater farming and now they are suffering.'* In the end the whole area was affected by the saltwater, due to this rice fields could not grow anymore.

In general, the local farmers shifted from paddy farmer to rice-shrimp farming in gher. In this gher, shrimp and sometimes some other salt fishes are grown in the dry season and there are paddy fields during the winter season: *'the rice here is grown in the winter season, but the production is not enough for them. You can say for 6 months they have to buy it from the market and for 6 months they produce for them.* In interview 9 it was explained they were completely self-sufficient and that the production was enough for them, but that is not the case anymore. Now it is a period of shrimp farming and a period of rice farming and sometimes only shrimp farming. Shrimp farming only takes place in the dry season of the year, so that means that people have to look for other job occupations in the rest of year. For example, one participant was an easybike driver, but there are also people who don't have an occupation next to shrimp farming as the experimenter elaborated: *'They have become very lazy because if they turn the saltwater into fresh water then they will have to do the farming like a whole year, but since they have become very lazy and shrimp farming only takes few months it actually depends on their seasons. That's why some of them are also not interested to the hard work all over the year.'*

5.2.2 Experiments

However there some exceptions. Some of the local people tried to experiment with growing rice during the shrimp season. The rich shrimp farmers told about a case where a couple of local people tried to stop with shrimp farming: *'Some people made some polder for experiment and they avoided the saltwater and brought the freshwater and they tried to experiment and they became so poor that they had to work as a day laborer in the market and now this year they came back with the saltwater.'* This experiment failed, but another participant succeeded in growing paddy instead of shrimp before the saltwater came in. Figure 6 shows the paddy that the participant grew in his field. The saltwater still came in his land, but he successfully grew the paddy before it reached the area. A couple of weeks after the interview with him he could harvest the paddy, while others in the area could not do it. He explained that he did it because he wanted to experiment, since freshwater is not coming in the area. He said that: *'I think that people will look at me and will be an example for other people and other people will also try this and people will live properly again.'*



Figure 6: Rice experiment in the World Bank area

5.2.3 Shrimp virus

The experimenter wanted to inspire people to do something else than shrimp farming. He was not the only one that wanted to get away from shrimp farming, almost all the participants of this research wanted to get away. However, initially the transition from rice farming rice-shrimp and shrimp farming was successful. According participant from interview 2: *'Initially the profit was really good.'* The same answer could be seen back by other participants. At the start it was really profitable

and shrimp farming could be combined with rice farming. However for most participants shrimp farming is not profitable anymore. The main reason for this is a shrimp virus that is attacking the shrimp of each participant. This 'virus problem' or the black spot disease started approximately around ten years ago and influenced the development of shrimp farming. For most participants it was first seen as a very profitable business, but when the virus attacked it was seen as a 'lost project.' The farmer from interview 3 elaborated on what happened: *'In the past there wasn't this virus problem, so people could not have realized this problem, they saw the cash flow.'*

In short the virus changed the appeal of shrimp farming in the region. Most of the participants are not profiting anymore and the participants that said they still made profit from interview 1 also mentioned that they lost a lot of their profits. *'Most of the people here were in debt and they have paid them back. So the shrimp farming had a great effect on their financial condition. It was more profitable in the beginning rather than the situation right now due to the virus.'* According to the same participant, which made a lot of profits from shrimp farming, the virus could not be prevented: *'They do their farming old school style, so it is not possible in this matter to prevent this virus, only if they use technology to shrimp farm, but in this area is quite impossible to use it, because there are no facilities here to use the technology.'* All the other participants also mentioned that there is not a way to prevent the virus and that they still farm the same way as when shrimp farming started. There was one exception. The political leader of the area said that he can manage the virus problem by using medicine, this is in contrast with all the other participants whom said that there was no existing medicine against the virus. However, the same participant toned this statement down by saying that everyone is affected by the shrimp virus, only some more than others. In addition, he mentioned that shrimp farming will decrease or even disappear if the virus stayed in the area. The virus has therefore a clear effect on the rice-shrimp model.

The statement that some are more affected by the virus could be seen back in the responses of the participants. The participants that make the most losses from shrimp farming due to the virus all have small shrimp farms. They don't have the means to stop it or predict the virus. When it was introduced shrimp farming was a stable source of income and a sustainable way of farming in Magurkhali, but this has changed. Now shrimp farming is very unstable and most participants mentioned that it was unsustainable, however there is still hope for the local community with experiments like the paddy field.

5.2.4 Domestic animals and other changes

The transition to shrimp farming also brought another big change in the local farming practices. Paddy farming was often combined with keeping domestic animals, the transition to rice-shrimp farming made this more difficult. Something really noticeable in the area was the lack of domestic animals, especially in comparison with areas which did not transition to shrimp farming. Farmers in those areas always had multiple cows and goats and sometimes chickens and ducks at their house. In the shrimp farms areas the amount of domestic animals was drastically reduced. A woman from the World bank told that she had 12 cows before, but now she has no cows anymore. The man who sat next to her explained that it was very rare to have cows. If people have cows they have two a three max and they are smaller and less healthy than normal cows according to him. In the other shrimp area



Figure 7: Livestock feed

participants told that they had to send their cows away to feed them. The only exception was the experimenter. He explained that he could not feed his cows when he had a gher, but now he can feed the cows dried rice. Cows are not only important for farming practices, but they are also holy animals in the research area, which means that cows are not eaten. One of the participants said that domestic animals are the main asset of humans and that it is really important to take care of them. He had to sell his cow, but could buy a smaller cow back from it. Some farmers could still afford to stock enough feed for the livestock, which is shown in figure 7.

Next to the changes in animal use are there also some other changes. All the participants mentioned that there are now more pesticides used to grow crops. In interview 7 the participants mentioned: *'The crops doesn't grow if they don't use pesticides.'* They had a field that they rented outside of the shrimp area, so that they still could grow crops, but to grow it they needed pesticides. All the participants mentioned that before shrimp farming pesticides were not used. From the interviews it is not clear if the use of pesticides grew because of shrimp farming, but it is clear that the use of pesticides is now more than before shrimp farming was introduced. Another change is in the products that are cultivated in the area. Next to paddy farming other products were cultivated in the area before shrimp farming was introduced, like coconut, mango, bananas, tomatoes, freshwater fishes and other vegetables. The disappearance of these products and the influence of the saltwater intrusion also had impacts on the local landscape. The next part elaborates on these changes and how the foodscape is changed.

5.3 Foodscape

During the interviews the participants gave a lot of information on the transformation of the foodscape as a result of the transition to shrimp farming. With this information it is clear what changed in the foodscape. This part elaborates first on the physical context, which focuses on the changes in the landscape and infrastructure of the area, then it looks to the changes in food habits and water availability, and this part also elaborates on the economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food. The participants all told different stories, but there were two clear narratives that came forward from the interviews: the narrative of the local people with small farms and the narrative of people who have bigger farms, whom also have lands outside of the shrimp area or the narrative of people who have advantages of shrimp farming and people who have disadvantages from shrimp farming.

