



**Livelihood Diversification?
Perspectives on Place and Space:
An Exploration of Seaweed Farming Practices in Jungut Batu,
Bali**

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MSc Master's Thesis
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Cover page: Seaweed farming plots in the Mangrove Conservation Area, Jungut Batu, Bali. The photo was taken by the author during fieldwork (2023).

ABSTRACT

Jungut Batu village on Nusa Lembongan Island, Bali, has become one of the forefront seaweed producers in Indonesia due to its unique geographical condition, calm bay, and tropical temperature. Seaweed farming in Jungut Batu emerged in the 80s and served as the primary source of income for the villagers. As the demand for tourism on Nusa Lembongan Island gradually increased in the 2000s, tourism started to become the primary activity in the village, replacing seaweed farming. Because of various factors, which one of them was tourism development, the practice of seaweed farming eventually vanished from Nusa Lembongan in 2018. However, the COVID-19 pandemic in 2020 halted tourism activity and thus caused a significant economic downturn. Villagers who predominantly worked in the tourism sector suddenly lost their source of income. As a result, locals had no choice but to return to their old ways of life in seaweed farming to support their livelihoods.

This study aims to unpack the dynamics of seaweed farming in Jungut Batu and its coexistence with tourism. Using an ethnographic approach, this study provides a comprehensive understanding of seaweed farming practices and their dynamics over the years. Data was collected through participant observation and semi-structured interviews with 19 local seaweed farmers. Using Doreen Massey's perspective on space, this study analyses the dynamics of seaweed farming and its relation to other sectors from a different angle. Moving away from the traditional geographical dimension and perceiving the farming system itself as a space, this study demonstrates the significance of social relations, 'thrown togetherness', and the relationality of various elements in seaweed farming practices. The study reveals that farming practices are maintained through social relations, meaning that seaweed farming itself is an open and ongoing process. Various elements, both living and non-living elements, are also interrelated and thus alter farming practices. These elements are connected to many elsewhere that stretch across and beyond the sector itself. In addition, the lens of 'thrown togetherness' recognises the power dynamics that play among various actors in the farming system, often leading to social exclusion and marginalisation of local seaweed farmers, as well as emerging potential conflict and resistance among actors.

KEY WORDS: Seaweed farming, Jungut Batu, Bali, tourism, Doreen Massey, space, social relations, 'thrown togetherness', relationality.

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1. Introduction

This chapter provides an overview of the research background, followed by an articulation of the problem statements and the thesis outline. In Chapter 2, a structured literature review will be outlined to identify the research gap. The given research background, problem statements, and research gap will shape the objectives and questions for this study.

1.1. Background

Over the past twenty years, seaweed farming in coastal Indonesia has experienced a substantial growth trajectory. Since the year 2000, the industry has expanded rapidly, making Indonesia one of the major players in this global industry. Indonesia accounts for 66% of the world's *hydrocolloid* seaweed species supply, primarily utilised in food and cosmetic industries (see Langford et al., 2021). Indonesian role in the global seaweed market became more evident in 2015 when the country was the second-largest seaweed exporter in the world after China, contributing to around 38% of the global seaweed market (Mulyati, 2015). The Indonesian trajectory in global seaweed production highlights the country's capacity to provide domestic and international demand for seaweed-based products. Red and brown seaweed, the two common types that can be widely found in the country, are utilised in many industries. Both red and brown seaweed are extracted not only in the food industry but also in pharmaceuticals, biotechnology and cosmetics (Mulyati, 2015; Barbaroux, n.d.).

Low-income smallholder farmers mostly perform seaweed production in Indonesia. These farmers typically earn around US\$2,000 per year from this industry (Langford et al., 2021). They consider seaweed farming a more profitable income source compared to other sectors such as copra, cocoa, and other marine-based businesses. Recognising the importance of this industry, the Indonesian government has prioritised its development as a strategy to reduce poverty in many coastal areas. In 2019, the government established the Indonesian Presidential Decree No.33 about the National Strategies on Seaweed Farming Expansion Roadmap. The roadmap primarily outlined strategic planning for expanding seaweed production in the period of 2018-2021.

Among other provinces in Indonesia, Bali has emerged as one of the prominent regions for cultivating seaweed. This success is attributed to Bali's unique geographical conditions, including its coastal conditions and suitable water temperatures for seaweed cultivation. Bali's seaweed farming history traces back to 1978. Seaweed cultivars established seaweed farming for the first time on Geger Beach at Nusa Dua Bali (Adnan and Porse, 1987, cited in Heijden et al., 2023). The techniques applied by local farmers were adopted from methods used in the Philippines (Heijden et al., 2023). Over the years, Balinese seaweed farmers have enhanced their skills and techniques, gradually transforming the island into a major player in Indonesia's seaweed industry (Heijden et al., 2023).

Seaweed farming in Bali is particularly concentrated in the south-eastern part of the island, specifically in the Nusa Penida archipelago. Nusa Penida archipelago is a group of small islands, consisting of Nusa

Penida, Nusa Lembongan, and Nusa Ceningan Islands. Those islands are all situated across the Badung Strait within the Klungkung region. To access the islands, people usually take a 40-minute fast boat ride from the mainland (see Figure 1.1).

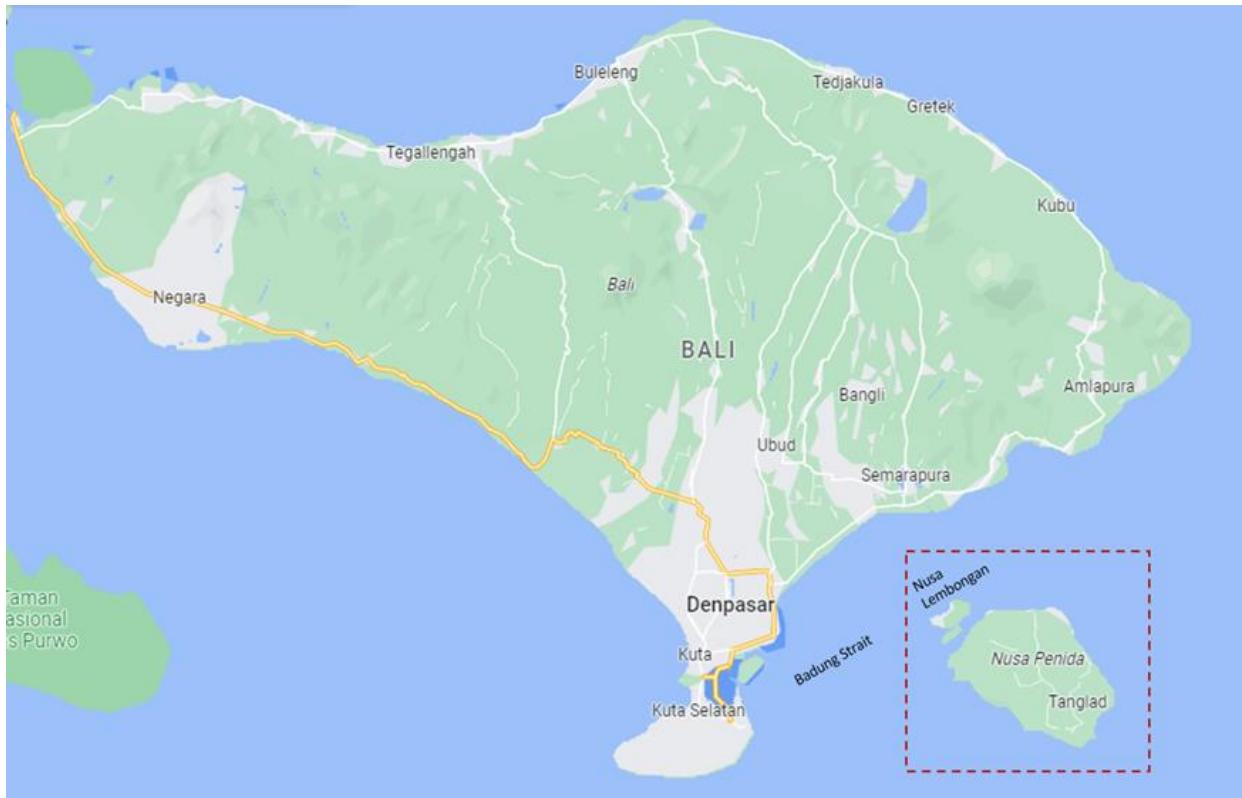


Figure 1.1: The Location of Nusa Lembongan Island on Map

Source: Google Maps, accessed in October 2023

As one of the most famous islands in Bali, Nusa Lembongan Island (also known as Nusa Lembongan), has become the forefront of seaweed production due to its unique geographical condition, calm bay, and tropical temperature (Mulyati, 2015). According to Pantall (2003), seaweed farming has emerged as a lucrative livelihood option for hundreds of villagers on Nusa Lembongan Island. Several factors make seaweed farming attractive. These include the relatively low production costs, the hassle-free harvesting process, and the consistent demand for seaweed. For farmers on Nusa Lembongan Island, seaweed farming has provided “a source of wealth and security.” (Pantall, 2003, p.1).

While the seaweed farming industry was steadily expanding, the tourism sector on Nusa Lembongan Island began to experience a significant surge in the 2000s. This was due to the general increasing number of tourists visiting Bali and surrounding islands. The statistics recorded that the number of tourists visiting Bali increased dramatically from seven million in 2010 to sixteen million in 2019 (Indonesian statistic data, 2019, cited in Andréfouët et al., 2021). The global demand for tourism on Nusa Lembongan Island has provided new job opportunities. Tourism was deemed more attractive as it offered a sense of safety for

steady income (Andréfouët et al., 2021). As a result, more islanders, particularly young people, abandoned seaweed farming to pursue a more promising income in tourism.

Although tourism has provided additional income for the local people on the island, and thus boosted the region's economy, the massive tourism development has threatened the local seaweed industry. The expansion of tourism has introduced new activities and different types of visitors. The rise of high-end hotels and businesses (Andréfouët et al., 2021; Davis, 2021; Neubauer, 2020) has also led to privatisation and environmental degradation. As explained in Pantall's (2003) article, tourism has negative impacts on the environment by polluting seawater and occupying areas that could have been used for farming. Additionally, the vast expansion of tourism facilities, such as the construction of numerous resorts, hotels, bungalows, restaurants, and other infrastructures along the beach, has taken up space that was once used for farming (Davis, 2021). Due to the lack of human resources, coupled with those factors mentioned, seaweed farming practices on the island gradually declined. By 2018, seaweed farming practices had entirely vanished from the Nusa Penida archipelago (Andréfouët et al., 2021; Neubauer, 2020). (see Figure 1.2)



Figure 1.2: The dynamics of seaweed farming in 2003 and 2015 in Nusa Penida Archipelago (where Nusa Lembongan is located). Mask orange represents the area covered by seaweed cultivation. In 2015, seaweed cultivation was barely seen, indicating a significant decrease in this sector between 2003 and 2015.

Source: Andréfouët et al., 2021

Since seaweed farming ceased to exist on the island, tourism has taken over the position and become the primary economic activity on Nusa Lembongan Island. The reasons why farmers left seaweed farming

were varied. According to local seaweed farmers, the main reason was due to unsuccessful harvests and low market prices (Andréfouët et al., 2021). This includes some other factors, such as the shortage of seeds and diminishing space on the coast to dry seaweed. However, it remains unconfirmed whether these farmers shifted their economic activity due to the massive tourism development or the lure of easier incomes.

Interestingly, even though the tourism sector has become the main source of income for the island since 2018, the sector still seems to be far from reaching sustainability. The Covid-19 pandemic that struck Indonesia in 2020 exemplified this condition. The pandemic has significantly declined the tourism industry, resulting in hundreds of people on the island losing their jobs. As the tourism sector was facing a decline induced by the pandemic, people were left with no choice but to rely on the ocean once again and make a living from the sea (Davis, 2021).

During the pandemic, the locals had to return to their old ways of life in seaweed farming in order to support their daily lives (Davis, 2021; Hunt, 2021). The pandemic is not the only sample where people are forced to quit the tourism sector to survive. Back in 2017, the villagers quit tourism and came back to seaweed farming as the eruption of Mount Agung paralysed Bali's tourism activities. Andréfouët et al. (2021) explain that farmers gained lower income and economic instability during the eruption, causing some individuals to return to seaweed farming. These conditions highlight the importance of seaweed farming as a crucial sector in supporting local people, especially at times when the tourism sector was in crisis.

1.2. Problem Statement

Seaweed farming on Nusa Lembongan Island has emerged as a resilient sector, serving as a fallback option during the crisis, including during the recent pandemic and economic crunch after the eruption of Mount Agung in 2017-2018 (Andréfouët et al., 2021). On the one hand, initiatives the local communities took to revive seaweed farming during the COVID-19 pandemic have demonstrated their adaptive quality to maintain economic stability amid uncertainty. On the other, the economic crisis that suddenly emerged due to the fall of the tourism sector has warned Balinese people about their over-reliance on tourism. Gounder & Cox (2022) argue that there is a greater need for economic anticipation in areas that rely heavily on tourism, especially small islands. Over-reliance on tourism has some disadvantages, including hindering the diversity of other alternative economic activities that can support local economic growth (Gounder & Cox, 2022). Diversification can be one of the key strategies to address the economic vulnerabilities associated with over-reliance on tourism. It involves developing and promoting various economic activities beyond tourism that can provide an alternative source of income when tourism is in crisis. By diversifying the local economy, communities can reduce their dependence on a single sector, making them more resilient in the face of economic challenges and external shocks.

Nusa Lembongan has become a hub for seaweed cultivation during the Covid-19 pandemic. However, as Covid-19 has ended, the number of visitors visiting this island started to increase again. Tourism revival in Bali post-pandemic has raised concerns about its potential impacts on the livelihood of those relying heavily on seaweed farming. Tourism might significantly affect their income and traditional way of life. As

tourism continues to grow, seaweed farming might start to lose its popularity again. It raises a question to what extent the emergence of tourism affects seaweed farming practices. Understanding the dynamics of seaweed farming and its coexistence with other sectors like tourism becomes critical to ensuring its sustainability and preserving local farmers' well-being. Furthermore, the diverse perceptions and attitudes of individuals who work in both sectors may play a critical role in shaping the overall direction of these sectors. These differing views, interests, and aspirations may lead to tensions and conflicts, impacting the coexistence of seaweed farming and tourism on the island.

1.3. Thesis Outline

This thesis consists of 9 chapters. In Chapter 1, the background and problem statement are presented. This chapter provides context for the research's topic on the phenomenon of seaweed farming resurgence on Nusa Lembongan Island during the COVID-19 pandemic. This chapter also conceptualises the research problem. In Chapter 2, I discuss the literature review on seaweed farming and tourism in Bali and identify the research gap. At the end of Chapter 2, the objective and questions for this research are formulated. Next, in Chapter 3, I discuss the theoretical framework which revolves around the theory of place and space in sociology. I focus on Massey's theory on space as an umbrella lens for the study. An explanation of the methodology is described in Chapter 4, entailing methods for data collection and analysis. Furthermore, I break the result section into three chapters. First, chapter 5 talks about seaweed farming history and trends. I begin the chapter by introducing my journey of settling in the village and how I discovered the study location. I then further discuss the main findings. Chapter 6 details the practices of seaweed farming and reveals farmers' perception of the sector compared to tourism. Moving on to Chapter 7. This chapter unfolds farmers' livelihood strategies and their aspirations and long term-goals. Each chapter (Chapter 5,6,7) will be closed by a sub-conclusion. I examine the theoretical relevance to the study case in Chapter 8 and finally offer the conclusion and recommendations in Chapter 9.

2. Literature Review

This chapter reviews the existing literature on seaweed farming and tourism in coastal areas, with a focus on Bali. I first provide an overview of seaweed farming to base our understanding of its practicality: its development, techniques, utilisation, and impacts on coastal communities. Next to this, I extend the literature review on tourism on Nusa Lembongan Island, which consists of its history of emergence and impacts on local seaweed farming. After gaining enough information on how two sectors can intertwine, I explain the concept of livelihood diversification in coastal areas. This part specifically addresses debates around the initiatives and the question of whether tourism can be an alternative. I conclude the chapter by stating the research gap and defining the research's objective and questions.

2.1 Seaweed Farming in Bali

2.1.1 Policy Development for Seaweed Farming

Bali offers an ideal environment for the growth of seaweed, characterised by the tropical marine climate with sea temperatures ranging from 25°C to 30°C (Keohane, 2016). The seaweed farms are densely aggregated in a bay between Nusa Ceningan and Nusa Lembongan islands, with the species of *spinosum* and *cottonii* dominating the cultivation (Mulyati, 2015). Looking at its history, *Spinosum* seeds were introduced in 1978, while *Cottonnii* was introduced a few years later in 1985 (Simbajon & Ricohermoso, 2001). The first seaweed cultivation technique, however, was introduced in 1984. It was originally brought from the Philippines. A few years later, during the 1990s, the practice of seaweed farming began to expand rapidly along the coast of Bali, and gradually became a lucrative means of income for the Balinese (Adnan & Porse 1987, cited in Keohan, 2016).

Keohane (2016) explained that during the late 1990s and early 2000s, the seaweed farming industry became progressively more export-oriented, and Bali was at the forefront of seaweed cultivation in Indonesia. Seaweed farming was promoted as an environmental-friendly, sustainable, and profitable alternative to harmful fishing practices that excessively exploit reef communities (Hill et al. 2012, cited in Keohane, 2016). The Indonesian government also recognised the importance of the industry for rural livelihoods and the national economy. Gaining more popularity in the global market, various policies and initiatives were established by the government to support and regulate the seaweed farming industry, including designing more serious national development planning for seaweed farming and signing Presidential Decree No.33/2019. This decree specifically outlines policy provisions to support the seaweed farming industry in Indonesia.

2.1.2 Techniques in Seaweed Farming

Seaweed is considered an easily producible sector. Pantall (2003) argues that not only is it easy to produce, but also does not require significant capital investment or specialised tools for cultivation. The important tools needed are only some ropes, bamboo or wooden stakes, and sprigs of seaweed (Pantall, 2003; Keohane, 2016; Mulyati, 2016). The cultivation period is also relatively short. After around 32 days until 45 days, depending on the seaweed type, or when the seaweed has reached about 1 kg in weight, it can be harvested by hand (Bast 2014, cited in Keohane, 2016; Pantall, 2003; Mulyati, 2016). In general, seaweed farmers in Indonesia utilise a method, referred to as an “off-bottom” method for cultivation (Conklin & Smith 2005, cited in Keohane, 2016). This refers to a specific method of cultivating seaweed that does not involve attaching or growing the seaweed directly on the ocean floor or substrate. Seaweed farmers use various floating or suspended structures to grow the seaweed in the water column instead of anchoring it to the seabed. This method offers several advantages for farmers, including easier to control, harvest, and more eco-friendly.

2.1.3 Seaweed Utilisation

Seaweed has a wide range of uses and applications across various industries due to its versatility and nutritional benefits. In terms of food consumption, it can be used in dairy products like ice cream, evaporated milk, milk puddings, chocolate milk, processed cheese, Jell-O, jellies, baby food and pet food. Beyond its use as an ingredient in food, seaweed is also utilised in many consumers and industrial products, such as toothpaste, shampoos, cleaners, skin creams, lotions, air fresheners, textiles, and pharmaceutical applications (Mulyati 2015, cited in Keohane, 2016). The global demand for seaweed is expected to continue to increase as the statistical data shows its uprise from time to time. For example, the use of *carageenan* – a substance extracted from certain types of red seaweed – in dairy applications, frozen desserts, and ice cream has increased by 5.5% annually from 2006 to 2011 worldwide (Mulyati, 2016).

The success of the seaweed industry is closely tied to its supply chain processes. In Indonesia, a seaweed supply chain comprises several key players: seaweed suppliers (including seaweed farmers, local collectors, large traders, and exporters), manufacturers (such as carrageenan and agar companies), and customers (as noted by Mulyati in 2015 and cited in Mulyati, 2016). Mulyati (2016) identifies three primary challenges for the seaweed industry. First, she points out that the unpredictable availability of dried seaweed can lead to periods of inactivity and difficulties in meeting customer demands. Secondly, the fluctuation in seaweed prices poses challenges in maintaining profitability and passing on these price changes to customers. Third, variations in seaweed quality can erode customer satisfaction over time. Additionally, the industry is susceptible to external uncertainties, including economic disruptions like exchange rate crises and natural or man-made disasters.

2.1.4 Seaweed Farming Impacts on Coastal Communities

Impacts on The Environment

Globally, seaweed farming makes up more than half of the production of marine aquaculture (Duarte et al., 2021, as cited in Ross et al., 2023) and contributes to climate change mitigation in several ways. The benefits of seaweed farming to climate change mitigation and adaptation have been highlighted by many researchers. For example, Ross et al. (2023) and Duarte et al. (2017) have similar views that seaweed farming helps mitigate climate change by sinking the carbon in the deep ocean. Seaweed farming can also reduce the CO₂ emission from agriculture by increasing the quality of soil, reducing wave destruction to shorelines, and enhancing the oxygen supply to the sea (Duarte et al., 2017). However, a study by Xiong et al. (2024) showcased another view, arguing that the seaweed farming environment may not always operate as the CO₂ sinker, and rather could become the source of CO₂. This sometimes possibly happens if the seaweed is not harvested at the right time, which is attributed to proper farming management.

Impacts on Socio-Economy

Unlike other parts of the world, seaweed farming in Indonesia is primarily performed by smallholder farmers (Cai et al., 2013; Neish, 2013, as cited in Larson et al., 2015). Therefore, the additional revenue from this sector can be considered critical to enhancing the economic well-being of the locals. Duika Watson, a researcher from Australia's University of Tasmania, studied the seaweed industry in Bali. He asserts that seaweed has proven to be a remarkable crop since its initial cultivation in 1984 (Pantall, 2003). Particularly in Nusa Lembongan, seaweed farming could employ around 85% of the islanders. Nusa Lembongan serves as an example of how seaweed farming can positively transform communities. Rimmer et al. (2021) similarly highlight the impacts of seaweed farming on coastal communities. They argue that contemporary coastal communities face limited economic alternatives due to increasing density and fishing pressures. In that regard, seaweed farming offers an alternative source of income in remote areas. Very small-income activities, such as seaweed farming, are often proposed as 'alternatives' or 'supplemental' livelihoods by local communities (Torell et al., 2017). The reason for this is that seaweed farming could provide a relatively steady (yet small) income for households. Larson (2020) and Rimmer (2021), who conducted similar studies highlighting the economic advantages of seaweed farming in Indonesia, shared the same findings. It was found that most farmers do not engage in seaweed farming as a full-time activity (Rimmer et al., 2021) due to its less labour-intensive work. This allows farmers and their family members to participate in other income-generating activities.

Not only contributing positively to income, Larson et al. (2020) in particular evaluated the impacts of seaweed farming on women's well-being and life satisfaction. The study was conducted in Takalar, South Sulawesi, one of the main regions of seaweed producers in Indonesia. The study quantified the subjective perception of well-being and life satisfaction levels gained through various factors, namely economic, health, social, ecological, institutional, and cultural factors. Some of these factors related to their well-being indicators, such as, having houses in good condition, having motorised transportation, being able to send kids to higher school, having social networks, sharing experiences and learning new skills, owning a business, and having more money to fulfil basic and secondary needs. The participants were asked to identify and rate their life satisfaction with those factors and link the rank with their past before starting

seaweed farming. The results showed that seaweed farming had improved their well-being. Around 37% of the female participants whose main income was seaweed farming stated that their income increased by 50%.

