

**THE INFLUENCE OF PRICE ON SEAWEED FARMING GROWTH**  
**A CASE OF EAST COAST REGION OF ZANZIBAR**

**By**

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**A Dissertation Submitted in Partial Fulfillment of the Requirements for the Award  
of the Degree of Master of Business Administration (MBA)-Corporate  
Management of Mzumbe University**

**2013**

**CERTIFICATION**

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## **DEDICATION**

I dedicate this dissertation to my lovely family.

## **LIST OF ABBREVIATION**

<b>CSE</b>	Chalmers School of Entrepreneurship
<b>DFMR</b>	Department of Fisheries and Marine Resources in Zanzibar
<b>GEM</b>	Global entrepreneurship monitor
<b>MNRT</b>	Ministry of Natural Resources and Tourism
<b>SPSS</b>	Statistical package for social science
<b>UNIDO</b>	United Nations Development Organization
<b>URT</b>	United Republic of Tanzania
<b>USAID</b>	United State Aid
<b>ZACOL</b>	Zanzibar Agro Company Limited
<b>ZANEA</b>	Zanzibar East Africa Seaweed
<b>ZRG</b>	Zanzibar Revolutionary Government

## **ABSTRACT**

This thesis aimed at Assessing the Influence of Price on Seaweed Farming Growth in East Coast Region of Zanzibar. The question behind is to explore the seaweed farming activities which carried out by seaweed farmers so as to alleviate poverty in order to improve their standard of living. The study intended to identify steps taken by seaweed farmers to get competitive price and find out steps taken by government to promote seaweed farming in East Coast Region of Zanzibar.

The research was conducted in three levels, East Coast Region of Zanzibar, Seaweed Companies and Government organizations which were concerned with seaweed farming. The study covered three wards namely, Paje, Bwejuu and Jambiani. Two types of data were collected primary and secondary data by using questionnaire, observation and documentation. The findings proved that there has been a negative influence of price on seaweed farming growth hence causes the low production of seaweed. The study revealed the obstacle which seaweed farmers faced include low price of seaweed to compare with the cost that the cultivators deserved, Stealing of seaweed during cultivation and drying season, Sometime seaweed was cutting in small pieces and lost in the water. Presence of seaweed diseases such as fungus/fungal disease, conflict between seaweed cultivators and other people who use marine for their economic purposes, for example fishermen and tourism investors., Increasing of investment of tourist hotel in the area of seaweed farming, lack basic farm inputs to enhance the production of seaweed and lack of knowledge for the competitive price of seaweed in the world market.

The study come up with recommendation that, provision of training, improving technology and seaweed market strategies will help seaweed farmers and government at all to achieve their goal.

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1. Background Information**

In Tanzania, seaweed was first harvested in the early 1950s, when native seaweed species were collected from intertidal zone of coral reefs. The collected species were *Euclima denticulatum*, common known as 'spinosum' and *Kappaphycus striatum* and *K. Alvarezii*, which are naturally abundant in Tanzania's coastline (Mshingeni 1973 and Jaasund,1976) Although no data was collected on the seaweed harvesting activities at the time, it is estimated that total collection was in range of 400 to 800MT per year.

Seaweed was found to have high content of carrageenan, a polysaccharide material found in seaweed cell walls used as a gelling, thickening and emulsifying agent in foods, cosmetic, paints, manufacture of soap and pharmaceutical products. Tanzania's seaweed was collected for export to France and Denmark, where the carrageenan was extracted for commercial purposes.

In 1997, Professor Mshingeni introduced the idea of seaweed farming in Tanzania. His idea was to supplement the wild stock, whereby improving production, particularly focusing on seaweed quality and quantity. Professor Mshingeni established the first seaweed farming trials in 1982-1983 in Kigombe village Tanga, Fumba bay in Unguja and Fundo island Pemba. At the time farming focused on the native strains of *cottonii* and *sponosum*.

In 1989, a second trial involving strain of *kappaphucus alvazerii* and *Euclima denticulatum* conducted on Zanzibar by Zanea seaweed CO. LTD. Its success in commercial seaweed production paved way for the subsequent entry of the other seaweed venture such as ZASCOL and C- Weed corporation. This second Trial generate growth rate of 6-7 percent per day (Mtolera,1995), demonstrating these exotic strains were suitable for commercial cultivation.

Finally in 1994, commercial developers began promoting seaweed farming on Tanzania's mainland. Using the two exotic strains of *cottonii* and *spinosum*, the seaweed was cultivated using production techniques introduced from Philippines and latter modified to better suit the local environment. The private sector developers brought to Tanzania technical assistance and financial support through the provision of equipment and supplies with the emphasis on coastal community participation.

In the last decade , the seaweed industry has rapidly expanded both in Zanzibar and on the mainland . In the early 90's production on the mainland was mainly confined to Muheza and Pangani District, however, in recent times, it has expanded to Tanga Municipality, Mtwara, Kilwa, Lindi, Temeke, Bagamoyo, Mafia, Mkuranga and Kinondoni District.

Today small-scale seaweed farming is one of the most important socio-economic activities along Tanzania coast playing a particular important role in coastal communities by providing informal employment opportunities, especially for women. Nevertheless, some very suitable sites have yet to attract commercial development and investment from the seaweed farming industry.

In 1989, seaweed farming was introduced on the east coast of Unguja (Zanzibar island) and has since become a vital source of income for coastal villagers. The seaweed is implanted and tended on beach areas between the high- and low-water marks. It is harvested and dried, collected in Zanzibar town, and then exported to several countries in Europe and Asia for use as a food thickener or stabilizer. Seaweed is now a valuable addition to Zanzibar's traditional exports of coconuts, cloves and other spices.

Seaweeds farms are generally located in shallow, calm and constantly warm waters, but only where the bottom part of water is sandy. The temperature should be between 25 and 30 degrees centigrade. He also hinted that the first farm of seaweeds was introduced in Zanzibar in 1989 when the government of Zanzibar solicited help from different experts from Asia and Europe. Then, the government embarked on major economic liberalization programs, including finding ways of diversifying the economy.

Seaweeds generate direct income to farmers and it has changed the livelihoods of thousands of people in Zanzibar especially women living along the coastlines of Zanzibar. Areas where seaweeds mostly grow are Pwani Mchangani, East Coast of Zanzibar and Pemba. Seaweeds farming have also created employment opportunities to many people in Zanzibar, reducing dependency on traditional economic activities such as fishing for people to earn a living.

At the moment there are ten privately-owned seaweed companies operating in Zanzibar and employing thousands of people with farming of red algae gathering momentum in both Unguja and Pemba, at the expense of some traditional coastal activities such as rope making, cockling and shell gathering. The price of seaweed is 400 TSh for the *Spinosum* type and 600 TSh for the *Cotonii* per kg of dry weight.

Women take a large group of seaweed farmers, and now there are over 25,000 of these seaweed farmers along the coast of Zanzibar. According to the Frame survey Of 2007 Zanzibar exported 12,000 tons of seaweeds in one year to Europe and North America, earning the Isles 4.8bn/-, the earnings from the export of seaweeds have brought significant social changes in many villages in Zanzibar since there are no middlemen in the trade to take a chunk of the growers' profits. The truth of the matter is that seaweeds are providing much needed income for impoverished families offering a lifeline to many families.

## **1.2. Statement of the Problem**

Seaweed farming contributes significantly to the economy of Zanzibar where it contributed 15% and 27% respectively of Zanzibar exports . (*Msuya et al. 1996*). There are three main industries that bring most of the foreign money in Zanzibar. In order of significance, they are tourism, seaweed farming and the clove trade. Apart from being the second most important foreign money earner, seaweed farming contributes above 90 percent of Zanzibar's marine export products.