In the World Bank area this difference was made clear after attending a funeral of a young men who suddenly died of a heart attack. When leaving this funeral one man explained: *'For local people it is really bad, in order to live you can't live with fish and money. You have to grow like fruit trees and all. Like environmental things there are so many things that are essential for them, but they are not getting it due to the salt water and the people who lives outside this area like in Khulna or any other cities and still owns some land here, they are getting the most benefit out of it. How? Because they have that fruit trees or whatever is essential for your life. They have it in their home and they just come here and do only the shrimp farming and get the money and then get back home. They are not part of this community here. The side-effects of shrimp farming are faced*



Figure 8: Landscape in a none-shrimp area

by the local people. They don't have fruits and they don't have a proper diet.' For local people the foodscape has changed significantly, that is partly caused by the change in landscape.

5.3.1 Physical landscape

In order to understand the change in foodscape it is important to understand what happened with the landscape. Fruit trees disappeared in the landscape due to shrimp farming, these were mainly mango, banana, coconut and jackfruit trees. These are all commonly eaten fruits in Bangladesh, whereas jackfruit is the national fruit of Bangladesh. According to the participants the area changed massively: *'it was like very, very green in the past.'* This area often had rice fields for farming, but there were also other vegetables cultivated and next to the rice fields there were the fruit trees. This is really similar to the Shovna area at the other side of the river, where shrimp farm never happened. Figure 8 shows this area, which has very green rice fields, small ponds with water and a lot of different fruit trees, which are often located at the houses of the local families.

The current shrimp farm area has none of these characteristics. Figure 10 to 15 show the current landscape. This landscape is very much impacted by the saltwater intrusion. The area has a strong salt scent in the air and salt deposition could be seen everywhere. Figure 11, 12 and 15 show these white salt depositions. This area almost has no vegetation, except some palm trees and a bit of grass in between the shrimp fields. The trees could not grow any fruit anymore, there was still a coconut tree, but it did not give any coconuts, one of the participants had lost 42 tree coconut trees. In addition, the most vegetation was at the residencies of local families, this mostly consisted of some plants, however these plants were mostly dead or not healthy like figure 9 shows. This figure shows the dead plants at the house of one of the participants. Furthermore, the area, consists mostly of shrimp farms, which are farmed in water. This has the characteristics of a monoculture, because next to shrimp and other saltwater products, it is almost impossible to grow other products when the saltwater is coming in with the switch gate and through the canals.

In the interviews these characteristics of the land came also forward. The participants mentioned that nothing can grow because of the salinization. The participants in interview 8 requested to include figure 9 to show the dead leaves. In the interview with the political leader he explained that the area was too saline to grow anything: *The area is highly salinized, so you cannot grow anything except shrimp, the land is not suitable for growing the crops or growing the vegetables or any other things*



Figure 9: Death leaves in the World Bank area



Figure 15: Salt depositions



Figure 14: Farmers working in their shrimp farm



Figure 13: Roads in the shrimp area



Figure 10: Shrimp fields



Figure 11: A house in the shrimp area



Figure 12: Salt depositions in the ground

In addition, the infrastructure also changed due to shrimp farming. According to the participants from interview 1 the infrastructure improved. They mentioned that with the money made by shrimp farming roads were constructed and houses were built: *'35 years ago there was only one constructed building and right now out of 250 houses more than 150 houses are constructed'* A lot of the houses improved due to the money made by shrimp farming due to them. Before shrimp farming the facilities to have electricity were not present in the area, but now there are electricity poles, which can be seen in figure 11. The political leader also saw infrastructural improvements due to shrimp farming: *'Infrastructurally this area has changed a lot. 'Newly constructed building like the school and roads. All of them are brick made, the road is better now than before. Infrastructure development happened because of the government and shrimp farming, because of the shrimp farming the local people have a higher income.'*

However, shrimp farming also have other effects on the infrastructure. The saltwater that is needed for the shrimp farming damages the houses and the roads: *'During the dry time there are like huge amounts of salt there in the infrastructure and this kind of house made with soil, it falls due to the saline and roads also breaks down because of it and if you don't put tiles on the constructed wall it is also very badly damaged and it breaks very quickly.'* In short, infrastructurally the shrimp area made a lot of changes, but these are still affected by the saltwater.

5.3.2 Food habits

This change in landscape could also have brought a change in the local food habits due to the disappearance of local products. However, this was mostly not the case. Before shrimp farming the participants were eating fish and rice and now the participants still eat fish and rice, just like the rest of Bangladesh. Next to fish there are also vegetables combined with the rice. Typical meal is shown in figure 16 and 17, which both consist of rice with vegetables; in this case potato and carrot; and two different kind of fishes. For breakfast, lunch and dinner the participants often eat the same thing. Some participants do not eat animal protein in with breakfast and some participants do not eat animal protein one day in a week or during Hindu festivals due to their religion.



Figure 16: A typical meal with vegetables and fish

However there are still some changes in the foodscape in relation with the transition to rice-shrimp farming. So, did the quantity of products change for some of the participants. For the participants that made profit of shrimp farming the quantity of products became higher, because they could spend more than before. The political leader explained: *'Before shrimp farming most people here were poor, they didn't have enough money for buying food, but now people are more well off, they have more services, that's why they can now afford more food'*, The participant from interview 2 added: *'There is no significant change but if you have more money you will also purchase something extra.'* With more money it is easier to buy something more like meat products, which are more expensive than fish and vegetables and are mostly cooked if guests come.



Figure 17: A typical meal with fish and potatoes

On the other hand, for people who did not profit or not profit anymore the quantity of food decreased. The products that they grew in their land are not there anymore and they cannot buy every product that is lost. Their

food habits have therefore lost some variety. This is partly caused by the shrimp virus, which has caused a drop in income. This makes it harder to buy a variety of food. In Bangladesh it is important to offer food to guests. This happened in most of the interviews, local snacks, tea, sweets, fried eggs and fried shrimp (figure 18) were offered among other things. However, some of the participants did not have anything to offer and felt really ashamed by that. In interview 8 the female explained what happened to her: *'She had lot of fishes in her ponds or in her farm, she had lot of vegetables and fruit trees and all, but now she has lost everything and now she has to other work for people like funeral work and this sort of work and she gets rice as gift or payment you can say and maybe some fruit and she has to live by it. So her situation has completely turned upside down. She had like everything, fishes in the pond, a rice field, but now she doesn't have anything. She is dependent of other people now, she is like a day laborer.* This female had a home with a lot of different products that she could cultivate, but she had nothing anymore and therefore also not anything to offer. If there is nothing anything growing at their home and if they don't have any domestic animals, they are dependent of the market to get food for their guests: *'When guests used to come in the past, what they did was they did provide some milk and some sweet with rice and they would be very proud of it, but now they have to go to the market to do this thing.'*



Figure 18: Consumed fried shrimps with rice

Due to the decline of domestic animals a product like milk is harder to get than before: *'they used to drink milk, but now they cannot provide any milk, because there is no grass due to the salt water intrusion.'* This is not the only product that became harder to get. Before shrimp farming there were mainly freshwater fish in the area, but now there are mostly saltwater fishes in the farms, so most of the people consume more saltwater fishes now than before like the fried shrimp in figure 18. Shrimp are mostly meant to sell for export, but there is still some self-consumption of shrimp, this are mostly shrimps that not suited for selling. All other products are still available in the area, except for tortoise according to one of the participants tortoises went extinct in the area and are not available in the market anymore. So the food stayed mostly the same, only some specific products are not available for everyone anymore.