Despite its positive impacts on farmers' well-being, Duarte et al. (2017) argue that it is essential to incentivise farmers for their roles in seaweed farming in relation to climate change mitigations. As indicated in the previous section, seaweed farming's contribution to climate change mitigation and adaptation is a testament. As most seaweed farmers typically live in poverty, providing economic benefits for farmers may be crucial in supporting the production of seaweed in the future (Duarte et al., 2017). As stated in the Indonesian Presidential Decree No.33/2019, farmers earn profits of approximately 2,000 USD per year (Langford et al., 2021).

Covid-19 Pandemic Effects on Seaweed Farming across Indonesia

The study of Pandemic-19 impacts on seaweed farming in Indonesia has been done by Langford et al. (2021). Using satellite imagery data, they studied the implication of the COVID-19 pandemic in 2020 on seaweed production in Takalar Regency, Sulawesi. The research location was in Pangkep, a region with around 115 offshore islands in the Southern part of Sulawesi. In normal situations, the quality of seaweed produced in this area is low because of water salinity and its remote location. During the pandemic, the production fluctuated with an extreme seasonality during 2020. The data shows that more than 60% of seaweed production happened only within three months, from February to April, compared to the previous year (Langford et al., 2021). The seaweed growth was most likely affected by the variations in rainfall, water salinity, and the intensity of light and waves (Langford et al., 2021). In particular, water salinity has a major effect on seaweed cultivation. In Indonesia, *hydrocolloid* seaweed grows most optimally at salinities of 29-34 ppt, slightly below the average water salinity of 35 ppt (Langford et al., 2021). Rainfall and water temperature also have significant effects on seaweed growth. For instance, rainfall, in particular, can increase river flows that bring nutrients to the sea. Therefore, in the period of heavy rain, between March and September, seaweed production typically surges.

However, besides the ecological factor, the growth of seaweed in Sulawesi was also affected by socio-economic factors and policy. The sector became most favourable during the pandemic for youth, especially those struggling to find jobs in urban areas. The government's seed distribution program in Pankep also had a role in encouraging more people to work on the farm. The situation where job opportunities were reduced during the pandemic had declined the seaweed price and labour costs. In contrast with the situation in Bali, seaweed prices fell by 27% in Sulawesi (Langford et al., 2021). This study's finding validates that the conditions of seaweed farming are very diverse across Indonesia.

2.2 Tourism Development in Jungut Batu

2.2.1 Tourism Emergence in Jungut Batu

Although Bali province comprises less than 1% of Indonesia's landmass, it attracts more than half of all foreign visitors. Looking at the potency of tourism, the Indonesian government set an ambitious target to boost it. In 2014, the President of Indonesia incorporated tourism as a new pillar in the national economic strategy to achieve faster and more inclusive economic growth. Having said that, the government aimed to increase visitors from 14 million in 2017 to 20 million by 2019, with Bali remaining the primary destination (Ollivaud & Haxton, 2019). However, as reported in many news articles, the surge in tourist numbers would put more pressure on infrastructure, local communities, cultural heritage and environmental assets, including disrupting long-standing sectors such as fishing and seaweed farming.

The literature analysing the social aspect of tourism in Lembongan is still limited. However, one study done by Long & Wall in 1996 questioned whether tourism could successfully thrive in Jungut Batu. According to their study, tourism started to develop in Jungut Batu in the 1970s with the arrival of some low-budget travellers staying at locals' houses. Tourism expansion then happened in the 1980s, with some people starting businesses in tourism accommodation, such as guesthouses, bungalows, and tour boats to visit the bay (Long & Wall, 1996). Besides becoming an alternative source of income, tourism also slowly altered the way in which people live. For example, tourism has made the culture more modern because of foreign exposure, especially among youth. Youth began to wear T-shirts and jeans more often than their traditional clothes, *sarong*. Nevertheless, the changes caused by tourism were much less influential than those caused by seaweed farming, which had brought economic cash and more networks to the village. The beach in Jungut Batu also functioned more as a place to cultivate seaweed rather than a tourist spot. However, the unstable price of seaweed made alternative sources of income like tourism appealing to the residents (Long & Wall, 1996).

2.2.2 Tourism's Impact on Seaweed Farming Downfall

Seaweed farming took almost every area of Nusa Lembongan before its downfall in early 2018. Before tourism gained its popularity, the islanders commonly worked in fisheries and dry farming as side jobs (Long & Wall, 1996; Keohane, 2016). Andréfouët et al. (2021) specifically studied the impacts of tourism on seaweed farming on Nusa Lembongan Island. The study involved spatial analyses to examine how seaweed farming in Nusa Lembongan had declined from 2015 to 2021. Their research revealed that many farmers had discontinued seaweed farming due to unsuccessful crops, primarily caused by the grazing pressure of fishing and water quality issues. Moreover, the availability of areas to dry seaweed had diminished due to tourism activities and coastal development. As the number of tourists in 2016 and 2017 rose, exceeding the government's target, fast-growing tourism was paradoxically likely to provide new opportunities and financial security for a sustained income, which seems to be the reason why people quickly abandoned seaweed farming (Andréfouët et al., 2021).

2.3 Livelihood Diversification in Coastal Areas

2.3.1 Why Should It Be Diversified?

The pandemic served as a glaring reminder of the importance of diversification and resilience in the face of unexpected shocks. Torell et al. (2017) argue that livelihood diversification could potentially increase income and reduce risks, which can help weaken vulnerability to stress and shocks (Olale & Henson, 2012; Phung Ha & van Dijk, 2013). Livelihood diversification refers to expanding sources of income by providing different options for income activities that “make it less remunerative to exploit natural resources” (Ellis, 1999, as cited in Torell et al., 2017, p. 200). Livelihood diversification, particularly in coastal regions, is considered to become a strategy to combat poverty and enhance economic stability (Torell et al., 2017). However, I found that most of the literature concerning coastal areas still focuses primarily on diversifying income in fishing communities rather than other communities. Take, for example, studies by Torell et al. (2017), Kimbu et al. (2022), Mills et al. (2017), and Hanh & Boonstra (2019).

Torell et al. (2017), in particular, analysed strategies to diversify the income of fishing communities in Tanzania. Their study proposed two methods for helping the poorest fishermen escape poverty. The first method involves gradually educating locals to build necessary assets. The second method involves providing a strong stimulus, such as aid or programs that promote livelihood diversification with higher returns (Cinner et al., 2009). Nevertheless, implementing these strategies is not easy, and there is no guarantee that the desired outcome will be achieved. One issue is that the income from diversified activities is often low, inconsistent, and spread out (Phung Ha & van Dijk, 2013, as cited in Torell et al., 2017). The other issue is known as “elite capture” (e.g., Scheyvens, 1999; Ashley et al., 2001; Fabinyi, 2010, as cited in Torell et al., 2017). This means that the most profitable parts of livelihood-diversified projects tend to benefit only certain groups. Those with strong social connections, language skills and education would have more opportunities, excluding those who are the poorest (Torell et al., 2017). The optimal approach to livelihood diversification is then to prioritise sustainability (Kimbu et al., 2022). The notion is characterised by a multifaceted process involving intricate relations to sustain not only people’s livelihoods but also their way of life, sense of belonging and identities (Kimbu et al., 2022). This implies creating strategies beyond immediate economic benefits and comprehensively considering the environmental and social impacts of it in the long run.

2.3.2 Tourism As an Alternative?

Tourism or the hospitality sector has frequently been used to increase income-generating activities so people can reduce their reliance on natural resource extraction (Kimbu et al., 2022). The aim of this is to alleviate poverty and reduce risks, especially in vulnerable areas. These areas could become vulnerable, for example, because of climate pressure, geographical conditions or protected areas where people live with limited opportunities (Kimbu et al., 2022). However, shortages in financial capital often make it difficult for coastal communities to transform their livelihood into tourism (Haque et al., 2014). In this context, loans often became an option. Haque et al. (2014) specifically studied the role of formal credits

in Brazil in helping fishing communities diversify their activities. In some areas, such as in India, informal moneylenders tend to exploit the financial crisis among fishing communities (Haque et al., 2014). However, accessing credit from formal institutions was not easy either. Some considerations, such as complicated bureaucracy, disagreement with the interest, fear of losing assets, and preference to use familial networks, commonly prevent the communities from having a loan from formal institutions.

Salgrama and Koriya (2008) proposed a framework of 'intersectional' and 'intrasectional' diversification (as cited in Haque et al., 2014). *Intersectional* diversification refers to moving the sector horizontally, meaning local communities opt to engage in other sectors, such as tourism while remaining connected to the former sector. Meanwhile, the *intrasectional* approach refers to locals moving their assets vertically – within the sector – either upward or downward, by downsizing their assets to reduce production costs or leveraging their assets to increase production and income. An example of *intrasectional* approach is a full-time fisherman opted to replace their mid-size, power-diesel boat with small boats to reduce the high operational cost. Or in contrast, a fisher could also diversify their fishing activities by buying a bigger and more modern boat. In the Brazil study case, small-scale fishers in Paraty reported that they engaged in both frameworks (Haque et al., 2014). Almost 40% of fishers expressed their desire to try out an *intersectional* approach, meaning they engage in tourism while remaining to earn money from fishing. In this case, the participants refurbished their boats to accommodate tourists in the summertime (December to February) while engaged in fishing from March until May. In contrast, others who had stronger capital pursued both *intersectional* and vertical *intrasectional* diversification. In this scenario, they chose to buy larger boats to engage in a larger fishing activity while transporting more tourists and local passengers.

2.4 Research Gap

Although some studies have been conducted about seaweed farming practices in Indonesia, I noticed that research on the practices in the western or middle part of Indonesia, such as in Bali, is often overlooked. Most studies have focused on seaweed farming in the eastern part of Indonesia, such as in Sulawesi, as this region is the largest seaweed producer in Indonesia. In terms of contents, these studies commonly centred around the practicality of the sector, such as problems in the supply value chain, production processes, technological advances to produce a more efficient and higher quality seaweed, and economic aspects of the sector, such as its impact on coastal populations' well-being. I also found that most of the literature captured the conditions before the pandemic, and none touched upon the conditions during or after the pandemic, even though the pandemic could be a significant turning point for this sector to fall deeper or thrive stronger than before. I found one study that researched the condition of seaweed farming *after* the pandemic, conducted by Langford et al. (2021) using imagery satellites. However, the primary data, such as interviews or fieldwork, was still missing in the research.

The case study in Bali was unique as tourism added another layer to seaweed farming dynamics. However, recent studies that delved into this topic are also still limited. A study that captured the early stage of tourism emergence and how the sector coexisted with seaweed farming was conducted by Long & Wall in 1996, or more than 20 years ago. As the current literature on seaweed farming practices in Bali is understudied, let alone the return of this sector after the shocks, my research will contribute to filling the

gaps in the existing literature that were previously mentioned. This study will focus on the sociological aspects of seaweed farming practices in Jungut Batu village, Nusa Lembongan. I chose this specific study area because it was less popular to research than its neighbouring island (e.g. Nusa Penida), despite its role in adding regional seaweed production. As there is a change in the way seaweed farmers navigate their lives because of climate change, globalisation or unexpected disasters like the recent global pandemic, it is important to understand their coping mechanism, focusing on the way in which they build social relations, community resilience and their perspective towards the future of seaweed farming. I believe this research will provide fresh insights into a larger body of literature on the diversity of seaweed farming practices in Indonesia and throughout Asia. Every case is unique, and so is the case in Jungut Batu.

2.5 Objective and Research Questions

Based on the background and problem statement in Chapter 1 and the research gap, this study aims to unpack the dynamics of seaweed farming in Jungut Batu using a sociological perspective. It will provide a comprehensive understanding of how seaweed farming thrives, coexists, and affects the lives of those who work in the sectors. The main question suitable for achieving this goal will be: *“How does the dynamic of seaweed farming in Jungut Batu affect the livelihood of those working in the sector?”* To answer the main research question, the following sub-questions will be answered:

- What are the historical trends of seaweed farming in Jungut Batu, and how has tourism development affected these trends?
- How do local seaweed farmers perceive seaweed farming and tourism?
- How do these perceptions influence their career choices and livelihood decisions?
- What are the aspirations and long-term goals of local seaweed farmers for both sectors?

3. Theoretical Framework

This section outlines the theoretical framework used in this research. I use Massey's perspectives on space as the overarching lens to understand the 'multiplicity' and complexity of the study case. To start, I present the meaning of place and space in sociology and why it matters to integrate spatiality into the research. Then, I explain Massey's propositions on space in more detail.

3.1 The Meaning of Place and Space in Sociology

The notions of space and place are intricate and often debated by many researchers (Garden et al., 2019). Place is a core concept in geographical studies, with a rich philosophical background dating back to ancient Greek times (Kirkpatrick et al., 2018). The ancient Greeks, including philosophers like Aristotle, laid the groundwork for understanding place by exploring its relationship to space and location. He described a place as "the where of something," (Cresswell, 2011, p. 236, as cited in Kirkpatrick et al., 2018), emphasising its importance in understanding the physical world. At least until the late 1970s, geographers perceived space as a neutral container and tended to separate this container from human social lives (Hubbard & Kitchin, 2011).

However, in modern geographical scholarship, the concept of place has evolved to encompass not only the physical location but also the social and cultural dimensions. Hubbard and Kitchin's (2011) book *Thinkers on Space and Place* sets out a different way of thinking about space and place. The book serves as a handbook to highlight some of contemporary academia's work on the theoretical framework of space. It explains the views of 66 scholars with distinguished views on space, emphasising how complex and broad the space discourse is.

According to Agnew (1987), place includes three key components: *location, locale, and a sense of place*. *Location* refers to the specific position on the Earth's surface, *locale* is the physical setting for social interactions, and *a sense of place* involves the emotional and experiential connections people have with a location (Kirkpatrick et al., 2018). In 1999, the concept of space extended (Hubbard & Kitchin, 2011). Space was seen as a backdrop on which relations between (measurable) things on Earth were carried out, emphasising the notions of direction, distance, and connection. Space, where human activities were playing, was reduced to the spatial physics of movements, networks, and hierarchical connections on the earth's surface. In contrast to this concept, some scholars have replaced this concept of absolute distance by considering historical materialism in geography and moving it into space (Crang & Thrift, 2000). Some researchers, such as Anna Buttner, David Ley, and Yi-Fu Tuan, reminded geographers that humans do not live in geometric relationships but in a world of meaning (Hubbard & Kitchin, 2011). In particular, Tuan (1977) proposed the aesthetic and emotional dimensions of space. He argues that place is not tied to a particular scale. A place is defined and maintained by the sense of care as a consequence of people's attachment. This reflects on how people could feel desires and fears associated with a specific place (Tuan,

1977, as cited in Crang and Thrift, 2000). therefore, these thinkers conceptualised a place to be defined subjectively so that every individual could have different meanings and interpretations towards a place. In other words, a place means different to different people (Crang & Thrift, 2000).

The concept of space nowadays has been widely used. For example, some researchers, such as Amartya Sen, posit space in the middle of economic thought. From an economic perspective, space is associated with globalisation (Hubbard & Kitchin, 2011). Some others, such as Judith Butler, draw space in contemporary international relations. As a result, the concept of space, as argued by Crang and Thrift (2000), “is everywhere of modern thought” (Crang and Thrift, 2000, p. 1, as cited in Hubbard and Kitchin, 2011). This means the concept of space has started to be used in multidisciplinary domains and adopted from geographical thoughts into multiple ways of thinking to make sense of the world (Crang & Thrift, 2000).

Because “humans are attached by gravity to the surface of the planet” (Gans, 2002, p. 329), humans are inherently linked to and adhere in place. Therefore, there is a strong connection between spatiality and sociology (Gans, 2002). Place and space influence how people interact and organise themselves. Space is not a passive backdrop but an active component of human life that influences and is influenced by social actions. A place can also shape identities and personal bonds (Massey, 2005). As many social lives manifest and are maintained in space, I would like to bring this understanding to the core of my analysis, conceptualise the study location as space and, from that point of view, further investigate how social lives (in the study case) occurred in this space. Simply put, I will apply the concept of space to Jungut Batu's case and analyse what it entails in more detail using Massey's propositions about space. In the next subsection, I will explain why Massey's perspective on space can help to explore the study case in Jungut Batu.

3.2 Space from Doreen Massey's Perspectives

I will adopt theoretical lenses from Massey to analyse the dynamics within seaweed farming practices in Jungut Batu. This stems from Massey's positive view of space, which focuses on relationality. As emphasised by Anderson (2008), this idea aligns with modern human geography, which no longer perceives space as just a container for activities. Instead, any space or place, from a body to the globe, is seen as a complex network of relationships between multiple entities.

Doreen Massey's relational thinking on space is pronounced in her book *For Space* (2005), in which she proposes three intertwined propositions. The first proposition is that space is a product of interrelations. Various interconnected elements have made up space, including natural, social, political, economic, and cultural aspects. All places, ranging from the global scale to the intimately tiny scale, are produced through these relationships. Without these relationships, space does not exist (Massey, 2005; Anderson, 2008). This means that space is a dynamic sphere. It is always changing and shaped by new relationships and thus always in a state of being made.

As space is a dynamic sphere, this brings us to her second notion that Massey imagines space as a sphere of possibility, the existence of multiplicity, and coexisting of heterogeneity. This notion suggests that space is not homogeneous but rather characterised by various heterogeneous entities and trajectories (Anderson, 2008). As quoted in *For Space*: Space is a “sphere of the continuous production and reconfiguration of heterogeneity in all its forms - diversity, subordination, conflicting interests.” (Massey, 2005, p.61). This multiplicity implies that space inherently allows for the unexpected to happen (Anderson, 2008). As a consequence, Massey proposes the third notion that space is always in process and will never be a closed system. It relates back to the first notion that space is socially produced. Given that understanding, space is refrained from permanency, is never finished and is always an ongoing achievement (Massey, 2005; Anderson, 2008). A place like London or Newcastle, for example, does not have a fixed identity; rather, spaces need to be continuously created and recreated because relationships are always changing (Anderson, 2008).

Massey gave a practical example of implementing the three notions through an example of a train journey from London to Milton Keynes:

“At either end of your journey, then, a town or city (a place) which itself consists of a bundle of trajectories. And likewise with the places in between. You are, on that train, travelling not across space-as-a-surface (this would be the landscape – and anyway what to humans may be a surface is not so to the rain and may not be so either to a million micro-bugs which eave their way through it – this ‘surface’ is a specific relational production), you are travelling across trajectories. That tree which blows now in the wind out there beyond the train window was once an acorn on another tree, will one day hence be gone. That field of yellow oil-seed flower, product of fertiliser and European subsidy, is a moment – significant but passing – in a chain of industrialised agricultural production.” (Massey, 2005, p. 119).

While the example was clear enough to show how space operates, Anderson (2008) summarised it in a simpler way, as follows.

“In a journey you are not simply travelling *through* space or *in* space (that is from one named place – London – to another – Milton Keynes). This would make space into a single container within which other things will only happen. Instead, you minutely alter it. – if only a little bit by virtue of your presence in one place and your absence from the other place – and thus contribute to its being made. Yet, as space is altered – by your active material practices – the places are constantly moving on and changing as they are constituted out of process that exceed you.” (Anderson, 2008, p. 230).

Massey’s relational approach also underlined the phrase of a ‘global sense of place’ (Meegan, 2017). This notion promotes the idea that the internal processes do not exclusively define places but by their relational qualities, namely connections with other parts of the world (Kirkpatrick et al., 2018), as stated in *For Space* (2005):

“One way of thinking about place is as particular moments... intersecting social relations, nets of which have over time been constructed, laid down, interacted with one another, decayed and renewed. Some of these relations will be, as it were, contained within the place; *others will stretch beyond it*, tying any particular locality into wider relations and processes in which other places are implicated too. ... The global is in the local in the very process of the formation of the local.” (Massey, 1994, p. 120).

This notion relates back to Massey’s relational thinking, which argues that regions need to be viewed as open spaces connected by networks of social relations that variously stretch across them (Allen & Cochrane, 2007, as cited in Meegan, 2017):

“In this open interactional space there are always connections yet to be made, juxtapositions yet to flower into interaction (or not, for not all potential connections have to be established), relations which may or may not be accomplished.” (Massey, 2005, p. 11).

Again, according to Massey, space is open to progressive politics instead of being inert and static and can change how it is imagined and produced (Mageen, 2017). Using an example of the Southeast of England, Massey, John Allena, and Cochrane, in their book *Rethinking the Region*, show that regions have been created and are being created by political processes that both stretch beyond and impact unevenly on it in a way that challenges the fixity of its boundaries (Allen & Cochrane, 2007, as cited in Meegan, 2017). These political processes are governed by ‘regional assemblages’ consisting of national and local institutions, agencies, partnerships, businesses, and interest groupings. This assemblage operates through networks rather than conventional hierarchical arrangements, with its authorities stretching beyond the regions it addresses (Meegan, 2017). In short, Massey proposes the relationality, multiplicity and openness of space (Hubbard & Kitchin, 2011). Open as it is always changing and never finished. Open as it is always connecting to other places.

Another example of Massey’s view in space is her visit to Keswick, a town in the Lake District, UK. This place is characterised by the timeless romance of its hills, a predetermined collective identity rooted in their traditional farming and now modern tourism practices. Using her visit as an example, Massey contends that what is special about this place is its ‘throwntogetherness’. Anderson (2008) helped to translate this ‘throwntogetherness’ into the meaning of diverse elements coming together to alter a particular “here and now” (Anderson, 2008, p. 232), making this place special:

“This is the event of place. It is not just that old industries will die, that new ones may take their place. Not just that the hill farmers round here may one day abandon their long struggle, nor that that lovely old greengrocer is now all turned into a boutique selling tourist bric-a-brac. Nor, evidently, that my sister and I and a hundred other tourists soon must leave. It is also that the hills are rising, the landscape is being eroded and deposited; the climate is shifting; the very rocks themselves continue to move on. The elements of this ‘place’ will be, at different times and speeds, again dispersed (And yet, in its temporary constellation, we (must) make something of it.)” (Massey, 2005, pp. 140 – 141).

Using this illustration, Massey argues that a place's beauty lies in its 'thowntogetherness'. This 'thown togetherness', at the very moment, is what a place uniquely connects to its (open) identities. Relating it back to the study case, as identified in the literature review, seaweed farming in Jungut Batu is unique for its specific diverse economic activities, special geographical locations, embedded social relations and long, rich-rooted culture and history. "Thowntogetherness" is therefore hypothetically operated in this specific case.

Massey's thinking about space, therefore, will be utilised to see how the dynamics of seaweed farming in Jungut Batu can be understood. This means, using the framework of space, I will examine how seaweed farming practices are shaped by and contribute to shaping other aspects, highlighting their relationality. Also, seaweed farming consists of diverse components with different trajectories, a concept that Massey refers to as 'thowntogetherness'. These practices evolve over time due to social, economic and environmental factors. By applying the same idea of space, we can explore how these practices are interconnected. In the discussion, the operationalisation of space, 'thowntogetherness', and relational thinking that fit the case of the study will be explained in more detail.