The current price in the world market is USD 330/550 for *Espinosum* and 700/750 for *cottonii* per ton. In Zanzibar the price of seaweed has risen to Tsh. 400 for the *Espinosum* type and Tsh. 600 for the *Cotonii* per kg of dry weight. At the moment there are ten privately-owned seaweeds companies operating in Zanzibar so that the competition is very high. Although seaweed farmers have significant contribution to support economic growth of Zanzibar, the price of seaweed is low despite the hard work done by the farmers.

The study intends to assess the influence of price on the growth of seaweed farming in East Coast of Zanzibar in order to enable responsible management and understand the magnitude so that justifiable decision can be effected to remedy the situation. This is a disincentive to farmers in such away it is likely to affect the production of this vital crop which support the economy of Zanzibar.

## **1.3 Research Objectives**

Research objectives are finer and specific statements that originate from the research problem indicating the aims to be achieved by the study (*Kothari, 2004*). They direct the researcher towards discovering answers to research questions through the application of scientific procedures aimed at finding out the truth which is hidden or not discovered yet. The objectives of a research summarize that the study wants to pull off.

### **1.3.1 General Objective**

The general objective of the study was to assess the influence of price on seaweed farming growth in east coast region of Zanzibar.

### **1.3.2 Specific Objective**

The specific objectives are to:

- (i) identify the influence of price on seaweed farming growth in East Coast Region of Zanzibar
- (ii) find out the steps taken by seaweed farmers in order to get competitive price.
- (iii) identify an effort taken by the Government to promote seaweed cultivation

### **1.4 Research Questions**

The research questions were as follows:

- (i) what is the influence of price on seaweed farming growth in east coast region of Zanzibar?
- (ii) what are steps taken by seaweed farmers in order to get reasonable price?
- (iii) what are an efforts taken by Government to promote seaweed cultivation?

### **1.5 Scope of the Study**

Adam *et al.*, (2008), explain that, the scope of the study aims at indicating the boundaries or limits of the study in terms of the study terms of content, sample geographical coverage and the period covered by the study. Scope of the study also helps a researcher to concentrate on important matters and avoid unnecessary diversion.

The study conducted in East Coast Region of Zanzibar. It covered three wards, namely, Paje, Bwejuu, and Jambiani. The reason of selecting was many people of this region engaging in seaweed farming, and was the first place where by seaweed farming is established in Zanzibar.

## **1.6 The Significance of the Study**

According to Adam and Kamuzora (2008), this section shows the importance of the study following successful completion by indicating the merits that will be obtained /enjoyed from the reliable and valuable findings. This study will help to generate new knowledge, where the researchers and academicians who intend to explore the impact of price to the seaweed farming growth, will be able to get information. The study will help in the formulation of policy that will provide win-win situation (seaweed farmers, government and private company dealing with buying seaweed). It will also provide information to the Zanzibar Revolutionary Government (ZRG) as the study will create awareness to the government which may take it as a policy issue hence improving the seaweed farming in Zanzibar. The findings will further help in raising the level of awareness of seaweed farmers through the support of government so as to improve seaweed production through better use of farming method and its technology in thus way production is likely to be improved. The findings of this study will remain at Mzumbe University library for lectures and the upcoming students for studies reference. Lastly it will benefit other researchers who will be conducting study in related topic, in terms of references and guidance.

## **CHAPTER TWO**

### **LITERATURE RIVIEW**

#### **2.0 Introduction**

This chapter gives the theoretical and empirical and literature review of the study aiming to provide better understanding of research topic and searching for different idea unsolved problems and recommendations. The main objective of this literature review is to show what others have already come up with the studies.

#### **2.1 Theoretical Literature Review**

Under theoretical literature review the researcher will be concerned with readings books, journals Articles and various reports, many scholars have written about seaweed such as

##### **2.1.1. Origin of Seaweed farming in Tanzania**

Zanzibar Islands have exported wild seaweeds since 1940s. The main species to export were *Eucheuma cottonii*. By 1950s the Islands were exporting up to 387 tons of dried wild seaweeds to the main markets in Europe (Sen, 1991). The collection of wild seaweed for export was possible at that time since the population in coastal regions was not large compared to recent population. In order to maintain income generated from seaweed exports, coastal communities engaged in seaweed farming due to the fact that wild collections are not abundant anymore.

Msuya (2004) pointed out that, the successful seaweed industry in Zanzibar Islands involved both men and women. However, the author adds that, men slowly left the industry and currently seaweed farming activities are being performed mostly by women. Additionally, Msuya (2006) pointed out that women who carried on with the activity are able to buy necessary household items such as clothes, school uniforms for their children as well as improving old homes.

Nationally, seaweed farming activities are recognized as forms of mariculture that can be adopted without difficulty by poor coastal communities. Currently, the government of Tanzania, through the concerned institutions, various stakeholders and government and Non-Government organizations, is facilitating and promoting seaweed farming. The aim is to develop these activities from local to industrial levels of production. Tanzanian

### **2.1.2. Seaweed Farming Technology**

There are various techniques for seaweed farming; these are deep water technique where the farm is kept underwater all times. The other one is raft method (floating lines technique) which involves anchors (stones are being used to reduce costs) and buoys to mark the farm, this also performed in high water (not intertidal areas). Apart from those two above peg and line is the common and easiest technique since it is performed in intertidal zone (shallowest areas inside the fringing reefs) and thus most women use this technique for seaweed farming. The later technique is also termed as *the tie-tie system* (Bryceson, 2002) or off-bottom technique (Msuya et al, 2007). This technique is common as said before but it is prone to seaweed die-offs and thus the floating line technique is likely to replace it. With this farming technique the fronds (seeds) of seaweeds are tied to strings stretched between wooden pegs. Seaweeds grow rapidly (up to 12% per day) and are harvested at spring low tides each fortnight.

### **2.1.3. Site Selection**

Seaweed farming starts with identifying suitable site for farm establishment. Suitable site for seaweed farm establishment is considered to be a difficult task due to the fact that seaweed plants are very sensitive to environmental changes. However, respondent identify identified some clues on sypinosum (*Eucheuma*) farm establishment. Some of these guides include the following;

- The *Eucheuma* farm should be located where there is good water movement or where there are rapid but not strong water turnovers such that the farm is not destroyed,

- The farm must be established in sheltered areas,
- The site should be located nearby freshwater runoffs such that the salinity level is maintained: the suitable salinity levels range between 27-35 parts per thousand,
- The site to be selected for farm establishment should have water temperatures ranging between 25-30<sup>0</sup> C,
- The farm should be situated 2 feet deep and 7 feet deep in water during low and high tides respectively, and water should be clear to allow sufficient sunlight to penetrate the water column
- The accessibility of the farm also should be considered.

Once the site is identified, the permit should be applied to the local government authorities for the establishment of seaweed farm. Once the permit is obtained the site should be cleared from unwanted weeds in order to reduce ecological competition between seaweeds and other weeds, and other materials such as stones should be removed from the site for easy stakes/pegs fixing on the ground.