However, there is a big change in the local food: the taste of the food. According to the participants the pesticides used for farming food have a big influence on the taste and quality of the food. The food has lost taste and the quality decreased: *'The quality of the vegetables and other food were really great, but due to the shrimp, it is not great anymore.'* Because of this participants like the food less than before, but it does not matter for them, because they have to eat to survive. In short, while the food habits have not changed significantly, the food itself did.

The local food habits did therefore not really change, but the food itself did undergo a big change. It is the same food, but the taste of the food is different. Before shrimp farming pesticides were not used and was the food more tasteful. This came back in almost every interview and every participant said that it was caused by pesticides. The same food is therefore still consumed, but this food is not the same as before.

5.3.3 Water availability

Next to food, water is also essential for survival. Due to shrimp farming the water availability changed. Before shrimp farming most people in the community got their water out of the ground

with a well. Now, this method is still used by some of the participants, but most of the participants used different ways for getting water now. This is as a result of the saltwater intrusion and because of the too much iron in the groundwater. Most of the participants use different ways to get water. The participants that are more profiting from shrimp farming use filters to purify water. They pay for this filters to get drinking water. For household work they use the water from their pond. The other profiteers from shrimp farming use rainwater as main source of drinking water. They also mentioned a tank from the political leader where they can get drinking water from, but they don't use that very often. This water tank (figure 19) located at a political building where the interview with the political leader was conducted and is provided by the Swiss government. He also mentioned that people purify their water and drink rainwater with the help of the government. The other participants did not mention the water tank, except one participant that mentioned that he gets drinking water from the project if he has guests. However, it is not clear if this is the same water project.



Figure 19: Safe drinking water supply

The participants that did not profit from shrimp farming got drinking water from rainwater as well, but during the data collection it was the dry period. During this time they have to buy their drinking water from people who have filters to purify water. *'Before shrimp farming they drank the groundwater: They could also drink the pond water, it was like so fresh and like so good and clean they could use pond water as drinking water and the well water used to be the best, but now it is not there anymore.'*

5.3.4 Economical context

One big change in the foodscape is the place where people get their food and water from. Before shrimp farming the community was mostly self-sufficient, where they provided most of the food and water from their own land. In the current shrimp area, that is not the case anymore, the community is now more dependent on the market. The product that were available in their land before are now available in the markets, which got a more prominent place in the foodscape. Most participants now go multiple times in a week to the markets, whereas before shrimp farming they needed to go only in few times in a month. According to the participants all the products are available in the market. If special product are required or guests are coming people choose to go for the bigger, but further away, Dumuria market (figure 20), but for their daily needs they mostly go to the local small markets. These local small markets did increase due to shrimp farming: *'There was availability of food in every house, he mentioned that he also used to grow vegetables, so there was less vegetables in the market, because the demand was low. Now because of the saline water they cannot grow it anymore, the demand is high for this kind of thing, so the supply is more.'* As a result, the local markets sell mostly vegetables and fruits, like bananas, tomatoes, potatoes and pumpkin among other things and local fishes were also sold there.



Figure 20: Food at Dumuria market

The bigger markets sold a higher quantity of products and sold more expensive products like meat as well. Next to the increase in markets, there was also an increase in tea stalls in the area where people came to drink tea and eat some cookies.

The choice to shift to shrimp farming and let the saltwater in was also an economic choice. Shrimp farming was a profitable business and the local community could make profit out of it. Which made people initially happy with and they could make improvements in their foodscape with the purchase of facilities like a rice cooker and a refrigerator. The profitable side of shrimp farming also attracted outsiders to the shrimp area. Multiple participants said that they had offers from outsiders to buy their land. The ones that are most profiting from shrimp farming are the ones with the biggest land. Next to shrimp farming renting land could also be profitable. The name for renting land is hari and multiple participants talked about hari. The three females use hari for land outside of the shrimp farm area, in this area they still could grow vegetables like cucumber and watermelon. With this hari they are able to grow the same products as before, but in less quantity. They have to pay 7000 taka for one bigha every year. One bigha is equivalent to 0,625 acres and 7000 taka is equivalent to 64 USD. In the World Bank area a participant with a big farm has 9 bigha, for himself and uses the other parts for hari. This is profitable for him.

However, this profits became less due to the shrimp virus: *'The local people has small lands, so they are not profiting and the people who are getting profit they are from outside of the area who owns the land and they use the land for rent, which is referred as hari. These people are not making huge amounts of money, but still they are making profits. The people who live outside of the area they have much money, so if they fail in the first attempt. Like if the fishes are affected by the virus then they will remove the shrimp from the land and they will prepare the land for the next year and they do it the next round, so they can prepare it. But the people who live in this area, they are very poor, so if their shrimp is affected by the virus, they cannot afford to do the second or third round.'* This virus has a big effect on the profits, so said a participant that he lost half of his profits. As a result, almost all of the participants want to stop with shrimp farming, except the participants that still could make profit out of it. According to the participant in interview 9 not many people make profits, but the people that make profit are influential: *'There are roughly 50 families in this community and only two to three of them make profits and the others have problems.'*

For most of the participant the main criteria for picking food is now money: *'He has to feed his family, so no matter from where he get the money like loan or whatever, he has to make sure that his family is eating.'* The food choices are balanced between the food that they really need and the budget that they have. In addition to making less profits due to the shrimp virus, the product became more expensive as well, according to one of the participants that happened recently and was a result of the war between Russia and Ukraine. In short, money is the most important driver of the food choices in the shrimp area, this is due more dependence on the market, the loss of profits and factors outside: *'The situation is too bad that if this continues like this then people will be so much in debt that he cannot even describe it in words. That why he wants from the gods or any other people to get rid of the salt water.'*

5.3.5 Political context

Not only economic decision influences the foodscape, but also political decisions. There are people in favor of shrimp farming and people against shrimp farming. The Political leader of the Magurkhali explained that a large majority is in favor of shrimp farming: *'80% is in favor of shrimp farming and 20% of the people are only against it. So then he tries to make a solution to how to farm shrimp there, because the 80% are on behalf of the shrimp farming. So he does on behalf of the majority of the*

people, because he is the political leader here.’ The shrimp farmers with huge lands also told that the majority of people were happy with shrimp farming, but other participants said the opposite. They are saying that 85 to 90% is against shrimp farming and not happy with shrimp farming. However, they don’t have the power to do anything against it: *‘They are going to the chairman, the mp’s and other political leaders and they are also agreeing with their talks and with their perspective, but they have some personal benefits that they are taking from shrimp farming.’* The political leaders are in control over the switch gate and can determine when the saltwater get in the land and when not.

