



ANALYSIS OF THE LIVELIHOOD ASPECTS OF THE SEAWEED VALUE CHAIN IN ZANZIBAR

Wahida Hamza Makame



International
Institute of
Social Studies

Ezafus

Published for:
REPOA
157 Migombani/REPOA Streets, Regent Estate,
P.O. Box 33223
Dar es Salaam.

Suggested citation:

Makame. W. H., (2022). Analysis of the livelihood aspects of the seaweed value chain in Zanzibar, United Republic of Tanzania. REPOA, Dar es Salaam.

Research Report

Suggested Keywords:

Livelihood aspects, seaweed value chain, Zanzibar, Tanzania

@REPOA, 2022

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means without the written permission of the copyright holder or the publisher.

This publication was produced with the financial support of the European Union, through the EU-ACP TradeCom II Programme, as part of the Targeted support to strengthen capacity of policymakers, exporters, and trade associations to assess and review trade and related economic policies to promote trade competitiveness and diversification for widening trading opportunities with the EU” project implemented by REPOA and ISS-Erasmus. Its contents are the sole responsibility of the research team and do not necessarily reflect the views of the European Union, the EU-ACP TradeCom II Programme, REPOA or ISS-Erasmus. The Member States of the European Union have decided to link together their know-how, resources and destinies. Together, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

ACKNOWLEDGEMENT

The study on 'Analysis of the Livelihood Aspects of Seaweed Value Chain in Zanzibar, United Republic of Tanzania' has been possible due to support and contributions from various stakeholders. Special thanks should go to REPOA and International Institute of Social Studies (ISS) at Erasmus University, Rotterdam in Netherlands for funding this research. Professor Peter Van Bergeijk and Dr. Binyam Demena from ISS and Dr. Jamal Msami from REPOA are highly appreciated for their support at every step of the research.

Special thanks should go to Zanzibar Ministries, namely, the Ministry of Blue Economy and Fishery (MBEF), Ministry of Trade and Industrial Development (MTID) and Ministry of Agriculture, Irrigation, Natural Resources and Livestock (MAINL) for providing support specifically staffs during field work. Specifically, thanks should go to MBEF staffs; Dr. Salim M. Hamza, Mr. Juma Kh. Jaffar, Mr. Mohammed S. Othman, Mohammed A. Abdi, Rabia M. Omar, Aisha B. Masoud, Aisha Kh. Juma and Mohammed S. Hassan (Driver - Pemba), staffs from MTID; Mr. Hamad O. Rashid, Mr. Mohamed O. Masoud, Mrs. Rehema H. Said, Mr. Yahya F. Haji and staff from MAINL Mr. Said S. Mohammed.

Other thanks should go to staffs from the Office of Chief Government Statistician, Zanzibar Mrs. Khadija Kh. Hamad (Technical Advisor), Mr. Abdullah O. Makame (IT) and Mr. Ali A. Shamte (Quality Assurance).

Much appreciation should go to Mr. Issa Mlingoti (Former Chief Coordinator at Zanzibar Government Affairs Coordination Office - Dodoma), Mr. Khamis Sh. Mohammed, Ms. Sabra H. Makame, Mr. Azzan Kh. Iddi (Driver -Unguja), local leaders (Sheha) from the surveyed villages and all those involved during the listing exercise, Focus Group Discussions (FGDs), survey, meetings, interviews and observation.

All are equally acknowledged for their support and contributions that have led to this important report.

EXECUTIVE SUMMARY

This research report is a result of the contract from REPOA which was undertaking an Organisation of African, Caribbean and Pacific Group of States (OACPS) 2 years funded program titled “Targeted Support to Strengthen Capacity of Policy Makers, Exporters and Trade Associations to Assess and Review Trade and Related Economic Policies to Promote Trade Competitiveness and Diversification for Widening Trading Opportunities with the EU” in collaboration with the International Institute of Social Studies at Erasmus University, Rotterdam (ISS). The Research came as a response to REPOA Call of Proposal which was advertised around July 2020, but due to COVID 19, the Research commenced around February 2021. The general purpose of the study was to analyze the seaweed value chain in Zanzibar and ultimately coming up with policy recommendations for scaling up the competitiveness of the seaweed sub sector.

The Seaweed Study Process

This study has passed through different phases and incorporated different research methods as follows:

1. **Inception Phase:** The Inception report was prepared in February 2021 and sent to REPOA and ISS for approval.
2. **Focus Group Discussions (FDGs):** Four FDGs were conducted in 24th and 28th March 2021 involving 10 focus group discussants per FDG in order to get information that could also be useful in preparing questionnaire. The FDGs with seaweed farmers were conducted at Paje and Bweleo Villages (Unguja) and Tumbe village (Pemba).
3. **Pre testing questionnaire:** The structured questionnaire was developed in April, 2021 and pre -tested to seaweed farmers at Bweleo and Chukwani villages in Unguja islands in May, 2021.
4. **Listing exercise:** Based on the list of seaweed villages provided by Ministry of Agriculture, Irrigation, Natural Resources and Livestock, sample of villages to be surveyed was drawn wherein seaweed farmers were listed. The seaweed farmers listing exercise was conducted in May and June 2021 and involved 11 villages from Unguja and 22 villages from Pemba. During listing exercise, meetings were conducted with seaweed farmers,

highlighting among others, the purpose of research and emphasizing the farmers to participate fully in the research. The meetings were done in nine villages in Unguja Islands which were Kilindi, Potoa, Pongwe, Nyamanzi, Bungi, Kajengwa, Chukwani, Uzi and Ng'ambwa.

5. **Training:** Prior to data collection, three-day training to enumerators was conducted in June 2021 at Ministry of Blue Economy and Fishery, Pemba to create common understanding on the questionnaire and survey approach in general.
6. **The Survey:** A study managed to survey a total of 2290 respondents out of a sample of 2400 respondents from 33 villages in Zanzibar. 1672 and 618 seaweed farmers were surveyed in Pemba and Unguja respectively around July, August and November 2021. The villages surveyed in Unguja Islands were Kilindi, Bungi, Potoa, Pongwe, Nyamanzi, Muungoni, Kajengwa, Chukwani, Uzi, Urowa and Ng'ambwa and Pemba Islands were Tumbe Mashariki, Tumbe Magharibi, Mtemani, Mjini Wingwi, Micheweni, Shumba Mjini, Sizini, Kinowe, Shanake, Tondooni, Makangale, Chokocho, Maziwa Ng'ombe, Kiuyu Mbuyuni, Gando, Kiuyu Minungwini, Kambini, Mchanga mdogo, Fundo, Chwale, and Kwale.
7. **Key Informant Interview:** The interview was conducted with seaweed companies involving Zanea, AZ company and HM Rashid company. The interview also was conducted to prominent persons in the seaweed industry.
8. **Observation:** During the study, many areas related to seaweeds farming were visited including seaweed farms at the sea, drying and storage areas as well as seaweed warehouses.
9. **Stakeholder's meeting:** A meeting involving 50 stakeholders was conducted on 21st December 2021 at the Ministry of Agriculture, Irrigation, Natural Resources and Livestock Pemba. The meeting had the purpose to collect more information and clarification on the data collected from the survey and involved seaweed farmers and government officials.

Research Findings

1. Of the total 2290 seaweed farmers surveyed, about 90.61% of them were female. Seaweed farmers were found in all age groups, with the greatest concentration in 36-49 age group. The difference in age distribution between male and female was insignificant.
2. On average, about 66% of farmers perceived that 75% of the households in the surveyed villages were engaged in seaweeds farming, as the days passed by, the number of seaweed farmers in Pemba seemed to increase, however that of Unguja seemed to decrease drastically as noticed in some villages such as Nyamanzi, Kilindi and Potoa. Either, by the time the survey was conducted, people in Fukuchani village in Unguja island did not farmed seaweeds anymore.
3. Nearly half of the surveyed seaweed farmers had not attended to school at all (47.29%) whereas number of females with no formal education was higher (48%) than males (44.86%). Number of seaweed farmers with no formal education was considerably high in Pemba (58.6%) as compared to Unguja (16.7%). The highest education level for seaweed farmers in Unguja was ordinary level while those in Pemba was primary level.
4. 97.29% of the seaweed famers considered income from seaweed farming not satisfactory despite the fact that about 94.89% of them took the seaweed farming as their main activity. The mean price of seaweeds sold for the last time by the time the survey was conducted was 596.15 per kilogram.
5. In terms of quality issues, 97.9% of the farmers reported that there was no institution that obliged them to conform to quality standards and about 98% of the farmers were not aware of quality aspects of seaweeds. Farmers had not adopted Good Agricultural Practices (GAP). Drying process being the very important quality factor for seaweeds, however 71% of the seaweed farmers dry their seaweeds on the ground (sand), very few used local mats or drying racks the situation that compromises quality of Zanzibar seaweeds.
6. Documentation in seaweed farming practices was poor. Nearly 90% of the farmers did not keep records of their sales and revenues and the use of receipt during selling of seaweeds was almost absent. There was no contract between farmers and buyer despite the fact that buyer (company) was required to train and give equipment to seaweed farmers. This situation

has sometimes resulted into conflict between farmer and buyer when the farmer sells to other buyer who has a little bit risen the price but give no support.

7. The seaweeds industry is being extremely impacted by climate change. The strong winds and waves do destroy seaweed farms. Productivity of seaweeds has reduced as there exists diseases and many dies offs of the seaweeds thus making farmers to always search for new plantation area hence moving far distance in the sea. The presence of diseases and dies offs of the seaweeds were reported in many villages including Kajengwa, Kilindi, Potoa, Uzi, Ng'ambwa, Makangale and Tumbe.
8. Seaweed farmers spent many hours in sea water yet 95.07% of them took no protective gear during their work, few of them use simple shoes or sometimes no shoes. 59.08% of the famers reported to experience seaweed health related problems such as overall body pain, swelling of legs, chest and spinal cord pains, cuts from harmful seaweed organisms and loss of eyesight. However, 86.81% of the total farmers surveyed had not used seaweeds for own consumption despite having many uses as a food with medicinal properties.
9. About 80.7% of seaweed farmers have been in seaweed industry for more than six years, yet they have been using the same traditional way of planting seaweeds. The farmers use wooden pegs where nylon ropes are tied upon. Sea ground being rocky area, tools such as crow bar, iron rods and plastic buckets and bags filled with sands and stone grave are used as anchors for tying ropes as noticed in some villages in Pemba including Kiuyu Mbuyuni, Makangale, Mjini Wingwi, Fundo and Tumbe. The farmers also use the crowbar and a hammer to create a hole where wooden pegs are inserted. To help in buoyancy of seaweeds in the sea, some farmers use plastic bottles and drums.
10. About 45.9% of seaweed farmers confirmed that there were some specific challenges to women in the industry. The work seemed to be heavy to them especially during their pregnancies and in some areas, the walking distance from the village to the sea is very long for example in Kiuyu Mbuyuni (5 km), Maziwa Ngo'ombe (4 km), Shanake (5 km) and Kajengwa (about 2 miles) considering that the same women are culturally responsible to fully engage themselves in family work as well. In some villages traditionally women do not go to the sea during their pregnancies and menses. Females' seaweed farmers at Kajengwa claimed that they did not have places where they could build a room/hut to exchange clothes when

they get wet as the places were taken for tourism investment.

11. Some economic activities were reported to impact seaweed industry. 65% of the seaweed farmers confirmed that fishing activities were destroying their farms. Other economic activities that were reported to impact seaweed industry was tourism investment especially in Unguja Islands such as Uroa and Pongwe Villages where seaweed farmers were claiming that water (e.g., swimming pool water) coming from hotels to the sea have chemicals that cause their seaweeds to become rotten and die.
12. The local market for seaweeds was seasonal. Farmers did not have guarantee on the timing of selling their seaweeds. Some farmers were paid once they sell their seaweeds while others reported to stay up to three to four months before getting paid. The local seaweed exporters had no guarantee on selling seaweeds to international market for example the local seaweed company that were exporting seaweeds to China had no contract with the buyer (according to the company, the Chinese importers did not want to enter into formal contract) thus making them to fail projecting their sales to that particular international market.
13. There was low knowledge and information about the seaweed industry and very big information gap among seaweed value chain actors. The research revealed that in some villages such as Bweleo and Paje, seaweed farmers were engaging in value addition activities to produce different products that sell at good price, other areas had no information regarding the different uses and benefits of seaweeds and majority (86.81%) had not used seaweeds for own consumption. Seaweed farmers at Chukwani village were found to only know personal name of the agent to whom they were selling their seaweeds but did not know the name of the seaweed company he was representing. The detailed market information seems to be unknown to seaweed actors especially those at low level of the seaweed value chain such as farmers and local agents of seaweed company at Shehia level.
14. In terms of policy and institutional framework, there are some national plans such as Vision 2050 that covers seaweed industry under the blue economy sector. It was found that there were seaweeds committees at almost every Shehia (local area), however, most farmers were unaware of them, and the committees seemed to be inactive.
15. Main challenges posed by seaweed buyers were infrastructure (port congestion, roads, power), high taxation, lack of education for seaweed farmer, improper handling of seaweeds

by farmers and slow handling of documentation and permits by relevant authorities in government.

Key Recommendations

- 1. Strengthening policy and institutional framework:** This should involve reviewing regulatory environment governing seaweeds subsector and formulating Policies and regulations to promote the sector, reviving, and establishing new seaweed farmers cooperatives and committees.
- 2. Investing in Education:** Introduce Training the Trainers (TOT) program to selected seaweed stakeholders at Shehia (local area) level and staffs responsible for seaweed sector with detailed M & E framework for making follows up. The trainees will be responsible to train seaweed farmers from time to time with different aspects related to seaweeds industry including swimming and dive skills, quality issues, value addition and farming technologies. Special program to emphasize the seaweed society into sending their children to school and adult education should be promoted.
- 3. Introduce experimental phase for seaweeds:** It could be two or three -year experiment aiming to generate information, among others, by understanding clearly best production period and areas for seaweeds, good farming methods and value addition technologies, production needs and world market demand and prices. The experiment should involve different activities such as capacity building program, seaweed site selection, research and make use of the outcomes of the research with emphasis on knowledge and information sharing across the seaweed value chain actors.
- 4. Investing in Quality Management:** Relevant quality bodies such as Zanzibar Bureau of Standards (ZBS), Government Chemist and Zanzibar Food and Drug Authority (ZFDA) should be strengthened through capacity building programs and acquisition of laboratory equipment so that they have parameters for measuring seaweeds in different forms to maintain good quality. The bodies and other relevant institutions such as Ministry responsible for Blue Economy should set up quality standards to be followed by seaweed

stakeholders including farmers and company agents. Ministry responsible for Agriculture needs to emphasize and adopt Sanitary and Phyto Sanitary measures.

5. **Putting in Place Supporting Infrastructure:** Infrastructure such as power supply, water and roads should be more reliable. Other infrastructure such as sea port, rubble roads ending to seaweed farms, seaweed warehouses, stairs and drying places including stony floor, bakery and exchange rooms for women should be constructed.

ACRONYMS

FAWE – Forum for African Women Educationalists

FAO – Food and Agriculture Organization

FDGs – Focus Group Discussions

GDP – Growth Domestic Product

HBS – Household Budget Survey

ISS – International Institute of Social Studies

IT – Information Technology

MAINL – Ministry of Agriculture, Irrigation, Natural Resources and Livestock

MBEF – Ministry of Blue Economy and Fishery

MTID – Ministry of Trade and Industrial Development

REPOA – Research for Poverty Alleviation

ZIPA – Zanzibar Investment Promotion Authority

ZPC– Zanzibar Planning Commission

TABLE OF CONTENTS

ACKNOWLEDGEMENT.....	3
EXECUTIVE SUMMARY	4
ACRONYMS	xi
TABLE OF CONTENTS.....	xii
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background.....	1
1.2 Existing Policy and Institutional Framework	2
1.3 Purpose and Objectives of the Study	3
1.4 Methodology	4
1.5 Organization of the Report	4
1.6 Ethical Clearance	4
CHAPTER TWO	6
SOCIO-DEMOGRAPHIC PROFILE.....	6
2.0 Overview	6
2.1 Location of the community	6
2.2 Age by sex distribution of the population.....	6
2.3 Marital status	7
2.4 Education level	8
2.5 Disability status	9
2.6 Household Size	10
CHAPTER THREE	11

SEAWEED FARMING IN ZANZIBAR COMMUNITY	11
3.0 Overview	11
3.1 Seaweed Farming Practices.....	11
3.2 Types of Seaweed Farmed	12
3.3 Farming Methods	13
3.4 Extent of Household Farming Seaweeds	14
3.5 Time Use by Seaweed Farmers	15
3.6 Growing Period of Seaweeds	18
3.7 Demand of Seaweeds.....	19
3.9 Experiences in Seaweed Farming.....	21
3.10 Training.....	21
CHAPTER FOUR	23
QUALITY, SAFETY AND MARKETING OF SEAWEEDS	23
4.0 Overview	23
4.1 Seaweed Own Consumption	23
4.2 Drying of Seaweeds.....	24
4.3 Storage of Seaweeds	25
4.4 Seaweed Health Related Problems.....	26
4.5 Usage of Protective gear	27
4.6 Standards of Quality.....	28
4.7 Technology use in seaweed	30
CHAPTER FIVE	31
INCOME AND EXPENDITURE ON SEAWEED FARMING	31
5.0 Overview	31

5.1	Sources of Startup Capital	31
5.2	Amount of the Startup Capital	32
5.3	Seaweeds Earned per Season	33
5.4	Quantities and Price of Seaweeds Sold.....	34
5.5	Income Satisfaction	35
5.6	Decision on the Uses of Income	35
5.7	Seaweed Markets (Buyers)	36
5.8	Last Time to Sale Seaweeds	38
5.9	Stocks of Seaweeds	39
5.10	Records Keeping.....	40
5.12	Economic Activities Affecting Seaweed Farming	43
CHAPTER SIX.....		45
FINANCE, CREDIT SERVICES AND ORGANIZATIONS.....		45
6.0	Overview	45
6.1	Community Based Organizations	45
6.2	Supporting Organizations outside Community.....	47
6.3	Possession of Saving Account	48
6.4	Request for loan	49
CHAPTER SEVEN		51
CASE STUDY.....		51
7.0	Overview	51
7.1	The Seaweed Farming in Mauritius and Rodrigues Project	51
7.2	The Branding Project for Zanzibar Cloves	53
CHAPTER EIGHT.....		55

CHALLENGES, CONCLUSION AND RECOMMENDATION	55
8.0 Overview	55
8.1 Challenges	55
8.2 Conclusion and Recommendations.....	60
REFERENCES	63

CHAPTER ONE

INTRODUCTION

1.1 Background

Zanzibar is composed of two main sister islands which are Unguja and Pemba and other small islands covering a total area of 2654 sq km. The projected population of Zanzibar for the year 2020 is 1.6 million. Zanzibar economy for the year 2020 grew at 1.3 percent from 7.0 percent in 2019. The GDP composition by sector in 2020 showed that among the four main economic sectors of Zanzibar, services sector was the leading one with a contribution of 43.9% of the total GDP followed by agriculture, forestry and fishing sector which had a contribution of 27.6% of the GDP (Office of Chief Government Statistician, 2020). Contribution of agriculture sector to the GDP increased from 22.1% in 2019 to 27.6% in 2020 while that of services sector within the same period decreased however tourism has emerged to be the main source of revenue for Zanzibar.