4. Methodology

This study was grounded in qualitative research, with a keen focus on ethnography as its guiding principle. Qualitative research is best suited for answering the research questions. It relies on narratives that can capture details that numerical measurement might overlook (Auerbach & Silverstein, 2003). Using ethnography, the study followed the experiences embedded in the community, with an emphasis on an exploratory approach. This resonates with Bernard's (2018) arguments that human practices and behaviours are interesting and unique, and thus, the study of human practices is always exploratory and will likely be inductive. This approach allowed the researcher to remain open to a wide variety of findings that might be encountered throughout the research (Wa-Mbaleka & Rosario, 2022). Furthermore, the research relied on participant observation and semi-structured interviews to develop an in-depth understanding of the situated context. The study was centred on a bottom-up process, implying that the ideas are primarily generated with an open mind without predetermined results.

4.1 Ethnographic Research

Ethnography is a specific method in qualitative research. It seeks to understand people and their activities from their own perspectives. This involves studying people in their natural settings and observing their behaviours, culture, and social interactions (Coffey, 2018). Coffey (2018) argues that there is no set formula for designing ethnography research. However, the researcher should enter the field with conscious preparation. This preparation includes preparing the research questions, potential target groups and data collection instruments. Once entering the field, the researchers are encouraged to make initial engagement with the community through observation, listening, asking questions, and gathering hands-on data such as photographs from and about the setting (Coffey, 2018). Following these ethnographic principles, I gradually immersed myself in the lives of seaweed farmers. I did the ethnography for one month in Jungut Batu village, Bali. I specifically observed the Mangrove Conservation Area as the study location.

My fieldwork lasted from December 2nd to December 31st, 2023. As I had time constraints, I realised that a one-month duration might be too short for ethnography. However, I tried to involve myself as much as I could to understand the community I researched and optimised the given time. According to Coffey (2018), instead of being "caught" (p.7), data in ethnography is created through various interactions. These interactions occurred between the researcher, the community, and the field itself. I rented a room for my stay during fieldwork in the middle of the neighbourhood, in the '*rural*' part of the village. The village, according to locals, is divided into 'city' and 'rural' parts based on the facilities provided and types of activities. The 'city' part of the village refers to a specific area located along the main road and is dominated by tourism activity and business, characterised by the spread of 'modernity' and tourism facilities such as hotels, restaurants, and some bars. The '*rural*' part of the village is a specific area in the eastern part of the village, dominated by agricultural activities.

Compared to its neighbouring village, Lembongan Village, the size and population of Jungut Batu were way smaller. However, the village was not as quiet as I thought. Since it is located in Bali, the village has always been busy with human activities and interaction. On some days, such as weekends, more tourists would visit the village, making it more alive. Since the village was also prepared to be a tourist destination, it was common to find tourist facilities, such as stores, food street vendors, restaurants, traditional markets, homestays, and other facilities – which, all in all, the facilities provided in the village was ‘enough’ to provide one’s need compared to other villages I had been to in Indonesia. Most of the facilities were family businesses and locally developed. So, the quality of some facilities, such as homestays and restaurants, was not as fancy as in other places in Bali. There was only one big hotel owned by foreign businesses operated in Jungut Batu. As I did not bring much stuff for the fieldwork, these ‘enough’ facilities helped me fulfil my daily needs, especially for food. The room I rented was simply a bedroom and a private toilet with no kitchen, so I had to buy my food daily. Buying food was not hard as there were a lot of food street vendors, small restaurants and one traditional market in the village. I communicated and interacted with the villagers through these day-to-day activities. Some people even thought I was a worker from Java who just moved into the village.

The timing of the research presents its own challenges for the research. The rain intensity and humidity in December were higher since it was the rainy season in Indonesia. During the rainy season, intense rain affected the types of activities I could perform during the fieldwork. For example, there were days when I was stuck in my room and had to go to the farm later than usual due to heavy morning rains. Farmers, who usually cultivate seaweed in the morning, also could not do their jobs until the heavy rain stopped. As a result, the time I spent on the farm decreased, and I had to change my plan for the day accordingly.

Performing an ethnography, I employed two methods for data collection: participant observation and interview. Here are the details of my data generation methods:

4.1.1 Participant Observation

Observations were taken in as many circumstances as possible to collect valuable insights by watching and engaging in farmers’ activities. During the observation, I became an active participant. This means I was involved in the situation I observed. I watched, listened, performed, felt, and recorded the data to make sense of what happened in the field (Coffey, 2018). For instance, I observed my surroundings as soon as I arrived in the village. I tried to sense the village before getting to know anyone on my first day there. I used all my senses to understand how the village looked like, felt, heard, smelled, and so on. With Massey’s ‘throwtogetherness’ in the back of my mind, I tried to sense it. Everything I found interesting to the research during my fieldwork would be jotted down in the fieldwork notes.

I had two kinds of notes for my observation: digital notes on my phone and physical notes in a book. I would use the digital one during the day when I actively moved around and in fast-paced situations. On the contrary, I would utilise the physical book at night when summarising my daily activities. I used double notes; in case something happened with my phone, I still have a copy of it in a physical form. Sometimes, I would prefer to utilise my voice recordings to make the activity of taking notes more efficient. These notes and recordings would consist of brief explanations of what I had experienced in the field to be

remembered and reflected upon in the field diary. I was aware of the difference between raw data and interpretation. Therefore, I would copy and re-write the jottings into the *fieldwork diary* after a few days. While fieldwork notes consisted of jottings – brief explanations of what I saw and heard – with fewer interpretations, the fieldwork diary consisted of raw data *and* my understanding of the situated context during the fieldwork.

To understand the practices, I was involved in the farming process. Every day, I went to the farm around 7 a.m., when seaweed farmers commonly just returned from the sea and started their work on the land. There were around eight family seaweed farmers in the Mangrove Conservation Area. However, I could only meet five families since they were the only ones who actively produced seaweed during my visit. The other three families were inactive (from what I heard from other farmers, they were taking a long break from farming), and thus, they did not go to the farm. Therefore, I interacted and immersed myself in the activities of these five family farmers during fieldwork.

To approach farmers for the interviews, I would go from one family to another each day, depending on my data needs and their time availability. Finding the informants was not hard as farmers usually gathered in the huts. One family owned one hut. I went from one hut to another to find the informants. In general, all farmer families were very welcoming to accept and have a discussion with me.

I did the farming practices with the seaweed farmers, mostly working on the land, helping them sort and tie the seaweed. As I had no prior experience in seaweed farming, farmers would first teach me how to do the work. While doing such a job, I started to ask them some questions related to my research, which meant I gradually started the group interview session. I would ask permission to start 'asking questions' to people in the group. Therefore, the interview setting was always less informal since we did it in the middle of the work (see the interview subsection for a more detailed explanation). I found this approach much more effective than more formal and separate interviews. Farmers got more relaxed in that kind of setting, and our conversation went more natural. I would also be aware of participants' condition. For example, I would stop asking them questions if I noticed they started to get tired. I tried to create a comfortable environment as much as possible, especially in my position as a stranger there. An awkward moment sometimes happened, especially when I visited a new family. However, as I kept focused on helping them and did not be pushy in asking questions, the flow got better and, in the end, everything went naturally. I returned home in the afternoon, around 1 or 2 p.m, after we all finished the work on the land. Sometimes, I stayed longer to have more time to observe the conditions in the area. Especially, sometimes, more tourists would come in the afternoon after lunchtime.



Figures 4.1 and 4.2: Pictures of when I worked with farmers while interviewing them in the morning (left) and in the afternoon (right).

Source: Author's own work, taken during fieldwork (2023)

Besides getting involved in farming practices, I also attended some cultural events in the village. Farmers invited me to see their traditional rituals, such as the *Tilem* ritual, a ritual to celebrate a new moon phase. I was also invited to have lunch or dinner together with farmers on the farm or at their houses multiple times.



Figure 4.3: When I attended the Tilem ritual.
Source: Author's own work, taken during fieldwork (2023)

Focus Location of My Study

Fieldwork Diary – 4 Dec 2023

In the afternoon, I strolled around the village on my own, riding on a motorcycle. I tried to get myself familiar with the place where I would stay for the next month. Later, I learned that seaweed farming activities in the village not only occurred in the Mangrove conservation Area – the site always visited for the last days – but also along Mahagiri Beach, another area in the village, in the city part. However, I chose the Mangrove Conservation Area as the study locus as I could explore how different economic activities coexisted in one area, just like the theory of ‘thrown togetherness’. After consulting with my supervisor, I decided to focus my study within the Mangrove area.

4.1.2 Interview

I conducted interviews with 5 farmer families (19 participants in total). 18 participants were seaweed farmers, and one participant was a village official. The age and genders of the participants were varied. I conducted the interviews both individually and in group settings (see Appendix 2. Interview List).

I had one-time interviews with some participants and multiple interviews with others. Multiple interviews mean I visited the informants repeatedly for additional interview sessions. I did multiple visits because, after reflecting on their answers, I often needed to follow up with more questions or clarification. In addition, having an interview during work on the farm sometimes reduced my focus on their answers. So, it was better for me to listen to the recording and prepare the follow-up questions for the next day at night. Since I was relatively close to (some) participants, it was easier to arrange multiple visits. This approach helped me to dig deeper and gain more comprehensive information.

The interviews were conducted in a less formal style, as I briefly mentioned above. I would approach a group of farmers who were seen working in the hut. They usually sat together with their family members and labourers, working on seaweed. I came to the hut and opened the conversation by asking what they were doing and if I could join their work. As they welcomed me, I took a chair and sat with them, started to introduce myself, my background, and the purpose of my research. After that, I would ask for their consent for the interview and if I am allowed to record the conversation. With their consent and permission, I recorded the conversation using my phone. I started the interview with ‘warm-up’ questions. The questions related to their activities and their progress on the farm. After the atmosphere became more relaxed, I then continued to ask deeper questions following the interview guide I had prepared the night before. The questions and the flow of discussions remained open, relating to semi-structured interview principles. I followed the interview guide, but most likely, it was modified according to the situation. The interviews lasted for about 40 to 60 minutes. Sometimes, they lasted longer because the conversation got interrupted (e.g. farmers had to pick up children at school, they had to buy something

from the market, the buyers came in, etc.), and we had to stop the interview for a while. We continued the conversation again when the participants were ready (while still doing our stuff together on the farm).

Sometimes, I found farmers working alone, for example, when they dried seaweed in the field. This way, I could also approach them and propose to have an individual interview. Depending on the situation, the setting could change from individual to group or vice versa. We conducted the interviews in Bahasa. However, farmers usually spoke in their traditional language in their daily lives, which influenced their language structure and interpretations of certain words when speaking in Bahasa. Therefore, we usually took more time to move from one question to another. I had to reconfirm informants' responses or re-explain my questions in simpler words. After ensuring we were all on the same page, we moved on to the next questions and ended the interview once I gained enough information.

Besides the formal interview, I also generated data through informal conversations with people in the village. The conversation could take place everywhere, such as on the street, on the farm, on a boat, in the huts, etc; and almost on any occasion, such as during lunch, break time, house visit, etc. The topic of our conversation varied. It could relate to research questions, such as the conversation about their personal stories during the pandemic, their reasons for why choosing their current career path, and their business experience in tourism and seaweed farming. Nevertheless, the conversation could also be an open discussion about other topics unrelated to the research. These conversations helped discover new information that was not covered in the interview questions, make correlations between the findings, and confirm the information that had been retrieved from the interviews. I summarised the highlight points of these informal conversations at night and documented them in my fieldwork diary.

4.2 Data Analysis

I conducted data analysis in January 2024 after finishing the fieldwork. The process took about a month. I utilised ATLAS.ti to help me analyse the data by generating codes and thematic groups.

4.3.1 Transcribing

I conducted the verbatim and edited transcriptions to reduce bias. As previously mentioned, the language structure and word usage of each interview differed. Therefore, I had to transform the audio data into textual data word by word first (verbatim). Then, I edited the transcripts to make them cleaner and more structured for analysis (edited). I transcribed all of the interviews manually.

4.3.2 Coding

Coding helped me analyse the repeated ideas in the text and shed light on my research questions (Auerbach & Silverstein, 2003). I developed the codes both deductively and inductively using ATLAS.ti. Deductive codes refer to a predetermined set of codes generated by the researcher according to theories and research questions. Meanwhile, inductive codes refer to a bottom-up process where I developed codes as I analysed data (Small & Calarco, 2022). I developed coding deductively before going to the field

based on literature and sub-research questions. I made a table that contains sub-research questions, categories, codes, and descriptions of the deductive codes (see Appendix 3). From the deductive process, I developed 31 initial codes. Besides these codes, I further created more codes as I analysed the transcription of the interviews. These codes emerged inductively from the repeating ideas that informants mentioned during our conversations. From 19 interview transcriptions, I developed 201 codes in total, combining deductive and inductive codes.

4.3.3 Thematic Grouping and Interpretation

The next step was to classify the quotations from the text into groups. I organised the 201 codes into 36 groups, which were then further condensed into four thematic themes:

1. Historical Trends of Seaweed Farming and Tourism.
2. Local Seaweed Farmers' Perceptions.
3. Influence on Career Choices and Livelihood Decisions.
4. Aspirations and Long-Term Goals.

I used these four themes to construct the outlines for the result section.

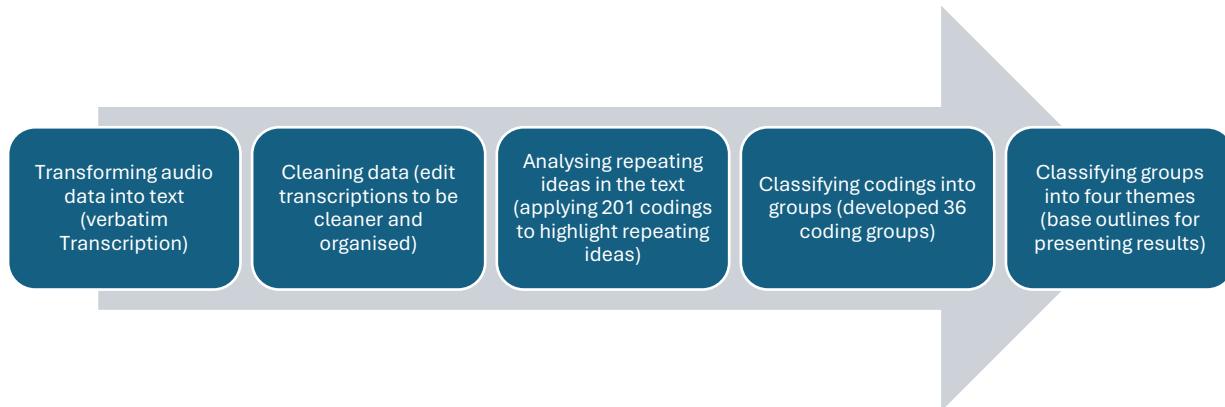


Figure 4.4: Data Analysis Process
Source: Author's own work (2024)

4.3 Ethical Consideration

I considered it crucial to obtain permission from the village government to conduct research in the village. I prepared a fieldwork letter and sent it prior to my arrival, making sure that my research activities would be under their acknowledgement. On my first day in the village, I came to the village office, accompanied by a local guide, to ask for permission and meet the authorities in person. It is part of Indonesian culture to show respect and build rapport with the local authorities and community members by introducing and

showing myself in person. After the research ended, I also notified the village government and expressed my gratitude for allowing me to stay there.

When conducting research, it is also important to approach the process with cultural sensitivity to honour the local customs and traditions. I tried to be mindful of the religious practices and ceremonies that are intrinsic to Balinese daily lives. To be able to blend myself better, I learned about their culture and traditions. I also learned about the common norms, habits, and boundaries of what is considered appropriate and not appropriate by communities. I did not provide financial incentives. Therefore, I tried my best to assist them in other ways outside the farm. For example, I provided my time to help female farmers make small baskets from coconut leaves for religious rituals, bought stuff from their stores, and helped them deal with foreign tourists who visited huts and stores. It was all just small things, but I aimed to support farmers both on and outside the farm. I believed that the things that seemed simple, such as listening to their stories and helping to promote the village through social media and word of mouth, could be significantly valuable for the communities. Some female informants even told me it was nice to have someone listening to their stories.

Furthermore, the informants had full autonomy and agency to decide whether or not they wanted to participate in this study. They had the right to continue, stop, or skip the questions during the interviews and refused my involvement in their activities. The activities of taking pictures and videos were also based on their consent and permission. To protect their privacy, I addressed the informants as anonymous in the report.

5. The History of Seaweed Farming

This section provides the first result of the study. In this chapter, we delve into the rich history of seaweed farming in Jungut Batu, exploring the narratives of its origin among the informants and analysing its evolution over time. This section mainly elucidates the various trends that have shaped seaweed farming and examines the significant impact of tourism on seaweed farming practices. I divide the time frame of seaweed farming development in Jungut Batu into three main stages. First, the stage when seaweed farming started to emerge (5.3); second, when seaweed farming started to fall (5.4); and third, when seaweed farming revitalised (5.5).

5.1 The Opening

The journey to Jungut Batu village was an adventure in itself. The journey began with a one-hour flight from Jakarta to Bali and then continued with a 40-minute car trip to reach Sanur Harbour. From Sanur Harbour, I headed to Jungut Batu by a speed boat, taking a 40-minute trip passing the ocean.

I arrived in the village on Sunday afternoon, just before sunset. My body was tired from the long journey, as I had travelled from Bandung – my hometown – to this village on another island – alone, with a big blue suitcase that was half my height – in my hands. This was my first time visiting Jungut Batu, so I had no idea what to expect.

Luckily, I had one person who would pick me up at the harbour once I arrived in the village. I had been in contact with the person since the fieldwork preparation process. I called him Wayan (not a real name), and he was very helpful. He had been helping me since the beginning of the fieldwork preparation, including helping me look for accommodation and transportation during my stay in the village. After waiting for about thirty minutes at the harbour, Wayan came by a motorcycle. He greeted me and asked me to get into a small pick-up truck – a typical transportation mode in the village that was used to pick up tourists from the harbour to their hotels.

The pickup driver was apparently his brother-in-law. I briefly introduced myself to him, and I got into the truck and sat in the back seat. The driver helped me to carry my suitcase and put it in the truck. The three of us then headed to where I would stay during the fieldwork. Wayan led the way on his motorcycle. The sun had already set, so it was a bit dark for me to be able to see my surroundings. However, along the way, I could feel my body sometimes moving from the seat as the road was not really in good shape. I also felt that this place truly was a tourist destination, as I saw some tourists here and there.

‘The touristy vibe’ was also something that I felt at Sanur Harbour. Perhaps because it was Sunday, thus the harbour was packed with tourists, both domestic and international. Sanur Harbour serves as a transfer point for travellers who aim to visit the nearby islands in Bali, namely Nusa Penida, Nusa Lembongan and Nusa Ceningan – which are the top three tourist destinations. According to what I heard from locals, tourists usually make ‘short’ visits to these islands to complement their longer stay on the mainland. Although the village I visited was a popular destination, I noticed that the infrastructure to support tourism

activity was still inadequate. For instance, the road was not well-maintained, and there were issues with clean water.



Figure 5.1: The entrance gate of Jungut Batu, saying “Welcome to the seaweed cultivation site in Jungut Batu Village, a partner of Mandiri Bank.”

Source: Author’s own work, taken during fieldwork (2023)

During the fieldwork, I decided to stay in a rented room owned by the locals. The landlord had two separate buildings in her housing area. The first building was used for her and her family's living space, and the second one was where she had multiple small rooms to rent. I lived in the second building with other tenants, and each tenant had their own separate room. My room was on the second floor, with two other families living on the same floor.

5.2 Welcome to The Mangrove Conservation Area

I started my new adventure in the village the very next day. I woke up early in the morning, had a quick breakfast, and got ready to go to the field. Wayan and I agreed to meet in front of my place at 10 a.m. The first activity we had was strolling around the village. Wayan drove the motorcycle, while I sat at the back. He showed me the surrounding area so I could navigate my fieldwork individually, even without him, in the following days. He said that the village wasn't too large, so we could easily go around it by motorcycle

in about an hour or so. However, that day, we decided to skip strolling around the whole village and head straight to a specific place where seaweed farmers usually gather to work. I decided to follow what he suggested.

As we were on our way, I noticed that motorcycles were the primary mode of transportation in the village. There was no public transportation like buses or online transportation such as *Grab* or *Gojek* – the typical online public transportation like *Uber* – which is very common in other regions of Indonesia. Therefore, it is normal to see people—locals and tourists, younger and older—ride motorcycles on this island at any time.

En route to the destination, we passed by the beach. While driving on the motorcycle, Wayan showed me some areas that used to be seaweed farms. His finger pointed out some spots in the ocean. "In the past, you could see the seaweed farm from here to there," he said while moving his hand from left to right as if he made an imaginary line to show me the location of what used to be seaweed farms in the past. "But now, most people have left seaweed farming, and the farms have all gone," he added.

Along the way, when we were about to reach our destination, we were greeted by some locals as we passed by on the motorcycle. It looked like people knew each other, and their bonds were obviously seen as strong. Wayan directly headed his motorcycle to one area where two farmers sat on a bench. One was a male, and the other one was a female; both were around their 60s. They seemed confused that two people were suddenly coming to their place, especially me – who, at that time, was still a stranger. Wayan parked the motorcycle and walked out to them. I was following him from behind. He then introduced me to them, and we started to have a conversation. *That was my first conversation with seaweed farmers in Jungut Batu.*

Later, I discovered that the area we just visited was called *Jungut Batu Mangrove Conservation Area (The Mangrove Conservation Area)*. The area is a famous tourist attraction in Nusa Lembongan, and it is a huge site where the mangrove forest is located. Both the water and land part of the area are used for tourism and seaweed farming activities. On the land part of the area, you will find restaurants, small shops, a place to book mangrove tours, and huts where seaweed farmers work. The water part of the area is filled with mangrove trees and places where seaweed is grown. Among seaweed farmers, it is common to call the area a 'working place'.

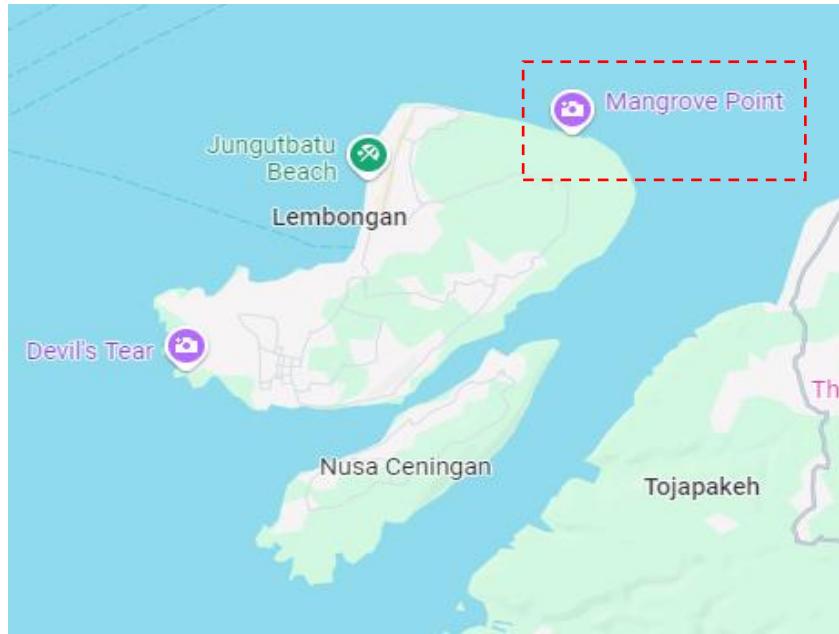


Figure 5.2: The Mangrove Conservation Area, which is the focus of the research, is located on a map.