Participants explained that the political leader of the area has the biggest shrimp farm in the area and he does not want to stop with shrimp farming, however he promised the participants that he would stop with shrimp farming multiple times: *‘The political leader promises that they will provide freshwater and stop the saltwater intrusion. They will vote for him because he promised, but after the election, they don’t do it.’* Even this year the political leader promised to stop with shrimp farming: *‘The political leader said the this year will stop with shrimp farming, but he said this before, but he lied, so they cannot guarantee it unless if he finally tells the truth.’* The same response came back in other interviews. For the last four years it was promised that the saltwater intrusion will be stopped, but it did not happen. The political leader did not mention that he will stop shrimp farming, but said that it will decrease or disappear from the area if the virus continues in his interview. The political leader therefore seems to have a lot of power over the shrimp area and on the local land-use. The political leader is now in power for 4 periods or 20 years. He is elected democratically, but according to the participant from interview 9 he always wins, but he does not have the support in the shrimp area. However, he doesn’t need the support of the shrimp community, because he has support in

other areas in Magurkhali,



Figure 21: Eating together at the Hindu festival



Figure 22: Snacks at the Hindu festival



Figure 23: Kitchuri at the Hindu festival

which don’t have trouble with salinization from the river water.

Next to the local political leaders, the government also has some influence on the foodscape. So is the example of the drinking water facilities already given. In addition, the government also has

provided training for shrimp farming. In short, the political dimension has played a big role in the transition to shrimp farming and still plays a big role with the control over the switch gate, while most of the participants want shrimp farming to be gone. Shrimp farming seemed to be a political choice. According to the participants who are not profiting, they are forced and want to stop with shrimp farming. While the political leader claims that shrimp farming is profitable for the community and that it has affected the lifestyle of the community beneficially .

5.3.6 Social-cultural context

Lastly, the social-cultural context also has an impact on the foodscape. In Bangladesh it is normal that the female, the housewife, cooks. In the shrimp area this is still the case and the transition to shrimp farming did not change this. In Bangladesh religion is also really of importance. In the shrimp area most of the people are Hindu, according to one of the participants 90% of the people living there are Hindu. During Hindu festivals food has a central role. Figures 22,23 and 24 shows the Puja festival. During this festival Hindu's from neighboring villages come over and there is a lot of music and food is shared with everyone. During this festival every food is vegetarian, there is sweet food shared like dates, bale, mandarin, grapes and other sweet snacks and as dinner there is kichuri, this is rice with spices and lentils, which everyone eats sitting on the ground. This is exactly the same as other Puja festivals in other regions, where shrimp farming never happened. The participants confirmed that these festivals did not change. The food at the festival is the same and there are no further changes due to shrimp farming at the festival. Only at their houses people cannot offer the same food as before. Further are there no unique traditions in the shrimp area in regards to food. Therefore, there are not much changes in the social-cultural context of the foodscape. There are strong religious and cultural traditions, which are not changed by shrimp farming.

5.4 Drivers of change

From the previous parts it has become clear that salinization is a direct driver of change in the foodscape. The main changes in the foodscape caused by salinization are in the production of food, from cultivating rice and vegetables to a rice-shrimp model and it also caused livestock to decrease. Because of this change people became more reliant on the local markets and less self-sufficient. Political powers and economic reasons are important indirect drivers of the foodscape. These are the reasons behind the salinization and why shrimp farming is still the most important way of land-use in the shrimp area. But there are also indirect drivers that are not mentioned yet.

Firstly, something that can impact the political power, is collective action in the form of protest by local people. During interview 8 the participants told about the protests: *'The thing is that local people protested for this, when they understood that this business is not profitable they are going to lose everything, so they protested against the political leaders and the political leaders had good connections with the rich people, so they are ruling this place all over. There was a woman who was leading this protest. She was attacked by bombs and she literally lost her life. He was also in the protest, he was supporting this protest and he really witnessed this incident, actually it is murder, just because they were protesting against saltwater. The way he explained it I still have goosebumps, it was really heavy, it was really bad.'* After this they changed the protest to more a smaller way of protesting: *'the protest is still ongoing, they still protest, but not in that massive way anymore. They have like different kinds of, like landless organizations. So there are more of them, like 85% of the local people are the same side, they don't want the saltwater. They are protesting, but what happened, the top leaders, they get a lot of money from the rich people like who get really benefit out of the shrimp farming and they don't care about the protests. They just let the switch gate on and let the saltwater intrusion into this area, but still they are protesting.'* However protesting became more difficult: *'The people who were protesting in the front line they went to the jail and the people who*

were behind them got scared and afraid, so that's how this protest ends.' A similar story came forward in interview 9, 10 and in the interview with the experimenter.

In the research area this protest didn't seem to have much effect, but in other area these kind of protests did help. The area next to the research area named Kanchan Nagar changed back from shrimp farming to freshwater farming: *'In Kanchan Nagar they also protested. And someone from them was also murdered, but they were successful with their protests, so now you will see that there is freshwater and they are cultivating with it. Since 10 years they are farming with freshwater there.'* In this area shrimp farming disappeared and they went back to what they did farm before. They grow fruit and vegetables and have many different domestic animals like cows, goats and chicken there. In this area protests were successful and brought a big change. In the research area the switch gate is still open and saltwater is therefore still coming in. According to the most of the participants they want to change this and once they thought that this was changed: *'They were protesting and the man who was appointed for the switch gate, he locked the switch gate and took the lock and went away. It was in the morning, so they thought since it is locked and he is going away, so it is finally locked, it will not be opened again, so they came back really happy, happiness in their hearts and during the evening they found out that they opened all the gates. They locked so they thought that it would be locked and they went back home and when they went back home they opened the switch gate again.'* That time it did not work, but these protest could still work in the future and be a big chance in the foodscape, like it was for the Kanchan Nagar area.

Another big impact on the foodscape is the shrimp virus, this made shrimp farming more difficult and caused for a decrease in profits. This caused a shift in the opinion towards shrimp farming. Now most people seem to be against it and it is seen as a lost project, while it was seen as very profitable before. People that were in favor of shrimp farming are now against it: *'He was really on the side of saltwater intrusion, he made like a lot of profits, but now he is like losing his money and he can't even tell anti-saltwater side.'* The political leader said that shrimp farming could also be the end of shrimp farming. Now most of the land in the research area was used for shrimp farming, but this could change in the near future. The hope of the participants was that shrimp farming and the saltwater would disappear from the area. The experimenter showed that rice farming is still possible during the shrimp period, maybe that was a harbinger for the future where the fields are green again and with plenty of fruits like what the participants dream of.