Agriculture, forestry and fishing sector is the industry that engage most of the employed persons - 36.2% (Household Budget Survey, 2020) in Zanzibar. According to Poverty Assessment Report (2015), more than half (56.2%) of the population of Zanzibar in rural areas were engaged in agriculture. Major cash crops that are grown for export are cloves and seaweeds. Seaweed is the third largest contributor to GDP proceeded by clove and tourism. It is estimated that about 24,000 persons in Zanzibar are engaged in seaweed farming whereas women account for more than 80% of the total seaweed farmers (Ministry of Agriculture, Natural Resources and Livestock, 2019).

Wild seaweeds existed many years in Zanzibar however commercial farming of red seaweeds started in 1989 after two private companies imported Eucheuma seaweeds from Philippines and established two pilot firms at Jambiani and Paje villages in Unguja Island (Msuya, 2011). Later on, seaweed farming spread to other areas of Unguja and Pemba and currently Pemba accounts for 80% of the total seaweed production.

Zanzibar farms two main varieties of seaweeds which are cottonii and spinosum. The cottonii is of high quality and fetches slightly higher price than spinosum. However, Zanzibar produces high

amount of spinosium because these seaweeds grow at shallow water which becomes easy for seaweed farmers most of whom are women to grow it. The higher priced cottonii is more prone to environmental changes compared with low priced Spinosium thus leading to many cottonii die offs. (Msuya, 2006). Production of two varieties of seaweeds in Zanzibar for the year 2015 to 2020 is shown in the Table 1.1below:

Table 1.1: Seaweeds Production by Species from 2015 to 2020

Year	Espinonium Seaweed		E. Cottonii Seaweed		Total	
	Quantity Tons	Value TZS. Mil.	Quantity Tons	Value TZS. Mil.	Quantity Tons	Value TZS. Mil.
2015	16,665.1	9,408.6	58.2	59.9	16,723.3	9,468.5
2016	11,113.5	4,932.6	1.2	1.3	11,114.7	4,933.9
2017	10,955.0	4,381.8	26	35.3	10,981.0	4,417.1
2018	10,296	4,211.8	129	147.1	10,424.9	4,358.8
2019	9,559.2	5,535.5	104	132.2	9,663	5,667.7
2020	8,668.2	5200.9	116.4	186.2	8784.6	5387.1

Source: Office of the Chief Government Statistician - OCGS, 2020

Seaweeds are widely used as food, production of hydrolloids, as fertilizers and soil conditioners, animal feed, fish feed, biomass for fuel, cosmetics, waste water treatment and integrated aquaculture (FAO,2003). In Zanzibar, about 99% of the seaweeds are exported in raw form. Major markets for Zanzibar seaweeds are Denmark, USA, Spain, France, China, South Korea, Philippines and Vietnam. Despite being one of the priority sectors in the blue economy agenda of Zanzibar, the seaweed sub-sector has been facing many challenges including climate change, diseases, low levels of technology and value addition, lack of standards, inadequate drying facilities, low price, inadequate storage facilities and working tools.

1.2 Existing Policy and Institutional Framework

Zanzibar has adopted number of plans and policies that have recommendations or/and impact on seaweed subsector. Seaweed sector together with tourism are developed sectors of Zanzibar within blue economy sector. Some of the frameworks are mentioned below;

1.2.1 Zanzibar Development Vision 2050: Under Pillar I Economic transformation, blue economy is one of the priority areas of pillar I with strategic direction to effectively coordinating and managing the development of the ocean and its endowments for significant contribution to

economic prosperity. The vision inspires to exploit marine related resources and products sustainably and industrial value addition including commercialization of fisheries and aquaculture.

1.2.2 Zanzibar Blue Economy Policy 2020: The Policy has laid out specific strategies for aquaculture that include: empowering stakeholders through institutional and farmers capacity enhancement, promoting resource use efficiency by identifying high potential aquaculture zones and appropriate production system, strengthening aquaculture R & D and infrastructure, strengthening the market for aquaculture products with emphasis on developing industrial potential for refined seaweed and other aquaculture products in line with regional and international export demand.

1.2.3 Zanzibar Industrial Policy 2019 -2029: The main objective of the Zanzibar Industrial Policy is to expand and develop existing and new manufacturing industries priority sectors in order to transform the country into a middle-income economy. The policy measures for blue economy are: to assist light fish and aquaculture product processing enterprises in the development of business and investment plans and marketing strategies, to promote improvement in processing and the use of improved equipment among fish and aquaculture enterprises, to support companies to improve quality and safety of products to better access regional and international markets, to strengthen safety and quality policies in order to comply with overall sanitary requirements and safety of fish products according to e.g. OIE WTO and FAO Codex, to create regional reference laboratories that meet the norms for main markets and other related infrastructure and build the capacity of the actors of the value chain.

1.2.4 Ministry of Blue Economy and Fishery, Zanzibar: In order to manage well blue economy sectors and prioritize the blue economy agenda, the government has established Ministry of Blue Economy and Fishery in 2020. The Ministry is responsible to coordinate sustainable use of marine and its resources and conservation of marine resources environment.

1.3 Purpose and Objectives of the Study

The general purpose of the study is to analyze the seaweed value chain in Zanzibar and ultimately coming up with policy recommendations for scaling up the competitiveness of the seaweed

sector. The research also seeks to identify practices, challenges and opportunities facing the seaweed actors along the seaweed value chain in Zanzibar.

1.4 Methodology

The study has used different research methods for data collection including household survey, Key Informant (KI) Interviews, Focus Group Discussions, personal observations, meetings, telephone conversation and literatures. The survey was conducted to 2290 seaweed farmers from 33 villages in Zanzibar. The survey deployed a multi stage cluster sampling with probability proportional to size selection where Shehias (villages) farming seaweeds were taken as clusters. In the second stage of sampling, a sample of individual seaweed farmers were selected from each Shehia using systematic selection method. Before the survey was conducted, listing exercise for seaweed farmers was conducted at all the selected Shehias (Villages). Four FGDs involved 40 discussants (seaweed farmers and processors) with 10 discussants per group was conducted in Tumbe (Pemba) and Bweleo and Paje (Unguja). Key Informant Interviews was also conducted to three seaweed companies and other prominent persons in the seaweed sector.

The qualitative data obtained from FGDs, personal observations, meetings, telephone conversation and FDGs was collected through manual. The quantitative data was collected through Cispro data entry program and analyzed as descriptive statistics using the Statistical Package for the Social Science (SPSS) and excel. Qualitative data collected from transcripts of Key Informant Interviews, FGDs, meetings and observations were analyzed.

1.5 Organization of the Report

After the Chapter on Introduction comes Chapter Two that describes Socio-economic Profile, Chapter Three explains about Seaweed Farming in Zanzibar Community followed by Chapter Four presenting Quality, Safety and Marketing of Seaweeds, Chapter Five describes Income and Expenditure on Seaweed Farming, Chapter Six describes Finance, Credit Services and Organization, Chapter Seven presents Case Study and Chapter Eight concludes with the Challenges, Conclusion and Recommendations.

1.6 Ethical Clearance

Prior to the commencement of the research, permission was sought from the Revolutionary Government of Zanzibar through the Second Vice President's Office and the Office of Chief Government Statistician, Zanzibar.

CHAPTER TWO

SOCIO-DEMOGRAPHIC PROFILE

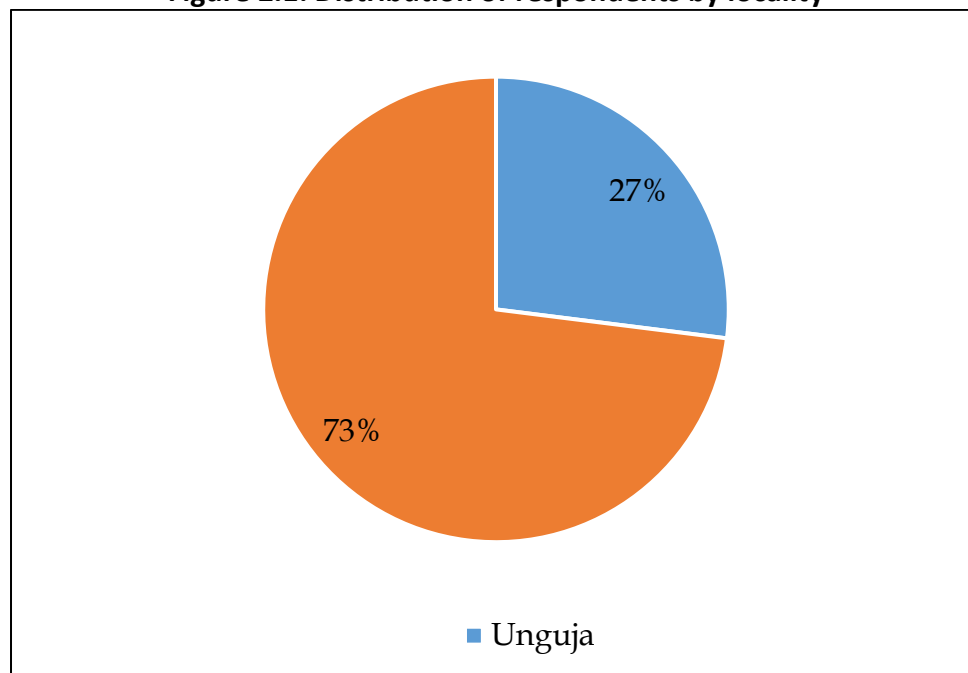
2.0 Overview

Socio-economic characteristics of the seaweed farmers are important factors to be assessed as they might affect the seaweed farming. This section presents socio economic characteristics of the seaweed farmers with regards to gender, age, marital status, education, average household size and household dependency among community.

2.1 Location of the community

This study managed to interview a total of 2,290 individuals from two islands of Unguja. Out of this interviewed population, 73% which is equivalent to 1,672 respondents were from Pemba Island while the remaining 27% (618 respondents) were from Unguja Island, Figure 2.1.

Figure 2.1: Distribution of respondents by locality



2.2 Age by sex distribution of the population

Majority of seaweed farmers across both islands were female (Table 2.1). About 90.61% of the total seaweed farmers surveyed were female. Previous studies confirmed that females were

more likely to be employed in the agriculture sector than males (43.8% of female are employed in agriculture; for male this is 38. 1% -OCGS, 2018).

Seaweed farmers were found in all age groups, with the greatest concentration in 36-49 age group (Table 2.2). The difference in age distribution between male and female was insignificant.

Other age groups with high number of seaweed farmers were 25-35 group and 50-64 group indicating that the sector comprise of many economically active persons.

The age structure of seaweed farmers indicates that the sector comprises of many economically active persons which is good sign for implementation of interventions targeting to improve the seaweed industry.

Table 2.1: Distribution of respondents by age and sex

Age group	Sex		Total
	Male	Female	
0 - 17	3	12	15
18 - 24	34	105	139
25 - 35	111	400	511
36 - 49	204	705	909
50 - 64	165	442	607
65 +	38	71	109
Total	555	1,735	2,290

The study done by Msuya (2011, 2017) revealed that men do not prefer seaweed farming because they need money on daily basis, they find it to be more time and labor intensive, low price of sea weeds and they were more attracted by fishing and activities triggered by tourism. However, proportions of males engaging in seaweed industry in Pemba (29.72%) was higher than that of Unguja (9.39%). According to (Msuya, 2012), in Pemba many men still farm seaweed because of lack of alternatives compared to Unguja where developed tourism provided the increased alternatives to the people living in Unguja.

2.3 Marital status

About 83.36% of seaweed farmers were married whereby proportion of male was high (89.01%) than female (81.56%), see Table 2.2.

Table 2.2: Distribution of respondents by marital status and sex

Marital status	Sex		Total
	Male	Female	
Single/never married	51	98	149
Married	494	1,415	1,909
Divorced/separated	5	115	120
Widow	5	106	111
Prefer not to state	0	1	1
Total	555	1,735	2,290

Majority being married implies that income earned from seaweeds is very important for sustaining family life.

2.4 Education level

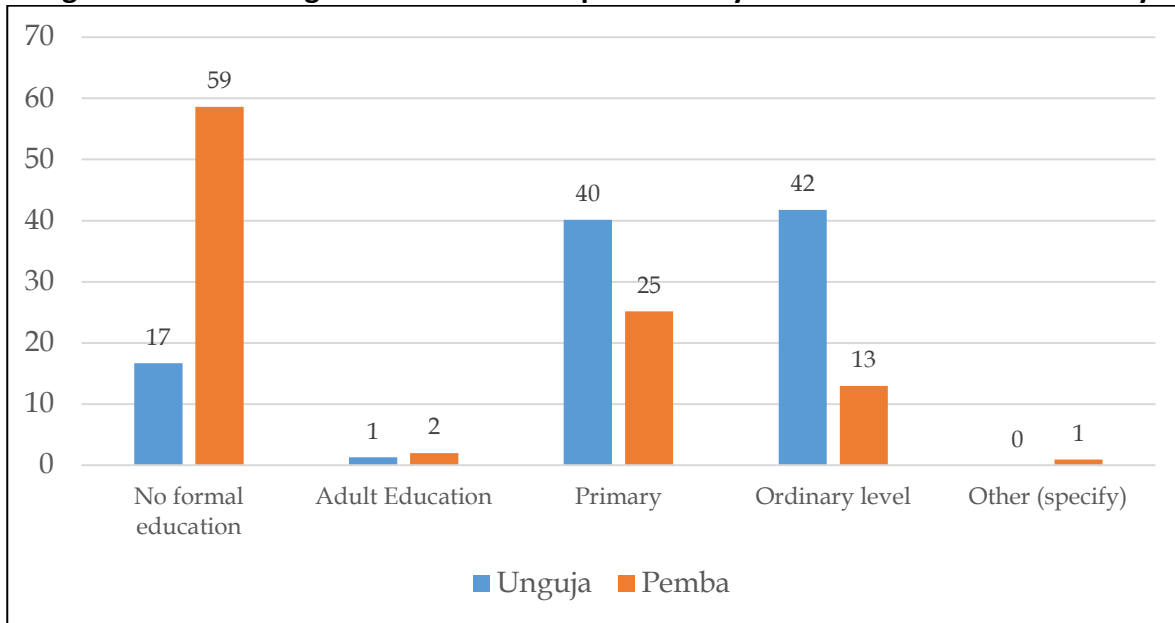
Nearly half of the seaweed farmers had not attended to school at all (47.29%) whereas number of females with no formal education was higher (48%) than males (44.86%). Majority of those who attended to school had primary education as their highest level of education (Table 2.3).

Table 2.3: Distribution of respondents by level of education and sex

Highest level of education	Sex		Total
	Male	Female	
No formal education	249	834	1,083
Adult Education	17	24	41
Primary	161	508	669
Ordinary level	125	350	475
Advanced Level	0	2	2
Certificate/Diploma	1	1	2
Prefer not to state	1	1	2
Other (specify)	1	15	16
Total	555	1,735	2,290

Across the two islands, number of seaweed farmers with no formal education was considerably high in Pemba (58.6%) as compared to Unguja (16.7%). The highest education level for seaweed farmers in Unguja was secondary level while that of Pemba was primary level, see Figure 2.2. This is parallel to the study by Ronald Bet al (2015) who found that majority of the interviewed seaweed farmers (60%) in Unguja island had a secondary education.

Figure 2.2: Percentage distribution of respondents by level of education and locality



Though having low or no formal education, many had confirmed to get education from religious teaching classes (madrassa). The low level of education has greatly impacted practices in seaweed industry. Challenges present such as limited use of documentation and technologies; quality control issues, lack of market information and negotiation power could easily be solved through education.

2.5 Disability status

Table 2.4 indicates the disability status of seaweed farmers. About 1.88% of seaweed farmers had disability whereby the number of males with disability was high (2.52%) than females (1.67%). Types of disability reported were mainly difficulties in seeing and hearing. The same types of disabilities were two main types of disabilities confirmed to face older people in Zanzibar (Household Budget Survey, 2019/2020).