Sources: Google Maps, Accessed in 2024

Historically, the area was a pristine forest without a touch of human activity. However, in 1980, the villagers started to see the potential of this nature and began utilising the area for various economic activities, including seaweed farming as the prominent one (Interview, 2023). Today, the area is a clear picture of the harmonious coexistence of tourism and local livelihoods. This place serves not only as a tourist hub but also as a place where the villagers conduct their farming work. Some people work in tourism-related jobs, like running mangrove tours or opening small restaurants. Meanwhile, others work in seaweed farming activities. This duality gives the area its unique characteristic, and it clearly has an important role in supporting the economy in the village.



Figures 5.3 and 5.4: Two main activities in the Mangrove Conservation Area. The left picture shows boats for Mangrove Tours gathered, and the right picture shows the area where farmers work on their seaweed.

Source: Author's own work, taken during fieldwork (2023)

5.3 Stage 1: The Emergence of Seaweed Farming

The literature about the history of seaweed farming in Indonesia, particularly in Bali, is relatively limited. Although some literature revealed that seaweed farming in Indonesia was originally brought from the Philippines, the beginning of seaweed farming in Bali, let alone in Jungut Batu, is still unclear. To understand its history, I combined the information from the literature with insights from locals during the interview.

The informants conveyed that seaweed farming has supported the village's economy for decades. However, before practising seaweed farming, the villagers mostly relied on salt farming for their livelihood. Besides sea salt farming, villagers also sold shells, which they gathered in the Mangrove Forest. Even in the past, villagers typically had multiple sources of income, and they often complemented them with fishing. Today, only two sea salt farmer families remain in the village. Most people now work either in seaweed farming or the tourism sector:

“Indeed, from the beginning before tourism, seaweed farming already existed. Before seaweed activities, the community here worked as salt farmers. And then, the community switched professions to look for ancient shells in the swamp, which are commonly used as porcelain materials.

Then, it was on to seaweed farming in the 90s until the end of 2008. After 2008 tourism took off. At the same time, seaweed farming declined.” - Village official, 2023.

According to what most informants argued, seaweed farming practices in Jungut Batu can be traced back to before 1985, with some of them estimating its inception around 1982. Although the practices have been passed on from generation to generation since the indicative year, most informants, especially younger farmers, were unsure about the precise origins: when and how practices began. This uncertainty arises from the absence of a shared narrative passed on from older generations. As a result, various narratives emerged among farmers. Regardless of the story, seaweed farming has been a part of village life for as long as the informants can remember.

My first informant, Informant 1, was the first seaweed farmer I talked to when I arrived in the village. According to him, he was one of the earliest seaweed farmers in the village. He has been involved in the practice since 1982. As he explained, a businessman from Sulawesi named Peter was the first to introduce seaweed farming to the village in around 1982. Peter gave free seaweed seeds and ropes to people who wanted to start planting seaweed for him. Informant 1 himself was also motivated to start seaweed farming after receiving these free seeds and ropes from Peter. He then found out that the seeds turned out to grow well.

Other informants, Informant 8 and Informant 9, admitted that they did not know exactly who initiated the practices in the village, nor did they know about Peter. They became a seaweed farmer later than Informant 1, in the 1990s. However, they believed that their community leader at that time, Luh Tarsin, was one of the pioneers. They shared, "Some believe that Luh Tarsin was the pioneer of seaweed farming here. I don't know if that's true. But for sure, he was the one who got the Kalpataru award¹ for developing seaweed farming here". They added that the Kalpataru Award was even shown to the public in one of their biggest traditional rituals, *Ngaben*.

The village official also mentioned a similar story. He explained that Luh Tarsin might have been the first to introduce seaweed farming to the villagers. Although he was not really sure about that, one thing he was sure about was that Luh Tarsin was the one who received the Kalpataru Award, which signified his role in developing the seaweed sector in Jungut Batu. He described that as a community leader, Luh Tarsin greatly influenced the community.

5.4 Stage 2: Tourism Resurgence and Reducing Seaweed Farming

Seaweed farming has been a vital part of the culture and economy of Jungut Batu for generations. However, around 2000, tourism began to flourish, and many foreigners established businesses on the

¹ Kalpataru Award is a prestigious recognition given by the Indonesian government to individuals or groups who have significantly contributed to environmental conservation and forestry.

island. This significantly impacted the local economy and livelihoods of the villagers. Tourism provided new job opportunities for the locals, such as restaurants, stores, homestays, and motorcycle rentals. As a result, many villagers who were previously engaged in seaweed farming shifted their focus to these emerging opportunities. Starting in 2013, the tourism sector rose significantly (Informant 14, 2023). In one formal conversation, one informant indicated that around that year, almost 90% of villagers worked in tourism. The reason why the tourism sector could successfully flourish in the village was because, apart from the growing job opportunities, the shift was also fuelled by a decline in seaweed production and prices. The village's overall seaweed production decreased as more and more farmers left seaweed farming, which weakened seaweed prices in the market. Contradicting what I read from the literature, one informant stated that many youths who had lived outside the village (e.g. in Bali) returned to Nusa Lembongan to work in tourism during those peak years (Informant 14, 2023).

Moreover, there was a domino effect when more farmers left seaweed farming. The decline in the number of seaweed farmers made the farming situation worse. With only a few seaweed farmers remaining, it became increasingly difficult to manage the challenges, such as protecting seaweed plots from fish attacks. Failed production due to excessive fish attacks, as all informants agreed, became one of the main reasons why they left seaweed farming. With fewer farmers to guard the plots, the risk of fish attacks increased, leading to further losses in seaweed production. All of those factors contributed to seaweed farming becoming less profitable and prompted more farmers to leave the practice. They then replaced it with tourism-related activities, which at the same time had a demand. By 2018, seaweed farming in the village was completely abandoned. From some informal conversations, it was also revealed that a lot of youth left farming to pursue better job opportunities in tourism. Some of them moved to Bali to look for better jobs in tourism.

5.5 Stage 3: Seaweed Farming Revival

The main reason why seaweed farming returned to the village was because of the paralysed tourism sector due to the COVID-19 pandemic that hit in 2020. The busy restaurants, lively tour offices, and bustling tourism activities that once added to the charm of the village were now facing a period of uncertainty and became silent during the pandemic. "It was a difficult time for everyone in the village", as one informant described. The villagers at that time abruptly lost their jobs in the tourism sector. Many businesses, small, middle, and big, were shut down. The lockdown period was the hardest time for the villagers since no visitors were coming to the village.

Actually, people were still relying on the tourism sector during the early period of the pandemic. As many informants highlighted, people still remained hopeful that the pandemic would soon come to an end. Many villagers thought that the lockdown would only last for a short period of time, ranging from 2 to 3 months. They remained optimistic while counting the days, waiting until the lockdown was lifted. However, the pandemic lasted for much longer than they had anticipated.

“I waited until tourism recovered. At that time, there was a lockdown, right? So, we kept waiting for the lockdown to end. Maybe next month, maybe next month, and we kept waiting for five months” – Informant 7, 2023.

Another informant also conveyed a similar statement:

“Indeed, when the pandemic happened, we waited for the first year for tourism to reopen. We thought it would be over after three months; then, we waited for six months until it finally continued for more than two years. It was only after a year had passed that seaweed farming activities revived.” – Informant 14, 2023.

The paralysis of tourism during the pandemic profoundly impacted the villagers. Their primary source of income, which had been flourishing in the last years, had to stop abruptly. Informant 7 shared his story that he had already used up all his savings to provide for his family during the pandemic. It left him with no other option but to return to seaweed farming.

“I don’t have any other options. So, I inevitably had to work like this. I also used to think that ‘when I grow up, I don’t want to work in seaweed farming’.” – Informant 7, 2023

Although it was not an easy option, Informant 7 considered working in seaweed farming as he saw the opportunity in the market. He used to work as a fisherman and hotel employee before the pandemic and thus had no prior experience in seaweed farming. The quality of seaweed during the pandemic was good, and demand for its production was relatively high. Informant 7 highlighted that he did not want to pass on the opportunity, saying that returning to seaweed farming “would allow me to earn some income instead of being jobless with no source of income...” After the pandemic, he continued working as a seaweed farmer while juggling his job as a hotel driver.

Informant 7 was not the only one who struggled during the pandemic. All of the informants expressed the same struggles and concerns,

“...during the pandemic, it was very difficult to live. People who had never been involved in seaweed before finally jumped into planting seaweed. They worked to make a living, to keep themselves busy, too. But the main reason was to make a living.” – Informant 1, 2023.

“It was because there was no other work available in the village. Everyone is unemployed” (Informant 8, 2023) or “when the pandemic happened, the tourism business disappeared, and everything was killed” (Informant 1, 2023) became the common reasons why the villagers returned to seaweed farming.

The Informants also highlighted their mixed feelings about the uncertainty of waiting for the pandemic to end, which often led to a great deal of frustration and disappointment. One remarked, “We are all waiting for the tourists to come here again. We waited for two months, three months, and so on, but no one came.” (Informant 11, 2023)

All informants described the quality of seaweed during the pandemic as excellent, better than the last few years before tourism flourished, with vibrant shades of green and a healthy texture. This might be due to the better water quality and the environment during the pandemic since tourism activities were at a halt. This high-quality seaweed was seen as an opportunity amidst the catastrophe: “So, it’s not bad to start farming again to increase income” (Informant 11, 2023).

People in the neighbouring village, Lembongan Village, were the first to revive seaweed farming. The success of this action then inspired their neighbours in Jungut Batu to do the same. As a result, more buyers came to the island, and the demand for seaweed grew.

“People in Lembongan village already knew; they had heard the news that seaweed growth was good during the pandemic. So, people in Lembongan had started planting seaweed earlier than us. At that time, people in Jungut Batu had not planted seaweed yet.” – Informant 11, 2023.

Informant 11, one of the earliest farmers to revive seaweed farming in Jungut Batu, revealed that he bought the seeds from Nusa Penida. Nusa Penida is a bigger island next to Nusa Lembongan. Unlike Nusa Lembongan, seaweed farming in Nusa Penida has never stopped, and thus, the seeds were always available there. As days turned into weeks and months, the number of people in Jungut Batu returning to seaweed farming began to rise. The villagers, one after another, followed in the footsteps of Informant 11 and a few other farmers who took the initiative. Many of them did not have prior experience in seaweed farming and started the practice only to survive. Around one year after the pandemic hit, the main economic activity in the village had returned to seaweed farming, with almost 90% of the villagers becoming seaweed farmers (informant 1 & 11, 2023).

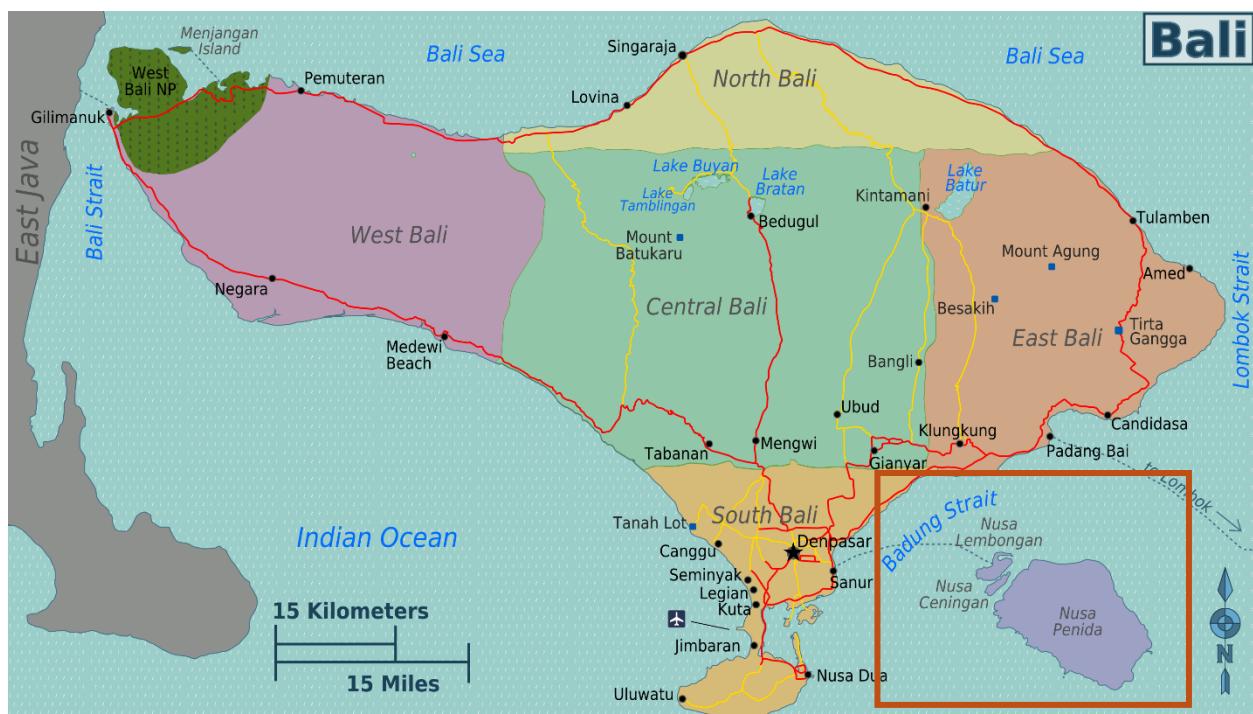


Figure 5.5: Nusa Lembongan, located between other two islands: Nusa Ceningan and Nusa Penida.

source: <https://aroundtheworldtravels.co.uk/bali-where-to-go-what-to-do/> (Accessed in May 2024)

How People Revived Seaweed Farming

Informant 11 shared his experience when he first attempted to revive seaweed farming. He used to be a seaweed farmer in the 90s, but stopped the job and shifted it to tourism in 2010. During the lockdown period, he was one of the earliest to take the initiative to revive seaweed farming in Jungut Batu. He stated that the journey to start farming again was not easy for him. He no longer had the tools, and the money to buy seeds and new tools was also limited.

One day, he took a step and made the trip to Nusa Penida, accompanied by his son, to look for the seeds. He gained information on where to buy the seeds from his colleagues in Lembongan. He moved from one place to another in surveying high-quality yet affordable seeds. He made the trips in the afternoon and spent one night in Nusa Penida. The next morning, He came back to the village with some seaweed seeds and new tools in hand.

In Nusa Penida, Informant 11 and his son had to travel quite a distance to reach the seedlings' location. Once the seeds were purchased, they rented a car to transport all the seedlings to the harbour. At the harbour, one of his workers would pick him up by a ferry. A single ferry could carry around 500 ropes of seaweed or approximately 500 kg. However, in the beginning, Informant 11 could only afford a small amount.

Transportation could also be a problem for some farmers. In Informant 11 case, he was fortunate enough to own a ferry to carry all of his seaweed from Nusa Penida to the village. His other colleagues often did not have a ferry and were required to rent one. The cost of renting a ferry was around Rp 600.000 (around 33 USD) for one round-trip journey. For some farmers, it was considered expensive, given their low income. To reduce the transport cost, some farmers often rented a ferry collectively. Other options, they bought the seeds from their colleagues in Nusa Lembongan.

5.6 Sub-Conclusion

This chapter provides results related to the history of seaweed farming in Jungut Batu, particularly answering the first sub-research question: *What are the historical trends of seaweed farming in Jungut Batu, and how has tourism development affected these trends?*

The history of seaweed farming in the village can be classified into three main stages. The first stage focuses on how seaweed farming first started in the village. The second stage looks at the rise of tourism and how it led to a decrease in seaweed farming. The final stage examines how seaweed farming made a comeback during the pandemic. This approach gives us a more in-depth understanding of the background and state of seaweed farming in the village over the years.

Seaweed farming in Jungut Batu has experienced significant shifts over the years and tends to fluctuate, influenced by various factors. The practice, which began more than 40 years ago, was deeply influenced by the village's geographical conditions and tradition (e.g. strong influence from community leaders). Despite its fluctuating production, seaweed farming has consistently played a vital role in supporting the

village's economy, either as a primary or a complementary sector. Reflecting on the evolution of seaweed farming over the years, it is evident that this sector did not come from the top-down but rather emerged from the community itself. The practices were enacted based on self-organisation, and most initiatives came from the lowest tier (local farmers).

Seaweed farming in Jungut Batu is estimated to have begun around 1982. Although seaweed farming has a long-standing history, there has never been the same narrative on how the sector emerged for the first time due to a lack of shared stories among the villagers. From the conversations, two narratives can be drawn. First, it was driven by the initiatives some businessmen from other regions took. Second, it was influenced by their community leader, who had a significant role in further developing the sector. Regardless, the bottom-up approach in this case is characterised by initiative, spirit, and strategy that emerge within the community, rather than being established by an external institution such as the government. The growth of this sector – before and after the revival – was largely independent, with little government intervention. The nature of its growth suggests a strong sense of autonomy and resilience among the community, as they have successfully – multiple times – overcome the challenges of seaweed farming, largely on their own.

The turbulence of seaweed farming happened around the year 2000 when the tourism sector started to peak. Locals shifted their professions to tourism-related activities for better income opportunities. Internal challenges within the sector, such as lower quality, intensified animal attacks and price fluctuation in the market, coupled with external influences, such as the increasing demand in the tourism sector, further worsen the decline in seaweed farming.

The villagers' shift from seaweed farming to tourism-related activities demonstrates their adaptability to changing economic situations. Without prior experience and enough support, people 'jumped' into tourism only to expand their safety net. The environmental changes that intensify predators and pathogens also highlight the significant impacts of climate change on the most vulnerable groups, namely seaweed farmers. They often lack the resources and capacity to implement adaptation strategies for their crops. In the end, switching occupations is one way to cope with such a harsh situation.

The COVID-19 pandemic in 2020 brought back the seaweed farming practices. For quite some time, seaweed farming became the primary activity in the village, replacing tourism. The villagers came back to this sector because of two main reasons. Firstly, they had no other job options available. Secondly, farmers saw the opportunities as the demand rose. The shift provided a much-needed source of income during a challenging time while fostering a sense of community and resilience among the villagers. Once again, the change that comes from within, at the grassroots level, demonstrates the community's adaptability and flexibility in navigating their livelihood, making strategies, and collecting the resources needed to survive.

The findings are relevant to what Torell et al. (2017) argue that seaweed farming is often proposed as an "alternative" or "supplemental" livelihood by local communities. The reason for this is that seaweed farming could provide a relatively steady yet small income for farmers. Larson (2015) and Rimmer (2021), who conducted similar studies highlighting the economic advantages of seaweed farming in Indonesia, shared the same findings. Looking at the study results, the role of seaweed farming in supporting the

livelihood of the informants is transient. This means while seaweed farming could provide immediate support when tourism collapses, it might be vulnerable in the long term to support the village's economy, as shown by its fluctuating general trends. In the 80-90s, it previously became the primary source of income. After the emergence of tourism, seaweed farming has tended to be perceived as a 'backup' sector when the primary economic activity collapses.

6. Seaweed Farming Practices and Farmers' Perceptions

This chapter explains the practicality of seaweed farming in more detail. It provides an in-depth look at seaweed farming practices as well as farmers' perceptions of the sector. In 6.1, I disentangle core activities, business processes, and labour allocation in seaweed farming. Understanding these practices helps us comprehend seaweed farmers' views on the sector, which is explained in 6.2. Specifically in 6.2, I get across farmers' perception of seaweed farming compared to their experience in tourism.

6.1 Practices in Seaweed Farming

6.1.1 Core Activities

The core activities of seaweed farming can be viewed as a cycle that begins with site selection and ends with post-harvest processing, after which the cycle begins anew with the next planting season. Keep in mind that the techniques used by seaweed farmers in each step of the process can be different for different locations, depending on the seaweed type and environmental conditions. For example, the security technique used by farmers in the Mangrove Conservation Area might be different from the technique used by farmers in the Mahagiri Area, even though both areas are located in the same village. I will unpack each practice as follows.

Seaweed farmers in Jungut Batu will select locations for growing seaweed solely based on their intuition, without following any predetermined criteria. For instance, they believe that a plot located closer to the middle (of the ocean) is better than one situated on the sides (close to the land), but they are not entirely sure why this is the case. The prediction is largely based on their years of experience, which has helped them develop an understanding of where and what makes a location suitable for growing seaweed. One farmer conveyed that he may know how to select the best location plots for planting his seaweed, although sometimes his prediction can go wrong:

“Because I have decades of experience, I know a bit better when the good and bad months for growing seaweed are and where the good and bad locations are. While my predictions are not always accurate, they are rarely wrong.” - Informant 1, 2023.

Farmers tend to select multiple locations scattered across the ocean to minimise risks. By doing so, farmers can disperse the risks and ensure that even if one location is affected by bad weather or animals, the other locations will not be affected. That way, farmers can increase the chances of a successful harvest and minimise potential losses.

In the Mangrove Conservation Area, fish is the main predator of seaweed. Farmers in the village have developed their own strategy for reducing seaweed losses due to fish attacks. They tend to select locations that are close to each other. Having a gathering location, they believed, would increase the quantity of seaweed in one area and thus reduce the individual loss when fish attack their seaweed.

As a security measure, farmers will protect their seaweed farms with nets stretched across the ocean between wooden stakes circling around the plots. The wood's roots grip tightly to the seabed. These barrier nets serve as guardians, protecting seaweed from animals and currents. Farmers will monitor the seaweed daily in the morning and afternoon. They will also make sure the tools on the ocean are maintained, for instance, regularly replacing crushed nets and wooden stalls with new ones.



Figures 5.6 and 5.7: fishing net to guard seaweed plots.

Source: Author's own work, taken during fieldwork (2023)

Informants select seaweed species based on local conditions and ecological compatibility. Over the years, three types of seaweed species have been used and cultivated in the area. In the beginning era of seaweed farming, farmers grew *Spinosom*, a kind of red seaweed with a relatively small size. However, after some years, *Spinosom* could not thrive anymore. As a result, farmers transitioned to growing *Cottonnii*, which for many years became the primary seaweed species cultivated in the village. Again, after some time, *Cottonnii* could not thrive. The informants could not pinpoint the exact factors that failed the seaweed growth. However, they assumed it might be because of the water quality and changes in water temperature. Today, *Sacol* is the only species that can grow healthy in the area.

Informants mostly bought *Sacol* seeds from farmers in Nusa Penida. One informant shared his story on how he transitioned to *Sacol*. According to him, a seaweed collector from Nusa Penida visited the village and gave farmers the *Sacol* seeds to grow, which they later found out that *Sacol* could grow well in the area. Since then, *Sacol* has become the preferred type of seaweed that farmers grow.

Farmers in Jungut Batu implement a cultivation technique similar to what Kasim et al. (2022) would describe as Long-Line Cultivation. This method includes tying seaweed to a long-line rope and stretching it across the water. The seaweed is tied apart 20 cm along the rope, with each weighing around 1 kg. Farmers anchor the ropes at both ends with wooden stakes across the ocean.



Figures 5.8 and 5.9: Farmers cultivating seaweed in the ocean (left) and a farmer showed me how the young seaweed looked like (right).

Source: Author's own work, taken during fieldwork (2023)

Farmers harvest mature seaweed when it has reached the desired size, typically after 25 to 30 days. They harvest mature seaweed traditionally using their bare hands. They lift the seaweed from the water, put it in a rotan basket, and bring it back to the land. Depending on how much seaweed they cultivate, farmers can spend an average of 3 to 4 hours in the ocean to complete the harvesting process. They sometimes bring their food to the plots and take a short break in between.