#### **2.1.4. Attending the Farm and Harvesting Seaweeds**

Attending the farm is done after every 3 days. This involves the uprooting unwanted weeds and to re-line up some lines that entangled with other lines as well as shaking sands from seaweeds. A farm of 30 lines can be managed by at least 2 people although family members normally do help to attend the seaweed farm. The harvesting procedures are done after the completion of growing cycle of seaweed and this is usually after 40 to 60 days after planting. During the harvesting process, the main ropes detached from the pegs or portions of seaweeds can be cut from grown seaweeds and packed in the sacks commonly known as viroba and brought to the shore. The pegs remain in the farm to support the left seaweeds in the farm or for the next farming cycle. The harvesting duties are organized in such a way that most of family members help out

whenever harvesting is required. While harvesting, farmers have to transport seaweeds ashore and therefore there are different ways of transporting harvested seaweeds from the farms to the shore. These include the use of boats, carrying on heads or pulling more than one *viroba* to the shore.

Traditionally, seaweed has been dried on palm fronds and cloth materials placed directly on the ground. Ground drying results in poor quality, so drying racks made of wooden stakes and palm fronds that elevate the drying surface off the ground are recommended as a best practice to improve the quality of the final product. (SDSP 2005) Seaweed should also be covered with tarps during rain events.

However, as local buyers do not provide a price differential for seaweed quality, few farmers use racks for drying or cover seaweed with tarps during rainfall events. The poor quality of Tanzania's seaweed is a continuing problem expressed by seaweed buyers, and contributes to a lower price when compared with the price that farmers in other countries. Farmers will likely use elevated racks and tarps, if buyers are willing to provide a price premium for improved quality product and a price penalty for lower quality product. Without a price differential for quality, farmers do not have an incentive to use drying racks to improve the quality of the final product. Recently, farmers have begun to learn and understand improved post harvest handling best practices, and some farmers have started to construct and use drying racks.

The cost of constructing a drying rack is included in this economic analysis. A drying rack frame is constructed of 2 bundles of wooden stakes each costing 2,000 Tsh. and two rolls of rope each costing 500 Tsh. The construction cost for one rack is approximately 2,000 Tsh., which is the amount paid to a hired builder; therefore, the total cost for a single drying rack frame is 7,000 Tsh. To complete the drying racks, 15 palm fronds are draped across the racks at a cost of 50 Tsh. per frond. The palm fronds must be changed after every three harvests. Tarps are also used to cover and protect the seaweed on the drying racks during rain events. (Mmochi, 2007).

Farmers also use plastic bags for both carrying wet seaweed from the farm to the drying area and for storage of dried seaweed. A woman owned off-bottom, a man owned off-bottom and a floating line plot require 10, 20 and 10 bags, respectively ( Mmochi, 2007).

### 2.1.5. Seaweed Marketing in Zanzibar

Zanzibar started to pursue partial liberalization of the economy and designed the open-door policy to encourage trade in 1984. At present, there is no document for Zanzibar’s trade policy but the draft to this effect is said to be at advanced stage which vividly intends to guide seaweed investors and other traders.

The operating seaweed trading companies are licensed within Zanzibar, but operate also in mainland at Tanga, Kilwa, Bagamoyo and Mafia where seaweed farming takes place. Each company establishes buying within respective allocate areas, where they also give production inputs. They buy the products from peasants companies and determine the prices at particular season as allowed in the trade liberalized system.

The Ministry of Trade, Tourism and Investments, has Marketing Department, which is charged to safeguard legal rights of trading, provide business news such as market operations and price for regional and world prices (MTTI, 2006).

**Table 2. 1: Seaweed Price trend per Ton**

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
USD /ton	320.3	334.6	299.3	319.1	359.7	282.3	1029.2	537.5	452.9	400.0	350.0
Tsh per ton (1000)	128.0	57.1	60.0	60.8	74.5	86.4	111.2	96.3	107.9	100.7	81.8

*Source: DFMP (2005)*

### **2.1.6. Pricing of Seaweed at the World Market to Zanzibar**

According to table number 1, it can be seen that world seaweed prices have been largely fluctuating. For analytical purposes, the figure can be broadly divided into three periodical phases, the first period is between year 1991 to 1996 whereby world seaweed prices were almost constant, ranging between USD 282.3 and USD 359.7 per ton with minor fluctuations. The second period is in 1997 when world seaweed price hit its peak of USD 1029.2 per ton. The highest price was attributed to low production of seaweed caused by el-Niño rains. The third phase is between 1998 and 2001 when the price began falling consistently from USD 537.5 in 1998 per ton through USD 452.9 in 1999 to USD 400.0 in 2000 and USD 350.0 per ton in 2001.

However, producer prices in Zanzibar have been considerably low during the first period between 1991 and 1996, producer prices have been low, ranging between Tsh. 57,100/= and 128,000/= per ton. The second period saw producer prices recording a moderate TZS 111,200/= per ton in 1997, during the third period between 1998 to 2001, producer prices have been almost constant, ranging between TZS 97.3/= and 139.2/= per ton.

A comparative analysis between world seaweed prices and Zanzibar's producer prices reveal that price trends in Tanzania shillings terms are not closely correlated with world prices in dollar terms. Whereas price of seaweed at the international level have been largely fluctuating and relatively unstable, producer prices in Tanzania shillings portrays a relatively stable trend.

**NB:** The implication is that world price increases in dollar terms did not significantly benefit the Zanzibar peasants.

**Table 2. 2: Producer price against World market price in USD**

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
USD per ton	350	335	299	319	360	282	1029	537	538	453	325
Tsh per ton (100)	128.0	57.1	60.0	60.8	74.5	86.4	111.2	96.3	107.9	100.7	81.8
Producer prices	139.0	145.1	161.5	150.7	152.3	153.2	164.7	139.2	114.5	126.6	97.3
Producer/W. price%	43.4	43.4	54.0	47.2	47.2	54.3	16.0	25.9	25.3	31.6	27.8

**Source: URT (2002)**

For instance world prices increased by 265.0% from USD 282.3 per ton 1996 to the highest Production of USD 1029.2 per ton 1997, during the same period, producer prices increased by a mere 28.7% from TZS 86,400/= per ton to 111,200/= per ton.

Furthermore, the price figures above show that between 1991 and 1995 in average producer prices in Zanzibar accounted for only 46.1 % of the world prices, the ratio increased to 54.3% in 1996 but declined considerably to 16.0% in 1997. Between 1998, 1999, 2000 and 2001 the ratios were 25.9, 25.3, 31.6 and 27.8% respectively. This trend is possibly explained by oligopolistic or cartel trading behavior practiced by the four seaweed-buying companies. It can be concluded that producer prices offered by the buying companies are lower, to the extent that cannot compensate production costs and labor costs.

#### **2.1.7. Seaweed Production in Zanzibar**

Zanzibar produces two types of seaweeds; thin layered leaves *Eucaema (spinosum)* and thick layered leaves *Eucaema (cottonii)*. The first type *spinosum* is the most common (90% of the production) and is resistant to coastal weather and movements of ocean water. Second type, the *cottonii* is fragile type and very sensitive to open exposures, water tides and high temperatures however *cottonii* fetch higher world

market prices than spinosum type. For both types they need six weeks from planting to harvest and they continuously grow throughout the year, these species grow well in different month of the year and some time in different habitats. *Eucheuma cottonii* is grow from April to December, *eucheuma spinosum* throughout the year (Mutatina, 2008).

Since the start of seaweed farming in 1989, farmers in Tanzania have been producing the seaweed and selling to the buyers who export it to Denmark, France, USA, and Spain. What has been persisting in the seaweed industry is that seaweed production fluctuates between 4000 and 6000 MT of dry seaweed (Msuya, 2005) with the highest ever of 9000 MT in 2002. This is (very) low production and there is potential to increase the production through the management/modification of the farming technique. The market is available for higher production because the buyers/exporters would like a production of up to 20,000 MT. The increase in production could result in the increase of seaweed prices within the country as the business running costs would be lowered.