Table 2.4: Distribution of respondents by disability status and sex

Has any disability	Sex		Total
	Male	Female	
Yes	14	29	43
No	541	1,706	2,247
Total	555	1,735	2,290

2.6 Household Size

Table 2.5 and Table 2.6 indicate number of households by gender and across the two islands respectively. Average Household size in Zanzibar is 5.3 (HBS, 2019/2020)

Table 2.5: Distribution of respondents by households and gender

	Gender		Total	Gender		% (Total)
	Male	Female		% (Male)	% (Female)	
0	1	1	2	0.18	0.06	0.09
1	0	5	5	0.00	0.29	0.22
2	10	40	50	1.80	2.31	2.18
3	20	83	103	3.60	4.78	4.50
4	30	140	170	5.41	8.07	7.42
5	53	244	297	9.55	14.06	12.97
6	54	220	274	9.73	12.68	11.97
7	70	256	326	12.61	14.76	14.24
8	79	244	323	14.23	14.06	14.10
9	96	194	290	17.30	11.18	12.66
10	46	116	162	8.29	6.69	7.07
11	48	110	158	8.65	6.34	6.90
12	23	38	61	4.14	2.19	2.66
13	12	13	25	2.16	0.75	1.09
14	7	14	21	1.26	0.81	0.92
15+	6	17	23	1.08	0.98	1.00
	555	1,735	2,290	100.00	100.00	100.00

Table 2.6: Distribution of respondents by households and locality

	Island		Total	Island		% (Total)
	Unguja	Pemba		% (Unguja)	% (Pemba)	
0	1	1	2	0.16	0.06	0.09
1	3	2	5	0.49	0.12	0.22
2	24	26	50	3.88	1.56	2.18
3	46	57	103	7.44	3.41	4.50
4	73	97	170	11.81	5.80	7.42
5	145	152	297	23.46	9.09	12.97
6	80	194	274	12.94	11.60	11.97
7	100	226	326	16.18	13.52	14.24
8	59	264	323	9.55	15.79	14.10
9	55	235	290	8.90	14.06	12.66
10	12	150	162	1.94	8.97	7.07
11	14	144	158	2.27	8.61	6.90
12	3	58	61	0.49	3.47	2.66
13	1	24	25	0.16	1.44	1.09
14	1	20	21	0.16	1.20	0.92
15+	1	22	23	0.16	1.32	1.00
	618	1,672	2,290	100.00	100.00	100.00

CHAPTER THREE

SEAWEED FARMING IN ZANZIBAR COMMUNITY

3.0 Overview

This chapter describes seaweed farming practices, types of seaweed farmed, farming methods, time use, growing period, experiences in seaweed farming and trainings.

3.1 Seaweed Farming Practices

Table 3.1 shows that majority of farmers in Zanzibar farm seaweeds as family members whereby percentage of male in total male (67.75%) is greater than percentage of female in total female (49.34%) farming as family.

Table 3.1: Farming practice by gender

		Gender		Total	% (Male in Total Male)	% (Female in Total Female)	% (Total)
		Male	Female				
Are you farming seaweed	Alone/individual	143	733	876	25.77	42.25	38.25
	cooperatives/association	15	58	73	2.70	3.34	3.19
	Family	376	856	1,232	67.75	49.34	53.80

Across the islands, majority of seaweed farmers in Unguja farmed seaweeds individually (68.12%) whereas in Pemba, majority of them farmed as family (63.88%) as shown in Table 3.2. however, some seaweed farmers were using two or all of the three approaches.

Table 3.2 Farming practice by locality

		Island		Total	%Unguja	%Pemba	% (Total)
		Unguja	Pemba				
Are you farming seaweed	Alone/individual	421	455	876	68.12	27.21	38.25
	cooperatives/association	4	69	73	0.65	4.13	3.19
	Family	164	1,068	1,232	26.54	63.88	53.80
	Others	1	10	11	0.16	0.60	0.48

3.2 Types of Seaweed Farmed

Spinosium is the main species of seaweeds farmed in Zanzibar. About 86.68% of the total seaweed farmers farmed spinosium only while very few farmed cottonii only (0.79%) as indicated in Table 3.3. Since Spinosium fetches low price (TZS 500 -TZS 700) as compared to cottonii (TZS 1,800 to TZS. 2,000), this has translated into low income earned by the seaweed farmers. According to (Msuya 2011), the world market prefers cottonii over spinosum because gel extracted from cottonii, kappa carrageenan, is stronger than that extracted from spinosum, iota carrageenan.

Table 3.3: Seaweed Types by Gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
What type of seaweeds are you farming?	Spinosium only	493	1,492	1,985	88.83	85.99	86.68
	Cottonii only	4	14	18	0.72	0.81	0.79
	Both almost equally	4	17	21	0.72	0.98	0.92
	Mainly spinosium few cottonii	48	180	228	8.65	10.37	9.96
	Mainly cottonii few spinosium	6	31	37	1.08	1.79	1.62
	Other type (please specify)	0	1	1	0.00	0.06	0.04
Total		555	1,735	2,290	100.00	100.00	100.00

Table 3.3 revealed that more females were farming cottonii (13.95%) as compared to males (11.17%) whereas spinosium may survive in shallow waters, currently cottonii survive only in deep sea water. This indicated that female farmers were also engaged in deep water farming. Some villages farming cottonii species were found to be Chokocho, Makangale, Wingwi, Fundo (Pemba) and Uroa (Unguja).

Table 3.4: Seaweed types by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
What type of seaweeds are you farming?	Spinosium only	454	1,531	1,985	73.46	91.57	86.68
	Cottonii only	1	17	18	0.16	1.02	0.79
	Both almost equally	3	18	21	0.49	1.08	0.92
	Mainly spinosium few cottonii	157	71	228	25.40	4.25	9.96
	Mainly cottonii few spinosium	2	35	37	0.32	2.09	1.62
	Other type (please specify)	1	0	1	0.16	0.00	0.04
Total		618	1,672	2,290	100.00	100.00	100.00

3.3 Farming Methods

Seaweed farmers used mainly line or off bottom method than floating method. This can be attributed by the fact that spinosium is the species that dominates seaweed farming in Zanzibar and can grow in shallow intertidal lagoons. The reasons to use line or off bottom method were found to be easy to use and learn it, less costly, easy to get support from others, no fish grazing, no risk of drowning, no swimming and dive skills required, less walking distance in the sea, no transport devices required e.g., boat, no big current oceans, good growth of seaweeds and unaware of other method. The challenge for using this method was that the pegs could easily get destroyed by strong winds and sea weeds may decay during summer season due to high water temperature.

Farmers confirmed that planting seaweeds at high water level using floating method may help to reduce die offs due to heat as well as dirties because these dirties would pass beneath the seaweeds thus providing high production. This is in line with the study by (Msuya, 2007) who reported that floating line method has advantage of reducing die-offs that occur using the off-bottom method. The author further explained that floating line plots also act as fish-aggregating devices and by using 'dema' traps, seaweed farmers can also harvest a substantial number of fish. Despite the advantages, farmers confirmed that farming seaweeds at high water level using floating method is more expensive as it requires tools such as boat and buoys, requires swimming and dive skills and sea weeds can be easily grazed by fish.

3.4 Extent of Household Farming Seaweeds

About 66.11 % of seaweed farmers perceived that over 75% of the households in their village were engaged in seaweed related activities (Table 3.5). Either same perception was held by seaweed farmers across both islands.

Table 3.5: Extent of household farming seaweeds by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
To what extent are households in this community involved in seaweed-related activities?	All households	54	130	184	9.73	7.49	8.03
	Over 75% of households	347	1,167	1,514	62.52	67.26	66.11
	About half (50%) of households	84	206	290	15.14	11.87	12.66
	Less than half (50%) of households	70	232	302	12.61	13.37	13.19
Total		555	1,735	2,290	100	100	100

However, number of seaweed farmers perceived that people continue to engage in seaweed farming as they were five years ago was almost equal between male and female.

Table 3.6: Perception about people involvement in seaweed industry in five years by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Are the people of this community farming seaweed as much as they were 5 years ago?	Yes	371	1,082	1,453	66.85	62.36	63.45
	No	184	653	837	33.15	37.64	36.55
Total		555	1,735	2,290	100.00	100.00	100.00

An average of 63.45% farmers perceived that people were farming seaweeds as much as they were five years ago (Table 3.6).

Table 3.7: Perception about people involvement in seaweed industry in a year by gender

		Gender		Total	(Gender)		% (Total)
		Male	Female		% (Male)	% (Female)	
Are the people in this community farming seaweeds as much as they were last year? (January to December 2020)	Yes	456	1,323	1,779	82.16	76.25	77.69
	No	99	412	511	17.84	23.75	22.31
Total		555	1,735	2,290	100.00	100.00	100.00

Across the two islands, proportion of farmers believing that more people were engaged in seaweed farming was 64.89% in Unguja Island, much lower than that of Pemba (82.42%). Table 3.8 illustrates this as follows:

Table 3.8: Perception about people involvement in seaweed industry in a year by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Are the people in this community farming seaweeds as much as they were last year? (January to December 2020)	Yes	401	1,378	1,779	64.89	82.42	77.69
	No	217	294	511	35.11	17.58	22.31
Total		618	1,672	2,290	100.00	100.00	100.00

Results show that more seaweed farmers perceived that people were joining seaweed farming as the time passed by. This situation has been noticed in Pemba at Tumbe village during FGDs where researcher noticed the presence of many seaweed farmers at age of 20's and 30's. However, perception that people were running away from seaweed industry should not be neglected. During FDGs in Unguja, seaweed farmers at Paje and Bweleo maintained that people especially youth did not prefer seaweed farming and number of seaweed farmers were decreasing. Either, during listing exercise in Unguja, it was found that people in Fukuchani village did not farm seaweeds anymore. These results confirm earlier study by (Msuya, 2012) who reported that in 1993 when cottonii was also farmed in Paje, the village had 500 seaweed farmers (440 women and 60 men) where the number grew to 1,400 farmers (men and women) in 1998. However, the author further explained that by 2010, the number of seaweed farmers at Paje had dropped to 150 farmers, all of whom were women and Bweleo village had decreased slightly from an initial of 152 farmers to 140 in the same year.

3.5 Time Use by Seaweed Farmers

On average, majority of farmers spent about four to five hours per day, six days per week and two weeks per month in seaweed farming as shown in Figure 3.1, Figure 3.2, Figure 3. 3, Figure 3.4 and Table 3.9.

Figure 3. 1: Time spent in seaweed farming by gender per day

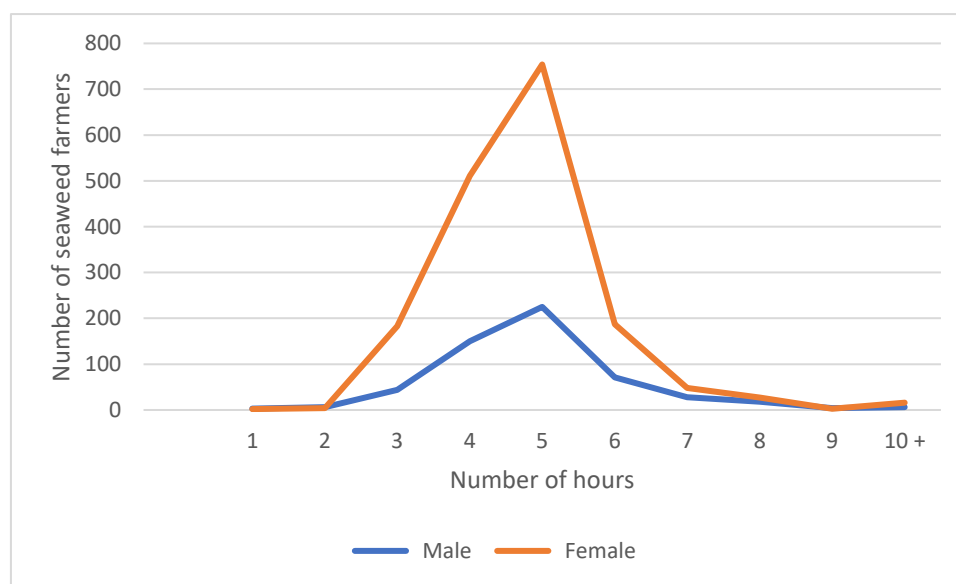


Figure 3.2: Time spent in seaweed farming by gender per week

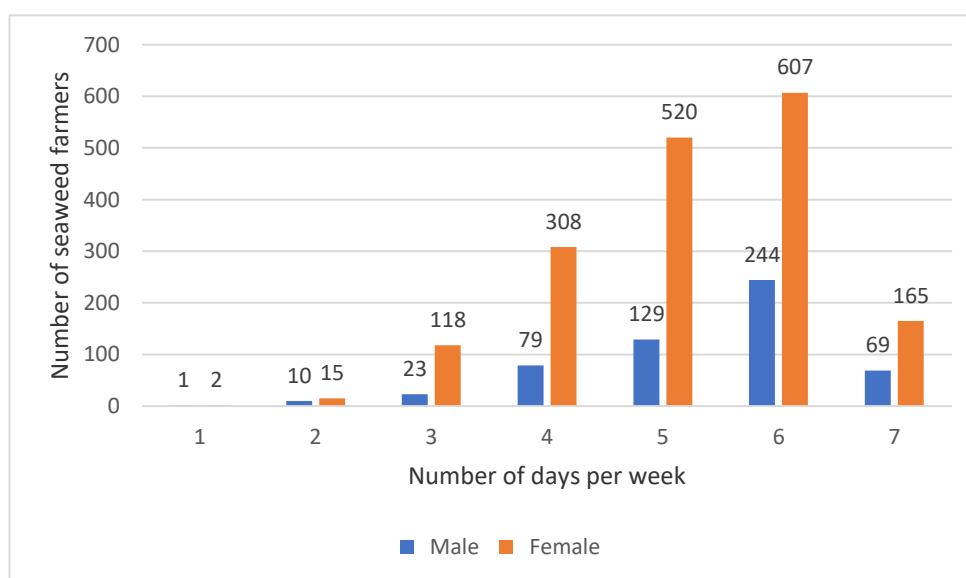


Table 3.9: Time spent in seaweed farming per week by locality

Number of Days	Island		Total	Island		Total
	Unguja	Pemba		% (Unguja)	% (Pemba)	
1	1	2	3	0.16	0.12	0.13
2	4	21	25	0.65	1.26	1.09
3	72	69	141	11.65	4.13	6.16
4	119	268	387	19.26	16.03	16.90
5	200	449	649	32.36	26.85	28.34
6	174	677	851	28.16	40.49	37.16
7	48	186	234	7.77	11.12	10.22
	618	1,672	2,290	100.00	100.00	100.00

The above times are times that are usually spent by farmers when doing seaweed activities at sea area for example planting and harvesting of sea weeds. The researcher has noticed other activities being done by seaweed farmers at home such as preparing tie tie and put them across ropes, drying, cleaning and packing seaweeds in the bags.

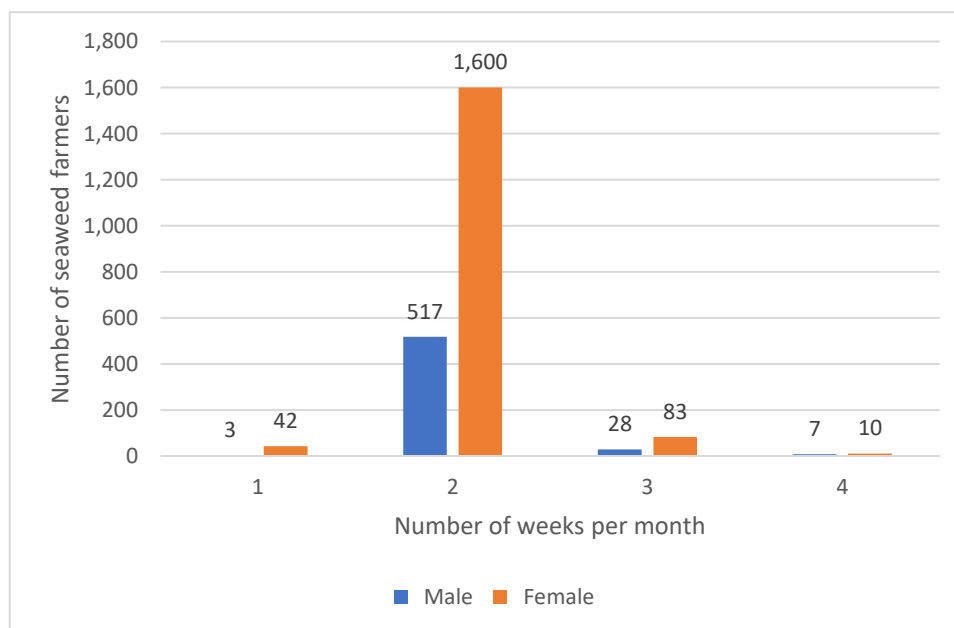
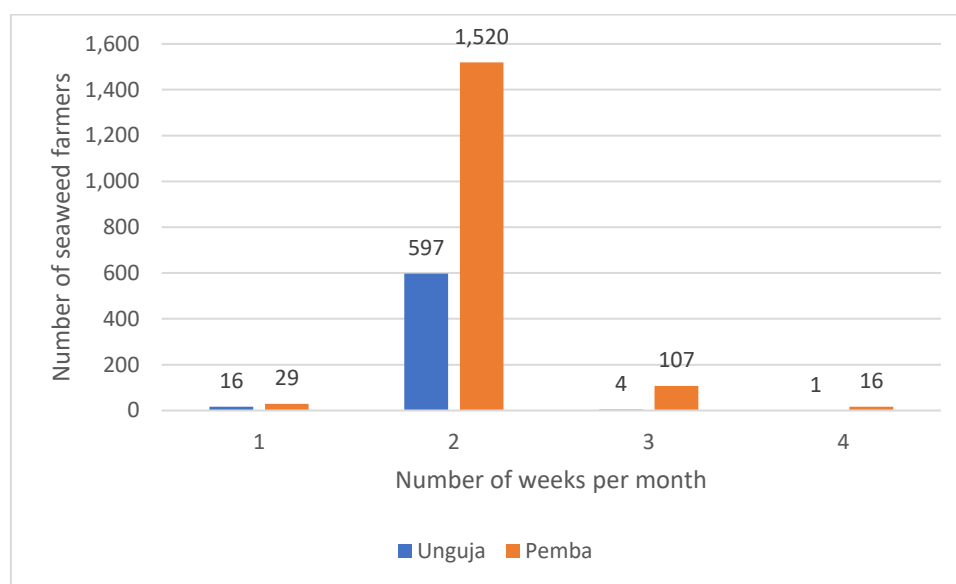
Figure 3.3: Time spent in seaweed farming by gender per month

Figure 3. 4: Time spent in seaweed farming by locality per month



3.6 Growing Period of Seaweeds

70% of seaweed farmers reported that seaweeds farming takes place throughout the year. However, there are times when seaweed growth is at high peak and times where seaweeds growth is low. Seaweeds grow well on September up to April. In rainy seasons, seaweeds can grow very well but may become rotten because drying of seaweeds depend on sunlight. During stakeholder meeting, seaweed farmer from Shanake village said that seaweeds in their village could grow well throughout the year and could die throughout the year depending on the area where it was planted. The research revealed that good growing period for seaweeds might differ from one village to another and may depends on weather in the particular year.