In short, shrimp farming has changed the foodscape in multiple ways. For people that are profiting these are positive changes, but for the majority of the community in the shrimp area the changes are negative. They feel forced to cultivate shrimp and are struggling with the virus, but they don't have the power to change it: *'Rice is better because it can saves lives. Shrimps can't saves lives.'*

6. Discussion

In this chapter the different empirical parts are put in a framework with links to the literature and there is a reflection on biases and omissions that possibly could have influenced the results. It ends with a critical reflection of the results in relation with development studies.

6.1 A transformation in the foodscape

A foodscape is the spatial manifestation of food distribution and eating habits. These are places where food has meaning for a person. These are the places where food is bought, where food is prepared, where food is consumed and where there is talked about food (MacKendrick, 2014). In the research area the significance of food was shown. Food does not only have a nutritional meaning, but also has cultural meaning, this is in line with Murcott (1982). In the research area the main food were rice, fish and vegetables. Every meal contained rice and fish and vegetables were in most of the meals. Most participants also ate meat 1 or 2 times in a month. This food did not seem to be chosen by cultural reasons. There were not any food traditions specific for the area for example. The food choices seemed to be based on what was available. According to Murcott (1982) food choices are related to social status, ethnicity and wealth. In the research area these choices were mostly on wealth. Money was an important criteria in picking the food. However, there were also some religious and cultural habits with food seen in the area. The participants of the research do not eat cow meat, there was special food at the Hindu festivals and everyone eats together on the ground, some days the participants only eat vegetarian food and it is important to offer guests food when they visit someone's home. Special food like meat or more expensive water will be bought for the guests, if it is known beforehand that guests will come. Not every participant had the means to offer food to guests anymore due to lack of money and means. Wealth seems therefore a more important driver of food choices than culture.

In literature it is seen that a foodscape is not something that is fixed, but something that changes over time. In Oranges (2007) the dynamics of the foodscape are influenced by place, religion, history, culture, technology, development and social organization. In the research area the salinization of the of the area that is necessary for shrimp farming was the main driver of change. This change was mostly caused due to the favorable location of the area and the social organization. According to Garden et al. (2019) changes in foodscape are caused by various local, national and global processes. This can also be seen back with shrimp farming. In the global North there was a demand for products like shrimp. As a result shrimp became an important national export product for Bangladesh (Belton, 2016). On the local level, due to the commodification of shrimp it was decided to allow the saline river water in the area in order to shrimp farm. According to most of the participants this was a political decision and not a decision of the community. This is in line with Archer et al (2008), there is a political influence on the foodscape. The political leader of the area has the power over the switch gate which let the saline water in. Despite promising to stop the saline water already for multiple years and protests from the local community the salinization has not stopped. Participants mentioned that this promise was made this year as well, however in the interview with the political leader did not say that shrimp farming will stop this year, but it will in the future.

According to Herforth & Ahmed (2015) there has been a switch in the foodscape, half a decade ago food was mostly obtained from local markets and self-consumption, but now it consist out small kiosks, corner stores, wet markets, urban gardens, food markets, formal and informal markets, supermarkets, restaurants, schools, hospitals, public canteens and vending machines. This was not seen back in the area, however there was a change in places where food is obtained. Due to the salinization local food markets gained a more prominent place in the foodscape. Before shrimp farming self-consumption was the most common way to obtain food. Farmers cultivated rice through

the whole year. Freshwater fishes and vegetables were cultivated as well, so there were sufficient means for self-consumption. Due to the salinization this is not possible anymore, as a result of this change people became more reliant on markets, but there is still self-consumption of rice, livestock and fishes from the pond. This is not in line with the switch suggested in Herforth & Ahmed (2015), there has not been a big switch from local-markets and self-consumption to more places to obtain food in the research area. However, next to the markets, there was also a rise in tea stalls, which sold tea, cookies, chips and cigarettes. This could not be linked to shrimp farming. Around the research base where shrimp farming did not happen the growth of tea stalls were also noticed, only in this area tea stalls were more frequent and bigger. According to Sonnino (2013), local food is considered as more fresh and nutritious. In the research area food from the market was considered less healthy, less nutritious and it had less taste than the food that used to be grown in the agricultural land as a result of the use of pesticides.

6.2 Food habits

The participants said that their food habits did not really change due to shrimp farming and they still eat the same food. When presenting this data professor Mallick disagreed with this. He said that people eat more meat now, but this could not be seen back in the data gathered from the shrimp areas. Participants said that they had to reduce their livestock, due to reduction of animal feed as a result of the salinization. Because of that less meat was eaten; once or twice in a month or at a special occasion. With profit loss due the shrimp virus and high inflation it is now more difficult to buy meat in the research area. An explanation for the difference in findings could be therefore be therefore be the timing of this research.

The food habits are similar to the food traditions as described in Islam (2012). It mostly consist out of rice, fish and vegetables. Islam (2012) describes this diet as not well balanced. Despite, eating mostly the same product each day, the participants thought that their diet was varied. In addition, Islam (2012) noticed a gender difference in nutrition, in which males got better meals. This was not seen back in the research area.

Despite that there a no gender differences seen in the food habits, there were gender differences in the foodscape. According to Asaduzzaman et al. (2015) preparing and cooking the food is the task for women in Bangladesh. This was also seen back in the research area and did not change as a result of shrimp farming.

6.3 Globalization and food sovereignty

Hawkes (2006) sees a food environment as more global, with more linkages to interconnected local, regional and global markets. This linkages were seen with shrimp farming, but this did not affect the local foodscape. The products that were sold at the market were local products like local fish and fruits. This does not corresponds with Islam (2008), which saw more connectedness with the Western World due to the money influx of shrimp farming.

The local farmers mostly got the eggs of the shrimp from hatcheries in Cox's Bazar in the Southeast of Bangladesh, after this the shrimps are cultivated in the shrimp farms in the Magurkhali region. They sell it at the local market to company dealers, whom take it to a shrimp factory in Khulna, where the shrimp is made ready for export to foreign markets. The local farmers are therefore part of a chain network, which corresponds with Rubens et al. (2006). However most of the shrimp farmers are small farmers and just sell their product to the company dealers at the local markets and don't know what happens with the products afterwards.

In the research area the participants seemed to have their own choice in which products to grow in their own farm land. This fits with the concept of food sovereignty, which is the right of peoples to define their own food and agriculture (Peoples Food Sovereignty Network 2002). Akram-Lodhi (2013) sees food sovereignty as something that gives opportunities to have more choices in the production of food and have more diverse food locally available, which leads to a healthier food choices, making more independent economic choices and being able to make strategic decisions in the food system. However explorations of food sovereignty have often been overdetermined by the broader political projects (Akram-Lodhi, 2013). This can also be seen back in the research area with the World Bank project and the switch gate of the political leader. It is the case that people have the choice to cultivate products that they want, but due to the salinization this is not possible, which give farmers no other choice than cultivate shrimp. From a theoretical perspective the area fits therefore with the concept of food sovereignty, but in reality the free choices are limited and is shrimp farming often the only solution to 'get at least some income.' Farmers want to cultivate products like rice, vegetables and fruits and want to have more livestock, which is not possible in an area that is affected by salinization.