The produced seaweed is exported in bulk, with no use in the country. Exporting in bulk leads to low prices paid to the producers (farmers). As a result, complaints from the farmers over the seaweed prices (Mmochi et al. 2005).

Coastal communities rely on coastal resources for their livelihood. Their economy is dependent upon small-scale farming, subsistence forestry, mangrove harvesting, artisanal fishing, lime and salt production, seaweed farming, livestock husbandry, small-scale trade and handicrafts. Due to the intensive and sustained exploitation of coastal resources, the natural resources of some areas can no longer support their growing population, resulting in increasing vulnerability to food shortages and poverty. Consequently, sustainable use of coastal resources and the development of income-generating activities are critical to poverty alleviation and to improving the well-being and livelihood of coastal inhabitants. Farmers at Songosongo exchanging ideas Socially

and economically the farming of seaweeds represents an environmentally sustainable opportunity for coastal villagers, especially women, to earn money. Seaweed farming has increased the standards of living in coastal communities, with the most notable impact to date being on Zanzibar.(SDSP 2005).

**Table 2. 3: Annual seaweed production for years 1995 – 2005 in Zanzibar**

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Production (MT)	3626	4774	3667	4171	6607	6607	4911	9091	-	6459	6097

**Source (Msuya F.E. 2006)**

### 2.1.8 The Seaweed Production Cycle

In both the off-bottom and the floating line methods of farming *cottonii*, there are eight production cycles per year but die-offs are estimated to occur in at least one cycle per year in the off-bottom method. The die-off typically occurs in a cycle following the heavy, rainy season (March to May) and is likely due to water salinity, sedimentation from run-off and/or temperature differentials during this period (Mmochi et al. 2005).

To account for the die-offs associated with the off-bottom method, this economic analysis bases its calculations for the off-bottom plot on eight effective growing seasons but on only seven harvests per annum. Note that when annual labour costs are calculated for the off-bottom method, this means that those costs associated with seed preparation, planting and farm management are incurred eight times per year and that those costs associated with harvesting and post-harvesting activities are incurred only seven times per year. The calculations for the floating line plot are based on eight effective growing seasons and eight harvests per year.

Either a senior female household member or a male household member manages each seaweed farm, and it is estimated that on the average two persons per family are involved in seaweed farming. Many farmers have more than one farm (ranging between 1-5 farms). Most off-bottom plots owned by men tend to be larger than those owned by women. A large, man owned off-bottom plot consists of 30 lines that are 20 meters each in length and a woman owned off-bottom plot consists of 30 lines that are 10 meters each in length. Seaweed seedlings are planted once every six weeks. The seaweed grows for six weeks and is harvested and re-planted in the same tidal cycle.

After each harvest, the seaweed is dried and stored by the farmers until buyers purchase it. The buyers then export the seaweed to international carrageenan processors. Carrageenan uses are related to their ability to form thick solutions or gels. *Cottonii* contains kappa carrageenan, a stronger gel that has a higher commercial value than the weaker gel, iota carrageenan, contained in *spinosum*. The main application for both types of carrageenan is in the food industry (McHugh 2003).

### **2.1.9 Falling of Seaweed Market Price**

Currently in Tanzania, the price paid for seaweed by developer is significantly lower than global beach price. Additionally, there is no price differentiation for higher quality seaweed – the same price is paid everywhere which is disincentive to farmers to invest in improved post- harvest handling techniques. Producers understand that the more they clean and dry their seaweed harvest, the smaller their profit. Therefore, to earn the greatest profit, producer do the least amount of drying and cleaning of the seaweed possible, drying and cleaning the seaweed just enough to satisfy buyer (MNRT, 2005).

In locations where there is more than one buyer, the problem is amplified as buyers who are known to allow the poorest quality seaweed tend to get the greatest fraction of the seaweed production. Soon buyers are competing to accept the poorest quality to in turn get the greatest fraction of the total seaweed production. If such a situation is allowed to

persist, it will hurt Tanzania's seaweed farming industry, resulting in lower prices to producers and a negative effect on Tanzania's seaweed farming industry's reputation world-wide, ultimately affecting prices of other exporters. (SPDS, 2005)

Globalization and the prices in international seaweed market challenges mariculture industry in Tanzania. The local seaweed farmers has no idea what looks like in the international markets for their produces, the only rely on the local buyer's information regarding on the production requirements. It is a day dream to have negotiation capacity in the international markets. Apart from that, there are low levels of education in coastal areas (just like other rural areas in Tanzania).

This is challenging mariculture developments in Tanzania, and it slows down the development in most cases. This is due to the fact that, people become easily satisfied with little success and see that they are not responsible for their development; the government is responsible to care of everything. Also there are many uncertainties naturally, therefore people finds difficult to concentrate on a single occupation for income generation (Mutatina 2008).

Commercial seaweed farming in Zanzibar started over 20 years ago (around 1989) in two wards in Zanzibar - Paje and Jambiani. When it started, positive articles were written by various people e.g 'Mwani is money', 'A gift from the ocean', 'Mwani, money and mamas' etc because it was giving the women a lot of benefits at that time. Seaweed production was around 200 tons, then it slowly increased and currently exports are over 12, 000 tons. Slowly the price of seaweed in relation to the dollar started to decrease. The women became demoralized and some have stopped farming (Jiddawi N, 2011).

Seaweed farming has been demonstrated to be an important employment opportunity and income earner for households in Zanzibar villages. In both cases it also tends to diversify household productive activities. This is important if we are concerned about

making communities more resilient and adaptable to various environmental or economic shocks and changes to any one type of productive activity that may occur from time to time. There is less evidence to suggest that seaweed farming of either variety provides an advantage in terms of greater overall household earnings when this is added to the productive household mix. In Mlingotini and Ushongo, seaweed farmers have lower median incomes than non-seaweed farmers.

However, we found no statistically significant differences, although a larger sample size would have given us more confidence in this statistical result. Even in Ushongo where seaweed farmers grow more seaweed and where its' rank of importance to the household is higher, they do not seem to do better economically either. In Mlingotini, if seaweed farmers grew more seaweed, it is reasonable to conclude that they might also improve overall household income. However, they do not rely more on seaweed and it does not seem to improve overall household income as well. (Crowford and Mwanahija, 2007).

#### **2.1.10 Steps Taken by Seaweed Farmers in Order to Get Competitive Price**

Seaweed farmers formed smaller groups and cooperatives, and a Seaweed Farmers' Association was active in each village. These cooperatives are now found in only a few villages. Cooperatives like those mentioned by Shechambo et al. (1996) and Msuya et al. (1994) in Bwejuu, Paje, and Jambiani are no longer active. In 2006, however, the Marine and Coastal Environment Management Project (MACEMP) mobilized farmers in different villages to form groups of 20-30 people so as to access support through the project. In the same year, ZaSCI also helped organize farmers into groups to get help from the initiative.

In Paje village, currently one committee, formed when MACEMP began assisting Zanzibar's seaweed farmers, remains. The committee was a link between members of 13 groups of about 20 people each and the village leadership/government. The different groups led by the committee were supposed to acquire funds from the project as a group, but the promised funds never materialized, and the groups no longer exist. Today, even

groups of three or four people no longer come together to form small cooperatives. (Msuya 2012).