Table. 3.10: Growing period of seaweeds by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
When does seaweed farming take place during the year?	All through the year	410	1,196	1,606	73.87	68.93	70.13
	All through the year but mainly in	107	415	522	19.28	23.92	22.79
	Only during certain months of the year (please specify)	38	124	162	6.85	7.15	7.07
Total		555	1,735	2,290	100.00	100.00	100.00

Table. 3.11: Growing period of seaweeds by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
When does seaweed farming take place during the year?	All through the year	332	1,274	1,606	53.722	76.196	70.131
	All through the year but mainly in	245	277	522	39.644	16.567	22.795
	Only during certain months of the year (please specify)	41	121	162	6.634	7.237	7.074
Total		618	1,672	2,290	100.000	100.000	100.000

3.7 Demand of Seaweeds

82.16% of seaweed farmers perceived that for the past five years, the demand for seaweeds has decreased (Figure 3.5 and Figure 3.6). With COVID 19 that has slowed down many business and economic activities across the globe, the demand for seaweeds has decreased more.

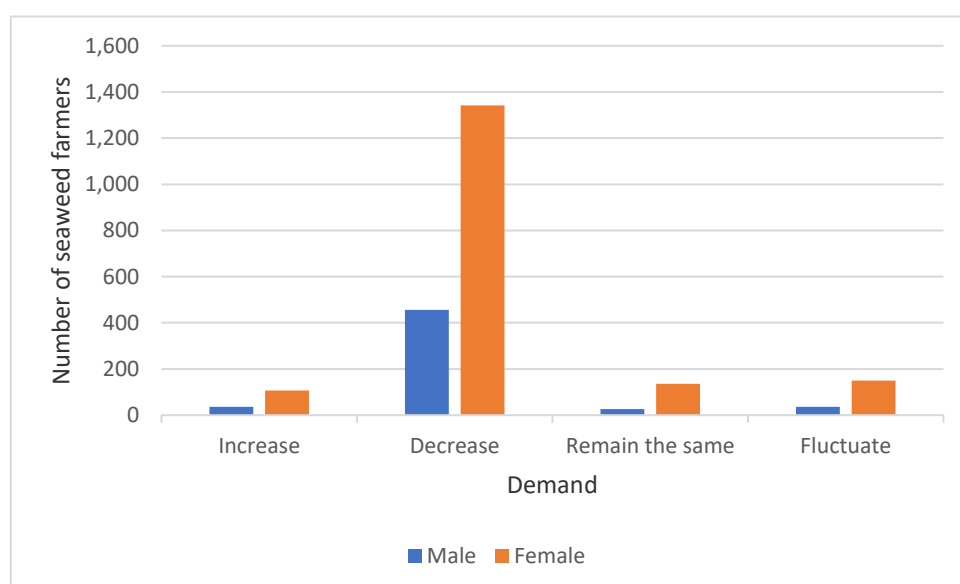
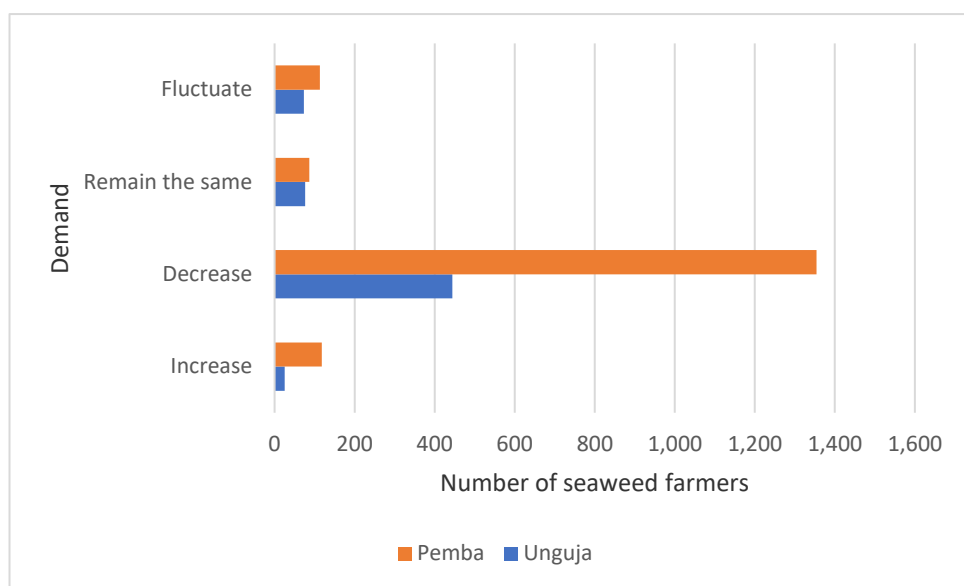
Figure 3.5: Perception on demand of seaweeds by gender

Figure 3.6: Perception on demand of seaweeds by locality



3.8 Price of Seaweeds

Proportion of more than 80% of farmers reported that for the last five years, price of seaweeds has decreased (Figure 3.7 and Table 3.12)

Figure 3.7: Perception on Price by Gender

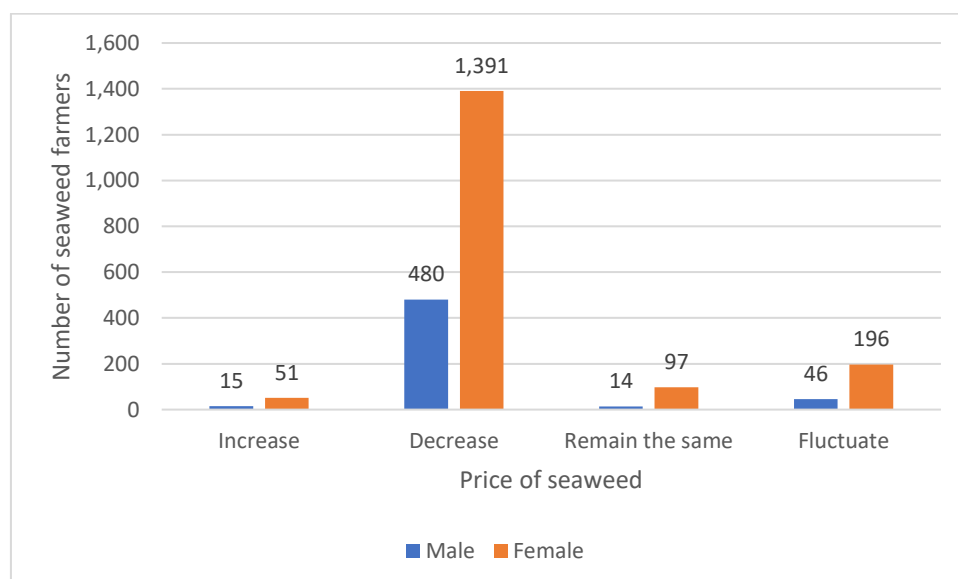
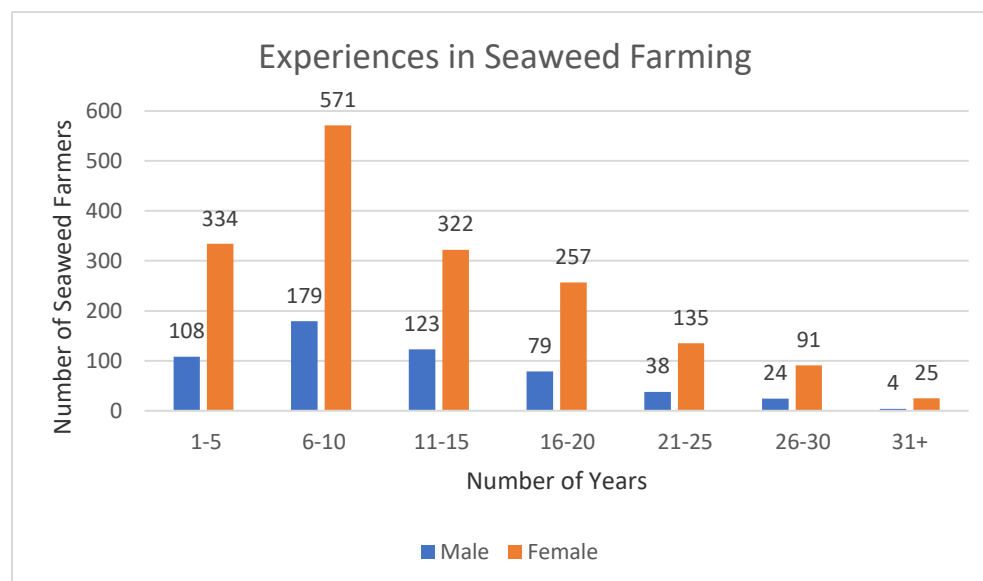


Table 3.12: Perception on price by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
For the past five years, has the price of seaweeds	Increase	12	54	66	1.94	3.23	2.88
	Decrease	443	1,428	1,871	71.68	85.41	81.70
	Remain the same	42	69	111	6.80	4.13	4.85
	Fluctuate	121	121	242	19.58	7.24	10.57
Total		618	1,672	2,290	100.00	100.00	100.00

3.9 Experiences in Seaweed Farming

Being the old sub sector, 80% of seaweed farmers have been in the industry for more than six years, see Figure 3.8.

Figure 3.8: Experiences in seaweed farming

These results confirm an earlier study by Ronald B et al, 2015 who reported that majority of the interviewed seaweed farmers in Zanzibar had a farming experience of 6 to 10 years.

3.10 Training

Only 13.49% of the farmers received training (Table 3.13). For those who had training, they got it from government, seaweed cooperatives and seaweed companies (buyer).

Table 3.13: Training on seaweeds farming by gender

		Gender		Gender	
		Male	Female	% (Male)	% (Female)
Did you get any training on sea weed farming	Yes	80	229	14.41	13.20
	No	475	1,506	85.59	86.80
Total		555	1,735	100.00	100.00

Only 14.56% and 13.10% of seaweed farmers in Unguja and Pemba Islands respectively received training as indicated in Table 3.14.

Table 3.14: Training on seaweeds farming by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Did you get any training on sea weed farming	Yes	90	219	309	14.56	13.10	13.49
	No	528	1,453	1,981	85.44	86.90	86.51
Total		618	1,672	2,290	100.00	100.00	100.00

Farmers use different methods to learn seaweed farming for the first time such as through observation, family, friends and training by government or seaweed company. 76.63% of seaweed farmers reported to have learn about seaweed farming for the first time by observing their fellows during seaweed farming activities. During FDGs at both Unguja and Pemba islands, some farmers reported to receive training from different stakeholders such as Zanzibar Seaweed Cluster Initiative, Institute of Marine Science, Department of Fisheries from Ministry responsible for Agriculture and FAWE.

CHAPTER FOUR

QUALITY, SAFETY AND MARKETING OF SEAWEEDS

4.0 Overview

Quality and safety are very important issues in the seaweed industry. Quality always determines the price of the product. Safe product and conditions sustain the practice of seaweed farming.

This chapter describes seaweed consumption, seaweed drying equipment, seaweed storage, seaweed health problems, use of protective gear, standard quality of seaweeds, technology use and other seaweed related activities.

4.1 Seaweed Own Consumption

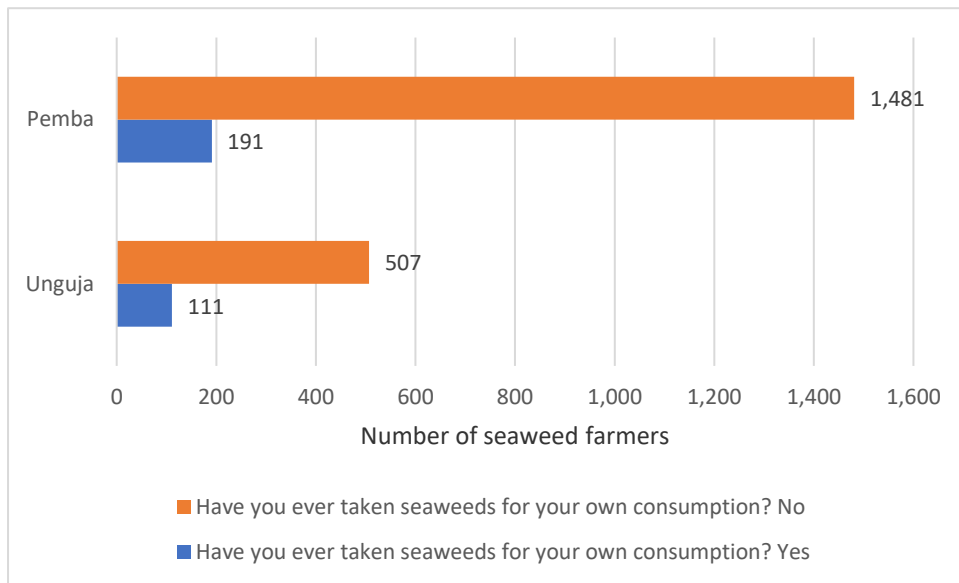
Despite the many benefits of seaweeds, 86.81% of the total seaweed farmers had not used seaweeds for own consumption (Table 4.1)

Table 4.1: Seaweeds own consumption by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Have you ever taken seaweeds for your own consumption?	Yes	55	247	302	9.91	14.24	13.19
	No	500	1,488	1,988	90.09	85.76	86.81
Total		555	1,735	2,290	100.00	100.00	100.00

Figure 4.1 indicates that 88.58% of Seaweed farmers in Pemba had not used seaweed for own consumption while proportion of farmers with similar situation for Unguja was 82.04%.

Figure 4.1: Seaweed own consumption by locality



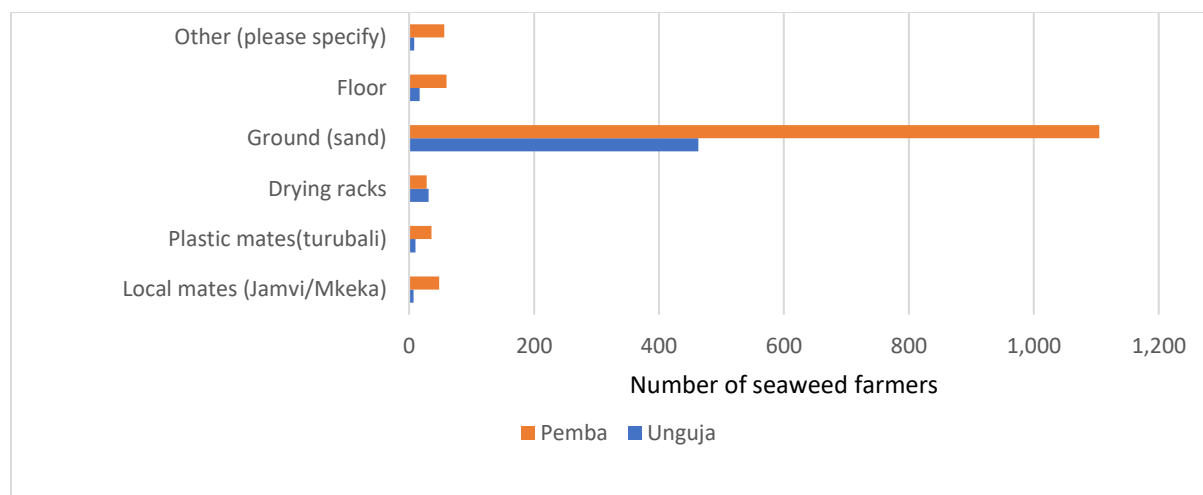
The lower level of seaweed own consumption was the result of low value addition of the seaweeds and lack of knowledge on the use and benefits of seaweeds by farmers. Seaweed having many benefits and uses; little consumption of it meant that seaweed farmers were not benefited from medicinal properties of seaweeds, taking into consideration that they reported to get health related seaweed problems such as overall body pains and joint pains.

In Zanzibar, there are few entrepreneurs who make different products from seaweeds such as cosmetics, body oils and soaps and used it as food whilst seaweed flower are used in making cakes, snacks, bread and juice. During FDGs, it was found that seaweed farmers at Paje and Bweleo were producing and selling different seaweed products at premium price. The packed dried seaweed and seaweed flower at Bweleo and Paje were sold at Tshs. 2,000 per 250g and Tshs.10,000 per kilogram respectively.

4.2 Drying of Seaweeds

About 71% of seaweed farmers dried their seaweeds on the ground (sand). Very few used local mates (jamvi), plastics mates (turubali), drying racks, floor and combination of these methods as indicated in Figure 4.2.

Figure 4.2: Seaweed drying equipment



According to various seaweed literatures, the most important quality factors for seaweeds are moisture content, seaweed maturity and impurities. Therefore, the drying process is very critical process for determination of the quality of seaweeds. Through verbal conservation, representative from CPkelco company from Denmark (seaweed buying company) confirmed that seaweeds in Zanzibar are of good quality as compared to other seaweeds from other countries, however the practices after harvesting may put seaweeds produced in Zanzibar at risk of losing its quality.

4.3 Storage of Seaweeds

Table 4.2 and Table 4.3 indicate that about 84.80% of seaweed farmers stored their seaweeds in their houses.

Table 4.2: Storage area by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
After harvesting seaweeds, where do you store them?	My house	431	1,511	1,942	77.66	87.09	84.80
	Warehouse	113	195	308	20.36	11.24	13.45
	Office	5	12	17	0.90	0.69	0.74
	Other (please specify)	6	17	23	1.08	0.98	1.00
Total		555	1,735	2,290	100.00	100.00	100.00

In some villages in Pemba, seaweed companies have built warehouses where seaweed farmers store their seaweeds. The warehouses were found in Kiuyu Mbuyuni, Wingwi Mtemani, Maziwa Ng'ombe, Shumba Mjini, Micheweni na Mjini Wingwi.

However, there were no warehouses in Fundo, Sizini and many surveyed villages in Unguja. Storing seaweeds into warehouses may lead into good control of quality than storing them at homes.