The next phase of work begins on the land. With the help of other family members and labourers, farmers untie the fresh seaweed from ropes. They carefully select and cut the parts of the seaweed. Fresh, good-quality fragments of the seaweed will be used as seedlings (propagation). The remaining parts are put in a basket to be dried under the sun. This dried seaweed is then sold to buyers.

Seedlings are neatly tied to a rope and placed in parallel rows, spaced approximately 20 centimetres apart along the rope. Depending on how much seaweed they would like to produce, farmers could propagate seedlings from their fresh seaweed or buy new seedlings from other farmers.

The seaweed drying process takes an average of 3 to 4 days, but this can vary depending on the weather. During the dry season, when the sun is shining bright and there is less intense rain, the seaweed can dry out in about 3 to 4 days. On the contrary, in the wet season when the rain is more intense, seaweed can dry out in longer days and take about 5 to 7 days. The longer the time to dry seaweed, the lower quality farmers will get.

When seaweed is wet, it contains a significant amount of water. As it dries out, the water inside evaporates, reducing its weight and size. Drying seaweed can reduce its weight by about 70%. Therefore, the longer it takes for the seaweed to dry, the lower the weight it gets. As a result, farmers will have less quantity of production. This means that weather heavily affects seaweed production. Too much rain can cause a longer drying process, while too much sun can cause seaweed to rot in the sea.

Farmers build huts to facilitate their everyday practices. In the past (in the 1990s), a hut also functioned as a house for some farmers. Today, a hut is only used to protect farmers from the sun and store farming tools. Dry seaweed ready to sell is also stored inside a hut.

Seaweed Farmers' Huts

A hut was typically built in a simple yet functional structure. It appears to be open, sometimes without doors or windows, providing natural light, easy access and ventilation. It has a corrugated metal roof supported by wooden beams above, and the walls often are made from woven materials. Most huts do not have floors; their floors are the very earth itself – sand and soil. Farmers would spread out thin tarps to cover the floors where the seaweed was being sorted and tied. People would gather around, sitting around a bunch of seaweed when sorting and tying them. Inside the hut, the seaweed will be stored in woven baskets. The farmers would carefully arrange the seaweed to prevent any damage or contamination.



Figures 5.10: Seaweed farmers working in a hut.

Source: Author's own work, taken during fieldwork (2023)

6.1.2 Division of Labour

According to interviews, both male and female farmers are generally responsible and can do each practice in seaweed farming. Some female informants told me that they used to conduct all of the farming practices in the ocean and on land. Therefore, in terms of practicality, both male and female farmers did not have rigid rules for dividing their tasks. Both genders could even sometimes have the same workload on the farm.

During high season, like during the Covid-19 pandemic and in the '90s, it is common to see the whole family work on the farm. The family would even take their children to sea. The children stayed in the boat while their parents carried out the tasks.

"Yes, everyone went out to sea during the pandemic because there was nothing to do on land. Even the children went to the sea. However, they (the children) didn't work; they just played at sea." – Informant 8, 2023

However, in recent times after the COVID-19 pandemic, when the number of productions dropped, the distinction between male and female farmers in roles became much more obvious. Male farmers are typically engaged with physically demanding tasks and marketing roles, such as constructing and maintaining the plots, harvesting seaweed and bringing it back to the land, and bargaining. Meanwhile, female farmers tend to handle processing activities on the land, pre- and post-farming, such as helping male farmers prepare seedlings and store seaweed in the huts. There is also a difference in working hours. Male farmers tend to work way longer than female farmers on the farm. I will explain these roles in more detail as follows.

Male farmers

Male farmers typically begin harvesting seaweed at dawn. They set their schedules according to lunar conditions, as the moon affects the tidal patterns in the oceans. Male farmers schedule their activities according to these tidal conditions, so their schedules can change every few days.

In the period during my fieldwork (December 2023), farmers set out to the sea at around 4 a.m., which they believed was the ideal time for harvesting seaweed as the tides were low, and the water was still relatively calm. They spent around 2 to 4 hours in the ocean to collect seaweed, depending on the quantity of seaweed they would harvest. Since seaweed production was not as high as during the pandemic, male farmers were the ones who were accountable for harvesting seaweed from the ocean. Meanwhile, female farmers stayed home and began working on the farm at around 7 in the morning. What female farmers did before coming to the farm was predominantly finish house chores, including serving food for daily rituals, preparing breakfast for the family, cleaning the house, and dropping kids at school.

Each male farmer had a different specific schedule for setting out to the sea, depending on their preferences and other business during the day. For example, Informant 7 preferred to set out to sea at around 2 a.m. because he had to work a side job at 9 a.m. On the contrary, Informant 10 preferred to set out a bit later, around 6 a.m. Despite the variations in their schedules, one commonality is to set the sail in the early morning, as shown in some answers below.

Informant 1: "I've been here since morning. I'm usually here (on the farm) from 4 a.m. I can't sleep from 3 a.m."

Informant 7: "It depends on the low tide. If the low tide is at 2 o'clock, I'd go to the sea at 2 o'clock. If I go out to sea at 2 o'clock, I finish the task and can come back to land at 4 or 5 o'clock in the morning. The other family members will be here by 7 a.m."

Informant 10: "I've been here since morning. I usually get here by 5 o'clock, but it depends on when the sea recedes. So, it could be 2 or 3 in the morning. It depends on the low tides."

Informant 5: "My husband goes to the sea at dawn and waits for the tide to recede. So, it's actually uncertain when he goes to the sea because it depends on the tides. But my husband usually leaves at dawn and is back on land by 6, 7 or 8 in the morning."

There is no specific reason for setting out such a schedule other than to accommodate seaweed planting in the afternoon. Two informants mentioned that they find it more efficient to harvest seaweed from the ocean in the morning because it leaves them with spare time to work other jobs in the afternoon (either in seaweed farming, such as drying and planting seaweed, or in the tourism sector)

"...because I'm used to harvesting at dawn. If you finish harvesting in the morning, you can plant and tie seaweed in the afternoon since people will be available to help in the afternoon."

Informant 1, December 2023.

Male farmers would bring fresh seaweed collected from the ocean to the land. The fresh seaweed would then be untied from the ropes and cut as it propagated. This work is done collectively with other family members and labourers. They would spend around 6 to 7 hours untying, cutting, and tying seaweeds, starting from 6 or 7 a.m. and finishing at around 1 p.m.

Male farmers brought back the ready seaweed to plant to the sea. They went in the afternoon, around 2 or 3 p.m. when the sea tides were slightly higher. These schedules have become a part of male farmers' daily routines. As I mentioned, in the past, both male and female farmers used to go to the sea to harvest and plant seaweed. However, the habit has changed recently, and only male farmers are responsible for harvesting tasks.

Female farmers

As the first light of dawn breaks, the female farmers would begin their day. They wake up early, often before the sun, to ensure that all household chores are completed. This includes preparing children for school, cooking for the family, and serving *canang*². Each family in Bali serves *canang* for their daily prayers at least two times a day in the morning and evening. It is served in a tiny rectangular woven basket placed in front of the house. In Bali, women traditionally are responsible for this specific task. Not only for daily prayer but also for preparing *canang* for bigger traditional rituals. Once the domestic duties at home are taken care of, they leave for work.

Female farmers commonly arrived at the workplace between 7 and 8 a.m., ready to start farming practices. Their duties were to help the husbands sort, tie, and dry the seaweed. They typically finished

² *Canang* (some people call it *banten*) are offerings in Bali culture and Hindu rituals. These offerings are usually made from rice, fruits, biscuits, sweets, coconut leaves, and flowers and are placed in various places such as homes, temples, streets, and schools.

the tasks at lunchtime. Working hours would be much longer at high season, lasting a whole day. Since seaweed production has recently decreased, the workday is not as long as it used to be (only 7 to 8 hours).

After completing their farming tasks, some female farmers go home and do the chores. Others stay at *working place* to do other side jobs, such as managing small restaurants and stores.

Informant 5: "I just went home in the afternoon. When I get home, I do a lot of cleaning, washing, and cooking. I'll come back here tomorrow at 7 am. I'll take my son to school first in the morning. My husband usually comes here earlier because he must harvest seaweed."

Informant 9: "I go back home to take care of my home and parents."

Informant 8: "I'm here until the afternoon because I look after the restaurant. I also wait for the seaweed to dry. I cook for visitors."

Labourers

I explain labourers separately to distinguish their roles. One family usually hires one or two labourers to help with their farming tasks. The labourers arrive at the workplace around 7 or 8 a.m. Their main task was to help farmers select young seaweed, sort it out, and tie it with ropes.

"The labourers would come at 8 o'clock and help tie the seaweed until 12 and 13 o'clock in the afternoon as well." - Informant 11, 2023.

During my visit, all the hired labourers were women. The labourers were paid according to the amount of seaweed they had tied. They were paid periodically, for instance, after finishing 50 ropes of seaweed. Labourers could work for more than one family farmer. They would finish their job in one family and then move on to another one.

The labourers I interviewed chose the job because it was an easier option for them. Firstly, most of them did not have money to buy seeds and tools for farming, so working for other people would be financially handy. Secondly, the workload was lighter, and the working hours were shorter. Their main responsibilities were helping farmers to sort out the seaweed, free from construction tasks. They would also have shorter times if they worked only for one family and thus could do other jobs. Thirdly, some of them did not have enough human resources to conduct the farming. For example, Informant 9 was the only one in her family who worked in seaweed farming. Her husband did another job at the market, and their kids were still in school. Therefore, it was easier for her to earn money by working as a labourer.

6.1.3 Business Chain and Utilisation

Before reaching out to companies, seaweed passed through a long business chain. It starts with the local farmers who harvest and cultivate seaweeds on the farm. These farmers sell their seaweed to small collectors, either local collectors in the village or outside the village. These small collectors usually collect seaweed from multiple local farmers. In the bargaining process, these small collectors will visit the farmers in the village, offering prices according to the seaweed price in the market. However, during this process, small farmers often followed what small collectors said (almost blindly) because they lacked knowledge

and information. When the two parties agree on the price, the transaction occurs. After that, small collectors will market the seaweed to bigger collectors, who trade the seaweed to companies or merchants.

During the fieldwork, I did not have a chance to interview other key players other than the farmers themselves. So, the information I gained about the business process was limited. Below the diagram shows the process in seaweed supply value chain according to interviews with local farmers.

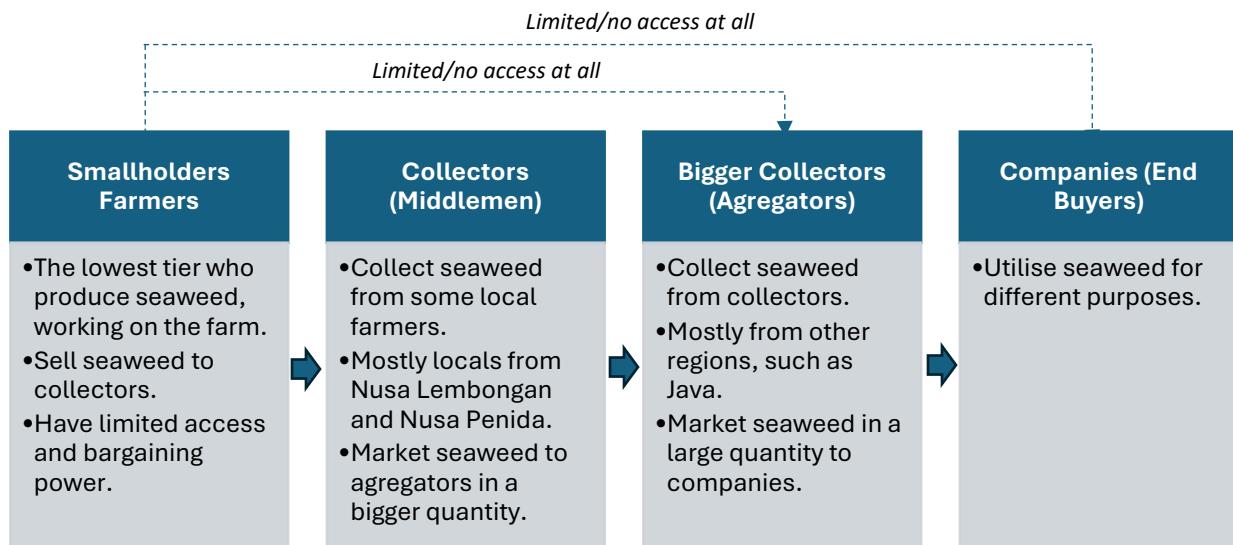


Figure 5.11: The key players and business processes in the seaweed farming supply chain. Local farmers often lack access to reach out to the market.

Source: Author's analysis, according to data gathered during fieldwork (2023).

During the interview, I included questions about how seaweed was being utilised and marketed by the industry. I read a lot about seaweed utilisation in the literature, but I wanted to cross-check it with farmers. However, most informants conveyed that they had little knowledge about it. They mostly had never seen the end product of seaweed. They also did not know where and to whom their seaweed was sold along the business chain. They only heard from some people or read online that their seaweed was utilised by industry for various reasons. They also heard that some of their seaweed was exported to some countries in Europe and Asia, such as China.

Informant 1: "The seaweed is processed for food, cosmetics, or medicine. I also don't know much about it. As a farmer, I only know that much. *I only hear what people say.*"

Informant 7: "*I was told* that the results are exported. But I also don't know where it is exported. I was only told by other people. Then they said that this seaweed is processed into medicinal ingredients. But I've never tried it."

Informant 22: "Most seaweed is shipped to Surabaya. The big factory is in Surabaya. The seaweed is concentrated and made into flour. The seaweed that is sent to China and Japan is made into noodles. Seaweed taken to Europe is processed into cosmetics. *That's what I read yesterday.* If I'm not mistaken, the quality of seaweed in Nusa Lembongan is the best."

6.2 Seaweed Farmers' Perception of Seaweed Farming Compared to Tourism

This sub-section explains the informants' perceptions of seaweed farming compared to their tourism jobs. It helps us understand why some farmers opted to continue or discontinue seaweed farming despite the struggles and allure of tourism. I analysed the factors based on time flexibility, profit and return, initial capital, competition, and environmental benefit. These factor classifications emerged from the repeating ideas conveyed by the informants during the interview. This information will be useful in dissecting the advantages and disadvantages of seaweed farming from the actors' perspectives. This sub-section sets a foundation for understanding seaweed farmer's strategies for navigating their livelihoods, which will be further discussed in the next chapter.

6.2.1 Time Flexibility

Unlike some occupations in the tourism sector that require strict adherence to a set schedule, all informants agreed that seaweed farming often allows farmers to work more flexibly. Farmers can tailor their schedules according to their personal needs. The pattern, in general, would be: farmers generally set out to the sea twice a day, at dawn and in the afternoon, following the tide conditions.

Female informants, in particular, emphasised the benefit of this flexibility. This time flexibility can be beneficial since women commonly play multiple roles, including as breadwinners, mothers, and caregivers for the family. Loose working time and environment allow female farmers to babysit their children on the farm during the day. This means the flexibility of seaweed farming allows female farmers to balance their work with other childcare and household duties. They can adjust their farming activities around other responsibilities and thus make the sector a feasible source of income for many women.

"I have kids. I become a babysitter at the same time. If I work in tourism, it's difficult for me to look after my child. I can't bring my child to work." — Informant 7, 2023.

Informant 1 shared a story about one of his female labourers who opted for seaweed farming over a more prevalent job in tourism. Her decision was driven by the flexibility that seaweed farming offered:

"She does not want to work in tourism even though there are many job vacancies. She feels sorry for her children if they have to work in tourism. Her husband also works, so there is no one to take care of her children at home." — Informant 1, 2023

Informant 9 also shared a similar story. She worked as a labourer for a farmer's family. She admitted that she picked the job because she could manage her time between home and work. At home, she had a parent with disabilities to care for. Working flexible hours would allow her to care for her parents while supporting her husband in generating income.

This is a common concern that female farmers share in the community. Female farmers would prefer to work in seaweed farming because it only takes a few working hours a day. Shorter working hours allow women farmers to balance their work on and off the farm. In other words, it enabled them to fulfil their duties at home while contributing to the family's income. Those stories underscore the fact that for some female farmers, balancing home and work duties is a significant factor in their job choices.

I observed that some children would be at the workplace accompanying their parents or grandparents, behaving as if it were their playground. While parents were working inside the huts, children would be playing around with other kids. The ages of the kids were varied. For those of school age, they would attend school in the morning, come to the workplace in the afternoon, and stay with their parents until the evening.

Informant 5 shared her experience of juggling work and childcare during the pandemic. She had four children. Two were in primary school; one was a toddler, and the other was still a baby. Although she was not the primary income earner in the family, her role was significant. Working with her husband, she had no choice but to chime in farming while caring for her children at the workplace. During the COVID-19 pandemic, the kids would stay at the workplace from morning until evening since they were not physically attending school and had the class online instead. While parents were busy on the farm, children would do their stuff: attending online classes, studying, working on their homework, playing around, and resting at the workplace. Sometimes, mothers were also responsible for assisting children in doing their homework and learning sessions. Therefore, life at the workplace could be hectic and stressful for female farmers.

On the contrary, depending on the types of jobs, occupations in the tourism sector often cannot accommodate this flexibility. Informant 5, who previously worked at a hotel, shared her view:

“...because if I work in tourism, it's difficult for me to look after my child. I can't bring my child to work.” – Informant 5, 2023.

Their stories during the interview highlighted the challenges many female farmers face when juggling work and family responsibilities. Many opted for seaweed farming because it could accommodate female farmers' needs. Meanwhile, the rigid and longer hours of the tourism industry were considered incompatible with being a mother or a wife.

Time flexibility also benefits female farmers who have side jobs in other sectors. All the male Informants I interviewed were doing multiple jobs simultaneously, and one informant even did three jobs simultaneously.

Informant 7 exemplifies this situation. He has been a seaweed farmer for three years. Besides becoming a farmer, he had a side job as a hotel driver. In the morning, he worked as a seaweed farmer; the remaining time, he worked as a hotel driver. His schedule would be very busy throughout the day: He would set out to the sea at 4 a.m. to cultivate seaweed and return to the land around 7 a.m. Once he was back on land, his wife, parents, relatives, and labourers were ready and waiting for him to proceed with the seaweed. He would hand over the fresh seaweed to them and let them do the rest of the process. While his family was working on farming, he would set out for his second job as a hotel driver. He drove from 9:00 a.m. to around 6:00 p.m., transporting tourists from one place to another.

6.2.2 Profit and Return

All informants agreed that both seaweed farming and tourism can be profitable. According to two informants, their incomes from both sources were equal. This, however, depends on various factors, such as the weather, seaweed prices in the market, and tourism peak season. For instance, during the pandemic, almost all farmers agreed that their income from seaweed farming was higher than their income from tourism prior to the pandemic. The surge in demand for seaweed in 2020-2022 led to increasing prices. Seaweed prices reached an average of IDR 30.000 to 40.000 per kilogram and peaked at IDR 42.000 rupiah per kilogram. The farmers could produce 500 kg to 1 ton of seaweed per month³. This income was obviously higher than they would usually earn in tourism in non-peak season.

However, it is crucial to note that high seaweed prices were not a constant trend. The unstable nature of the seaweed market allows a rapid change in prices on a daily basis (Interview, 2023). Furthermore, these peak prices (IDR 40.000 – 42.000 rupiah) were short-lived, lasting only a few months during the COVID-19 Pandemic. Therefore, while the high season during the pandemic offered high-earning income for the informants, it was not a settled trend, and the market was dynamically changing throughout the years.

Among other popular opinions, one Informant expressed a different view. "Earnings in seaweed farming are a lot, but you cannot work individually. On the other hand, working in tourism can generate income individually". He continued to explain, "Let's assume that in tourism, the average person earns IDR 3 million per person. If two persons in the family earn Rp 3 million, the family can earn IDR 6 million in total. Now, in seaweed farming, that might not be the case. If you can earn IDR 6 million, you must divide the income with other family members."

Family members here usually refer to individuals from families who help the farmers in farming, such as parents, siblings, and relatives. In family-based seaweed farming, income is generally earned and managed collectively. Therefore, the income earned in seaweed farming must be divided according to the number of people involved in farming, which can vary.

From my observations, family-based work can be carried out by at least two people (husband and wife). However, it is more common to have more people involved (husband and wife, plus parents and adult children). Depending on the workload, the number can get bigger. Some families hire labourers to reduce the workload. This means that even if the total income from seaweed farming is high, the individual share might be less, especially if a large family conducts the farming.

In tourism, each individual's earnings are independent and contribute directly to the total family income. For example, if two family members, say a father and son living under the same roof⁴, and both are working in tourism, their individual earnings are added together to the family's total income. This

³ If converted to Euro, the income will be around 1200 – 2400 Euro per month (1 Euro = 17.000 Rupiah)

⁴ It is common in Jungut Batu to have more than one family living in one house. For instance, parents, kids, and grandchildren living in one house.

distinction in income distribution significantly influenced the job preferences among informants, especially youth.

Furthermore, the informants compared the return in tourism to that in seaweed farming much quicker. Money can be earned daily in some businesses, such as tour guides and motorcycle rentals. In seaweed farming, informants need to wait for the whole seaweed cycle to get a return. For some informants who have limited saving accounts and need immediate access to cash, having a daily income is substantially more appealing and secure.

6.2.3 Workload

All informants perceived the workload in seaweed farming as relatively higher than in tourism. This can be due to the labour-intensive nature of seaweed farming, which requires constant attention and physical effort. The farmers must adhere to a strict schedule dictated by the tidal conditions, which can often mean long working hours throughout the day. In seaweed farming, farmers tend to work the whole year and take breaks only when needed, for instance, when they feel tired, sick or on holy days for religious matters. The workload in seaweed farming is also divided based on gender, with male and female farmers performing different roles on the farm (see previous section in Labour Division).

In contrast, the workload in the tourism sector is perceived to be 'lower'. This could be due to the nature of the work itself, which might be less physically demanding. Most of the Informants I interviewed had experience working as tour guides, small restaurant owners, cooking assistants, or hotel drivers. However, while the physical workload might be less in tourism, other forms of stress and pressure could emerge, such as the need to provide high-quality service and good managerial, communication, and marketing skills to attract visitors and sustain their businesses, which on the other seaweed farming is free from these kinds of pressure.

6.2.4 Initial Capital

All informants agreed that initial capital in seaweed farming is less demanding compared to tourism. The initial capital required to start seaweed farming varies among farmers. However, instead of making a large investment all at once, farmers can purchase the necessary seeds and tools incrementally according to their savings and financial condition. Unlike most businesses in tourism, people can start seaweed farming without the need to take a loan from the bank, which helps them to minimise debts.

On the contrary, starting a business in the tourism sector often requires considerably larger initial capital. This is particularly true for those who wish to establish their own small enterprises, such as building their own stores, restaurants, or snorkelling activities – the common business that Informants had. The high cost could come from different factors. For instance, informants need to secure money for construction, maintenance, and labour in a restaurant or homestay business. For those interested in offering snorkelling or Mangrove tour activities, the initial investment could include the purchase of a boat and snorkelling tools. This would also involve costs related to maintenance and possibly hiring trained staff.

6.2.5 Competition

The seaweed farming community thrives on mutual support and cooperation, while the tourism industry is characterised by individualism and competitiveness. All informants agreed that the competition in seaweed farming is less intense compared to tourism.