#### **2.1.11 The Zanzibar Seaweed Cluster Initiative (ZaSCI)**

The Zanzibar Seaweed Cluster Initiative (ZaSCI) is one of the clusters formed under the Innovations Systems and Clusters Programme in Tanzania (ISCP-Tz), now called the Pan African Competitiveness Forum. ZaSCI started its activities in 2006 and is now working with seaweed farmers in nine villages in Zanzibar and one village on mainland Tanzania. ZaSCI is facilitated by the “Cluster Facilitator” who is based at the Institute of Marine Sciences of the University of Dar es Salaam.

The aim of the seaweed cluster initiative to address the problems and tap scientific information for the benefit of farmers and the country at large. The basis of the aim is that, there is possibility to increase seaweed production through modifying the farming technique and adding value to the produced seaweed. Trying to solve the problem of cottonii die-off and rising the income of the farmers by enabling them to farm the high priced cottonii farm is one way of increasing production per unit. (Msuya F.E, 2006).

#### **2.1.12 Seaweed Centre Zanzibar**

Over the years students from Chalmers School of Entrepreneurship and the School of Intellectual Capital Management have conducted several projects all around the globe. In the year of 2009, the Seaweed Center Project was founded by the students of CSE'10. Since January 2010 the students of ICM'11 will take over the task of further develop the project. They also aiming at making the Seaweed center a center for knowledge development for the working women. Those activities will make the Seaweed center self-sustaining, make the women farmers independent, establish a market and create sales channels also improve the economic and social welfare for the entire Zanzibar. (CSE. 2009).

The Seaweed Center project was started in 2008 by the students in the Chalmers School of Entrepreneurship class 2010 and is today a collaborative project between CSE and ICM, the Rylanderska Foundation in Sweden, the Zanzibar Adventure School, Dar es Salaam University in Tanzania, and the local women from the village of Paje in Zanzibar. The goal of the project was from the beginning to create work opportunities and increasing the living standards for the women working with seaweed farming at Zanzibar, by providing them with sustainable means of creating a higher value-added product from seaweed. Therefore, the idea came up of building a seaweed soap factory facility where the women could dry their seaweed in a proper way, and providing them with machines for making soap with seaweed as one ingredient. This way more value can be extracted from the seaweed farming.

As of today the Seaweed Center is built and the women has started to produce and even sell some soaps. The goal is that the center should be self-sustaining within a year, run by the local women with support from the surrounding organization, by selling seaweed soaps to tourists and to local hotels at Zanzibar, and to the Swedish market. We are still in the very long process of registering a social business at Zanzibar, but hopefully we will soon run the first social business on the island. The center is also developing into a knowledge center where the local people of Paje could go to English classes and get access to Internet, and other businesses are planned to be started in relation to the center, such as seaweed center tours for tourists and sales of local made clothes.

Through the Seaweed Center we are also hoping that will increase the entrepreneurial spirit of the people in Paje and that more businesses will be started as a positive effect. In a few years time we are also aiming at spreading the concept to other villages at Zanzibar to help more people increasing their living standard through entrepreneurship. Even though we don't solve a huge global problem we are doing something for some people that hopefully will have large impact on the society in Paje. (Nyberg,2011)

Seaweed farming has frequently been suggested as both a means to improve economic conditions and a means to reduce fishing pressure. It tends to fit many of the criteria suggested by Pomeroy (1992) necessary for fishers to shift from fishing to aquaculture. Seaweed is simple to cultivate, requires low initial capital investment and provides a rapid and high return on investment.

Seaweed farming in Tanzania has also been viewed as a potential economic opportunity for coastal communities and a way to reduce pressure on marine resources and coral reefs (Msuya 1998).

#### **2.1.13. Efforts of Government to Help Seaweed Farmers**

The talk was about the involvement of the Government from the start, during the first experiments in the early 1980's. Government plays a role between farmers and buyers in aspects of prices, revenue, and land lease. Efforts of the Government to make seaweed farming a free trade were explained and stated that the process is still not as successful as thought because farmers fail to buy inputs after selling seaweed.

They use the money obtained from selling seaweed for other purposes. Nevertheless, negotiation/efforts are continuing with farmers and buyers. It was reported that Government officials were (in July 2005) visiting Philippines, Indonesia, and China to learn the success of free trade and the markets so the tactic can be applied in the country ( Msuya, 2005).

Seaweed farming in Zanzibar has reportedly improved living standards in coastal villages International development assistance projects have also been promoting seaweed farming as a way to reduce fishing pressure. (Zanzibar 2002).

The SDSP provides the framework for the expansion and prosperity of the Tanzania's seaweed industry. It complements the National Integrated Coastal Environment Management Strategy and Fisheries and Environment Policies. Covering the period from January 2004 to December 2009, the plan also compliments government efforts to

reduce poverty by improving coastal community livelihood and stewardship of marine and coastal resources.

The primary goals of the SDSP is to promote *cottonii* production as an income generating activity for Tanzania's coastal inhabitants, reduce poverty of coastal communities, and improve stewardship of marine and coastal resources. Specific objectives:

- (i) Create an investment environment that encourages new investment and maintains confidence of all seaweed industry stakeholders.
- (ii) Build the capacity of producers to become self-reliant.
- (iii) Expand extension and research in the seaweed industry.
- (iv) Increase farmer productivity by promoting better farm management practices so that it becomes a primary source of income; and seaweed
- (v) Increase awareness about *cottonii* farming as an attractive income generating business (URT, 2005).

The public sector, private sectors, NGOs and other seaweed stakeholders in Tanzania jointly facilitates seaweed activities along the coast. The decisions to culture seaweed originate from local communities, and under poverty reduction philosophies in the country these farmers are being helped out with some seed-money or production in puts to sustain their seaweed activities. Normally, seaweed farmers are organized themselves into groups with their leaders who acts as representatives for their groups. These are accountable to other groups of stakeholders as well as within the group such that any leader will decide fairly according to the nature of the group being represented and in most cases leaders are from both genders. (Mutatina, 2008).

The primary role of Government is to support the development of seaweed farming and it can do this though the following interventions:

- (i) In most countries, the coastal waters are property of the State. But rights of management may be partially devolved to district or village governments, and perhaps even to private investors in specific cases, to secure the access to the lagoon or bay for seaweed farming;
- (ii) Provide a certain degree of protection to investors in seaweed farming by creating exclusive operating (buying) zones, albeit with some conditions attached relating to a minimum tonnage to be produced and the duration of the exclusivity agreement;
- (iii) Create a platform (or forum) where the three main stakeholders (farmers, investors and the government) are able to discuss the development of the industry in an open and constructive manner. And provide scientific support to the sector through the platform.
- (iv) Ensure that the prices paid to the farmers (called the 'beach price') are in the same range as those paid in the region as a whole
- (v) Capitalize on the opportunity to introduce some compensatory fisheries and/or coral reef management measures, once the seaweed farms are operational and profitable for local people; and,
- (vi) Limit the burden of long and costly Environmental Impact Assessments (EIA) but nevertheless monitor the outcomes of the development of the industry. For example, in Tanzania the requirement for an EIA for village-level seaweed farming has recently been abandoned (De san, 2012)

#### **2.1.14. Roles of Donors and NGOs.**

The intervention of donors is welcome, and may even be indispensable at the outset, in order to encourage the interest of an investor or large-scale buyer. But an NGO cannot replace an investor.