Table 4.3: Storage area by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
After harvesting seaweeds, where do you store them?	My house	612	1,330	1,942	99.03	79.55	84.80
	Warehouse	4	304	308	0.65	18.18	13.45
	Office	0	17	17	0.00	1.02	0.74
	Other (please specify)	2	21	23	0.32	1.26	1.00
Total		618	1,672	2,290	100.00	100.00	100.00

4.4 Seaweed Health Related Problems

Proportion of 49% of the seaweed farmers reported to get health problems due to seaweed activities as indicated in Table 4.4 and Table 4.5. The difference in proportion of male and female who experienced seaweed health related problems was insignificant.

Table 4.4: Proportion of respondents with seaweed health related problems by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Have you experienced seaweeds health related problems?	Yes	339	1,014	1,353	61.08	58.44	59.08
	No	216	721	937	38.92	41.56	40.92
Total		555	1,735	2,290	100.00	100.00	100.00

Table 4.5: Proportion of respondents with seaweed health related problems by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Have you experienced seaweeds health related problems?	Yes	291	1,062	1,353	47.09	63.52	59.08
	No	327	610	937	52.91	36.48	40.92
Total		618	1,672	2,290	100.00	100.00	100.00

Health related problems that were reported by seaweed farmers were chest pain, pains in spinal cord, poor eyesight, waist pain, swelling of legs, skin diseases and overall body pain whilst

majority reported to have combinations of these problems. Sometimes farmers get stings, bites and cuts from sea organism (e.g., bochu and nyenga).

During FDGs at Tumbe, the discussants confirmed the presence of unknown organism which they named it 'Kiwasho' which was said to be very harmful. According to the seaweed farmers, once 'Kiwasho' comes into contact with your skin, you get very severe irritation, your ribs become squeezed, you get vomiting and coughing and the body become very painful. As first aid, one needs to drink a lot of coconut water and milk then get hospitalized.

The discussants further explained that at hospital, the patient usually get syringe and drip as treatment and there were no particular treatment and people have been trying local medicine to treat 'Kiwasho' but no success. As for the case of cuts from sea organisms such as stonefish 'nyenga', one may get heal after three months. (Msuya, 2012) stated that when farmers get stings from stonefish, they must inject against tetanus and sometimes had to go to neighboring village for tetanus injection. Seaweed farmers explained that one can get rid of 'Bochu' and 'nyenga' by wearing shoes but for 'Kiwasho', it is difficult to protect from it, because it is not easily recognizable as it looks like dusty water or a foam.

These results confirm the study by (Msuya, 2011) that revealed that due to seaweed farming, farmers were experiencing a number of undesirable skin conditions including itching, scarring and marking, darkening of color, skin that shrinks and changes in its firmness or condition, bodily aches and pains including headaches, backaches, leg and joint pain and farmers' eyes were subject to negative effects including pain, blindness from prolonged exposure to strong sunlight, redness from salt water and intensified reflections, and itching from salt and sand particles.

4.5 Usage of Protective gear

Seaweed farmers need to use specialized clothing or equipment to protect themselves from getting injured by harmful organisms present in the sea. However, about 95% of seaweed farmers did not use any protective gear when doing seaweed farming activities (Table 4.6)

Table 4.6: Usage of protective gear by gender

	Gender		Total	Gender		% (Total)
	Male	Female		% (Male)	% (Female)	
Yes	57	56	113	10.27	3.23	4.93

Do you have any protective gear to protect you when doing activities of seaweeds farming?	No	498	1,679	2,177	89.73	96.77	95.07
Total		555	1,735	2,290	100.00	100.00	100.00

Across the two islands, more farmers at Pemba (6.04%) used protective gear than those of Unguja (1.94%) as shown in the Table 4.7. For those few who used protective gear, they mainly used rainboots.

Table 4.7: Usage of protective gear by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Do you have any protective gear to protect you when doing activities of seaweeds farming?	Yes	12	101	113	1.94	6.04	4.93
	No	606	1,571	2,177	98.06	93.96	95.07
Total		618	1,672	2,290	100.00	100.00	100.00

The presence of health-related problems to seaweed farmers can also be contributed by not using protective gear when doing seaweed activities.

4.6 Standards of Quality

Quality is the good determinant factor of price. Generally, the good quality product fetches the higher price. In the seaweed industry, proportion of farmers at 98.82 % are unaware of the quality standards for seaweeds (Figure 4.3 and Table 4.8). The seaweeds have no grades, unlike cloves which have three grades with three different prices.

Figure 4.3: Awareness of quality standards for seaweeds by gender

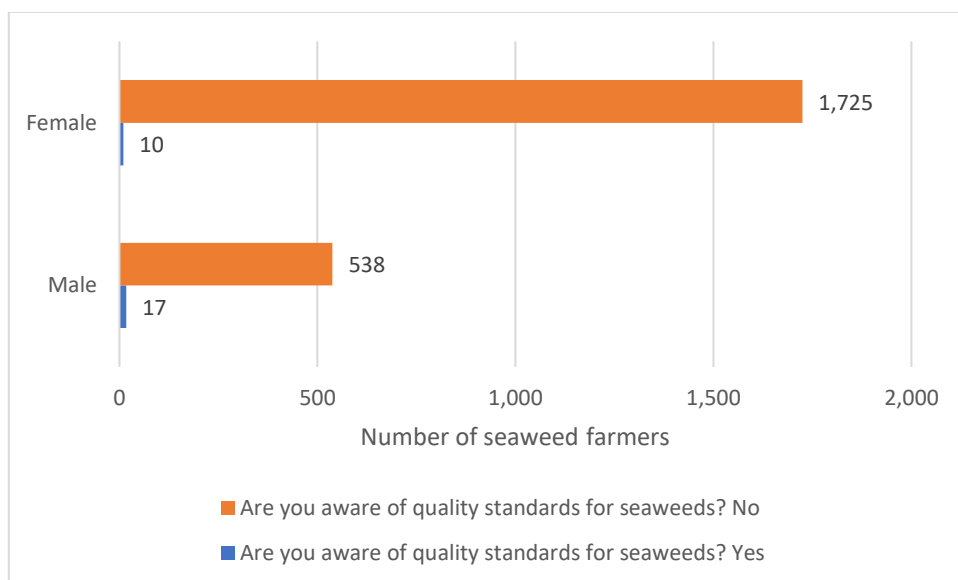
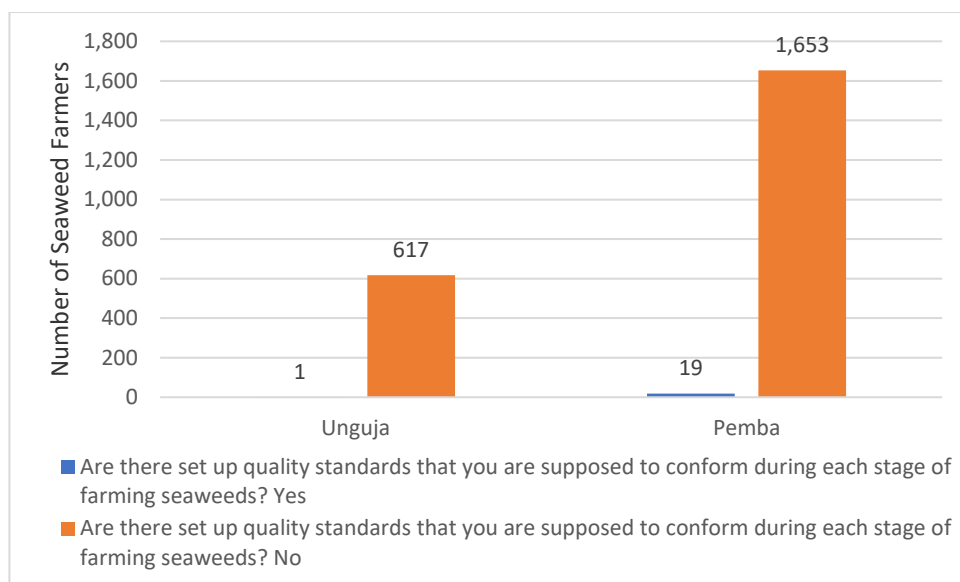


Table 4.8: Awareness of quality standards for seaweeds by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Are you aware of quality standards for seaweeds?	Yes	2	25	27	0.32	1.50	1.18
	No	616	1,647	2,263	99.68	98.50	98.82
Total		618	1,672	2,290	100.00	100.00	100.00

Moreover, about 99% of seaweed farmers confirmed that there were no set up quality standards that they were supposed to conform to during each stage of farming seaweeds as shown in the Figure 4.4.

Figure 4.4: Quality standards for seaweeds



Generally, farmers are using normal practices so as to have good seaweeds during different stages of seaweed production. For example, during planting seaweeds, farmers choose good plantation area, use good seedlings, use of buoys, strong ropes and pegs, spacing between ropes and regular cleaning of the farm.

4.7 Technology use in seaweed

Table 4.9 illustrates technology use by seaweed farmers whereby an average of 94.93% of the farmers did not engage themselves into seaweed related activities such processing and value addition technologies.

Table 4.9: Technology use by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Are you engaging in any other seaweed related activities?	Yes	34	82	116	6.13	4.73	5.07
	No	521	1,653	2,174	93.87	95.27	94.93
Total		555	1,735	2,290	100.00	100.00	100.00

Generally, more than 99% of sea weeds currently produced in Zanzibar are exported as raw with value addition less than 1% thus making farmers not to realize the full potential of the seaweed industry.

CHAPTER FIVE

INCOME AND EXPENDITURE ON SEAWEED FARMING

5.0 Overview

The chapter describes sources and amount of startup capital, seaweed earned per season, quantities, and price of sold seaweeds, income satisfaction, decision on the use of income, last time for selling seaweeds, seaweed buyers, stocks of seaweeds, records keepings, earnings from other economic activities and economic activities affecting seaweed farming.

5.1 Sources of Startup Capital

Seaweed farmers started seaweed farming using different sources of capital including assistance from seaweed company (buyer), own savings, assistance from friends and relatives. The Table 5.1 and Table 5.2 show the main sources of startup capital where more than 70% of the farmers started seaweed farming with their own savings.

Table 5.1: Sources of startup capital by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
What was the major source of your start-up capital for your seaweed business?	Seaweed company	101	349	450	18.20	20.12	19.65
	Own savings	421	1,237	1,658	75.86	71.30	72.40
	Assistance from relatives/friends	24	128	152	4.32	7.38	6.64
	Private loan agent	2	1	3	0.36	0.06	0.13
	Other specify	7	20	27	1.26	1.15	1.18
Total		555	1,735	2,290	100.00	100.00	100.00

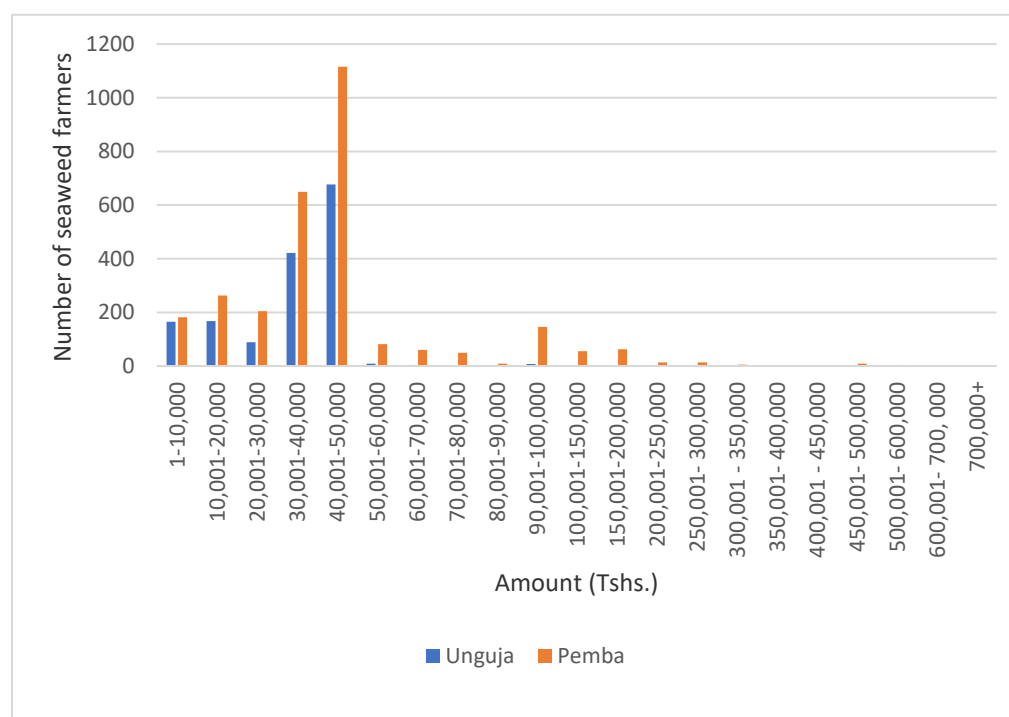
In Unguja, proportion of farmers with startup capital from seaweed company was nearly twice (31.39%) than those of Pemba (15.31%). This could be attributed by the fact that commercial seaweed farming was first introduced in Unguja around 1989 before spreading to Pemba. In the initial days, seaweed companies used to give support to farmers to encourage them to farm seaweeds.

Table 5. 2: Sources of startup capital by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
What was the major source of your start-up capital for your seaweed business?	Seaweed company	194	256	450	31.39	15.31	19.65
	Own savings	387	1,271	1,658	62.62	76.02	72.40
	Assistance from relatives/friends	36	116	152	5.83	6.94	6.64
	Private loan agent	0	3	3	0.00	0.18	0.13
	Other specify	1	26	27	0.16	1.56	1.18
Total		618	1,672	2,290	100.00	100.00	100.00

5.2 Amount of the Startup Capital

The amount of startup capital for a proportion of 78.29% of farmers ranged between TZS. 40,000 to TZS 50,000 as shown in the Figure 5. 1 below:

Figure 5. 1: Startup capital by locality

Farmers were also able to start the seaweed farming with capital below TZS 30,000 because seaweed farming involves related people living in the same society therefore it becomes easy for new farmer to get raw materials freely for example seaweed seedlings. Either, during

introduction of seaweed farming in Zanzibar economy, some seaweed companies (buyers) were giving to farmers free farming materials such as ropes and tie tie to encourage them to farm seaweeds.

5.3 Seaweeds Earned per Season

About 63.19% of seaweed farmers earned between 1-200 kg of seaweeds per season as shown in Table 5.3.

Table 5.3: Quantities of seaweeds earned per season by gender

Kg	Gender		Total	Gender		Total
	Male	Female		% Male	% Female	
0 1 -50	50	423	473	9.01	24.38	20.66
51-100	61	360	421	10.99	20.75	18.38
101-150	30	126	156	5.41	7.26	6.81
151-200	99	298	397	17.84	17.17	17.34
201-250	21	57	78	3.78	3.28	3.41
251-300	45	147	192	8.11	8.47	8.38
301-350	9	19	28	1.62	1.09	1.22
351-400	25	67	92	4.50	3.86	4.02
401-450	3	1	4	0.54	0.06	0.17
451-500	95	86	181	17.12	4.96	7.90
501-550	1	0	1	0.18	0	0.04
551-600	29	27	56	5.23	1.56	2.45
601-650	0	1	1	0.00	0.06	0.04
651-700	12	25	37	2.16	1.44	1.62
701-800	8	17	25	1.44	0.98	1.09
801-900	0	8	8	0.00	0.46	0.35
901-1000	40	38	78	7.21	2.19	3.41
1,001-1500	7	11	18	1.26	0.63	0.79
1501-2000	8	10	18	1.44	0.58	0.79
2001-2500	0	3	3	0.00	0.17	0.13
25001-3000	5	2	7	0.90	0.11	0.31
3001-3500	0	1	1	0.00	0.06	0.04
3501-4000	2	0	2	0.36	0	0.09
4001+	5	8	13	0.90	0.46	0.57
	555	1735	2290	100.00	100	100.00

The results show that proportion of males earning high quantities per season was high than that of female despite the fact that female constituted about 90% of the total seaweed farmers. This may imply that males are more advantageous than females in the industry which could be attributed to access to equipment such as boats and bicycle for seaweeds transportation during

planting and harvesting. This situation also implies that if more men participate in the sector, production of seaweeds could increase more. In other seaweed producing countries, evidence has shown that both men and women have significant participation in the seaweed sector. In Philippines and Wagina Islands, men carry 60% and 68% of the seaweed farming respectively (Bacaltosi et al 2012 and Kronen et al 2010).

5.4 Quantities and Price of Seaweeds Sold

Table 5.4 shows the quantities of seaweeds sold by farmers in their last sale. The trends show that as quantities of seaweeds increase, proportion of male is high as compared to female, see Table 5.4.

Table 5.4: Quantities of seaweeds sold for last sale by gender

Sea weeds (Kg)	Gender		Total	Gender		% (Total)
	Male	Female		% (Male)	% (Female)	
0	9	39	48	1.62	2.25	2.10
0 1-50	59	541	600	10.63	31.18	26.20
51-100	80	449	529	14.41	25.88	23.10
101-150	58	132	190	10.45	7.61	8.30
151-200	104	191	295	18.74	11.01	12.88
201-250	18	38	56	3.24	2.19	2.45
251-300	45	83	128	8.11	4.78	5.59
301-350	10	16	26	1.80	0.92	1.14
351-400	22	54	76	3.96	3.11	3.32
401-450	5	3	8	0.90	0.17	0.35
451-500	60	81	141	10.81	4.67	6.16
501-550	3	2	5	0.54	0.12	0.22
551-600	28	35	63	5.05	2.02	2.75
601-700	7	12	19	1.26	0.69	0.83
701-800	12	17	29	2.16	0.98	1.27
801-900	3	3	6	0.54	0.17	0.26
901-1,000	12	23	35	2.16	1.33	1.53
1,001-1,500	14	14	28	2.52	0.81	1.22
1,501-2,000	4	2	6	0.72	0.12	0.26
2,000+	2	0	2	0.36	0.00	0.09
	555	1,735	2,290	100.00	100.00	100.00

The result shows that the price of seaweeds sold last time by farmers varied between farmers depending on the types of seaweed sold and location where seaweed selling was taking place.

Table 5.5 shows the price of seaweeds sold in the last sale by seaweed farmers across the Islands.