6.4 Shrimp farming

The research area underwent a change in land use. This change was the change of land use from paddy farming to paddy and shrimp farming or only shrimp farming. According to Anderson et al., (2018) one of the drivers of this change to shrimp farming is globalization, there is a global demand for shrimps. This could also be seen back in the results. The transition to shrimp farming was mainly as a result of the profitable side of shrimp farming.

According to the participants with small farms shrimp farming happened because of people that had influence. This is in line with Pokrant (2014), which describes that government, business and international aid agencies supported the expansion of shrimp production integrated into global trading networks at the expense of local resource extraction activities such as artisanal fishing and forestry. In the Magurkhali region this happened, because of political leaders and the World Bank was also involved. In the research area, the participants described how they were forced to switch to shrimp farming due to the saltwater intrusion. This is not seen back in literature, however the participants could have also said this because they are against shrimp farming now. Other participants said that initially most of the people were happy with shrimp farming, but that they didn't know the effects of the saltwater yet in the first years. The landscape has changed and the profits have declined, therefore the change to shrimp farming could feel forced now, when at the time it could have been a more a collaborate community decision, because of the profitable side of shrimp farming. However the switch gate was located at the farm of the political leaders, which led to the saltwater intrusion in the region.

The transition to shrimp farming is in line with Pokrant (2014), Swapan & Gavin (2011) and Belton (2014), it is at the expense of farming traditions. Pokrant (2014) mentioned that shrimp farming is monocultural and Swapan & Gavin (2011) call shrimp farming 'a desert in the delta, where agricultural crops cannot grow anymore.' This matches with the responses of the participants, which mentioned that other products cannot grow anymore in the shrimp area. The results showed that the area consisted mostly out of the ghers and there was almost no vegetation. 'A desert in the delta' is therefore a fitting description of the area. However, the period of data collection was during the dry period and at a period when shrimps are cultivated. Some of the participants said that it still was possible to cultivate rice in the winter. During the period of data collection this was not possible, with the exception of the experimenter, but his rice was also influenced by the salinization.

In the research area, there mostly is a period of shrimp farming and a period of rice farming. The paddy farming happens in the winter season, when there is less salt present in the area. The cultivation of shrimp happens in the same fields, where rice is cultivated or was cultivated. This corresponds with the data of Ahmed et al. (2009) and Abdullah et al., (2016), which mentioned that shrimp farming happens in converted rice fields. Swapan and Gavin (2011) mentioned that before shrimp farming, the production of rice was supplemented by other vegetables and fruits. This production became less regular because of salinity caused by the new form of aquaculture. In addition, the intrusion of saline water destroyed local fish populations, which removed a protein source from the diets of the local communities. This was also seen back in the responses from the participants. They mentioned that local freshwater fishes disappeared, but that fish was still important to their diet.

The research data showed two different social impacts of shrimp farming. For a small group, there were benefits, like improved income and capabilities, which matches with Ahmed et al. (2009). Islam (2008) saw the eruption of a new middle class as a result of shrimp farming, this was not seen back in the shrimp area, which showed an unequal distribution of profits. From the 50 families only 3 families were profiting according to a participant, this became also clear in other interviews. From all the interviews, there were only 2 interviews, in which was said that shrimp farming was profiting. One was a farmer that only lives in the area during the period of shrimp cultivation and the other one was the political leader, who has a shrimp farm of approximately 70 acres. This unequal income distribution was also seen back in Abdullah et al. (2016), which saw this as a result of the reduction of income generation such as livestock and crops as a consequence of shrimp farming. This matches with the research area. Some participants specifically mentioned that they could make more money with other crops and more livestock, but that it was not possible to grow it in the area because of the saline environment. Shrimp farming plays therefore an important role in the food production and the income generated for buying food.

6.5 Reflection

In literature there is already been a lot of research on shrimp farming in Bangladesh. This research provided new insights by focusing on the foodscape, which was not done before in literature. The focus of this research was to research how one change in agricultural land use due to demand from Western countries transform a local foodscape. In this case the transition to shrimp farming. The effects of shrimp on landscape which was described in Pokrant (2014), Swapan & Gavin (2011) and Belton (2014) were also seen back in the research area, as well as the social impacts described in Abdullah et al. (2016). Research on foodscape is mostly done in an urban context, while there are a lot of changes happening in rural context due to globalization and changes in the landscape. This research focused on a rural community to fill a gap in literature.

Most researches on shrimp farming are quantitative and focuses on the changes that shrimp farming causes for a community. This research also focuses on the changes for individuals. There are a lot of different viewpoints on shrimp farming in the research area, this research highlights both viewpoints on shrimp farming to tell both stories on how shrimp farming affected the foodscape. One side was in favor of shrimp farming, while the other side was against shrimp farming. This could be seen back in the responses of the participants.

Next to filling a gap in literature this research also looked to the social impacts of shrimp farming. While shrimp farming could be a really profitable business and could help with the development of a region, in reality it is only profitable for farmers with a big farm. Local people don't have a say in it and they say that they are not getting any help from the government. Shrimps are an important export product, so the government should also look to the local impacts it has on local foodscapes.

The participants of this research said that shrimp farming like this is not sustainable and they expected that shrimp farming would disappear from the region. Therefore it is important to reflect on how a shrimp farm can transition back to other agricultural land use. Close to the research area, there were at least two areas where there was a transition back from shrimp farming to the old farming ways. A follow-up research on how the foodscape of this areas is transforming again due to this change would add on this literature. Next to shrimp farming, the area also is experiencing more severe droughts, as a result the river is drying out, if this happens shrimp farming is not possible anymore. A follow-up research could focus on how local adapt their agricultural practices in shrimp areas, which were dependent on the river.

In addition to contributing to the theoretical debate could this research also have some implications to policies too. The World Bank planned for a limited area to be affected by the saltwater intrusion, when the World Bank left these plans were not followed and most of the area became salinized. To solve this problem proper land-use planning must be implemented. With this salinization could be mitigated to a limited area that is designed for shrimp farming.

Another problem is that a lot of farmers are dependent on the incomes generated from their farm. The virus caused a lot of farmers to lose income. Policies which supports diversification of income sources could be a solution to this problems. An example of this could be investing in making handicrafts, which was seen back with the experimenter, who sold art next to his farm or another participant, who worked as an easybike driver.

According to the participants, the decisions on shrimp farming are made by a few people. Policies should focus in involving more people from the shrimp areas in the decision making. Most of the farmers have lived their whole life in the shrimp area and their history with the area goes back for generations, their knowledge of the area could contribute to more sustainable of farming.