Based on interviews, the culture in the seaweed farmer community promotes a sense of teamwork and mutual support, seeing each other as part of a family rather than as rivals. This familial bond encourages them to have each other's support when needed. Sharing knowledge and resources, especially in difficult times, was a common thing among farmers. Farmers helping each other to revitalise seaweed farming during the pandemic can be a clear example. They shared knowledge, tools, seedlings, lands and whatever they had to help the ones who needed them. They also initiated collaborative action to build seaweed farming associations and collected communal investments that can be used to help farmers who lack money. Some farmers even went together to Nusa Penida to buy seaweed and shared the travel cost. Some others gave their seedlings and farming tools for free to other farmers, as one farmer remarked:

“None. There is no competition between farmers here. Instead, we exchange information about the condition of the seaweed; if the condition is not good, we discuss what to do and how to overcome it. We also exchange information about where to buy good seeds.” – Informant 1, 2023

Meanwhile, the tourism industry presents a starkly different environment. Here, individuals are more inclined towards individualism and competitiveness. The nature of the industry fosters such intensity. Two Informants who once worked in tourism expressed the same sentiments. Informant 1 explained, “It's a bit difficult to explain. To work in tourism, if we don't have the courage to scramble to find guests, it will be difficult.” He further conveyed that ingrained self-confidence was necessary to counter the pressure in what seems like a competition in tourism. According to informants, because of the influence of cultural work, competition in tourism does not necessarily always mean attracting more guests. But it also includes competition for bigger businesses and more luxurious materials, such as bigger boats, more branches of businesses, bigger homestay, etc. - saying, “Working in tourism requires a brave mentality, not listening to what other people say.” By saying this, he implied that sometimes, the competitive environment of the tourism industry can lead to a challenging situation where self-assurance and a strong mindset are the keys to enduring rivalry and not being easily swayed by other people's negative influence.

Each business owner, whether they run a restaurant, a store, or a snorkelling activity, strives to offer unique experiences to differentiate themselves from other competitors, as most Informants revealed. This necessitates the uniqueness of each person that often leads to a more individualistic approach, where sharing and cooperation are seen as less important. One farmer framed:

“I often see tour guides scrambling to tourists who have just gotten off the boat. They offer their services to tourists, and sometimes *they get into fights*. Therefore, working in tourism is difficult. We are competing fiercely. In the past, tourism competition was not as intense as it is now. For example, if I had 2 motorcycles, I could rent them to visitors. Now, it's different. Everyone is getting into tourism, so we are in high competition to attract visitors.”—Informant 1, 2023.

6.2.6 Environmental Benefit

Seaweed farming is generally considered to be environmentally friendly as it requires no additional inputs such as fertilisers or pesticides, which are common in land agriculture and can lead to pollution. Seaweed absorbs nutrients directly from the seawater, as most Informants conveyed that seaweed “100% depends on nature” (Informant 7, 2023). Seaweed can also help absorb carbon dioxide and toxic pollutants in the water, mitigating the risks of climate change. Informant 1 believed that some wild seaweed species, which are normally grown in surrounding seaweed plots area, can absorb the pollutants in the air.

However, like any form of farming, if not managed properly, seaweed farming can have negative impacts. For instance, if the farms are too dense, they can alter local water flows and light levels, potentially impacting other marine life. Also, I noticed that the excessive use of plastic ropes, which are common in seaweed farming, can lead to plastic pollution.

On the other hand, the tourism sector tends to have significant environmental impacts. The construction of tourism facilities has proven to lead to habitat destruction and water pollution. The influx of tourists puts pressure on local resources like water and leads to excessive generated waste. One informant shared their experience about the effects of tourism in Jungut Batu. They noticed the sad difference in water conditions before and after the surge of tourism activities in the village. The Informants noted that activities associated with tourism, like boating and snorkelling, contributed to water pollution. These activities release chemical substances that could harm the environment, such as substances from sunscreen and leaking oil from boats that polluted the water. Additionally, those activities also often disturb marine life if not properly managed.

6.3 Sub-Conclusion

Seaweed farming in Jungut Batu is a complex process that involves different practices, key players, and labour divisions, as explained in 6.1. This complex process helped us understand farmers' different perceptions of the sector. In 6.2, I compared the advantages and disadvantages of working in seaweed farming with farmers' experience working in the tourism sector. I grouped farmers' opinions into six categories: time flexibility, profit and return, workload, initial capital, competition, and environmental benefit.

To begin with, farming practices tend to be physically demanding and require daily monitoring and maintenance. Instead of following guidance or certain protocols, farmers rely solely on their intuition and years of experience in determining their schedule and farming techniques. Farmers have adapted to changing socio-environmental conditions and altered their techniques multiple times. This is shown in the way farmers choose different seaweed types, farming scheduling, and employing security strategies. The method employed in seaweed farming is also relatively simple compared to other agricultural practices. Farmers use traditional tools to conduct the practices with minimum or without the intervention of technological advances. Farmers mostly rely on natural conditions to direct their farming practices, such as the moon, waves, and sun. They use these traditional calendars to understand the patterns. Culture

also influences the way in which farmers carry out their time and manage tasks, as shown in the gendered labour division.

Regarding gender roles in seaweed farming, there are no predetermined rules or guidelines for dividing tasks between male and female farmers. Seaweed farming is a family task; therefore, all family members are included in the process. Back in the '90s and during the pandemic, both male and female farmers could carry on with each practice of seaweed farming, starting from site selection to drying. Therefore, the on-farm workload for both genders is almost equal. However, after the pandemic recently, male farmers are associated more with physically demanding tasks, such as planting and harvesting in the ocean. Meanwhile, female farmers mostly stay on the land and predominantly help with the seedling's preparation. Although the intensity of the workload for female farmers seemed to be lower, female farmers were the ones responsible for taking care of all the household chores at home, including taking care of children and preparing rituals. In some cases, female farmers also managed small businesses such as restaurants and stores.

In addition, most farmers hire labourers to help them conduct farming processes on the land. Labourers typically are not part of the close family (e.g. neighbours or far relatives). During my fieldwork, all the labourers were female. They chose to become labourers because of some factors, primarily financial, workload, and human resources. The business process in seaweed farming is relatively long and involves some key players. However, local farmers at the heart of this process often find themselves at a disadvantage, lacking access to bigger markets. This lack of access also restricts their agency to control the prices.

As farmers are marginalised, they do not have knowledge about the value of their products. This also shows the lack of transparency in the business process. This lack of transparency can lead to a sense of powerlessness and vulnerability (Wahyularassati et al., 2019). Due to their limited knowledge, farmers tend to rely on the information given by collectors when determining prices. This reliance can result in farmers receiving a smaller share of the profits despite being the ones who invest the most time and effort into cultivating and harvesting the seaweed. This disproportionate distribution of profits, bargaining power, market access, and knowledge about the market value of seaweed products paints a picture of a significant imbalance of power and agency between the various actors in the seaweed farming process. As shown, this systemic opacity and farmers' disconnection from the broader market dynamics might set the stage for exploitation. Without any significant intervention, farmers are prone to unfair practices that can madden their marginalisation and poverty.

In terms of perceptions, firstly, seaweed farming offers a flexible work schedule compared to work in tourism. This allows farmers, especially females, to balance their work with other responsibilities, such as childcare and household duties. This flexibility can be beneficial not only for females but also for male farmers as they can perform other jobs besides seaweed farming. These findings matched the findings in Rimmer et al. (2002) that farmers in seaweed farming mostly do not engage full-time. High living costs and insufficient income drive the farmers to work harder, often beyond the normal working hours, with two or three jobs simultaneously. The loose working environment in seaweed farming also allows farmers

to bring their children to the workplace. The sense of a family-based working label is heavily attached to seaweed farming.

Secondly, although both seaweed farming and tourism can be profitable, the income from each can vary depending on various factors such as weather, market prices, and peak season. When the growth of seaweed is high, for instance, during the pandemic, the income from seaweed farming can be significantly higher than the income from tourism. However, peak season in seaweed farming is still far from sustainable since the prices are subject to change on a daily basis, and production can drop due to various factors. The income earned from seaweed farming is typically divided according to the number of family members who carry out the farming tasks.

In addition, all informants perceived seaweed farming to have a higher workload due to its physical-intensive nature. Meanwhile, tourism jobs might be less physically demanding but could involve psychological stress and pressure as the farmers need to acquire certain skills to sustain the business, such as marketing, language, communication and managerial skills. The work culture in seaweed farming and tourism is also prevalent in terms of competition and individuality. The atmosphere of the seaweed farming community thrives on mutual support and cooperation, which has been developed since the very beginning of seaweed farming emergence.

And lastly, the initial capital required for seaweed farming is also generally lower and less demanding than that for starting a business in the tourism sector. This finding is also relevant to what Pantall (2003) has identified as seaweed farming typically requiring simple tools. Not only that but also farmers can typically buy seeds and farming tools gradually according to their needs and financial capacity, which helps to reduce their debts. Meanwhile, in tourism, the informants commonly need much larger initial capital to invest in tourism. Lastly, seaweed farming is generally considered to be environmentally friendly as it requires no additional inputs such as fertilisers or pesticides and mostly depends on nature. Seaweed could also help to reduce water and air pollutants. However, if not managed properly, seaweed tools, such as ropes, can contribute to generating plastic waste. On the other hand, the tourism sector tends to have significant environmental impacts, as proven by the change in water conditions in the village.

7. Navigating Lives in Seaweed Farming

This section outlines how the informants navigate seaweed farming and their livelihoods. Section 7.1 exposes the informants' strategies for managing seaweed farming. It includes their strategies for managing income as family farmers, integrating seaweed farming and tourism, overcoming farming problems, and making collaboration with other fellows. Meanwhile, 7.2 reveals the informants' aspirations and long-term goals. Here, I contrast the informants' aspirations with the village's development plans.

7.1 Seaweed Farming Strategies

7.1.1 Balancing Family Income

The high cost of living on Nusa Lembongan Island is a common concern shared by informants. This problem adds to a complex set of socio-economic issues already presented on the island. As the informants believed, it was caused by the island's geographical isolation from the mainland, which resulted in higher transportation costs. Every conversation I had with the locals would circle back to this concern: the high cost of living and poverty that drove them to work harder and necessitated them to juggle multiple jobs.

The majority of informants admitted that having a single source of income is insufficient to survive. Everything from food and clothes to utilities such as electricity, water, and gasoline is way much more expensive than in other regions of Bali. In addition, most of these Informants were parents with children of school age. The lack of educational facilities on the island means they need to send their children to the mainland, Bali, for schooling. As Balinese, they also face additional expenses related to their traditional practices. This includes the obligation to conduct rituals and celebrations regularly: on a daily, monthly and yearly basis.

The need for multiple incomes to suffice daily needs became more apparent. Based on interviews, informants have multiple jobs, mostly in the aquaculture, agriculture, and tourism sectors. For example, Informant 13 juggled three different professions in a single day. He worked as a seaweed farmer in the morning, a snorkelling tour guide in the afternoon, and a fisherman at dawn. In a day, he worked for almost 14 – 15 hours from 3 a.m. to 5 p.m.

In a close-knit village community like the one in Jungut Batu, it is common for parents, children, and grandchildren to live under the same roof. Both parents and children work together in the same or different sectors and then share their income with the family. The income each person earns in the family is not just about individual earnings but about pooling resources for the benefit of the family.

“Yes, we earn money together. If my son doesn't have money, he asks me for money. If he has some more money, he gives it to me.” – Informant 11, 2023.

The fact that both parents and children contribute to family income suggests that people in the village commonly nurture a culture of shared economic responsibility within a family. They have learned from

the experience during the pandemic that relying solely on one sector can be risky. By diversifying their income sources, they are better equipped to anticipate economic downturns; as one farmer stated, “Now we work in two sectors so that the income can continue to run. Sometimes tourism is more profitable; sometimes it's seaweed farming; this way, they can cover each other.”

Interestingly, some Informants opted to work consistently on seaweed farming despite the price uncertainty post-COVID-19 pandemic. Two farmers argued that they were not overly concerned about the unstable price. Instead, their primary focus is on maintaining the production of seaweed, meaning they try to *always* produce seaweed so they can always have a bit of money earned. Most Informants viewed the price fluctuation in seaweed farming as an inherent risk. I talked to Informant 1, and he confirmed this, conveying that price fluctuation in farming is simply something that one needs to embrace.

“Yes, that's true. But for me, that's the risk of being a farmer. I saw on TV that other farmers are going through the same thing. For example, in 2006, the price of rubber and palm oil was very high. [...] Palm oil once reached a price of Rp 15,000 per kilogram, then dropped to Rp 4,000, and continued to drop to Rp 1,000, and even to Rp 900. Or for example, the price of chilli peppers in the market always fluctuates according to the season. *Therefore, I actually don't think too much about the price in the market.* What I think about is how I can keep producing seaweed, and that's it. I don't really think about the price because if I can produce a lot of seaweed, then I will earn a lot of income even though the price is low.” – Informant 1, 2023.

Since the price is unpredictable, and the informants did not have prior knowledge about the price forecast, they typically sold their dry seaweed whenever there was a demand from buyers. If it took a while for the buyer to come, they would store the dry seaweed in the huts for some time. Therefore, the income they earned from selling seaweed would vary throughout the year according to the market price.

When I asked the informants how such price fluctuation could happen, they did not have a clear answer. Some speculated that it might be caused by changes in seaweed demand in the market. Others guessed that seaweed quality might be a factor. Some others argued that it might be due to price competition with other seaweed producers, such as Lombok or Sulawesi. Informant 8 gave an example of this competition, saying, “The collectors mostly look for seaweed in Lombok. In Lombok, the quality of seaweed is better, and the price is lower”. Despite these price challenges, some Informants still viewed the job as something worth trying.

7.1.2 Integrating Seaweed Farming into Tourism

Integrating seaweed farming and tourism is indeed possible, as there is some precedence of how people used to integrate seaweed farming into tourism in the past. For instance, in the 90s, dry seaweed used to be sold as souvenirs. According to some informants, seaweed from Nusa Lembongan Island was famous for its taste and quality. Thus, it was not surprising that many tourists were interested in bringing some seaweed from this island to their home countries. Not only as souvenirs but also the farming activities themselves were once used by some hotels as tourist attractions. Although the idea of offering visitors a real-life experience cultivating seaweed in the sea seemed promising, the hotels had to stop such activity since seaweed production had gradually decreased over time.

Despite all of those success stories, the integration of the two sectors at the present time, especially in Jungut Batu, seems to have vanished. At the moment, the two sectors are operating independently. According to interviews, there are some factors that hinder such an integration. Firstly, the seaweed plot location and accessibility. Since the location of seaweed plots in the Mangrove Conservation Area is relatively far from the land, taking visitors to the plot area for tourism would be a hassle and more risky. In addition, most tourists would likely be more interested in doing other activities, such as snorkelling, kayaking, or having a Mangrove tour, instead of doing farming activities or seeing the seaweed. This also means that the market for these activities is considered narrow, as the ones who might be interested in seeing seaweed are merely students or researchers instead of general visitors. Furthermore, if seaweed farming were transformed into a tourism activity, it would be necessary to make the sector available year-round. The more seaweed produced in the sea, the more appealing it is for the visitors. However, considering its natural condition and fluctuation in seaweed production, enabling year-round availability in the sector would be quite challenging.

Therefore, from most Informants' point of view, merging the two sectors is not worth that much and thus making the effort less desirable. The Informants, and villagers in general, were more enthusiastic about developing other activities than trying to combine the two sectors.

7.1.3 Combating The Challenges

Recapping fieldwork data, the threats to seaweed farming are related to three things: environmental changes, diseases, and market prices. The informants have their own strategies to cope with each challenge.

Firstly, threats from increasing tourism activities to seaweed farming are poignant. Since the resurgence of tourism in the village, beach water quality has changed. Some informants said that it could be seen from the changing water's colour and taste. Informants said that oil often leaks from boats, and snorkelling activities contribute to adding more chemical substances to the ocean. Trash and rubbish from tourism also pollute water. As I asked the informants what people would do seeing water pollution, most of them did not have an answer. Instead, this actually presents a dilemma choice for the locals: whether to continue with seaweed farming despite the environmental challenges or switch to tourism-related jobs, which might cause worse environmental changes. Related to low-quality plots, what the informants would do was change their locations, although sometimes this strategy did not add much to the situation.

Furthermore, bad weather – often due to climate change – such as heavy rain and wind, and increased water temperature, significantly influences farming productivity. As sea temperatures rise, the water can become too warm for seaweed to grow, leading to slower growth or even death of the seaweed.

"The heat and strong wind really affect the growth of the seaweed. The wind can damage the seaweed, making it mushy. If the seaweed is mushy and then exposed to sunlight, its colour will turn reddish and then white." – Informant 11, 2023

In addition, higher water temperatures have increased the number of diseases that affect seaweed. For example, a disease called “ice-ice” recently broke out⁵ and caused many seaweeds in the plots to harden, turn icy white, and rot.



Figures 5.12: Seaweed's colour turned white, infected by the 'ice-ice'.

Source: Author's own work, taken during fieldwork (2023)

During my visit, I observed high temperatures, combined with the ‘ice ice’ disease, caused many farmers to lose their seaweed. One by one, the farmer family found themselves unable to produce new seaweed because their existing seaweed crop had rotten in the sea. When the disease struck, the farmers were often left helpless and could do nothing but surrender to nature due to their limited knowledge and capacity how to combat this issue. They continued to carry on the practices without any preventive measurement or medication to cure the disease.

Informant 7 stated, “Yes, it goes away on its own. There is no cure,” as he believed there is currently no known treatment, and it would eventually resolve with time. This statement was echoed by other farmers and ‘nothing was done to cure it’ was the common answer from the Informants. “If there had been a cure, it would have been given to us (by researchers or the government) a long time ago,” said Informant 1. According to him, some researchers have visited the village in the past to study seaweed. However, until now, no medication for the disease has been available in the village. “Seaweed grows very naturally, depending on natural conditions,” explained Informant 1, emphasising that what he could do for this seaweed was solely rely on nature.

Farmers typically distinguish their seaweed quality from its colour. The good one is fresh green, while the unhealthy—affected by the virus—will turn white. The unhealthy ones will be dried out in the sun and sold. Besides viruses, invasive species also threaten seaweed crops, as I have previously explained. Specifically fish, they ate the seaweed crop in the plots, often leaving the farmers with nothing to cultivate.

“It's hard to keep fish from coming to our land. Sometimes I use nets to keep the fish away. [...] They come from various directions, from above and also from below. When the tide is high, the fish attack the seaweed from above. When the tide is low, they attack the seaweed from below. The sea surface is uneven, so there must be a gap for fish to enter through the nets.” – Informant 7, 2023.

Lastly, fast-changing and unpredictable prices became the major problem that seaweed farmers faced. Farmers got information about the price of seaweed from collectors who came to the village. The

⁵ It broke out in November and December 2023

collectors told farmers about the current market prices and offered the price. If the farmers agreed, they made a deal and had the transaction. This issue was a bit complicated as it involved a lot of actors within the business chain. What farmers could do was keep selling their seaweed to collectors, meaning they always tried to always produce seaweed, and sometimes bought more seedlings.

Prolong dry season, unusual Pattern, challenging times faced by farmers

Fieldwork Diary – 16 Dec 2023

It was a sunny day, hotter than the usual days in mid-December. As usual, I arrived at the workplace in the morning after the breakfast time. My phone showed the time, it was around 10:00 in the morning. I saw one farmer from a distance, standing next to seaweed that was dried under the sun. He stared at the seaweed. His expression looked sad. I walked out to him to say hello. He replied to my greeting with a weak smile – an awkward, unusual expression.

He then shared his plight that he had just cultivated seaweed from the sea only to find out that all of his seaweed was rotten in the ocean. This was because of the high temperature in the water. It was true, that for the last couple of days, the temperature had increased, showing an unusual pattern. Since all of his seaweed was rotten, there was nothing left to propagate for the next cycle. Now, he was trying to dry all of the rotten seaweed he had. He would sell what was left, although it was not that much.

“It’s all rotten in the sea, it’s all rotten...unfortunately, nothing left. Today, I do not tie the seaweed; there is nothing to tie..”. I listened attentively to his explanation. His voice sounded weak and desperate, and his gesture showed a hint of disappointment.

Fieldwork Diary – 18 Dec 2023

I came to the area again to check in seaweed and farmers conditions whether it got better or stagnant. I could not see any family gathered in their huts today like I used to see in the previous days. From what I heard from Informant 11, all the family farmers in the area had gradually stopped producing seaweed as their seaweed was all rotten. This is due to the virus and rising sea temperature.

And then, I spotted a farmer working hard drying his seaweed in front of his hut. The day was hot, and the sun was shining brightly above him. I could only meet one farmer working today.

I walked out to him, trying not to interrupt his work, and observed. I started the conversation by saying, “It’s not usually like this, right?” I was confirming the information that I previously heard from some other farmers that this prolong dry season was unusual.

“In the previous year.. it was not like this (the temperature). If the seaweed turns white like this, it is usually because of the heat in the sea... August or September, it usually happens in those months”, the farmers answered while still busy spreading out his seaweed on the ground using a spading fork.

“And apparently, the heat continues until mid-December?”, I asked.

“Yes, until December”, He replied with a bitter laugh. “And also, last November, we just had a pathogen break-out. And so, the seaweed could not grow.”

Apparently, farmers have been struggling with their crops for months. Even last month, in November, they struggled with the pathogens.

The farmers continued to say, “Although I have years of experience in seaweed farming, the conditions are still unpredictable to me. Nature is always changing. I did not predict this situation would be like this at all.”

7.1.4 Collaboration Among Farmers

Wayan once told me that “the sense of helping among the villagers is great.” I experienced this first-hand during fieldwork, and the stories shared by informants during our conversations confirmed this.

Especially during the pandemic, when everyone in the village was struggling, the revival of seaweed farming would not be able to happen without collective efforts shared among the villagers. Informant 1 recalled that everyone was very helpful towards each other in difficult times. “Yes, we were helping each other. Not only teaching how to grow seaweed but also providing seeds to those who need them.” Informant 7 expressed a similar opinion. He mentioned that when one farmer needed help, he would help, and when he needed help, others would also help him in return, emphasising that “among fellow farmers, we are still considered one family.”

During the pandemic, 90% - 95% of villagers were involved in seaweed farming, leading to many suddenly becoming ‘newcomers’. People who had never experienced seaweed farming suddenly joined in. They began sharing lands, tools, seeds, and knowledge to revive the sector. When I asked Informants if it was difficult for new farmers to find available plots, they responded that it was not challenging. On the contrary, it was simple. As long as there were plots left in the area for them to use, they could start farming. Former farmers were more than willing to guide these new farmers in seeing which areas were available.

This sense of community could not be more apparent. Informant 10’s experience can be an example of how he and other fellow farmers collectively bought seaweed from Nusa Penida during the pandemic. They rented a ferry, shared the travel cost, and went together to look for the seeds. Informant 7 also illustrated a similar experience. He started farming during the pandemic, utilising some free seeds given by other farmers.

The sense of community among seaweed farmers has flourished for a long time, even way before the pandemic happened. Informant 10 shared his experience of starting seaweed farming in 1995. One of his motivations was the generosity of other seaweed farmers who taught him techniques and gave him free seaweed. In the end, “I bought the ropes, and then I joined them in seaweed farming”, Informant 10 added.