Table 5.5: Price of seaweeds sold per kilogram by locality

Price Tshs/ Kg	Island		Total	Island		% (Total)
	Unguja	Pemba		% (Unguja)	% (Pemba)	
>=500	30	1,136	1,166	4.85	67.94	50.92
600	82	482	564	13.27	28.83	24.63
700	461	6	467	74.60	0.36	20.39
800	12	0	12	1.94	0.00	0.52
1,000	20	0	20	3.24	0.00	0.87
1,200	0	1	1	0.00	0.06	0.04
1,600	1	1	2	0.16	0.06	0.09
1,700	0	1	1	0.00	0.06	0.04
1,800	1	27	28	0.16	1.61	1.22
1,900	0	16	16	0.00	0.96	0.70
2,000	10	1	11	1.62	0.06	0.48
3,000	1	1	2	0.16	0.06	0.09
	618	1,672	2,290	100.00	100.00	100.00

5.5 Income Satisfaction

By the time the research was conducted, the mean price of seaweeds was Tshs. 596.9. More than 97% of seaweed farmers confirmed that the income earned from seaweeds was not satisfactory when compared to the many efforts put on seaweeds until sold to the buyer. Table 5.6 indicates this scenario.

Table 5.6: Income satisfaction by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Is the income obtained from seaweeds satisfactory according to your work?	Yes	18	44	62	3.24	2.54	2.71
	No	537	1,691	2,228	96.76	97.46	97.29
Total		555	1,735	2,290	100.00	100.00	100.00

According to study by (ZPC, 2018), Zanzibar seaweed farmers were realizing between 30% to 40% of the export price compared to farmers in Philippines and Indonesia who earned between 60% to 70 % of the export price.

5.6 Decision on the Uses of Income

Table 5.7 and Table 5.8 indicate that more than 75% of the total farmers make decision on the uses of the income they earn from seaweed farming activities. However, still close family members such as husband/wife do make decision on the income earned from their spouses.

Table 5.7: Decision on the uses of income by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Who make decision on the uses of the income obtained?	Myself	449	1,314	1,763	80.90	75.73	76.99
	Husband/Wife	98	387	485	17.66	22.31	21.18
	Son	0	4	4	0.00	0.23	0.17
	Daughter	0	3	3	0.00	0.17	0.13
	Other relatives	8	27	35	1.44	1.56	1.53
Total		555	1,735	2,290	100.00	100.00	100.00

Across the islands, proportion of seaweed farmers in Unguja making own decision on the uses of income earned was higher than that of Pemba. This could be associated with the tendency of seaweed farmers in Unguja to prefer farming individually rather than a family.

Table 5.8: Decision on the uses of income by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Who make decision on the uses of the income obtained?	Myself	504	1,259	1,763	81.55	75.30	76.99
	Husband/Wife	110	375	485	17.80	22.43	21.18
	Son	2	2	4	0.32	0.12	0.17
	Daughter	2	1	3	0.32	0.06	0.13
	Other relatives	0	35	35	0.00	2.09	1.53
Total		618	1,672	2,290	100.00	100.00	100.00

5.7 Seaweed Markets (Buyers)

About 73.1% of the seaweed farmers sell their seaweeds to private company (Table 5.9).

Table 5.9: Seaweeds markets (buyers) by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Where do you normally sell your seaweeds?		4	5	9	0.72	0.29	0.39
	A	15	72	87	2.70	4.15	3.80
	AB	7	10	17	1.26	0.58	0.74
	ABD	0	2	2	0.00	0.12	0.09
	AD	1	4	5	0.18	0.23	0.22
	B	86	219	305	15.50	12.62	13.32
	BC	4	5	9	0.72	0.29	0.39
	BCD	9	10	19	1.62	0.58	0.83
	BD	30	81	111	5.41	4.67	4.85
	C	1	14	15	0.18	0.81	0.66
	CD	6	22	28	1.08	1.27	1.22
	D	387	1,287	1,674	69.73	74.18	73.10
	DZ	4	1	5	0.72	0.06	0.22
	E	0	1	1	0.00	0.06	0.04
	Z	1	2	3	0.18	0.12	0.13
Total		555	1,735	2,290	100.00	100.00	100.00

Where A. locally to other members of the community

B. Locally to traders who come to the community

C. At nearby center

D. At private company

E. At Tanzania mainland

F. At other East African Countries

Z. Other (Please Specify)

Across the two Islands, proportional of seaweed farmers selling to private company was higher (99.19%) in Unguja than that of Pemba (63.46%), see Table 5.10.

Table 5.10: Seaweeds markets (buyers) by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Where do you normally sell your seaweeds?		0	9	9	0.00	0.54	0.39
	A	0	87	87	0.00	5.20	3.80
	AB	0	17	17	0.00	1.02	0.74
	ABD	0	2	2	0.00	0.12	0.09
	AD	1	4	5	0.16	0.24	0.22
	B	2	303	305	0.32	18.12	13.32
	BC	0	9	9	0.00	0.54	0.39
	BCD	0	19	19	0.00	1.14	0.83
	BD	2	109	111	0.32	6.52	4.85
	C	0	15	15	0.00	0.90	0.66
	CD	0	28	28	0.00	1.67	1.22
	D	613	1,061	1,674	99.19	63.46	73.10
	DZ	0	5	5	0.00	0.30	0.22
	E	0	1	1	0.00	0.06	0.04
	Z	0	3	3	0.00	0.18	0.13
Total		618	1,672	2,290	100.00	100.00	100.00

The higher dependency of the seaweed farmers to one type of buyer implies the presence of market information gap among seaweed value chain actors. Of the total farmers surveyed, no one was selling seaweeds outside Zanzibar. During FGDs, it was found that farmers were selling their seaweeds to Tanzania mainland and Kenya.

5.8 Last Time to Sale Seaweeds

By the time the survey was conducted, about 75% of the farmers sold their seaweeds for the last time not more than three months (Table 5.11 and Table 5.12)

Table 5.11: Last time to sale seaweeds by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
When did you last sell your seaweeds?	less than one month ago	211	634	845	38.02	36.54	36.90
	1 month to 3 months	227	661	888	40.90	38.10	38.78
	3 months to 6 months	86	256	342	15.50	14.76	14.93
	More than 6 months ago	31	184	215	5.59	10.61	9.39
Total		555	1,735	2,290	100.00	100.00	100.00

Table 5.12: Last time to sale seaweeds by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
When did you last sell your seaweeds?	less than one month ago	324	521	845	52.43	31.16	36.90
	1 month to 3 months	138	750	888	22.33	44.86	38.78
	3 months to 6 months	68	274	342	11.00	16.39	14.93
	More than 6 months ago	88	127	215	14.24	7.60	9.39
Total		618	1,672	2,290	100.00	100.00	100.00

5.9 Stocks of Seaweeds

76.42% of seaweed farmers confirmed that they had no stocks of seaweeds that they wished to sale, see Figure 5.2.

Figure 5.2: Possession of stock of seaweeds by gender

For those few who had stocks of seaweeds, the amount of their stocks is indicated in the Table 5.13 below:

Table 5.13: Quantities of stocks of seaweeds by gender

Seaweeds Kg	Gender		Total	Gender		% (Total)
	Male	Female		% (Male)	% (Female)	
0 1-50	30	169	199	23.81	40.82	36.85
51-100	23	89	112	18.25	21.50	20.74
101-150	18	27	45	14.29	6.52	8.33
151-200	21	45	66	16.67	10.87	12.22
201-250	1	6	7	0.79	1.45	1.30
251-300	5	15	20	3.97	3.62	3.70
301-350	2	0	2	1.59	0.00	0.37
351-400	3	8	11	2.38	1.93	2.04
401-450	0	1	1	0.00	0.24	0.19
451-500	3	23	26	2.38	5.56	4.81
501-600	3	11	14	2.38	2.66	2.59
601-700	0	3	3	0.00	0.72	0.56
701-800	0	2	2	0.00	0.48	0.37
801-900	1	1	2	0.79	0.24	0.37
901-1000	11	8	19	8.73	1.93	3.52
1001-1500	2	1	3	1.59	0.24	0.56
2000+	3	5	8	2.38	1.21	1.48
Total	126	414	540	100.00	100.00	100.00

The reasons for having stocks were found to be low demand, low price, the stocks came from recent harvest and farmers were accumulating more seaweeds to sell at large quantities.

5.10 Records Keeping

Documentation in the seaweed industry at grass root level was very poor. About 90% of the total farmers did not keep records of their sales and revenue as indicated in Table 5.14 and Table 5.15.

Table 5.14: Records keeping by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Do you keep records of sales and revenue?	Yes	76	162	238	13.69	9.34	10.39
	No	479	1,573	2,052	86.31	90.66	89.61
Total		555	1,735	2,290	100.00	100.00	100.00

Table 5.15: Records keeping by locality

	Island	Total	Island	% (Total)
--	--------	-------	--------	-----------

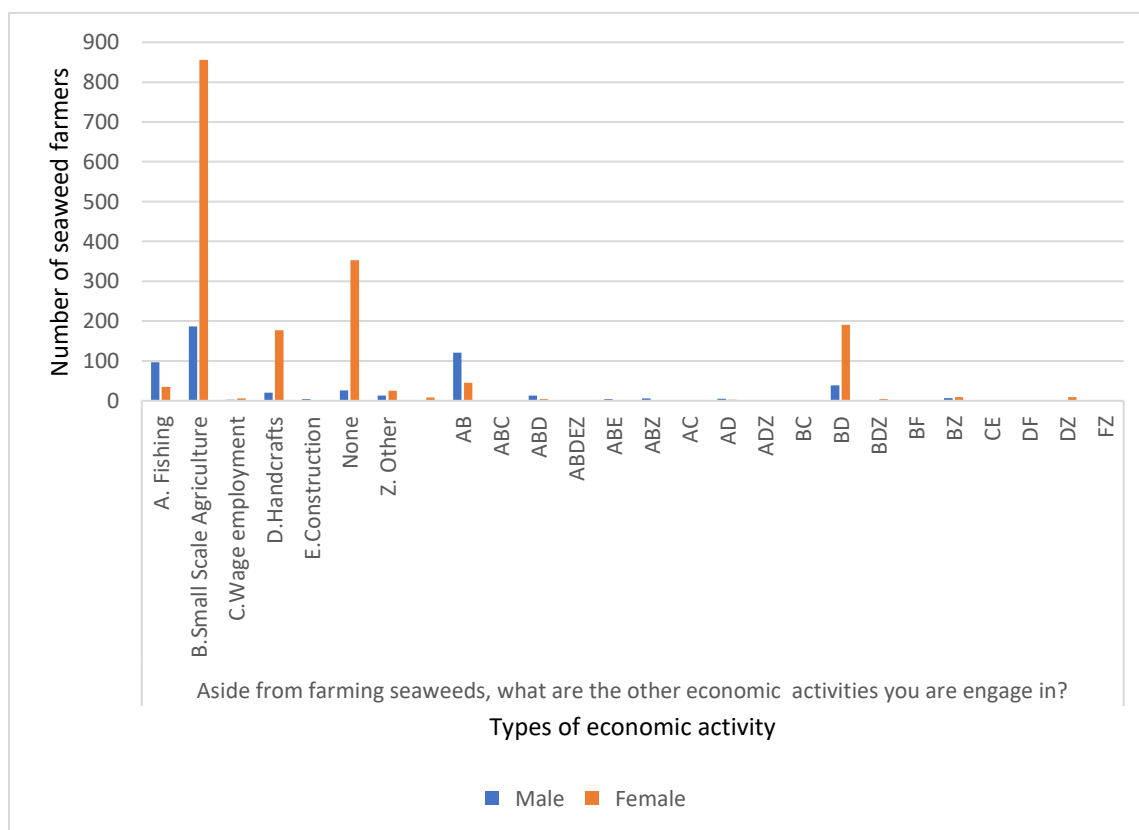
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Do you keep records of sales and revenue?	Yes	15	223	238	2.43	13.34	10.39
	No	603	1,449	2,052	97.57	86.66	89.61
Total		618	1,672	2,290	100	100	100

The proportion of seaweed farmers who did not keep records of sales and revenue was higher (97.57%) in Unguja than those in Pemba (86.66%).

5.11. Engagement in Other Economic Activities

The study indicates that about 79.65% of the seaweed farmers were engaged in different types of economic activities apart from seaweed farming (Figure 5.3)

Figure 5.3: Types of economic activities engaged by gender



At least 65.33% of seaweed farmers were engaged in small scale agriculture followed by fishing whereby women seaweed farmers dominated small scale agriculture while man dominated fishing sector. Other economic activities that seaweed farmers reported to engage themselves into during the survey and FGDs were small business, wage employment, handicrafts, cookery

and construction of buildings. Table 5.16 shows income earned by farmers from other economic activities per month besides seaweeds.

Table 5.16: Earnings from other economic activities per month by gender

Amount (TSHS.)	Gender		Total	Gender		% (Total)
	Male	Female		% (Male)	% (Female)	
	103	790	893	18.56	45.53	39.00
01-10,000	53	180	233	9.55	10.37	10.17
10,001-20,000	65	192	257	11.71	11.07	11.22
20,001-30,000	42	141	183	7.57	8.13	7.99
30,001-40,000	14	51	65	2.52	2.94	2.84
40,001-50,000	67	131	198	12.07	7.55	8.65
50,001-60,000	18	35	53	3.24	2.02	2.31
60,001-70,000	1	17	18	0.18	0.98	0.79
70,001-80,000	9	38	47	1.62	2.19	2.05
80,001-90,000	8	39	47	1.44	2.25	2.05
90,001-100,000	38	51	89	6.85	2.94	3.89
100,001-150,000	35	34	69	6.31	1.96	3.01
150,001-200,000	36	20	56	6.49	1.15	2.45
200,001-250,000	14	6	20	2.52	0.35	0.87
250,001-300,000	32	6	38	5.77	0.35	1.66
300,001-350,000	4	0	4	0.72	0.00	0.17
350,001-400,000	4	1	5	0.72	0.06	0.22
400,001-500,000	8	3	11	1.44	0.17	0.48
500,001-600,000	2	0	2	0.36	0.00	0.09
600,001+	2	0	2	0.36	0.00	0.09
	555	1,735	2,290	100.00	100.00	100.00

The trend of income shows that there was income inequality between male and female whereby male earned more income than female.

Despite having engaged in other economic activities, yet an average of 94.89% of seaweed farmers across both islands considered seaweed farming as their main activity whereby proportions of women was higher than that of man, see Table 5.17 and Table 5.18.

Table 5.17: Seaweed as main activity by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Do you consider seaweed as your main activity?	Yes	495	1,678	2,173	89.19	96.71	94.89
	No	60	57	117	10.81	3.29	5.11
Total		555	1,735	2,290	100.00	100.00	100.00

Table 5.18: Seaweed as main activity by locality

	Island	Total	Island	% (Total)
--	--------	-------	--------	-----------

		Unguja	Pemba		% (Unguja)	% (Pemba)	
Do you consider seaweed as your main activity?	Yes	578	1,595	2,173	93.53	95.39	94.89
	No	40	77	117	6.47	4.61	5.11
Total		618	1,672	2,290	100.00	100.00	100.00

5.12 Economic Activities Affecting Seaweed Farming

About 65% of seaweed farmers confirmed that fishing affected seaweed farming followed by fishing with tourism, small scale agriculture, tourism, and transportation by small boats (Figure 5.4). Seaweed farmers were claiming that fisherman do their fishing in the same areas where seaweeds are planted, and the small boats destroy the seaweed firms. This situation has sometimes resulted into conflicts between seaweed farmers and fisherman.

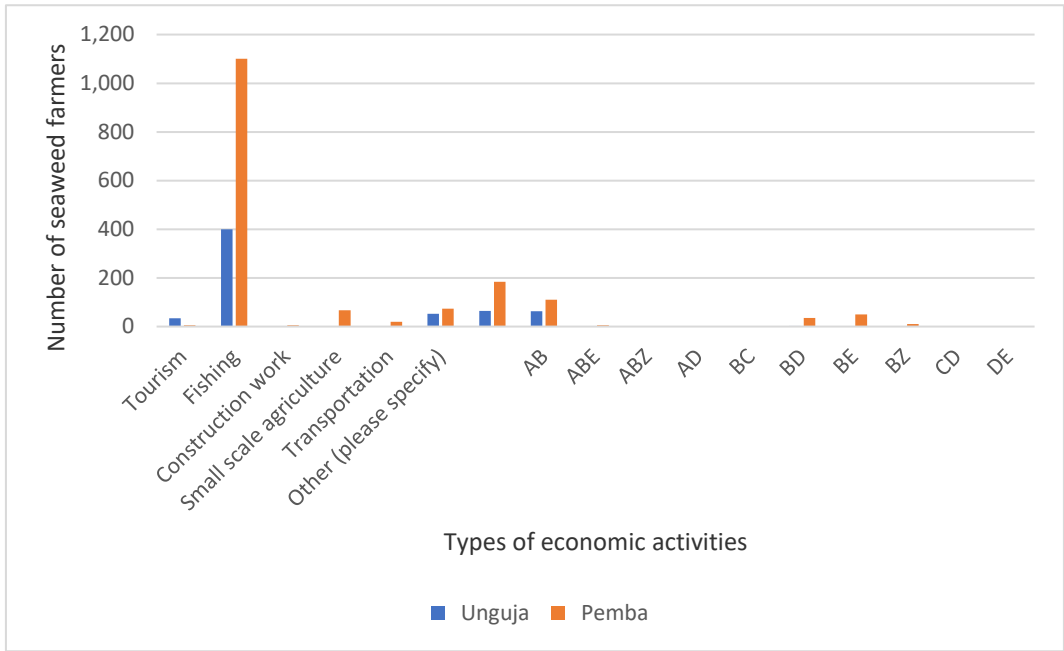
Tourism sector was reported to affect seaweed farming especially in Unguja island. This has also been confirmed during FDGs at Paje where discussants said that investors use kite for tourist gaming which hit people and pegs thus destroying their farms. They further explained that previously, people used to put local mates around 20 feet from seashore for sun drying seaweeds, but due to construction of hotels near the sea, the owners of hotel do not want to see seaweeds spread in the open space hence they have to carry heavy seaweeds long way.