Lastly there should be education and awareness about shrimp farming. Participants mentioned that they initially did not know the consequences of shrimp farming. It is important that farmers have knowledge of the long-term consequences of shrimp farming. This knowledge could empower farmers to make more informed decisions.

7. Conclusion

In this chapter the research questions are answered. It is explained how the transition from rice farming to rice shrimp farming transformed the foodscapes of farmers in the research area and how this can be explained with the drivers of change.

In rural Bangladesh the livelihood of the local people is often dependent on farming. The most common product has always been rice. This was also the case in the research area, where paddy farming was the common way of farming. The local people also cultivated vegetables, fruits and had livestock. However there was one change in the agricultural landscape: saltwater was let in the area, so shrimp farming could be possible. This one change caused for changes in the local foodscape of farmers.

Shrimp farming was introduced at the beginning of the 1990s in the research area. According to the data gathered from the interviews, this happened because. The introduction of shrimp farming could be a successful way to improve farming and most importantly make more benefits. Shrimps have a higher commodity value than most other agricultural products. As a result of shrimp farming the area could develop a lot, but not everyone wanted to make the shift to shrimp farming. Despite this, the political leader and people with influence decided to make the choice for local people to shift to shrimp farming by letting saltwater in with the help of a switch gate and with the digging of a canal in an area where the saltwater was not planned. Due to this saltwater intrusion people had to make the switch to shrimp farming, because other products did not grow as well in saltwater as in freshwater.

Initially, the local people were happy with this change, because they made profits with shrimp farming and next to shrimp farming they could still farm paddy. The introduction of shrimp farming led to the development of a rice-shrimp model or gher farming, in which shrimp farming happens in the dry period and paddy farming happens in the rainy season. However, this model has changed. Through the years, salinity levels increased in the area, which resulted in difficulties with farming other products than shrimps and saltwater fishes. Because of that local farmers only have work during the shrimp period, while before shrimp farming they were occupied with farming food during the entire year. As a result people have to do other labor or 'became lazy', instead of doing food related farming activities. Another influence on farming practices is the black spot disease or 'shrimp virus'. Due to this farming practices are affected: farmers make less profits and shrimp farming is more difficult, this is mostly the case for farmers with small lands.

In the research area there are therefore two different groups with different changes in the foodscape. The first group are farmers with influence and big lands. This group is still able to farm the same products as before, next to shrimp farming. They are also able to rent their shrimp farms to other farmers. Shrimp farming brought more profits for them, because of this they could make changes in their foodscape by buying new facilities like a refrigerator or rice cooker. In addition, there was also a change in infrastructure: there were improvements in the road, electricity facilities were installed and houses are made of better materials. The food habits of this group did not change, they still eat fish and rice like before shrimp farming. Only the quantity of food has changed, because of the higher income created by shrimp farming.

For the shrimp farmers with smaller lands the quantity of food choices changed as well. The quantity became less. The quality of food did also decrease for them. One of the causes of this decrease in quality was that people became more dependent on the market. Before shrimp farming local farmers were self-sufficient, most of the food that they ate came from their own land. Due to the saltwater intrusion it became more difficult to grow the products that used to be cultivated in the area. To get the same products as before, it is now required to get them at the local markets, which became

bigger due to higher demands of products and due to the profits made by shrimp farming. The products that are sold at the market are the same as cultivated before like mango, banana, jackfruit, fishes and other vegetables, however these products are influenced by the use of pesticides. Due to this the products lost taste, quality and is less healthy than before. However, local people have no other choice than buy the food with pesticides.

The direct driver of change in the foodscape is the saltwater intrusion. Because of the saltwater intrusion the local people are forced to farm shrimp. This caused the change in land use in regards with cultivating for food. It caused the disappearance of local agricultural products, which resulted in the need to go to markets for food. In addition, the salinization also caused a decrease in livestock, which caused a decrease in milk consumption. The salinization also caused also a change in the fish that are cultivated in the area: from freshwater fish to saltwater fish and it affected the drinking water. Lastly it also affected the environment with saltwater depositions throughout the area and the loss of vegetation.

Indirect drivers of change are the profits that are made by shrimp farming, which led to improvements; the shrimp virus; which led to a decrease in profits and made shrimp farming more difficult; political decisions and power relations, which led to the introduction of shrimp farming and still keeps shrimp farming in the area with the switch gate; and lastly individual actions against shrimp farming like protests, which led to an end of shrimp farming in Kanchan Nagar, which is next to the research area.

Summarizing, the transition to shrimp farming led to a transformation in the foodscape mainly due to the effects of saltwater. Initially, the local people were happy with shrimp farming, but the effects of saltwater and the shrimp virus led to a lot of changes in the food and landscape. These effects are mostly hit the farmers with small farms, while the big farmers have land outside of the shrimp area and are not much affected. This led to a two-sided foodscape in the region: farmers who could profit of shrimp farming and farmers who could not.

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Appendix I: Interview guide

Basic information:

Age:

Gender:

Religion:

How long the participant already lives in the area:

1: What is your favorite food?

Probe: available food

2: Where do you buy your food?

Probe: food, market

3: With who do you eat food? / who are part of your household?

Probe: gender, household

4: do you have family that migrated away?

Probe: migration

5: What do you think about the presence of food markets?

Probe: Feelings towards the market

6: What do you do during a normal week?

Probe: job, family, how many visits to food markets

7: What role does food play in your daily life?

Probe: importance of food

Local environment

8: Have there been big changes in the environment in the last years? What happened and do you know why it happened?

Probe: shrimp farming, climate change, salinization, sediments

9: How does this impact your livelihood/ daily life?

Probe: livelihood

10: Did you make any adaptations in your field because of this?

Probe: adaptation, environmental changes, awareness

11: What kind of effects did salinization have on the efficiency of the production at your farm?

Probe: food production

12: Do you use pesticides in your land and why?

Probe: salinization, environment, awareness

13: Where is the food from your field going?

Probe: value chain, local markets, export

14: What are the most important export products?

Probe: agricultural products, export, diversification

15: Did you make any changes in the product that are growing in your land in the last 10 years and why?

Probe: diversification

16: What are the most important import products?

Probe: local markets, foodscape, import

17: What are the reasons for growing the products on your land?

Probe: Climate, challenges, local food

18: What kind of technologies are you using in your land and how do you feel about this technology?

Probe: advancement

19: Is the selling of your crops profitable, did this change because of environmental reasons?

Probe: economy

20: Do you think that this way of living is sustainable?

Probe: sustainability

21: Are you ever approached by outsiders to buy your land?

Probe: Selling of land

Shrimp farming:

22: What kind of experiences do you have with shrimp/prawn farms?

Probe: encounters with the aquaculture

23: What are the reasons that shrimp farms settled in this area in your eyes?