Other institutions are joining forces with ZaSCI in adding value to seaweed in Tanzania. Chalmers School of Entrepreneurship in Sweden, in collaboration with ZaSCI is constructing a Seaweed Center in Zanzibar. The Center is equipped with facilities to dry seaweed, especially during the rainy season, and produce value-added products. When completed, the Center will be equipped with a seaweed soap factory kitchen to cook seaweed food to visitors and a shop to sell the seaweed value added products as well as traditional products.

The United Nations Industrial Development Organization (UNIDO) has recently started working with ZaSCI and the Ministry of Tourism, Trade and Investment in Zanzibar to train in seaweed value addition and production of value-added processes. Three training sessions have been conducted and a number of value-added products have been produced by seaweed farmers in a number of villages.

It is also necessary to ensure, during the implementation, effective coordination with any private sector already involved in seaweed farming. This is in order to avoid the situation that developed in south-west Madagascar, for example, where some associations and donor projects provided seaweed farming materials with little thought towards training the farmers in their use, or even about village site selection. Through these projects, hundreds of individuals took up seaweed farming but lost everything with the first problem that arose. The result is that entire villages now reject seaweed farming and will likely continue to do so for many years. (Michel 2012).

### **2.1.15. Production of Value Added Seaweed Product**

To try to ease the hardship on the farmers, different stakeholders have come in to help the farmers with alternatives to the seaweed farming industry, in general. One such alternative is innovation of the seaweed farming activity by adding value to the seaweed through production of value-added products. The idea of adding value to Tanzanian seaweed goes back to 1983. During 1983/84, Prof. Keto Mshigeni and Dr. Flower Msuya, who was then a student of Mshigeni, used extracts from the seaweed *Gracilaria* as a fertilizer for bean plants.(Msuya,2006)

This had been the only way of gaining income from seaweed farming until 2008 when the first seaweed value-added product was produced under the ZaSCI. Other institutions are joining forces with ZaSCI in adding value to seaweed in Tanzania. Chalmers School of Entrepreneurship in Sweden, in collaboration with ZaSCI is constructing a Seaweed Center in Zanzibar.

The Center is equipped with facilities to dry seaweed, especially during the rainy season, and produce value-added products. When completed, the Center will be equipped with a seaweed soap factory kitchen to cook seaweed food to visitors and a shop to sell the seaweed value-added products as well as traditional products. The United Nations Industrial Development Organization (UNIDO) has recently started working with ZaSCI and the Ministry of Tourism, Trade and Investment in Zanzibar to train in seaweed value addition and production of value-added processes. Three training sessions have been conducted and a number of value-added products have been produced by seaweed farmers in a number of villages. (Msuya 2006).

### **2.1.16. Seaweed Products Produced by Seaweed Farmers in Zanzibar**

The principle interest in seaweed is for the extraction of carrageenans, which are processed into gels that are subsequently used in the food industry, cosmetics, and pharmaceuticals as thickeners, stabilising agents and emulsifiers. One of the important

characteristics of carrageenan-based gels is that they remain fluid under pressure and then recover their original viscosity.

The following are some example of specific uses of carrageenan gels:

- (i) Food Industry: deserts, ice-creams, concentrated milk, pasta, processed meats, sauces and chinese soups, in beermaking processes, soy milk, animal feed, dietetic drinks, jams etc.
- (ii) Comestics: toothpaste, shampoo, skin-care creams etc.
- (iii)Pharamceuticals: in pills, gels etc.; and,
- (iv)Others: for example, in fire-extinguishers andpolish.(Michel Dan San,2011)

One of the most remarkable results of adding value to seaweed is the production and sale of seaweed powder. Under ZaSCI, a group of women in Kidoti, northern Zanzibar, is now selling seaweed powder to many users in Tanzania. One kg of seaweed powder is sold at 10,000 Tsh. (~US\$6.7).

When this is compared with the price of the low priced seaweed, spinosum, which is used to produce the powder, this is a very high increase in value. The powder is produced by using a diesel engine powered machine acquired through ZaSCI. Even if the costs of grinding the seaweed are included, including the grinder, the diesel fuel, the engine, the time spent and some loss of the seaweed during the grinding process, there will still be a very high percentage of increase in the value of the seaweed. This is a very pronounced result of innovation in the seaweed industry, from a seaweed farm, to dry seaweed, to seaweed powder. The group is the only source of seaweed powder in the country. This is a boost to the income of the seaweed farmers and an encouragement that may keep them in the industry and probably bring men back to the seaweed industry in Zanzibar.

Products that have been produced so far are seaweed soaps (with or without spices), seaweed powder, massage oil, body cream, cakes, cookies, jam, puddings and salads. Of these products soaps, body creams and powder are marketed commercially. The products were produced starting in 2008. Table 1 summarizes the types of the value-added products and the years that they were produced. (Msuya 2006)

**Table 2.4: Seaweed products produced by seaweed farmers in Zanzibar**

Product name	Type	Year of production
Dry seaweed		Up to 2006
Seaweed bar soap (1 type)	Seaweed only	2008
Seaweed desserts	Cold process products, Maha Blanca, Gulaman, Halua ya mwani)	2008
Seaweed bar soap (3 types)	Seaweed with cinnamon, lemon grass and lime (citrus)	2009
Seaweed body creams (3 types)	Seaweed only, seaweed with lemon grass, seaweed with cinnamon	2009
Seaweed puddings (2 types)	Seaweed with fruit chops	2009
Seaweed gels ( 2 types)	Seaweed with fruit concentrate	2009

**Source: ( Msuya, 2006)**

### **2.1.17 Seaweed uses and Utilization**

Seaweeds are used in many maritime countries as a source of food, for industrial applications and as a fertiliser. The major utilisation of these plants as food is in Asia, particularly Japan, Korea and China, where seaweed cultivation has become a major industry. In most western countries, food and animal consumption is restricted and there

has not been any major pressure to develop seaweed cultivation techniques. This present and potential uses of seaweeds. Industrial utilisation is at present largely confined to extraction for phycocolloids and, to a much lesser extent, certain fine biochemicals. Fermentation and pyrolysis are not been carried out on an industrial scale at present but are possible options for the 21st century. (Michael, 2000)

The present uses of seaweeds at present are as human foods, cosmetics, fertilisers, and for the extraction of industrial gums and chemicals. They have the potential to be used as a source of long- and short-chain chemicals with medicinal and industrial uses.

Marine algae may also be used as energy-collectors and potentially useful substances may be extracted by fermentation and pyrolysis. Many seaweed products or products containing seaweed available today, all of these are made by Irish companies and/or from Europe and North America, many claims have been made for the effectiveness of seaweeds on human health. It has been suggested, amongst other things, that seaweeds have curative powers for tuberculosis, arthritis, colds and influenza, worm infestations, and may even improve one's attractiveness to the opposite sex. *Digenea* (Ceramiales; Rhodophycota) produces an effective vermifugal agent (kainic acid). Recently, aqueous extracts from two red algae belonging to the family Dumontiaceae have been found to inhibit the *herpes simplex* virus but no tests have been carried out on humans. Carrageenans have been patented as anti-viral agents. Many of the reported medicinal effects of marine algae have not been substantiated. *Corallina* is being used in bone-replacement therapy. Some kelps may have polysaccharides that apparently reduce the incidence of breast cancer (Stein & Borden, 1984).

## **2.2 Empirical Literature Review**

In case of documentation, researcher came about different reports about the influence of seaweed to the marine coastal region and seaweed.