The discussants also reported that there were no space or thoroughfare in between hotels thus making them to walk long distance while transporting seaweeds from sea to storage areas. These results confirm an earlier study by Msuya 2012 who reported that the growth of the tourism industry in Paje has impacted on farmers access to the beaches and thus farms and hotels had built seawalls, which required farmers to walk long distances to access the beaches. Either hotel walls had also been built in areas which had previously been used for the drying of seaweeds. Additionally, in Uroa and Pongwe villages, surveyed farmers reported that the swimming pool water coming from hotels to the sea have chemicals that cause their seaweeds to decay.

Seaweed farmers at Kajengwa claimed that due to construction of hotels, they were move out of areas where they used to plant their sea weeds. The farmers further explained that they did not get open space where they could dry their sea weeds and areas where they could build room or hut for exchanging clothes when they get wet in the sea.

In rare cases, during rainy season, water from farms such as rice farms move to the sea and seaweeds may get infected due to fertilizer that comes with water from those agricultural farms.

Figure 5.4: Economic activities affecting seaweed industry



Where A-Tourism

B- Fishing

C – Construction Work

D- Small Scale Agriculture

E- Transportation

Z- Other

CHAPTER SIX

FINANCE, CREDIT SERVICES AND ORGANIZATIONS

6.0 Overview

Seaweeds farming need support of various types such as finance so as to develop. Both privates and private entities should provide support to seaweed industry. This chapter highlights community-based organization, supporting organizations outside community, possession of saving account and credit services.

6.1 Community Based Organizations

An average of 98.65 % of seaweed farmers reported that there was no community-based organization that focused on seaweed farming issues in their community (Figure 6.1 and Table 6.1).

Figure 6. 1: Presence of community-based organization by gender

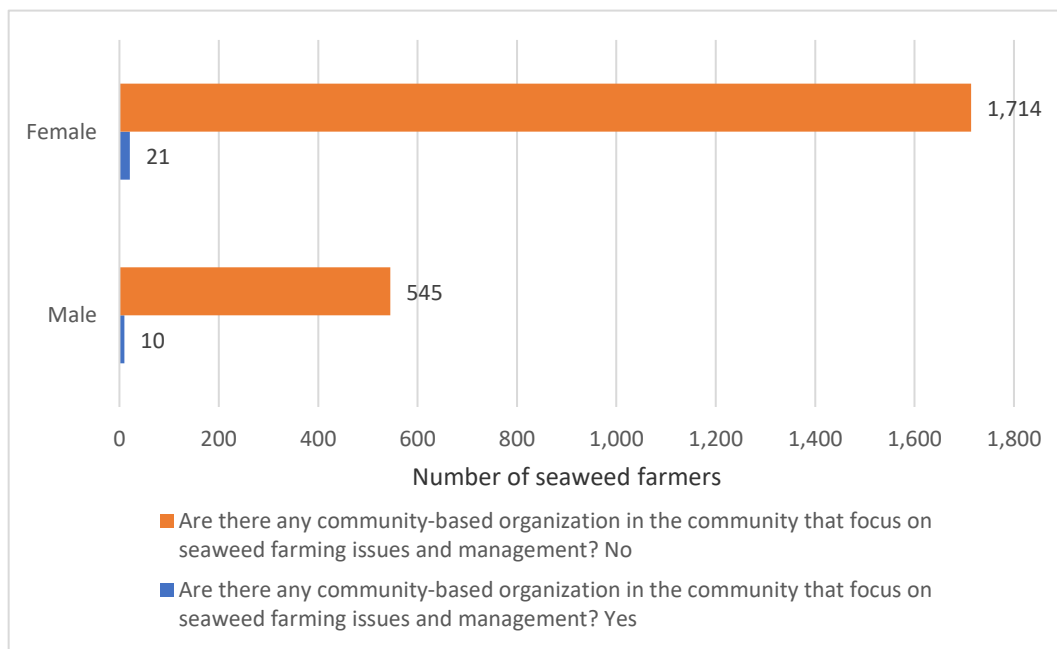


Table 6.1: Presence of community-based organization by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Are there any community-based organization in the community that focus on seaweed farming issues and management?	Yes	17	14	31	2.751	0.837	1.354
	No	601	1,658	2,259	97.249	99.163	98.646
Total		618	1,672	2,290	100.000	100.000	100.000

Thirty-one seaweed farmers who confirmed the presence of organizations in their society focusing on seaweed issues and management reported that the criteria for gaining access to these organizations were having a minimum age from 18 years, be a seaweed farmer and have knowledge on seaweed farming sector.

Table 6.2: Accessibility of community-based organization by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Is organization open to	Women only	5	0	5	29.41	0.00	16.13
	Both	12	14	26	70.59	100.00	83.87
Total		17	14	31	100.00	100.00	100.00

Members further reported that responsibilities of these organizations were, among others, to encourage seaweed farming, to buy sea weeds, to value-add seaweeds, coordinate list of seaweed farmers, supervise small regulations regarding sea weed sector and to provide loans to the members

Table 6.3 and Table 6.4. indicate how the farmers perceive the advantage or benefit in becoming a member of community-based organization.

Table 6.3: Benefits of community-based organization by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Do you see any advantage or benefit in becoming a member?	Yes	5	14	19	50.00	66.67	61.29
	No	5	7	12	50.00	33.33	38.71
Total		10	21	31	100.00	100.00	100.00

Table 6.4: Benefits of community-based organization by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Do you see any advantage or benefit in becoming a member?	Yes	9	10	19	52.94	71.43	61.29
	No	8	4	12	47.06	28.57	38.71
Total		17	14	31	100.00	100.00	100.00

6.2 Supporting Organizations outside Community

Proportion of farmers at 87.99% reported that there were no institutions outside the community that supported seaweed farmers operation and management (Table 6.5)

Table 6.5: Organizations outside community supporting farmers by gender

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Are there other organizations or institutions outside the community that influence/ have an impact on/provide support to seaweed farmers operations and management in the community? (FAWE, Govt, University, Marine institute,)	Yes	81	194	275	13.11	11.60	12.01
	No	537	1,478	2,015	86.89	88.40	87.99
Total		618	1,672	2,290	100.00	100.00	100.00

Those who confirmed the support from institutions outside their community mentioned that the main support was training and equipment and more than 90% of the support came from seaweed companies. However, for the last 12 months, more than 97% of farmers received no support from any organizations as shown in Table 6.6 and Table 6.7.

Table 6.6: Support from organizations in last 12 months by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Have you received any support in the last 12 months?	Yes	14	41	55	2.52	2.36	2.40
	No	541	1,694	2,235	97.48	97.64	97.60
Total		555	1,735	2,290	100.00	100.00	100.00

Table 6.7: Support from organizations in last 12 months by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Have you received any support in the last 12 months?	Yes	12	43	55	1.94	2.57	2.40
	No	606	1,629	2,235	98.06	97.43	97.60
Total		618	1,672	2,290	100.00	100.00	100.00

6.3 Possession of Saving Account

More than 95% of seaweeds farmers did not have bank account or any account in other small micro finance groups (Table 6.8 and Table 6.9). Few have account in saccos and cooperatives.

Table 6.8: Possession of saving account by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Do you have a saving account with financial institution?	A. Yes (Bank)	9	4	13	1.622	0.231	0.57
	B. Yes (SACCOS)	5	16	21	0.901	0.922	0.92
	C. Yes (Cooperative)	0	13	13	0	0.749	0.57
	D. Others (please specify)	6	12	18	1.081	0.692	0.79
	No	532	1,688	2,220	95.856	97.291	96.94
		2	1	3	0.36	0.058	0.13
	BC	0	1	1	0	0.058	0.04
	D	1	0	1	0.18	0	0.04
Total		555	1,735	2,290	100	100	100

Table 6.9: Possession of saving account by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Do you have a saving account with financial institution?	A. Yes (Bank)	1	12	13	0.162	0.718	0.57
	B. Yes (SACCOS)	8	13	21	1.294	0.778	0.92
	C. Yes (Cooperative)	9	4	13	1.456	0.239	0.57
	D. Others (please specify)	5	13	18	0.809	0.778	0.79
	No	594	1,626	2,220	96.117	97.249	96.94
		0	3	3	0.000	0.179	0.13
	BC	0	1	1	0.000	0.060	0.04
	DE	1	0	1	0.162	0.000	0.04
Total		618	1,672	2,290	100.000	100.000	100.000

6.4 Request for loan

Table 6.10 and Table 6.11 indicate that majority of seaweed farmers (about 97%) had not requested for loan. Farmers confirmed that the main reasons for not requesting loans were as follows: They were not in need of loans, they had no information on where to obtain the loan, unaware of loan procedures, presence of interest rate and long procedure for getting loan.

Table 6.10: Loan request by Gender

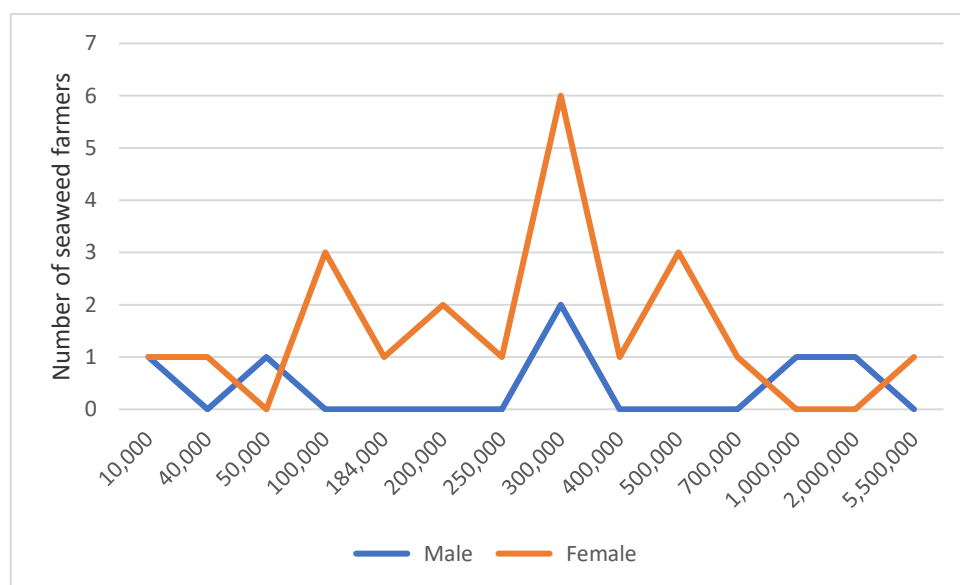
		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Do you ever ask for and receive a loan from a financial institution?	Ask and receive	6	21	27	1.08	1.21	1.18
	Ask and not received	6	13	19	1.08	0.75	0.83
	Do not ask	543	1,701	2,244	97.84	98.04	97.99
Total		555	1,735	2,290	100.00	100.00	100.00

Since more than 95% of seaweed farmers had no saving account from bank or any other microfinance institutions, this situation might deprive them from getting access to loans.

Table 6.11: Loan request by locality

		Island		Total	Island		% (Total)
		Unguja	Pemba		% (Unguja)	% (Pemba)	
Do you ever ask for and receive a loan from a financial institution?	Ask and receive	13	14	27	2.10	0.84	1.18
	Ask and not received	2	17	19	0.32	1.02	0.83
	Do not ask	603	1,641	2,244	97.57	98.15	97.99
Total		618	1,672	2,290	100.00	100.00	100.00

Figure 6.2 indicates that the highest money received from financial institution/micro finance was TZS 5.5 Millions and was received by female seaweed farmer.

Figure 6.2: Money received from financial institution/ microfinance by gender

About 30% of seaweed farmers who requested loan perceived that getting credit was not simple (Table 6.12). The difficult part of getting loan was said to be possession of collateral, long procedures, the need to have guarantor and waiting for the association to have capital. Collateral and stringent conditions were main reasons reported to prevent other farmers from getting loan after requested.

Table 6.12: Perception on getting credit by gender

		Gender		Total	Gender		% (Total)
		Male	Female		% (Male)	% (Female)	
Do you think getting credit is simple?	Yes	4	15	19	66.67	71.43	70.37
	No	2	6	8	33.33	28.57	29.63
Total		6	21	27	100.00	100.00	100.00

CHAPTER SEVEN

CASE STUDY

7.0 Overview

Case studies are used to show application of concepts or theories in real situation and act as a learning tool. This chapter presents description about the project on Seaweed Farming in Mauritius and Rodrigues and Zanzibar Branding Project as learning projects for increasing competitiveness of the seaweed sector.

7.1 The Seaweed Farming in Mauritius and Rodrigues Project

The seaweed farming in Mauritius and Rodrigues Project was initiated by Mauritius Research and Innovation Council (MRIC) with collaboration of Dr. Flower Msuya, Marine Scientist from Institute of Marine Science (IMS), Zanzibar branch. The project aimed to investigate the potential of developing an economically, technically and environmentally viable seaweed industry in Mauritius and Rodrigues. The project involved the following activities:

Phase 1: Capacity Building in Seaweed Farming for Technical Personnel of Mauritius and Rodrigues

Three researchers from Mauritius were trained in Zanzibar from 10 to 24 October, 2011 which involved 2 days lecturers and the rest being field work. The different aspects of training program are listed below:

1. Overview of Seaweed Farming in Tanzania -history, development, challenges. Farming methods for Eucheumatoids.
2. Lecture on other methods of farming e.g., Ulva, Hypnea. Seaweed Innovation-innovative farming, value addition
3. Visit to seaweed farms in Paje- first hand observations and practical training in farming. Visit to various stages of production cycle. Cultural practices involved in farming from

planting to harvesting. Harvesting of seaweeds, drying of seaweeds at beach, home and seaweed center and an experience of 'Seaweed Tourism' Paje Village.

4. Collection and identification of seaweed species of interest in Chwaka Bay (Seaweed Taxonomy)
5. Preparation of farming materials, construction of 2 floating systems. Preparation of bamboo poles, construction of 3 bamboo rafts
6. Continue construction of bamboo rafts. Planting (tying) of seaweed and anchorage of bamboo rafts. Measurements of water parameters and others e.g., weather conditions
7. Visit to Paje seaweed center and practical training in value addition. Post-harvest handling-drying/preparation for storage. Quality management of produce. Value addition – use of soap production machines. Value addition – soap packaging and marketing. Value addition -making of salad
8. Preparation of farming materials. On land demonstration of an off-bottom seaweed farm-distances between ropes, pegs and tie ties demonstrated and measured. Afternoon (Tide is 1.6): measurement of water and weather parameters and how to keep a logbook of data
9. Purchase of wooden pegs. Preparation of farming materials. Afternoon: (Tide is 1.8) set up of an off-bottom method. Measurement of water and weather parameters – use of a logbook. Group discussions with farmers – problems faced in farming and possible solutions.
10. Visit to Kidoti women group. A different environment of post-harvest handling-drying, value addition – manual making of seaweed soap, making of body Vaseline.

Phase 2: Setting up Experimental Seaweeds Farming in Mauritius and Rodrigues

In order to start seaweed farming in Mauritius, five sites were selected to conduct experimental Seaweed Farming which were Albion, Petit Stable, Pointe aux Feuilles, Poste La Fayette and Vieux Port Ground. The objectives of the experimental seaweed farming were the following:

1. To provide hands on training workshop on seaweed farming to stakeholders.

2. To set up an experimental farm in collaboration with local groups (fisherman, entrepreneurs etc.).
3. To cultivate *Glacilaria* species in the experimental farm and monitor the growth rate.
4. To evaluate and adapt different farming techniques for local seaweed production.
5. To build up local capacity in seaweed farming.
6. To sensitize the Mauritanian population on the use of seaweeds

In order to achieve the above objectives, several activities were undertaken including community mapping with stakeholders, bio assessment, workshop for setting up the firm, monitoring of the experimental firm, harvesting and community involvement. The following were summary of the problems encountered and lesson learnt during the experiment:

1. Presence of harmful organisms (shark) resulting into not monitoring farm for two weeks.
2. Bags used in seaweed farming could not resist harsh weather.
3. Direct sunlight caused discoloration and die off of *glacilaria*.
4. Best quality of growing *glacilaria* is found under the rock and best period for farming seaweed is April till September.
5. *Glacilaria* grew better in cool environment.
6. Some fish grazed seaweeds.

These setting up experimental farms in the two areas helped Mauritius to learn more about the seaweed farming. Some fishermen were involved in the experimental phase hence made it the protection of seaweeds farms to be much easier.

7.2 The Branding Project for Zanzibar Cloves

On 9th November 2012, a tripartite agreement was signed between the Ministry of Trade and Industrial Development - Zanzibar, The World Intellectual Property Organization (WIPO) and International Trade Center (ITC) to implement a two-year project which was known as “A Strategic Use of the Intellectual Property (IP) System and Branding Techniques for Value addition and Improved Performance of the Zanzibar Cloves Industry”. Activities of the project included, among others, formulation of IP Policy and its regulations, capacity building for stakeholders,

establishment of branding strategy and preparation of specification document for cloves of Zanzibar.

Zanzibar has been claiming that her cloves are unique with special quality as they have good aroma, low oil content, good taste and color hence the need for preparation of specifications that would differentiate Zanzibar cloves from the general standards of cloves in the world raised. The quality of Zanzibar cloves was associated with the soil of Zanzibar and climatic conditions. In order to prepare specifications for Zanzibar cloves, Mr. Didier Chabrol from CIRAD, France was contracted and produced initial specification document titled 'Zanzibar Clove: Towards specification (code of practice) of a Geographical Indication'.

The specification report found that the level of scientific and market knowledge about the clove in Zanzibar was low and the level of sharing the knowledge among value chain stakeholders and producer was also low which were not good conditions for writing specifications. Therefore, it was difficult to prepare specifications for the cloves of Zanzibar. The report further explained that the specific qualities of Zanzibar clove were not enough quantified or precise. According to the report, the "brown reddish color", the "slenderness", the "pungent, not bitter" aroma must be quantified (for "slenderness") or precisely defined (in reference to a color system for the color, by a sensory panel for the aroma). Unlike normal association of quality of cloves with the soil and climate conditions by people, the study for the specifications of cloves found that harvesting and post-harvesting appeared to be the most important quality factors. Thus, quality of cloves grown in Zanzibar was found to depend mainly of the skills and commitments of the producers.