Probe: explanation for the presence of shrimp farms

23: what are the effects on the water availability in the region because of shrimp farms?

Probe: drinking water, use of water

24: How has the growth of shrimp farming influenced tradition fishing practices in the region?

Probe: Fishing

25: How has the growth of shrimp farming in your region affected the availability and quality of local foods

Probe: quality of food

26: How did shrimp/prawn farming influence the local infrastructure?

Probe: infrastructure

27: Are the benefits of shrimp farming shared equally in the community?

Probe: equality

Foodscape:

28: Could you elaborate on all the kinds of food you eat daily?

Probe: eating habits, consumption

29: Do you have any dietary needs?

Probe: diet, food habits, allergies, difficulties

30: Do you follow any diet guidelines from the government?

Probe: information

31: What are your criteria for selecting food?

Probe: food choices

32: Are there any particular challenges or barriers to accessing healthy foods in your community?

How do you address these challenges?

Probe: Food accessibility

33: What do you eat in a week (breakfast, lunch, dinner)

Probe: eating habits, processed food, fresh food

34: How varied is your diet?

Probe: eating habits

35: Are there any particular food-related traditions or practices that are unique to your community or region?

Probe: food habits

36: Which products from your own land are you consuming?

Probe: agricultural products, food habits

37: Are your food choices affected by special occasions like Ramadan? / season differences

Probe: festivities, religion, 6 seasons in Bangladesh

38: What is the most important driver for the food choices that you make?

Probe: Globalization, tradition, religion, gender

39: Next to this market, what are the places where you get food and why do you choose to go to these places?

Probe: food space

40: Could you elaborate on the places where you consume food and with whom do you consume food?

Probe: Consumption, sharing food experiences

41: Are there any other places that are food-related with importance for you and why?

Probe: foodspace

42: What are the main challenges in regards to food?

Probe: food security

43: Do you feel that there is something missing in the food landscape?

Probe: missing products

44: Has your dietary habits changed over the years and how so?

Probe: changing foodscape, if yes also ask for the reasons

45: Who in your household is cooking the food and what is the importance of preparing food for you?

Probe: Gender roles

Closing questions

46: What role will shrimp/prawn farms play in your future food choices?

Probe: food choices, shrimps

47: Do you think shrimp/prawn farming will increase in Bangladesh and how will this affect your food choices?

Probe: local landscape, food choices

48: Do you think your food habits will change in the coming years and what could be drivers of change?

Probe: future foodscape

49: Do you think you're going to change to shrimp farming in the future

Probe: future foodscape

50: Are there any opportunities for improving the foodscape in your community? What specific actions do you think could be taken to promote healthy, sustainable, and equitable food systems in Bangladesh?

Probe: Future foodscape

Appendix II: Codes

Theme	Sub-theme	Code
Foodscape	<i>Physical context</i>	Agricultural land-use
		Infrastructure
		Water availability
		Facilities
		Housing
		Landscape before shrimp farming
		Food shops and markets
		Livestock
		Vegetation
		Transportation
		Changes in climate
		Switch gate
		Pesticides
		<i>Political context</i>
	Protests	
	Government influence	
	Other institutions	
	Education	
	<i>Socio-cultural context</i>	Gender roles
		Religion
		Traditions
		Community
		Migration
		Outsider
		Meaning of place
	<i>Economic context</i>	Import
		Export
		Wealth
		Income
		Job occupation
		Land ownership
		Hari (rent of land)
	<i>Food consumption</i>	Rice consumption
Fish consumption		
Meat consumption		
Vegetable/fruit consumption		
Quality of food		
Quantity of food		
Criteria for selecting food		
Cooking food		
Health		
Taste		
Shrimp farming	<i>Reasons for shrimp farming</i>	Profits
		Start of shrimp farming
	<i>Sustainability</i>	Shrimp virus

		Technologies
		Future of shrimp farming
	<i>Feeling of shrimp farming</i>	Angry
		Desperate
		Happy
		Optimistic
		Pessimistic
		Sad

Appendix III: Informed consent form

INFORMED CONSENT FORM

Agreement to participate in my master thesis research project

Title: The impact of the rise shrimp and prawn aquaculture on the local foodscape in Bangladesh

Thank you for taking the time to consider my master thesis research project. I am at your disposal for any questions you might have.

Purpose of the Study

The purpose of this study is to gather data on local foodscape in order to understand how this is impacted by the rise of shrimp and prawn aquaculture.

Procedures

As a participant in this study, you will be asked to participate in an interview. The main use of the information you provide will help me to understand the local foodscape. The study will take approximately an hour to complete.

Risks, discomforts and Benefits

There are no known risks or discomforts associated with participating in this study. The benefits of participating in this study include the potential for contributing to the understanding of how aquaculture impacted the local foodscape.

Confidentiality

Your participation in this study will be kept strictly confidential. Your name will not be associated with any data collected, and any data collected will be kept confidential.

Participation and Withdrawal

Your participation in this study is completely voluntary. You may choose not to participate or you may withdraw from the study at any time without penalty.

Contact Information

If you have any questions or concerns about the research privacy, the treatment of research participants or this study project, please contact Daan van Berk at d.vanberk@students.uu.nl. If you have any complaints regarding the research or the researcher, you may contact Bishawjit Mallick at b.mallick@uu.nl.

I can confirm that (please tick box):

- I have read and understand the information sheet and consent form of this research project.
- I have had the opportunity to discuss this study. I am satisfied with the answers I have been given.
- I agree that my participation in this research project is voluntary and that I have the right to withdraw from the study until the moment that the study has been published, and to decline to answer any individual questions in the study without needing to say why.
- I understand I will not be paid for my participation.
- I understand I can ask questions at any point during, before or after the activity about any aspect of the research.
- I understand that I can request any [texts/photos/etc.] with identifiable features to be blurred, made non-identifiable or removed from the research.
- I understand that the data collected for this study will be kept confidentially either in a locked facility or as a password-protected encrypted file on a password-protected computer of the researcher. [If applicable: Audio files or transcripts will be removed after the completion of the research].
- I understand that the information collected for this study will be used only for research purposes only, such as a MSc thesis, articles, book chapters, published and unpublished work and presentations (if relevant).
- I consent to my [interview/focus group discussion] being audio-recorded [if relevant], and understand I have the right to ask for the audio-recorder to be turned off at any time.
- I understand that my name will not be used on any documents, presentations or other output of the research.
- [A pseudonym of my own choosing can be used in this research: _____]

“I agree to participate in this individual research project and acknowledge receipt of a copy of this consent form and the research project information sheet.”

Signature of participant: _____ Date: _____

“I agree to abide by the conditions set out in the information sheet and I ensure to minimalise harm done to any participant during this research.”

Signature of researcher: _____ Date: _____

Please fill in the following information. It will only be used in case you want to be sent a copy of interview notes and/or transcripts [so that you have the opportunity to make corrections; if relevant].

Address: _____

Email: _____