According to Sevaly Sen (1989) in his study 'Seaweed collection and culture in Tanzania', it was observed that collection of seaweed from the wild is a sporadic and declining economic activity for women and children in coastal fishing communities. Collection occurs during the northwest and southwest monsoons when plants located offshore are uprooted and deposited on beaches. However, Smith (1980) reported that, the success of seaweed farming is dependent on the market prices. Early successes and introductions when prices are high may not be sustained when prices drop.

Faki (2012) reported Seaweed cultivation on a commercial scale in Zanzibar has only taken place since 1989, so it is difficult to predict the long-term sustainability and viability of this practice.

However, indications are that, despite initial resistance to seaweed cultivation in coastal communities, the simple technology of the off-bottom method, the low cost of inputs required and the ease of cultivation and drying in terms of time and knowledge required, as well as high returns have led to such a practice becoming rapidly acceptable for both individuals and families. Some groups have also started to farm communal plots although the preferred practice appears to be individually-owned plots. In addition, once it was proved that seaweed farming does not interfere with fishing activities, the activity became more acceptable to men. At Jambiani, some fishermen reported that seaweed cultivation was positively affecting their catch rates as the farms were attracting fish which were being caught with gill nets.

Furthermore, Cheng Shenbian, (2012) insisted that sea algae (seaweed) are also important raw material for chemical industry. As earlier of the 17<sup>th</sup> century, the European people started using sea algae to produce pure soda, which grow into an important chemical industry in the middle 19<sup>th</sup> Century. Sea algae provide us agar, carrageenam, align,etc. as well as raw materials such as iodine and mannitol, etc., which

can be further processed into foods, health care products, medicines, fertilizers, pesticides and feeds.

Mmochi (2005) reported Associated with the low production is the problem of the die-off of the higher priced *Kappaphycus alvarezii* (Cottonii). The species is more prone to environmental changes compared with the low priced *Eucheuma denticulatum* (Spinosum). The die-offs are experienced in some parts of the country mostly Zanzibar and Tanga. Possible causes of the die-offs have been studied recently and thus there is need to try and combat the problem.

Naylor (1975) demonstrate that From its beginnings, seaweed farming proved to be a profitable commercial proposition for many coastal communities. For example, for plots of approximately one hectare, net income from seaweed farming was five to six times the minimum average wage of an agricultural worker. Recognizing its potential to uplift the socio-economic status of marginalized coastal populations, international development agencies began promoting seaweed farming in Indonesia and neighboring countries since the 1980s, Seaweed farming is a relatively simple technology and it requires low initial capital investment; in addition, with grow out cycles as short as six weeks and favorable prices, it provides a rapid and high return on investment. A number of studies have corroborated the positive impact of seaweed farming on the socio-economic conditions of coastal villages in countries as diverse as the Philippines, Indonesia, Tanzania, India, Vietnam and Kiribati

Bayer (2002) reported that in Zanzibar, females are the main laborers engaged in seaweed farming. Since females and children can be involved in seaweed farming, the impact on these individuals should also be considered in policies that promote alternative livelihood. Where males make up only a fraction of the labor pool in seaweed farming, there is less likelihood that permanent occupational shifts from fishing will occur.

According to Diego Valderrama (2011) The evidence collected throughout the case studies indicates that the socio-economic impacts of seaweed farming on coastal communities have been positive to a very significant extent. Because the production model favors small-scale, family operations over corporate, plantation-style farms, seaweed farming generates substantial employment relative to other forms of aquaculture. In addition, seaweed farming is often undertaken in remote areas where coastal communities face a reduced number of economic alternatives. Many of these communities have traditionally been reliant on coastal fisheries and are currently being affected by overexploitation of these resources. In these cases, the impact of seaweed farming goes beyond its economic benefits to communities as it reduces the incentives for overfishing.

Michael Guiry (2000) reported that Seaweed products have long been used by humans for food and healing. They are becoming increasingly popular for use as Spa and Thalassotherapy products. "*Thalassa*" is Greek for "*sea*" and lends its name to this unique method of preventative and curative treatment which uses the renowned therapeutic virtues of seawater and seaweed to oxygenate, tone, moisturise and revitalise the body and the skin.

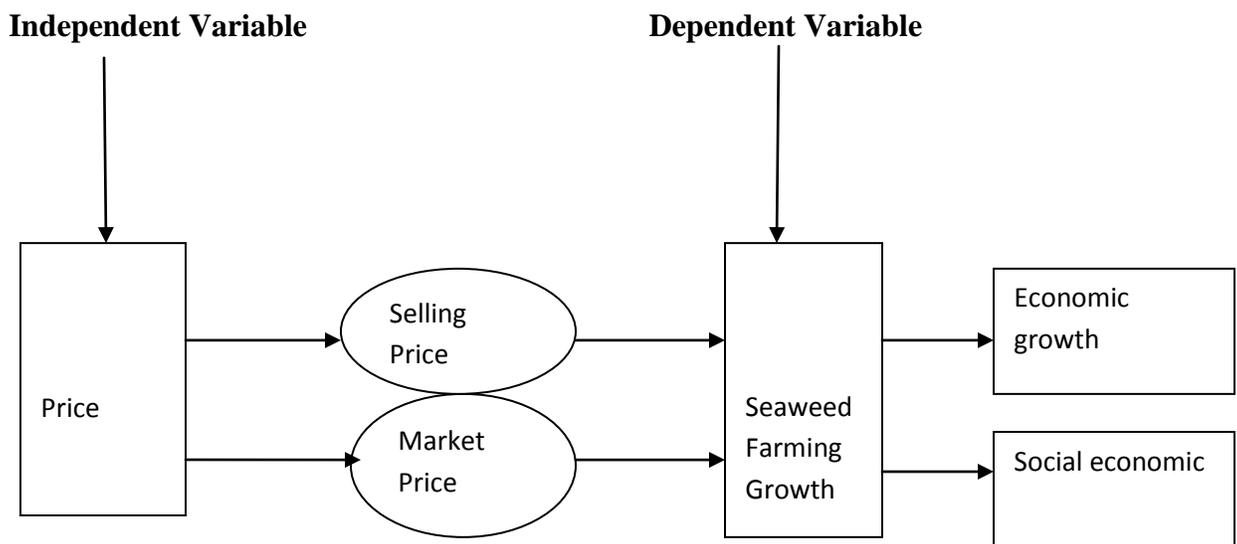
The FAO study [11] explains how the economic fortunes of many villages have been transformed by seaweed farming. Many of these communities routinely lived at or below poverty levels prior to engaging in aquaculture; with their incomes earned from the sale of seaweeds, many farmers have experienced substantial improvements in their standards of living as they are able to send their children to school, introduce improvements to their dwellings, enhance their diets, increase their purchasing power of material goods, etc. In particular, seaweed farming has had a remarkably positive effect on the socioeconomic status of female farmers as it allows them to engage in an income-earning activity that can be undertaken without neglecting traditional household chores.

Many studies have been done about seaweed such as impact of seaweed farming in socioeconomic factors to the coastal communities of Zanzibar (Msuya, 2006); Seaweed Farming: An Alternative Livelihood for Small-Scale Fishers? (Brian, 2002) and Interactive governance approach in mariculture activities in Tanzania (Mutatina, 2008). However, there are little studies done to investigate the influence of price on seaweed farming growth. Therefore it is comparative to make this study since the prevailing information gap signifies the potential for the study.