With the lack of information and knowledge gap in the clove industry, the specification report recommended an experimental phase of 2 to 3 years where people would use it as a learning process. It was suggested that during the experimental phase, assessment of it and gathering more information should allow for taking stock and make new plans as well as sharing the initiative among the value chain.

CHAPTER EIGHT

CHALLENGES, CONCLUSION AND RECOMMENDATION

8.0 Overview

This chapter presents challenges that were drawn during the study and provides conclusion and recommendation to help boosting the seaweed industry in Zanzibar.

8.1 Challenges

The research has revealed a lot of insights regarding the seaweed sector in Zanzibar as follows:

1. Seaweed sector comprises of people in different ages, majority were found in 39-40 age group. Of the total 2290 seaweed farmers surveyed, about 90.61% of them were female. Nearly half of the surveyed farmers had no formal education whereas number of females with no formal education was higher (48%) than males (44.86%). Seaweed farmers with no formal education was 16.7% and 58.6% in Unguja and Pemba respectively. The highest education level for seaweed farmers in Unguja was ordinary level while those in Pemba was primary level.
2. On average, about 66.11% of the farmers reported that over 75% of the surveyed households in Zanzibar were engaged in seaweeds farming. Commercial seaweed farming has existed in the isles for more than 30 years with very little use of technologies during production as well as post harvesting. While some areas experience more people coming to the seaweed sector, other areas experience more people running away from it.
3. There exists mistrust between farmers and buyers (seaweed company agents). The farmers did not have trust on the measuring process of seaweeds. Almost in all surveyed villages e.g., Uzi, Ng'ambwa and Chukwani, farmers were claiming about the measuring process where they reported that the weight recorded for a bag of seaweeds always came in whole number, there was no quarter or a half. When one agent in Pemba was asked about why he did not consider a half or a quarter during measuring process of seaweeds, the reply was he was compensating for sands and dirties that were usually present in the seaweeds. Study by Ali (2014) revealed that farmers at Uroa reported that measuring devices of buyers had faults

because whenever they measured seaweeds before selling to buyers, it had never happened for their weights to tally with weights provided by the buyer.

4. The company agents did not have trust on farmers as well. The agents were claiming that the farmers sometimes do not dry their seaweeds very well purposely to make them weigh heavy. The agents further claimed that the farmers mix seaweeds with dirties and put water on them thus increasing cost of cleaning the seaweeds to the company. Study by (Ali, 2014) revealed that buyers reported that seaweed farmers were not cleaning and drying their seaweeds well.
5. The seaweed farming might have environmental implications. For example, to produce 1.5 tons per season, one needs to have 1000 nylon ropes and 600 wooden pegs whereby pegs usually lasts for 6 months. Imagine thousands of people replacing hundreds of pegs after every six months for decades! This situation translates into heavy deterioration of trees. Despite having existed for more than thirty years, farmers use crow bar, iron bars and rods and buckets and drums filled with sands which might have environmental implication as well.
6. Quality issues are not well addressed in the seaweed sector. Drying process being the very important quality factor for seaweeds, however 71% of the seaweed farmers do dry their seaweeds on the ground (sand), very few used local mats or drying racks. Nearly all the surveyed farmers were unaware (98.82%) of quality aspects of seaweeds. Even in the company warehouses, seaweeds were not very well handled to ensure no contamination with sands and other dirties. Study by (ZPC, 2018) revealed that lack of modern drying facilities (e.g., solar driers), screeners and transportation equipment have significantly affected the quality of seaweeds produced in Zanzibar.
7. The seaweeds industry is being extremely impacted by climate change. According to the farmers, productivity of seaweeds has severely reduced. The seaweeds become rotten and die in many villages pushing farmers to always move and go far away in the sea in search of new plantation area. Seaweed die off in Zanzibar was caused by severe epiphyte infestation coupled with high incidence of ice-ice disease (FAO,2020). Farmers reported that currently there were no treatment for seaweeds diseases unlike in other agricultural produces. Either

they confirmed that authorities from government visited their areas and took the infected seaweeds for research however they did not get any feedback thereafter.

8. During FDGs at Bweleo, the discussants said that in the past, they were planting and harvesting seaweeds throughout the year, however, once after the big tsunami that hit Indonesia, farmers started to notice environmental changes that have been affecting production of seaweeds hence they could no longer plant and harvest seaweeds throughout the year as they used before. According to them, there occurred many dirties that covered both varieties of seaweeds (*spinosium* and *cottonii*) and causing them to die. It was also reported that during sunny days (summer) there was so much heat that killed seaweeds because most of them were planted at low water level. The survey has also confirmed this situation whereby 82.9% of the farmers confirmed to have notice environmental changes over the past five to ten years mainly dirties, high temperature and strong waves. This is in line with the study by Cleyndert et al (2021) who reported that seaweed farmers in Zanzibar indicated that seaweed farming had been affected by changes in climatic factors over the last 20 years include increased sea temperatures, increased winds and irregular rainfall. This also confirms study by Shimba et al (2021) which revealed that seaweed farmers in Zanzibar reported that some water channels have dried up, farms water levels had been declining and new beaches appeared to have formed.
9. The FDGs discussants further explained that they had been told by seaweed consultant from Indonesia that those considered as dirties in Zanzibar were type of seaweeds known as *Glacilaria* that were normally used for many purposes in other countries including Indonesia. Since the 'dirty' is not type of seaweed that is acceptable in market of Zanzibar as of now, therefore farmers continue to consider it as 'dirties' and make no use of it.
10. There seems to be very low knowledge and information regarding the seaweed sector as well as wide information gap across seaweed value chain actors. Despite being the old sector, still people do not have clear information about the different aspects of seaweeds. The study revealed that while some villages were active in value addition activities, yet many seaweed farmers did not know the different uses of seaweeds and its benefits. According to

Shimba et al (2021), seaweed farmers lacked knowledge on the competitive price of seaweeds in the world market.

11. 59.08% of the famers reported to experience seaweed health related problems such as overall body pain, swelling of legs, chest and spinal cord pains, loss of eyesight, cuts and bites from harmful seaweed organisms. The farmers were claiming that hospitals in their villages had no specific treatment especially for injuries and infection caused by harmful sea organisms.
12. About 80.7% of seaweed farmers have been in seaweed industry for more than six years, yet they have been using the same traditional way of planting seaweeds. farmers use pegs made up from trees where strings are tied upon. The sea ground being rocky area especially in Micheweni district, tools such as crow bar, iron rod and plastic buckets and bags filled with sands and stone grave are used as anchors for tying strings as noticed in some villages in Pemba including Kiuyu Mbuyuni, Makangale, Mjini Wingwi, Fundo and Tumbe. The farmers also use the crowbar and a hammer to create a hole where pegs are inserted. To help in buoyancy of seaweeds in the sea, some farmers use plastic bottles and drums.
13. About 45.9% of seaweed farmers confirmed that there were specific challenges to women. The seaweed farming is very labor intensive and seems to be heavy work to women thus making them to depend on support from men. In some areas farmers need to walk long distances from their village to the sea, e.g., about 5 km as observed in Kiuyu Mbuyuni, while carrying load such as hammer, crowbar, strings and seaweed seedlings. This confirms the study by Victoria (2018) who reported that women seaweed farmers could walk one to two hours when going to their seaweed farms. Also, women were complaining about family matters such as leaving children behind without proper care and late preparation of family meals.
14. High production of seaweeds come by using floating method which is usually done at high water level. However, this method is very expensive to farmers as it needs tools such as boats, buoys and requires swimming skills. The farmers reported that planting seaweeds at high water level seemed to reduce die offs. Either high production and good growth of

seaweeds occur during rainy season. Again, during this period seaweeds may become rotten since there is no sunlight as farmers depend solely on sunlight for drying their seaweeds.

15. Some economic activities were reported to impact seaweed industry. 65% of the seaweed farmers confirmed that fishing activities were destroying their farms. Other economic activities that were reported to impact seaweed industry was tourism investment especially in Unguja Islands where seaweed farmers confirmed the presence of chemical water coming from hotels to the sea that kill their seaweeds.
16. The local market for seaweeds was seasonal. Farmers did not have guarantee on the timing of selling their seaweeds. Some farmers were paid once they sell their seaweeds while others reported to stay up to three to four months before getting paid. The local seaweed exporters either had no guarantee on selling seaweeds to international market for example the local seaweed company that were exporting seaweeds to China had no contract with the buyer (according to the company the Chinese importers did not want to enter into formal contract) thus making them to had no guarantee or projection of their selling to that particular international market.
17. Main challenges posed by seaweed buyers were infrastructure (port congestion, roads, power), high taxation and slow handling of documentation and permits by relevant authorities in the government. The buyers reported that taxes were too high and they sometime did not understand why they were required to pay for a particular tax. For example, a buyer (Zanea Company) was claiming that the company is being asked by relevant government authority from time to time to pay taxes (have a license) for a go down where they are storing seaweeds, according to the company, since they were paying license to ZIPA and other taxes, the owner of the go down is the one who was supposed to pay for a license of the go down not a company.
18. The buyer further explained that when transporting seaweeds from Micheweni district to Mkoani district, they are paying charges in relevant government authority found in Micheweni, however, when the seaweeds reached Mkoani district, the company is also required to pay charges ((Tshs. 5000 per ton of Seaweed) to relevant government authority found in Mkoani district. Study report by (ZPC, 2018) revealed that seaweed sector was

facing multiple taxes charged by multiple authorities such as Tanzania Revenue Authority (TRA), Zanzibar Revenue Authority (ZRB) and local authorities at different stages of seaweed value chain creation.

8.2 Conclusion and Recommendations

Respondents; among others; have recommended for a rise in price of seaweeds, provision of working tools such as boats, strings, drying racks and transport, education on different aspects of seaweeds such as uses, benefits and value addition, sharing the results of researches to the farmers, provision of special areas for drying sea weeds, construction of warehouses, exchange rooms and value addition plant, seaweed measuring process to be followed up, implementing measures to combat climate change and facilitation of legal environment governing seaweeds sector. Based on the findings and other insights, the research recommends the following:

- 1. Strengthening policy and institutional framework:** This should involve reviewing regulatory environment governing seaweeds subsector and formulating Policies and regulations to promote the sector, reviving and establishing new seaweed farmers cooperatives and committees.
- 2. Investing in Education:** Introduce Training the Trainers (TOT) program to selected seaweed stakeholders at Shehia level and staffs responsible for seaweed sector with detailed M & E framework for making follows up. The trainees will be responsible to train seaweed farmers from time to time with different aspects related to seaweeds including swimming skills, quality issues, value addition technologies and Good Agricultural Practices (GAP) in general. There should also be a program to emphasize the seaweed society into sending their children to school.
- 3. Introduce experimental phase for seaweeds:** This should involve doing researches at grass root level to the top sector in order to get details information about the seaweed sector and shared across value chain actors. It could be two-year experiment aiming to generate information, among others, by understanding clearly for example best

production period and areas for seaweeds, good farming methods and technologies, production needs, world market demand and prices.

- 4. Putting in Place Supporting Infrastructure:** Infrastructure such as power supply, water and roads should be more reliable. Other infrastructure such as rubble roads ending to seaweed farms, seaweed warehouses, stairs and drying places including stony floor, bakery and exchange rooms for women need to be constructed.
- 5. Investing in Research and Development:** This involves conducting research in order to find solutions to various situations and challenges existing in the seaweed sector. Research can include analysis of the market, production, and seaweed technologies in order to generate information that would be useful in increasing competitiveness of the seaweed sector.
- 6. Investing in Quality Management:** Relevant quality bodies such as Zanzibar Bureau of Standards (ZBS), Government Chemist and Zanzibar Food and Drug Authority (ZFDA) should be strengthened through capacity building programs and acquisition of laboratory equipment so that they have parameters for measuring seaweeds in different forms to maintain good quality. The bodies and other relevant institutions such as Ministry responsible for blue economy should set up quality standards to be followed by seaweed farmers. Ministry responsible for agriculture needs to emphasize and adopt Sanitary and Phyto sanitary measures.
- 7. Strengthening collaboration and coordination among stakeholders:** The seaweed subsector needs to be supported by other sectors as follows:
 - i. **Education** – Investing education in seaweed society for both children and adult so that it becomes easy to for farmers to adopt good practices including the use of technologies and make the farming more profitable.
 - ii. **Health** – Proper health infrastructure and staffs to be available where farmers can rely upon when getting injured or impacted by seaweed farming activities.

- iii. **Tourism** – The sector needs to be socially responsible by operating without affecting environment and impact seaweed farming negatively. Seaweed and tourism should co-exist and not compete as a notable example of investor from Marijani Beach Resort and Spa at Pwani Mchangani who has allowed farmers to continue farming seaweeds in the sea near his hotel and put aside area for drying seaweeds.
- iv. **Agriculture** – The sector should encourage planting of trees to replace trees affected due to use of pegs.
- v. **Environment**– To fully supervise national plans on environment.
- vi. **Private Sector** – Collaborate fully with the government in implementation of national plans and interventions supporting seaweeds.
- vii. **Finance** – Adequate financial resources to be allocated to interventions and programs aiming at promoting seaweed industry in Zanzibar.

The research has limitation, due to limited resources, some areas of high interest were not researched in this study therefore it is recommended in the future researches to be undertaken to explore potential of Zanzibar seaweeds and to analyze legal environment governing the seaweed sector.

REFERENCES

1. Ali, N. S. (2014). Assessment of the market relations between smallholder seaweed farmers and buyers for poverty reduction in Zanzibar: A case of Uroa village Kusini district. Dodoma (master's dissertation). The University of Dodoma, Dodoma.
2. Ana Menezes (2020), Understanding diseases and control in seaweed farming in Zanzibar- FAO Aquaculture Newsletter
3. Bacaltosi, D, Revilla, N, Castañaga R, Laguting, M, Anguay, G, et al, 2012, 'Gender Roles in the Seaweed Industry Cluster of Southern Philippines': The DICCEP Experience Della Asian Fisheries Science Special Issue Vol.25s 251-256.
4. Christina Shimba Douglas A. Magombola, Suleiman Ibrahim (2021) Assessment of Seaweed Farming in Sustaining Household Livelihood in East Coast District, in Zanzibar, Tanzania European Journal of Physical and Agricultural Sciences.
5. Georgia de Jong Cleyndert, Rebecca Newman, Cecile Brugere, Aida Cuni-Sanchez, and Robert Marchant (2021). Adaptation of Seaweed Farmers in Zanzibar to the Impacts of Climate Change. Researchgate.
6. Kronen, M, Meloti, A, Ponia, B, Pickering, T, Diake, S, Kama, J, Kenilolerie, P, et al, 2010, 'Gender and seaweed farming on Wagina Island, Choiseul Province in Solomon Islands' SPC Women in Fisheries Information Bulletin #21 – December.
7. Ministry of Agriculture, Natural Resources and Livestock, (2019), "Zanzibar Agricultural Sector Development Program (ZASDP)".
8. Ministry of Trade and Industrial Development, (2019), "Zanzibar Industrial Policy 2019-2029".
9. Msuya, F.E., (2011) "The Impact of Seaweed Farming on the Socioeconomic Status of Coastal Communities in Zanzibar, Tanzania." World Aquaculture 42:3 pp 45-48.
10. Msuya, F.E., (2012) "A Study of Working Conditions in the Zanzibar Seaweed Farming Industry". Women in Informal Employment Globalizing and Organizing U.K.
11. Msuya, F.E., M.S. Shalli, K. Sullivan, B. Crawford, J. Tobey and A.J. Mmochi. 2007. A Comparative Economic Analysis of Two Seaweed Farming Methods in Tanzania. The Sustainable Coastal Communities and Ecosystems Program. Coastal Resources Center, University of Rhode Island and the Western Indian Ocean Marine Science Association. 27p.
12. Msuya, F.E., M.S. Shalli, K. Sullivan, B. Crawford, J. Tobey and A.J. Mmochi. 2007. A Comparative Economic Analysis of Two Seaweed Farming Methods in Tanzania. The

Sustainable Coastal Communities and Ecosystems Program. Coastal Resources Center, University of Rhode Island and the Western Indian Ocean Marine Science Association. 27p.

13. Msuya F.E. 2006. The Seaweed Cluster Initiative in Zanzibar, Tanzania. In Mwamila B.L.M. and A.K. Temu, Proceedings of the 3rd Regional Conference on Innovation Systems and Innovative Clusters in Africa, Dar es Salaam, Tanzania, September 3-7, 2006. pp 246-260.
14. Msuya Flower E. (2011) The impact of seaweed farming on the socioeconomic status of coastal communities in Zanzibar, Tanzania World Aquaculture 42:3 pp 45-48.
15. Ronald B, Silayo GF, Abdalah KJ (2015). Preference Sources of Information used by Seaweeds Farmers in Unguja, Zanzibar. Inter. J. Acad. Lib. Info. Sci. 3(4): 106-116.
16. Msuya Flower E. (2011) The impact of seaweed farming on the socioeconomic status of coastal communities in Zanzibar, Tanzania World Aquaculture 42:3 pp 45-48.
17. Msuya Flower E. (2012) Women in Informal Employment Globalizing and Organizing, A Study of Working Conditions in the Zanzibar Seaweed Farming Industry.
18. Office of the Chief Government Statistician (OCGS) (2020) "Zanzibar Statistical Abstract".
19. Office of the Chief Government Statistician (OCGS) (2019/2020) "Zanzibar Household Budget Survey".
20. Viktoria Forsberg & Veronika Vestling Pages: 2018 The livelihoods of female seaweed farmers – A study about women's experiences of new and old techniques of seaweed farming on Zanzibar, Tanzania. Jönköping University Bachelor thesis.
21. Zanzibar Planning Commission (2020) "The Blue Economy Policy".
22. Zanzibar Planning Commission (2020) "Zanzibar Development Vision 2050".
23. Zanzibar Planning Commission (2018) In-Depth Study to Explore the Best Way to Increase Seaweed Production, Improve Seaweed Trade, Value Addition and Processing in Zanzibar.