Sharing knowledge about seeds and farming is also a common practice among farmers. For instance, farmers share knowledge about places to buy good-quality seeds and their experience in tackling farming problems, such as pathogens.

“We exchange information about the condition of the seaweed; if it is not good, we discuss what to do and how to overcome it.” – Informant 1, 2023.

Sharing information among seaweed farmers also contributed to the success of seaweed revival during the pandemic. Seaweed farmers disseminated information about social assistance given by the government and other seaweed farmers’ success stories. The news was echoed among the communities, which inspired more and more people in the village to take up seaweed farming.

7.2 Aspirations and Long-Term Goals

8.2.1 Income Diversification

During the interview, it was evident that Informants were actively exploring ways to expand their source of income besides seaweed farming. Fishing and dry farming were once considered options, especially since most informants had prior experience in these two sectors. However, due to the current geographic condition, in which the land structure on the island is less productive for planting dry crops, dry agriculture does not really work out. Additionally, the fuel prices that currently keep rising have made fishing significantly less profitable. As a result, most Informants found that working in dry agriculture and fishing is more demanding, less efficient, and insufficient to provide for their daily needs.

If only the price and quality of seaweed remained as good as they are now, all informants would consider continuing to work in seaweed farming. It all seemed that they had a desire to diversify their source of income but not leave seaweed farming altogether. This is because seaweed farming has emerged as a reliable alternative sector, especially in an area like Jungut Batu, where any other options seemed to fail and tourism, once a major income activity, has experienced a downturn. Working as a seaweed farmer has given villagers opportunities to increase their income, especially when other traditional sectors, such as fishing and land agriculture, proved to be less profitable and sustainable.

Among others who wished to diversify their incomes, Informant 1 had the opposite opinion. He shared that he has not thought about potentially taking another job apart from seaweed farming at the present time or in the future. “This is my only plan,” he continued, “to be a seaweed farmer.” Similarly, Informant 9 also expressed her interest in staying in seaweed farming without switching jobs to tourism or other sectors because working in other sectors is equally uncertain. Even though tourism might be considered a lucrative job, she learned how unstable tourism could be based on what happened during the COVID-19 outbreak. In this regard, she thought seaweed farming was safer and could be her ‘comfort zone’.

When it comes to wishes and career aspirations for their children and future generations, all informants expressed a passion for their children to have freedom in choosing their own career path. They, as parents, do not want to impose any particular sector or profession upon their kids. Informant 18, who used to work as a seaweed farmer and currently was managing a snorkelling business, shared his perspectives on this.

He understands that each individual has their own interests. Therefore, insisting on certain professions for their children will only give them a burden, and instead, giving children the freedom to work according to their passion will add to their job satisfaction. “I don't have my own wishes. So, it just depends on my kids' interests. They can work whatever makes them happy. If I regulate, I'm afraid my kids won't be happy and thus won't even focus on their work. They will feel burdened,” Informant 18 highlighted.

This implies that there is no predetermined idea from the older generations to younger generations about a specific future path that needs to be taken. Most informants also said they decided to be seaweed farmers based on their free will. They made the decision without any external pressure from their parents or family members. When it comes to their children, accordingly, they understand the importance of freedom in choosing one's own future. They recognise its value and let their children choose whatever makes them satisfied.

8.2.2 Village's Development Priorities

In order to gain a better understanding of the village's long-term goal of job diversification, I conducted an interview with one of the village officials. This interview was aimed at understanding the village's long-term goals and priorities in terms of job diversification. By doing so, I aim to identify whether the aspirations of the villagers align with what the village administration is capable of and willing to provide to support these goals. I tried to connect with more village officials. However, since December was a busy time, I could not manage to interview more officials.

According to the interview, one of Jungut Batu's main priorities is developing its tourism sector, including improving the existing tourist destination. This includes maintaining existing beaches and adding new objects and activities in the village. Today, the two most popular tourist attractions in the village are Mahagiri Beach and the Mangrove Conservation Area. Meanwhile, the most famous activities for tourists are snorkelling, kayaking, and Mangrove tours. Specifically in the Mangrove Conservation area, the village government planned to optimise its potency by adding new objects in order to attract more visitors since the activities in that area are still limited to Kayaking and Mangrove tours.

The village government planned to build a large fishpond near the Mangrove Forest area, which the villagers could use to grow aquamarine species, such as fish. By building this new object, as one village official stated, the village government aims to “create a new business opportunity for the villagers in case tourism is paralysed again in the future.” (Informant 19, 2023). He continued to note, “However, if tourism continues to grow, the pond can be transformed into a new tourist attraction”. This also implies that the village's development planning is still heavily focused on tourism. As the plan became more serious, the village government already started discussing it with the local tour guide community in the area. The village considers a bottom-up approach to executing the plan and trying to avoid possible conflict with locals as much as possible. They are currently looking for a suitable location for the pond.

While the village's priorities are primarily on developing the tourism sector, the attention to maintaining seaweed farming tends to be minimal without any further action to develop it (“business as usual”). The Official believed that tourism held more promise. Therefore, the village tended to view seaweed farming merely as a side sector. The village's plan was clear: further develop tourism, quoting that “if it turns out

that the development of tourism is more promising, maybe our main activity will switch to tourism. Seaweed farming will probably be used as a side sector." He also noted that it was challenging to harmonise the two sectors, as the growth of tourism would only cause a decrease in seaweed production. This situation seemed to present a binary choice that forced them to pick one over the other.

7.3 Sub – conclusion

The first sub-section provides a comprehensive overview of various informants' strategies for making seaweed farming more profitable and sustainable. These strategies are operated as individuals and as a community. They include balancing family income, integrating seaweed farming with other sectors, coping with challenges, and working collaboratively to maintain the sector. Some highlight points for these strategies are as follows.

Balancing family income. The high cost of living and insufficient income from seaweed farming were shared as common concerns among the Informants, which became a driving force for them to work harder. Most of these farmers have side jobs in tourism activities, while few of them engage in dry agriculture and fishing. Culturally, working family members typically share their income with other family members who live in one house. This means individual earnings are attributed to the total income of the family, and they share economic responsibility within a family. This pooled income is then used to meet the family's needs and expenses, such as food, housing, healthcare, and other necessities. This is one of the family's coping strategies for the economic downturn, in addition to having side jobs.

The informants remained committed to seaweed farming despite the uncertainties and saw this sector as worth trying. They kept on producing despite the low prices to keep getting the income. Most informants see price fluctuation as an inherent risk in the agriculture sector. From the COVID-19 pandemic, the farmers have learned that relying solely on one sector is actually riskier.

Integration with other sectors. While seaweed farming currently tends to stand alone, there is potential for it to be integrated with tourism, only if some requirements are met. However, a gradual drop in seaweed production makes this integration more difficult to implement. As a result, the idea of integrating the two sectors is less desirable. In this case, the Informants believe that many other activities, such as snorkelling, can offer more appealing activities to visitors and attract a wider market group.

Coping environmental challenges. Seaweed farmers have their own coping strategies, mainly relying on traditional methods with minimum technological intervention. These strategies are passed down through generations. However, they may not always be sufficient, especially in the face of rapid and unpredictable environmental changes. This lack of knowledge often leads to a sense of helplessness in which farmers frequently surrender to nature and wait for time to fix the problems.

Working collaboratively. A sense of community is highly valued, as is seeing each other as a family within the farmer community. Working collaboratively became one of the informants' coping mechanisms. They

shared everything collectively and in a non-transactional way. As this study indicates, farmers could seek help from farmer cooperatives and/or their networks.

In the second part, the informants conveyed their aspirations and long-term goals in terms of career choices. Most of them consider diversifying their incomes besides seaweed farming. The three most famous income-generating activities among informants besides seaweed farming were tourism, fishing and land agriculture. Seaweed farming and tourism became the most popular and feasible ones among others. Meanwhile, fishing and land agriculture were less desirable since these sectors provided lower incomes.

All informants expressed a willingness to continue seaweed farming if the price and quality of seaweed remain favourable. All informants seem to consider not leaving seaweed farming altogether and view it as a backup income when tourism fails. Among others, some informants plan to remain in seaweed farming and have not had any other plans for their career path. All informants also expressed a desire for their children to have freedom in choosing their own path as long as they have economic stability in the future. The informants acknowledged the importance of freedom, which could help grow their job satisfaction.

The village's long-term plan to improve the tourism sector is believed to be a strategic approach to improving welfare. On the other hand, the effort to develop seaweed farming, either through sector integration or other development programs, seems to be minimal. This raises a question about the future of some seaweed farmers who opted for or could not switch to other jobs besides seaweed farming: "How can they survive?"

8. Discussion

This research aims to provide a comprehensive understanding of how seaweed farming thrives, coexists, and affects the lives of those who work in the sectors, with tourism inherently adding a new layer to it. As Hubbard and Kitchin (2011) argue, the theory of space is everywhere in modern thought today to make sense of social life, so I would like to apply the notion of space to the study case. Borrowing Rodgers's (2004) idea to apply Massey's perspective on space to the modern communication system, I use Massey's perspective as the overarching theory, seeing seaweed farming practices themselves as a space. I moved away from the geographical dimension of space and argued that Massey's view on space can be applied in another context of our everyday lives, including farming practices. As we now imagine seaweed farming practices as a space, I would explain how social relations, multiplicity and relationality are nested within them as follows.

Applying Massey's Theory on Space: Seaweed Farming is A Space

Seaweed farming practices in Jungut Batu are a manifestation of what Massey would explain as a space, reflecting in their interwoven social relations, 'thrountogetherness', and relationality (Massey, 2005). The practices are particularly shaped by many social interactions; diversity of actors, knowledge, and power; and relations to other sectors like tourism, which creates a complex web of economic and social relationships. These elements are not isolated but are intertwined and influence each other in multiple ways.

First, for Massey, space is created through social relations (Massey, 2005). This concept is evident in how seaweed farming in Jungut Batu shapes and is shaped by social relations. The study shows that farming practices are influenced by various factors, such as social, economic and environmental conditions. Those factors are not static, but they develop according to interactions and relations between actors. For example, in recent times during my visit, tourism had started to increase post-Covid-19 and more visitors came into the village. The increasing number of tourists had an impact on water quality in the Mangrove Conservation Area. As conveyed by one informant, he noticed the difference in colour and the taste of the water. Tourism activities, such as leaking oil from the boats and releasing chemical substances from tourists' sunscreen, had polluted the water. As the water got polluted, seaweed could not grow optimally, and most even died. Not only from tourism, but also climate change has worsened the situation. Heat rotted the seaweed in the ocean and made it more vulnerable to disease such as 'ice – ice'. As a result, the informants gradually lost their seaweed production. However, some informants who saw this phenomenon did not stay quiet. Using their networks in the community, farmers shared struggles and knowledge to sustain their businesses. On the last day of my visit, I found one family enduring to produce seaweed despite the challenging situation. This one family used their relations with other seaweed farmers in the neighbouring village, Lembongan to get better quality seedlings. In difficult situations like during the COVID – 19 pandemic, social networks among seaweed farmers also helped them to access resources. Farmers within the community shared seeds, tools, and lands with those who did not have access to those resources. As more farmers started work in farming, seaweed farming then succeeds to

revitalised. Another example was when farmers needed each other's support to protect their lands from animal attacks. They utilised a community-based approach to survive their seaweed from the attacks. In this case, social relations within the farming community have maintained the farming practices. We can also take the example of Informant 11, who also joined seaweed farming in 1995 because of this generosity and sharing tradition within the seaweed farmer community as he first got free seeds from his colleague. In other words, social relations among farmers have increased the community's resilience and their capabilities to navigate the sector. In contrast, the way farming is practised also influences social relations. Unlike any other type of agricultural activity, seaweed farming is built on the basis of togetherness and cohesion. Therefore, community bonds are *exercised* and *constructed* through the practice of seaweed farming itself. The majority of steps in seaweed farming are collaborative work. Specific tasks such as tying and sorting seaweed are labour-intensive work. Therefore, the nature of seaweed farming requires coordination and human resources to maintain the sector and achieve success. One of the reasons why the sector once failed was also because of the lack of human resources.

Secondly, Massey argues that pace is a "sphere of the continuous production and reconfiguration of heterogeneity in all its forms - diversity, subordination, conflicting interests." (Massey, 2005, p.61). In the case of Jungut Batu, 'throwntogetherness' can be seen in multiple actors who are involved in the farming system. Not only seaweed farmers but also other actors, including labourers, intermediaries, companies, and village officials as the authorities who develop the policies. The power relations that play among these actors who posit different positions create social dynamics on how they manage the resources. The findings reveal that seaweed farmers have become the most vulnerable groups. Despite being vulnerable, they are frequently marginalised and excluded from business processes and larger economic structures. As the study shows, local farmers typically find themselves in disadvantaged positions as they lack support, mainly to access markets and fundamental resources, such as financial support, legal protection, technology, information, and capacity building. The power imbalance between seaweed farmers and small collectors in the bargaining process also serves as a clear example of how power dynamics between different actors are exercised in farming practices. According to interviews, farmers typically had limited access to the market and could only sell their products to collectors as intermediaries. However, the informants, who predominantly have low education and networks, struggle with obtaining accurate information about prices and market conditions when dealing with collectors. This led them to follow the offered prices by the collectors on the basis of 'trust', and they tended to not have much power to demand higher prices or profit shares. As a result, local seaweed farmers were put in the weakest position of the bargaining process and ended up receiving the lowest income despite the ones who worked the most.

The 'throwntogetherness' in seaweed farming not only allows us to notice power relations that often lead to marginalisation and social exclusion but also conflicts of interest and resistance. This is exemplified by the persistent push from the government to transform the locals' livelihoods from seaweed farming to tourism. Responding to this initiative, seaweed farmers from older generations expressed their concerns and struggles to keep up with the fast-changing situation (interview, 2023). While tourism presents a lot of job opportunities for villagers, these opportunities are not for everyone. One requires certain skills to thrive in tourism, such as business and communication skills. However, some farmers, especially older ones, often did not possess these particular skills. Consequently, some of them 'resist' the changes by

holding onto their old practices in seaweed farming and refusing to move on to tourism. Not only that, the persistent push from the government could also merge social conflicts. This is showcased when tourism development has become one of the key strategies used by the village government to boost local economic growth. As the government tried to attract more visitors, tourism posed some threats to the environment, while clean and healthy ecology was essential to maintaining seaweed,

Farming practices as 'throwntogetherness' can also be translated into multiple actions that are linked to many elsewhere. As described in the result section, the practices of seaweed farming entail a lot of activities. The commuting and movement patterns as part of farmers' activities inevitably create inward and outward connections. These movements and mobilities not only apply to human mobilities but also to logistics. For example, seaweed, seeds, and tools are transported from one place to another through these social interactions. Non-tangible things, such as knowledge, tradition, and habit, are also mobilised through these social relations. The dynamic and interconnected flows of these tangible and non-tangible elements have shaped the farming system, as these flows have brought new markets, business relations, perspectives, methods, traditions, etc. Relating to Massey's notion of a 'global sense of place', the linkage with elsewhere influences farming practices:

"... Some of these relations will be, as it were, contained within the place; *others will stretch beyond it*, tying any particular locality into wider relations and processes in which other places are implicated too." (Massey, 1994, p. 120).

During the COVID-19 pandemic, for instance, the interactions with the outside world have once been disrupted. This interruption had some consequences. For the tourism sector, the pandemic caused a paralyse. On the other, for seaweed farming, the pandemic means a continuation. Demands for seaweed farming increased during the pandemic. Collectors from outside the village came in to buy seaweed from the farmers. In this case, farmers' interactions with collectors from outside the regions altered seaweed farming practices. Demands from the outside also influenced seaweed farming trends.

Furthermore, Massey's view on relational thinking is applicable to analyse multi-scalarity. Using the same framework proposed by Reimer et al. (2022), this study reveals that the behaviour of seaweed farmers and their decisions on a household scale can influence a larger production of seaweed on a regional scale. For example, in 2010 – 2015, seaweed farmers, one by one, made conscious decisions to pursue their careers in the tourism sector. Initially, it was only decisions made by one or two families. However, as time passed, the number of farmers leaving seaweed farming grew, causing a domino effect on seaweed production on a regional level. In the beginning, it was only an individual choice to leave seaweed farming practices. However, over the years, this choice was aggregated into community choice and thus impacted the seaweed farming businesses on a larger scale. As seaweed farmers adopted similar mindsets of closing their seaweed businesses one by one, the sector became less and less profitable. As a result of this domino effect, the total production of seaweed farming on the island dropped close to zero.

Relationality in seaweed farming practices can also go *through time*. When using Massey's space-time lens, we understand that the current condition of seaweed farming practices was a manifestation of the practices in the past. The aspects of the farming practices that contributed to its success, such as

techniques and farming methods, are not necessarily built up by one generation of farmers but rather as a production of knowledge passed down from multiple layers of farmer generations (Burton, 2004). This means that relationality is not only applied to spatial connection but also to time connection. The way seaweed farmers in former generations carry out their practices influences the way in which seaweed farmers in the later generations conduct their practices and make decisions. The informants emphasised this, saying they mostly learned the practices from their parents and older generations. The strong-rooted culture embedded within the farmer community also influences the conduct of farming. This is shown by the continued use of the Balinese traditional calendar until recent times despite the possibility of using modern alternatives. Going back to Massey's preposition about space as something interconnected and a place where multiple trajectories coexist (Massey, 2005), this interconnectedness in the form of knowledge, habits, and culture is passed down from one-time trajectory to another through farming practices. Furthermore, going back to 'throwntogetherness', it could also mean multiple trajectories within one space. In seaweed farming, this notion is exemplified. The techniques and methods carried out in seaweed farming today, as shown in this study, were products of these different trajectories. Some methods were ancient; some were new and innovative. When we think about space-time, different trajectories in seaweed farming methods were present in one space in the farming system, just like Massey (2005), who imagined a city consisting of different buildings and elements from different time trajectories.

"At either end of your journey, then, a town or city (a place) which itself consists of a bundle of trajectories." (Massey, 2005, p. 119).

This study also strengthens the argument made by some researchers, such as Anna Buttner, David Ley, and Yi-Fu Tuan, who argue that space is not tied to a particular scale but rather defined and maintained by the *sense of care* as a consequence of people's attachment (as cited in Hubbard & Kitchin, 2000). As this study shows, the seaweed farmer community has a deep sense of belonging to their farming practices, reflected in their commitment, adaptability and resilience in maintaining and nurturing the farming system over time. A sense of care is also echoed in their continuous effort to protect their land, combat diseases, tackle environmental challenges and support each other in difficult times. The collective sense of belonging and care defines the character of farming space, making it different from what Agnew (1987) argues, that place consists of three components: *location, locale, and a sense of place*. *Location* refers to the specific position on the Earth's surface, *locale* is the physical setting for social interactions, and *a sense of place* involves people's emotional and experiential connections with a location (Kirkpatrick et al., 2018). If we compare the findings of this study and Agnew's (1987) argument, the farming system as a space, therefore, can detach from those geographical components of absolute distance (Crang & Thrift, 2000) and has its own characteristics defined by intangible things such as a sense of belonging and care.

If we go back to what has been discussed in the literature review, I would like to highlight that this study adds a new perspective to the existing body of literature. Most of the literature that I found mainly focuses on seaweed farming as an economic activity, emphasising its productivity, efficiency, profitability, and market dynamics. For example, studies by Larson et al. (2015), Keohane (2016), Pantall (2003), Mulyati (2015), and Mulyati (2016) are more likely to focus on seaweed farming as an economic activity and see

it as a solitude sector. In contrast, this research shows that productivity and activities within the farming system are interrelated and shape one another, and these relations can go beyond the sector itself. Recognising seaweed farming as a space also means opening up possibilities (Massey, 2005). It emphasises the aspect of 'openness', meaning that the farming system is an open and never-ending process that is always evolving over time and influenced by social relations. This aspect of 'openness' tends to be overlooked in much of the literature that I have found since the majority used the economic view that sometimes undermined the social relations and temporal aspects of the farming system.

This research particularly complements a study by Andréfouët et al. (2021) that specifically studied the impacts of tourism on seaweed farming on Nusa Lembongan Island. Andréfouët et al. (2021) identified the fast-changing socio-economic conditions of seaweed farming due to tourism and the Mount Agung hazard using Spaceborne images (satellite imagery) and semi-structured interviews. Their study's focus was on the reasons why seaweed farming gradually declined over time. They argue that people gradually leave seaweed farming due to several factors, such as limited lands to cultivate seaweed because of coastal developments, failing production, low market prices, and easy jobs in tourism, which all are relevant to this study's findings. However, besides those factors, this study gives a more nuanced understanding of seaweed farming dynamics by identifying not only the reasons why seaweed farmers leave the sector but also why farmers opt to maintain the sector by analysing it from multidimensional perspectives (social, economic, and environmental). For example, high salaries and easier jobs in tourism do not necessarily attract people; rather some people, especially females, tend to opt for a loose and flexible working environment in seaweed farming. Similarly, despite the benefits of tourism, working in it poses some challenges, including a more competitive and individual atmosphere, which has become a source of pressure and stress for some people. Massey's view on space, in this case, has an implication to see the study case as relational; thus, the factors mentioned are interrelated, influencing the dynamics in seaweed farming practices.

This study is relevant to what Taylor (2013) argues in his article, that applying Massey's view on one study case has some implications. First, "the case may be bigger than we think" (Taylor, 2013, p. 809). Taylor (2013) argues that a case is usually conceived as a fixed entity bounded within space and time. However, Massey's theory on the multiplicity of trajectories has expanded our thinking in seeing the case by also incorporating non-living environment (Fenwick & Edwards, 2010, as cited in Taylor, 2013). In my study case, the non-living environment can be seen, for instance, in history, knowledge, and power dynamics. With the perception that the farming system itself is a space, interrelationships between living and non-living environments are "inevitable and valuable rather than being unfortunate" (Taylor, 2013, p. 809). Second, Taylor (2013) argues that "the case is relationally complex" (Taylor, 2013, p. 809). I would agree with this statement. Taylor (2013) contends that relational complexity expands significantly when the cultural context is considered. Each individual is part of and belongs to a larger and intersecting group of people (family, inhabitants, members of associations, etc) and their histories, along with their interests and everyday experiences, alter a unique constellation of the study case (Taylor, 2013). As for my study case, it can be perceived that each seaweed farmer in the farming system has their own social links and histories that influence the way they build and maintain the farming system.

All in all, Using Massey's theory on space, I tried to dissect the complex dynamics of seaweed farming in Jungut Batu. As the theory of space is underused to understand farming dynamics, I use this lens to grasp the farming system from a different angle. I moved away from the geographical dimension of space and applied the concept to a non-geographical element: the farming system. As the study reveals, perceiving farming practices as a space allows us to analyse farming activities more holistically since the farming system is an entity full of diversity, social relations, and interconnections with other dimensions socially, culturally, and environmentally.

9. Conclusion and Recommendations

9.1 Final Conclusion

The primary objective of this research is to explore the social dynamics of seaweed farming in Jungut Batu amid the emergence of tourism. The research aims to answer the main question: *“How does the dynamic of seaweed farming in Jungut Batu affect the livelihood of those working in the sector?”* Four sub-research questions were generated to answer this question. In the final conclusion, I will try not to repeat but summarise the important points drawn from the previous chapters to answer each sub-research question in a direct way.

SRQ 1: What are the historical trends of seaweed farming in Jungutbatu village, and how has tourism development affected these trends?

As explained in Chapter 5, the general trend of seaweed farming fluctuates throughout the years. I identified the trend by classifying it into three phases. The first phase ranges from its inception in the 1980s to the emergence of tourism in the 2000s. The emergence of seaweed farming in Jungut Batu was influenced by its geographical conditions and tradition. The narratives about how the sector loomed are diverse among the informants, but it was believed the community leader had a strong influence in developing the sector in the village. In this first phase, seaweed farming became the primary economic activity in Jungut Batu, and tourism has not yet had any significant influence.

The second phase lasted from the emergence of tourism around 2000 until its collapse due to the COVID–19 pandemic in 2020. During this second phase, seaweed farming gradually vanished, and tourism became the main economic activity in the village. As demand for tourism continued to rise, more people left seaweed farming and shifted their profession to the tourism sector. Tourism started to reach its peak in 2013, with almost 90% of the villagers working in tourism, including youth who made a come back to Nusa Lembongan to pursue a career in tourism.

The third phase captures the return of seaweed farming during the COVID–19 pandemic until 2023. The main driver for this return was economic stability. The pandemic lasted longer than the informants thought. Therefore, inspired by their neighbours in the neighbouring village, people revived seaweed farming. However, since tourism has come back post–COVID–19, seaweed production has started to decline. Worsen environmental conditions influenced the quality of seaweed.

From the explanation above, various factors have influenced the fluctuation trend of seaweed farming. These factors vary, and it is hard to pinpoint which factor is more influential than others. As identified in this study, these factors include volatile seaweed prices in the market, decreasing demand for seaweed, environmental changes, and the emergence of tourism that serves as an appealing alternative to the villagers. In addition, encouragement from external institutions such as the government is also influential. Limited support from the government makes it harder for seaweed farming to thrive, especially when the

recent government's planning focused on developing tourism instead of preserving seaweed farming practices. Regardless, seaweed farming has shown the spirit of people's autonomy and resilience. This is apparent in the way the villagers have maintained the sector over the years, especially in the 1980s, 1990s, and 2020. The role of this sector in supporting the village's economy also has shifted. It used to be the main source of income, but now it is perceived as the 'backup' sector that supports the households' economy when tourism falls.

SRQ 2: How do local seaweed farmers perceive seaweed farming and tourism?

I analysed the detailed process of seaweed farming in Chapter 6 as the answer of the second sub-research question. Chapter 6.1. explains the farming process in several themes: core activities, division of labour, and business chain and utilisation. These themes describe a clear picture of how the informants conducted farming in practice. Section 6.2 lays out informants' perceptions about their jobs as seaweed farmers and tourism actors (details of informants' occupations can be seen in the Appendix Interview List). I divided informants' perceptions according to time flexibility, profit and return, workload, initial capital, competition, and environmental benefits.

In general, seaweed farming offers a more flexible and loose working environment compared to their jobs in tourism, which benefits the informants. Women have the flexibility to take their children to the workplace and do household chores. Meanwhile, men can have jobs other than farming since the profit from seaweed can vary depending on seasons. Both tourism and seaweed farming can be profitable, and it is hard to compare which one is more profitable since both sectors fluctuate. Most informants would lean towards one sector over the other depending on peak seasons. This is also the reason why the informants were persistent in working in both sectors: to have a backup income. Tourism can offer cash on a daily basis, which is important for informants.

In addition, seaweed farming is perceived to have a higher workload due to its physically-intensive nature, while working in tourism can create individual psychological pressures and competition among actors. Seaweed farming is attached to a sense of community, while tourism is performed on individuality and competitiveness. The sense of community has been developed in the seaweed farming community since the beginning. Initial capital could also pose a challenge for the informants who want to start working, especially in tourism. One way to tackle this is by taking a loan from a bank.

SRQ 3: How do these perceptions influence their career choices and livelihood decisions?

Chapter 7 focuses on the strategies employed by the informants to maintain their livelihoods and navigate the challenges in seaweed farming. These strategies include:

- *Balancing family incomes.* High living costs and low income drove the informants to have multiple jobs besides farming. Culturally, a family could stick together and live in one home, therefore managing their income and expenses on a household basis. The family members shared their economic responsibilities and supported each other in difficult times; for example, children supported their parents economically and vice versa.

- *Integrating seaweed farming and tourism.* Historically, dry seaweed used to be sold to tourists as souvenirs. However, this is not a common thing anymore today. Some attempts to integrate the two sectors have been made in the past, such as a hotel used to prove farming activities for its visitors. However, gradually reducing seaweed production has made such an initiative sustainable. As for now, the two sectors are operating independently as two separate sectors. According to informants, merging the two sectors seemed to be a hassle and less desirable.
- *Coping environmental challenges.* The informants deployed their own strategies to cope with environmental challenges using their traditional methods. These strategies were developed based on their years of experience with limited to non-support from external actors. The informants still struggle to cope with persistent issues, such as diseases and environmental changes.
- *Working collaboratively.* As farmers are mostly self-organised, they tend to rely on support from the farmer community. In this case, they shared their struggle, exchanged knowledge and developed solutions collaboratively. They seek help from farmer cooperation or networks.

SRQ 4: What are the aspirations and long-term goals of local seaweed farmers for both sectors?

I included this question to understand the aspirations of the informants about their future career paths and the sectors. I juxtaposed the informant's opinions with the village government's views in 7.2. The study reveals that most informants did not plan to leave seaweed farming completely since this sector is the only possible occupation for them and their families. Most informants have tried to engage in other sectors, such as dry agriculture, salt farming, fishermen, and entrepreneurship. However, they could not thrive, and seaweed farming was conceived as their 'comfort' sector. Opposed to this view, one of the village's focuses is on developing tourism. From the interview, the programmes to increase farmers' capacity to develop their business in seaweed farming tend to be limited and not a priority. This prompted a question of how those who can rely on seaweed farming can survive and how the government could anticipate potential conflicts.

I tried to apply Massey's perspective on space to the practice of seaweed farming and analyse its dynamics from a different point of view. Massey's theory helps recognise the diversity and relationality within the sector. The study exemplified how 'throwtogetherness' created and/or exercised in the marginalisation and social exclusion of seaweed farmers. The study also showed how social relations contributed to strengthening the sense of community and resilience among seaweed farmers. In terms of relationality, the study illustrated how the multitemporal and multidimensionality of seaweed farming are interrelated and shape one another. Understanding seaweed farming as a space helps to see the relationships and interactions between different elements within that space. It also opens many possibilities for the practices as they are constantly shaping and evolving as unfinished work (Massey, 2005).

9.2 Reflection on Research Limitations

As for my research limitations, I could only carry out fieldwork for a limited period, which was only one month in December 2024. It is worth noting that the nature of seaweed farming and tourism can vary significantly throughout different seasons. For example, December is a wet season, which might affect the abnormality in seaweed production. Similarly, December is a holiday season that tourists might visit more

often, which affects the activities of farmers working in both sectors. As a result, the insights gained from this research are confined to conditions observed during December 2024 and may not represent all the variety throughout the year. Similarly, The Mangrove Conservation Area is not the only location where seaweed farming practices are held in Jungut Batu. During the interview, I learned that seaweed farmers' experiences are very diverse even when they live in one village. A specific farming location has different environmental conditions and, thus, different challenges for farming. As I decided to focus on this particular area (The Mangrove Conservation Area), the results of this study will, therefore, be specifically applied to this specific location.

Furthermore, I was only able to interview one village official since December was a busy time for the government apparatus. The village was preoccupied with important tasks, such as preparing its yearly budget, which made it difficult to arrange a meeting with multiple officials. Having more interviewees from the government side (with different roles) would enrich the study's findings, especially in order to better understand the challenges from the government's point of view.

Lastly, my study limitation relates to language use. I conducted the interviews in Bahasa and needed to translate them into English for the report. Therefore, the meaning of the answers may get lost in translation.

9.3 Recommendations For Future Research

I would encourage more researchers to study seaweed farming in Nusa Lembongan. As pointed out in the literature review, seaweed farming in Bali, let alone on Nusa Lembongan Island, is still understudied. More research on this topic could help policymakers develop strategic policies to improve the overall condition of this sector on the island. The study identified that aquaculture, including seaweed farming, could offer promising income opportunities for the islanders compared to other types of agriculture. This is because soil qualities on the island are different and typically not suitable for dry farming. This condition could be different per specific location. However, exploring seaweed farming in Bali or Nusa Lembongan is beneficial in adding more options for income diversification in coastal areas.

I would also suggest conducting research on livelihood diversification on Nusa Lembongan Island. As many researchers have discussed, coastal communities tend to rely on a single sector, such as tourism. This is also a case on Nusa Lembongan Island. However, over-reliance on only one sector could increase vulnerability and is often unsustainable, as shown by this study. Therefore, diversification can promote more resilience, stability, and less exploitative income-generating activities in Nusa Lembongan. If the government would consider agriculture or aquaculture next to tourism, then sustainable tourism development should be managed. In addition, the impacts of climate change are prevalent, and coastal communities become the most vulnerable to it. Therefore, more studies on income diversification can help policymakers make strategies for these communities to become more adaptable to such changes.

Moreover, the study has indicated some problems in seaweed farming supply chain management, such as transparency, coordination, and power dynamics between actors. Supply chain management in seaweed farming is a broad and multifaceted topic, and thus it could include the distribution, utilisation,

and market processes of seaweed (Interview, 2023). Therefore, I think a topic on seaweed farming supply chain would be interesting to explore. A more in-depth analysis can be carried out to see power relations among actors and the overall transparency of the process. Understanding these processes, especially from a sociological perspective, can help improve the overall inclusivity and equity of the industry.

In terms of methodology, I would suggest further research to be mindful of the research period. I encourage researchers to conduct a study analysing the trends in seaweed farming over a longer period that captures some seasons. In terms of samples, other researchers could also select more than one specific farming area as the study location.

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APPENDIX

Appendix 1: Interview Guide Village Official

Historical trends of seaweed farming

1. Can you provide a historical overview of seaweed farming in Jungutbatu? (the story of how it started, key milestones and changes over the years)
2. When and how did seaweed farming emerge as the primary activity in the village? what were the initial motivations for engaging in this practice?
3. Can you describe any changes in farming practices (technique and methods) that have occurred throughout the history of seaweed farming in the village?
4. How the economic conditions and market dynamics has influenced seaweed farming during different historical periods?
5. Were there any notable fluctuations in the demand and pricing of seaweed products, and how did these fluctuations impact local farmers?
6. How has the pandemic or other crisis affected seaweed farming practices?

How tourism development has affected these trends.

7. Can you provide a historical overview of tourism in Jungutbatu? (the story of how it started, key milestones and changes over the years)
8. How has tourism affected the environment and social and economic conditions in the village? (not related to seaweed farming)
9. Can you describe any significant changes in seaweed farming techniques, production, labour, market, or income that coincide with the growth of tourism in the area?
10. Have there been changes in land use patterns for seaweed farming as a result of tourism development?
11. Have there been changes in access to seaweed farming as a result of tourism development?
12. To what extent have cultural practices related to seaweed farming been impacted by the rise of tourism?
13. How has tourism development influenced the environmental sustainability of seaweed farming in Jungutbatu?
14. In the face of tourism development, have seaweed farmers in Jungutbatu implemented any adaptations or innovations to sustain their livelihoods?
15. Can you share any experiences or observations of how community relationships have changed in response to tourism development?

Government policy and support

16. Have there been government policies or interventions that have influenced the historical trends of seaweed farming, especially in response to tourism development?
17. How has the local community collaborated with or responded to government initiatives in relation to seaweed farming and tourism?

Aspirations and long-term

18. What are your aspirations for the future of seaweed farming in Jungutbatu, goals
19. Do you see any potential for balancing or integrating seaweed farming with your current work in the tourism sector?
20. Are there ways in which the two sectors could complement each other for the benefit of the community?

Seaweed Farmers

Personal Experiences and Observations.

1. What is your motivation to become a seaweed farmer?
2. Can you share your personal experiences with seaweed farming in Jungutbatu and how it has evolved over the years?
3. In your own words, how would you describe the relationship between seaweed farming and tourism in the village?

Role of Seaweed Farming in Livelihood.

4. How important is seaweed farming to your livelihood, and how has it contributed to your economic well-being?
5. Have you noticed any changes in the economic aspects of seaweed farming due to the presence of tourism?

Perceived Benefits and Challenges.

6. From your perspective, what are the main benefits of being a seaweed farmer in Jungutbatu?
7. What challenges do you face, and have these challenges been influenced by tourism-related activities?

Impact on Traditional Farming Practices.

8. Have there been any changes in traditional seaweed farming practices influenced by the growth of tourism in the area?
9. How do you balance traditional methods with potential modifications to adapt to tourism-related changes?

Tourism-Related Opportunities.

10. Are there opportunities for collaboration or mutual benefit between seaweed farming and tourism in Jungutbatu?
11. Have you personally explored or experienced any positive outcomes from the coexistence of seaweed farming and tourism?

Environmental Sustainability.

12. Are there environmental concerns or considerations that you and other farmers share regarding the impact of tourism on seaweed farming?
13. How has tourism affected the access to land?

Community involvement

14. How do you perceive local communities?
15. How are decisions related to seaweed farming and tourism made within the local community, and to what extent are farmers involved in these decisions?

Labour division in family

16. How do you divide labour in your family in seaweed farming practices?

Career choices

17. Do you have other side jobs apart from seaweed farming? How do you manage the time and workload in those jobs and seaweed farming?
18. How do those jobs affect your income and livelihoods?

Aspirations and long-term goals

19. What are your aspirations for the future of seaweed farming in Jungutbatu, considering the current dynamics with tourism?
20. How do you envision the long-term relationship between seaweed farming and tourism in the village?
21. Do you see any potential for balancing or integrating seaweed farming with your current work in the tourism sector?
22. Are there ways in which the two sectors could complement each other for the benefit of the community.

Appendix 2: Interview List

Groups	Name of Informants	Relation in Family	Occupations	Interview Methods
Family 1	Informant 1	Husband (farm owner)	<ul style="list-style-type: none"> • Seaweed farmer • Mangrove tour guide 	<ul style="list-style-type: none"> • Individual and group interviews • Multiple interviews
	Informant 2	Wife	<ul style="list-style-type: none"> • Seaweed farmer • Housewife • Help her son manage a homestay 	<ul style="list-style-type: none"> • Individual and group interviews • Multiple interviews
	Informant 3	Not part of the family	<ul style="list-style-type: none"> • Labourer 	<ul style="list-style-type: none"> • Group interview • One-time interview
	Informant 4	Not part of the family	<ul style="list-style-type: none"> • Labourer 	
Family 2	Informant 5	Wife	<ul style="list-style-type: none"> • Seaweed farmer • Housewife 	<ul style="list-style-type: none"> • Group interview • One-time interview
	Informant 6	Uncle	<ul style="list-style-type: none"> • Seaweed farmer • Mangrove tour guide 	
	Informant 7	Husband (farm owner)	<ul style="list-style-type: none"> • Seaweed farmer • Hotel driver 	<ul style="list-style-type: none"> • Individual interview • One-time interview
Family 3	Informant 8	Wife	<ul style="list-style-type: none"> • Seaweed farmer • Cooker for a restaurant 	<ul style="list-style-type: none"> • Group interview • One-time interview
	Informant 9	Not part of the family	<ul style="list-style-type: none"> • Labourer • Own motorcycle rental 	
	Informant 10	Uncle	<ul style="list-style-type: none"> • Seaweed farmer • Snorkelling tour guide 	
Family 4	Informant 11	Husband (farm owner)	<ul style="list-style-type: none"> • Seaweed farmer • Mangrove tour guide • Owning a small store in the Mangrove Area 	<ul style="list-style-type: none"> • Individual and group interviews • Multiple interviews
	Informant 12	Daughter in law	<ul style="list-style-type: none"> • Seaweed farmer • Housewife • Helping her husband manage the store 	<ul style="list-style-type: none"> • Group interview • One-time interview

Groups	Name of Informants	Relation in Family	Occupations	Interview Methods
	Informant 13	Wife	<ul style="list-style-type: none"> • Seaweed farmer • Housewife 	
	Informant 14	Son	<ul style="list-style-type: none"> • Seaweed farmer • Snorkelling tour guide 	<ul style="list-style-type: none"> • Individual interview • Multiple interviews
Family 5	Informant 15	Husband (farm owner)	<ul style="list-style-type: none"> • Seaweed farmer • Fisherman • Mangrove tour guide 	<ul style="list-style-type: none"> • Group interview • One-time interview
	Informant 16	Wife	<ul style="list-style-type: none"> • Seaweed farmer • Housewife 	
Family 6	Informant 17	Husband (farm owner)	<ul style="list-style-type: none"> • Seaweed farmer 	<ul style="list-style-type: none"> • Group interview • One-time interview
	Informant 18	Wife	<ul style="list-style-type: none"> • Seaweed farmer • Housewife 	
-	Informant 19	-	<ul style="list-style-type: none"> • Village officer 	<ul style="list-style-type: none"> • Individual interview • One-time interviews

Appendix 3: Deductive Codes

DEDUCTIVE CODES			
Sub – Research Questions	Categories	Codes	Description of codes
What are the historical trends of seaweed farming in Jungutbatu village, and how has tourism development affected these trends?	Historical Trends of Seaweed Farming	1.1 Historical Background	<ul style="list-style-type: none"> The historical background of seaweed farming in the village (who introduced it and how). Motivations that drive farmers to start farming.
		1.2 Traditional Farming Practices (harvest, dry, cultivate)	<ul style="list-style-type: none"> Techniques employed by early seaweed farmers in the village. Tools and methods used in seaweed cultivation by early seaweed farmers in the village.
		1.3 Economic Dynamics	<ul style="list-style-type: none"> Income diversification before seaweed farming. Changes in the income of seaweed farming over time (price fluctuation).
		1.4 Cultural Practices	<ul style="list-style-type: none"> Cultural rituals or traditions associated with historical seaweed farming. How seaweed farming has been woven into the cultural routine of the village ((e.g <i>Tilem</i> rituals, Bali's calendar, gender roles).
		1.5 Techniques Evolution	<ul style="list-style-type: none"> Changes in methods. Changes in equipment and tools. The impact of technological/methods advancements on productivity.
	Tourism Development's Impact on Seaweed Farming Trends	1.6 Economic Shifts	<ul style="list-style-type: none"> Changes in income generated by seaweed farming post-tourism development. Economic diversification on tourism-related income (farmers experiences in tourism).
		1.7 Land Use Changes	<ul style="list-style-type: none"> Alterations in land use patterns for seaweed farming due to tourism. How tourism-related activities affect available land for seaweed farming practices
		1.8 Sector integration	<ul style="list-style-type: none"> Integration of seaweed farming practices into tourism. How tourism activities influence sector integration.

DEDUCTIVE CODES			
Sub – Research Questions	Categories	Codes	Description of codes
How do local seaweed farmers perceive seaweed farming and tourism?		1.9 Environmental Consequences	<ul style="list-style-type: none"> • Ecological impacts of increased tourist activity on seaweed farming. • Changes in water quality or other environmental factors affecting seaweed cultivation.
		1.10 Social Dynamics	<ul style="list-style-type: none"> • Shifts in community cohesion or social interactions related to tourism and seaweed farming.
	Policy and Regulation	1.11 Government Intervention	<ul style="list-style-type: none"> • Policies or regulations that have influenced seaweed farming. • Challenges or conflicts arising from regulations related to seaweed farming and tourism.
	Economic Perceptions	2.1 Income Generation in seaweed farming	<ul style="list-style-type: none"> • Farmers' views on how seaweed farming contributes to their income. • Perceptions of the economic challenges associated with seaweed farming.
		2.2 Tourism as an Economic Opportunity	<ul style="list-style-type: none"> • Views on tourism as an additional economic opportunity. • Perceptions of the economic drawbacks of engaging with tourism.
	Income sustainability	2.8 Sustainability of Seaweed Farming	<ul style="list-style-type: none"> • Farmer views on the long-term sustainability of seaweed farming. • Perceptions of the factors influencing the viability of a career in seaweed farming.
	Environmental Awareness	2.3 Tourism-Related Environmental Concerns	<ul style="list-style-type: none"> • Farmers' concerns or awareness of environmental impacts related to tourism. • How tourism development is perceived regarding its effects on the local environment.
	Farmer Responses to Tourism Impact	2.9 Community Perspectives on tourism.	<ul style="list-style-type: none"> • The diversity of opinions within the community regarding tourism impact. • Community attitudes towards tourism.
	Challenges in seaweed farming	2.4 Workload concerns	<ul style="list-style-type: none"> • Farmers' concerns about the workload of engaging in seaweed farming. • Farmers concerns about the workload of engaging in tourism

DEDUCTIVE CODES			
Sub – Research Questions	Categories	Codes	Description of codes
		2.5 Non-workload concern	<ul style="list-style-type: none"> • Farmers' concerns about non work load concerns related to seaweed farming (e.g virus, weather, season).
	Social Dynamics	2.6 Community Relationships	<ul style="list-style-type: none"> • Views on social interactions and collaborations within the farmers community. • Perceptions of how seaweed farming and tourism affect community relationships.
		2.7 Farmer-Tourist Interactions	<ul style="list-style-type: none"> • Farmers' experiences and perceptions of interactions with tourists. • Whether they see tourism as fostering positive or negative social dynamics.
		2.8 Farmer-Government interactions	<ul style="list-style-type: none"> • Farmers' experiences and perceptions of interactions with the governments. • Whether they see the government as fostering positive or negative on seaweed farming.
	Responses to Covid -19 Pandemic	2.9 Covid lesson learned	<ul style="list-style-type: none"> • Insights into how the pandemic highlighted the need for diversification. • Insights into how the pandemic changed the perceptions of the community on resilience.
How do these perceptions influence their career choices and livelihood decisions?	Career choices	3.1 Income Prioritization	<ul style="list-style-type: none"> • How farmers prioritise income sources, considering both seaweed farming and tourism. • Factors influencing the decision to prioritise one source over the other.
		3.2 Tourism as a Livelihood Choice	<ul style="list-style-type: none"> • Perceptions of tourism as a potential alternative or supplementary livelihood option for the future. • How tourism is seen in relation to the stability of their future livelihood.
	Livelihood Strategies	3.3 Diversification Strategies.	<ul style="list-style-type: none"> • Farmers' perceptions of the need for livelihood diversification. • Strategies employed to evolve their career landscapes.

DEDUCTIVE CODES			
Sub – Research Questions	Categories	Codes	Description of codes
		3.4 Income balancing strategies	<ul style="list-style-type: none"> • How they strategise balancing multiple income sources.
What are the aspirations and long-term goals of local seaweed farmers for both sectors?	Economic aspiration	4.1 Economic Prosperity	<ul style="list-style-type: none"> • How farmers envision financial stability as part of their long-term goals.
		4.2 Diversification goals	<ul style="list-style-type: none"> • Aspirations for diversifying income sources within seaweed farming and tourism • Aspirations for creating new opportunities and businesses outside seaweed farming and tourism.
		4.3 Capital and Skill Development Goals	<ul style="list-style-type: none"> • Goals related to enhancing capital and skills.
		4.4 Community Empowerment Goals	<ul style="list-style-type: none"> • Aspirations for empowering the local community through both sectors (from the government's perspective).
		4.5 Future career	<ul style="list-style-type: none"> • Values that farmers passed to their future generation about career choices. • Aspirations for their children in terms of their career choices.