### 2.3. Conceptual Framework and Research Model

A conceptual frame work is an assemblage set of research concept cum Variable together with their logical relationship often represented in the form of diagrams, charts, photographs, flow-charts, organ gram or mathematical equations. Conceptual research unveils studied phenomenon of understood, modelled and studied (Ndunguru 2007:47)

**Figure 2. 1: Conceptual Model**



**Source: Researcher's Model 2013**

Figure 2.1 explains the relationship between the independent variable and dependent variable. Effective of seaweed farming growth depends on price. It is believed that there is a direct relationship of the growth of seaweed farmers both socially and economic as shown in measurement of variable.

**2.3.1. Measurement of Variables**

<b>Variable</b>	<b>Measurement</b>	<b>Indicator</b>
<b>Independent Variable</b>		
Price	Supply and Demand	Increase or decrease
<b>Dependent Variable</b>		
Production	Improved agricultural method	Increase or decrease

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.0 Introduction**

This chapter presents the methods and techniques that researcher will used to collect data that help to assess the influence of price on the seaweed farming. This chapter includes the design of the study and Description of study area, the study approach, sampling techniques and data collection instruments which will be used in the study.

#### **3.1 Area of the study**

The study covered in East coast region of Zanzibar. A total of three wards, Paje, Bwejuu and Jambiani reached. The East Coast Region of Zanzibar is located between latitudes 5°40' and 6°30' South and longitude 39° East. The main economic activities in this area are small-scale fishing and subsistence agriculture. There is also a small tourist industry. This region selected because of the following reasons; it is the first place where seaweed farming was established in Zanzibar. Also is the region which has a numbers of small seaweed farmers group (Msuya 2006).

#### **3.2 Research Design**

Research design is a blue print that enables a researcher to come up with a solution to the problem and guides him/her in various stages of problem solving. Kothari, (1990) states that a research design provides a framework for the collection and analysis of data

The research explored the influence of price to the growth of seaweed farming in East Coast Region of Zanzibar, hence a cross section design was employed in the investigation.

### 3.3 Study Population and Sample Size

Population is described by Best and Khan (1998) that a group of individual who have one or more characteristics which are of interest to study. According to Bobbie (1992) the target population is basically a population from which sample member is drawn.

#### 3.3.1 Population

The study targeted population were seaweed farmers who live in East Coast Region of Zanzibar. The study covered people of three villages Jambiani, Paje and Bwejuu. This Region has the population of seaweed farmers about 1009; Jambiani 552, Paje 257 and Bwejuu 200 that consist of 52 male and 957 female.

#### 3.3.2 Sample Size

The study involved a total of 50 respondents composed by 40 seaweed farmers who acted as a main sample size of the study; 5 staffs from seaweed buying companies and the remaining 5 respondents' were government officers from Department of Marine Resources as they participate in day to day decision making.

**Table 3.1: Sampling Frame**

<b>Respondents</b>	<b>Number</b>
Seaweed farmers group	40
Government officers	5
Seaweed companies staff	5
<b>Total number</b>	<b>50</b>

**Source: Researcher's findings 2013**

### 3.4 Sampling Techniques

This study used purposive sampling and cluster sampling techniques. These clusters classified based on geographical locations being most villages were found along the

coast as described in aspect of reasoning for selecting this unique. In addition to that, villages are spread over large geographical portion and each has unique characters. The clustering technique allowed fair presentation of respondents from all villages; purposive sampling used to collect data from seaweed buying companies staffs and Government officers.

### **3.5 Unit of Enquiry**

This study involved respondents from two levels: Fourty Seaweed farmers group from three wards, five officers from seaweed buying companies and five officers from the Department of Marine Resources concerned with seaweed product. At the seaweed farmer's group level, the researcher was interested to know how they were affected by price and what step they had taken to get competitive prices. From the seaweed companies, the study investigated challenges faced in dealing with seaweed farmers, and for the government officers, the researcher was interested to know efforts taken by the Government to promote seaweed farming.

### **3.6 Data Collection Method**

This study portrayed both, primary and secondary data to achieve its objectives. The data collection methods to be applied comprised of:-

#### **3.6.1 Primary Data**

These are data which are original in character, collected a fresh and for the first time. The proposed study obtained the data by interviews, questionnaire and focus group discussion. These can be collected from seaweed farmers group and those who are responsible of seaweed farming.

- **Observation**

This technique of data collection were also be applied to collection of information as researcher shall participate fully in the day-to-day activities of some departments with

the aim of monitoring daily operations and therefore make an appropriate analysis of each particular observation.

- **Interview**

The researcher conducted interview with seaweed farmer groups in East Coast Region, staff from two company concerning with buying and transporting seaweed, Zanea Seaweed Ltd and C-Seaweed Corporation Ltd and officers from Department of Marine Resource Zanzibar.

### **Questionnaire**

The researcher used both open and closed ended questionnaires to collect the data from respondents who were performed the seaweed farming survey, this instrument provide the respondents freedom to give their experience regarding on impact of price on the growth of seaweed (see Appendix 1).

### **3.6.2 Secondary Data**

These are data that have been collected by someone else and have already passed through the statistical process. The proposed study obtained these data from different sources such as books, article, performance report, papers, files, journals, summary records from Ministry of Trade Zanzibar and involved visiting the Central Library of Zanzibar, and different Web sites.

### **3.7 Data Analysis**

According to Kothari (2004:130), Data analysis means the computation of certain indices or measures along with the searching for patterns of relationship that exist among the data groups.

In fulfilling the objective of the study the data collected have been analyzed using explanatory method such as descriptive method using tables, charts and graph, this will be possible through the use of statistical package for social science (SPSS).

**CHAPTER FOUR**  
**RESEARCH FINDINGS AND ANALYSIS**

**4.0 Introduction**

This is chapter four of the report. It is a chapter where the results and outcome of research are displayed vividly. Moreover, it is a chapter that tries to answer the research questions. Analysis is done in order to show what is put forward by the data. Research findings presented were obtained from the field through different tools like questionnaires, interviews, and observations. Contingent tables, charts and graphs are some of the result presentation techniques which were employed in this study.

**4.1 Characteristic of Respondents**

**4.1.1 Composition of Respondents by Profession**

This study involved 50 respondents, ( n = 50 ) of whom 40 were seaweed farmers, 5 were governments officers from Department of marine resources concerned with seaweed and the remaining 5 were staffs from seaweed companies. This information is summarized in table below:-

**Table 4. 1: Composition of Respondents by Profession**

<b>S/N</b>	<b>Profession</b>	<b>Frequency (n = 50)</b>	<b>Percentage</b>
1.	Farmers	40	80
2.	Government officers	5	10
3.	Staff from Seaweed companies	5	10
<b>Total</b>		<b>50</b>	<b>100</b>

**Source: Research Findings (2013)**

#### 4.1.2 Composition of Respondents by Sex

In this study many respondents were women as compared to males. Out of 50 respondents, 38 (76%) were female and 12 (24%) were males. Taking seaweed farmers alone, out of 40 farmer respondents 35 (70%) of them were females, while 5 (10%) were male. Government officers, male were 3 (6%) and female were 2 (4%) while seaweeds companies' staffs; male were 4 (8%) and 1 (2%) was female.

**Table 4. 2: Composition of Respondents by Sex**

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S/N	Profession	<u>Sex of Respondent</u>		Total
		Male	Female	
1.	Farmers	5	35	40
2.	Government Officers	3	2	5
3.	Seaweed Companies' staffs	4	1	5
<b>Total</b>		<b>12</b>	<b>38</b>	<b>50</b>

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**Source: Research findings (2013)**

Table 4.2 shows that seaweed farmer's respondents were mostly female who were 35 (70%) match up to numbers of male who were (10%), this is because most of them were housewives so they engaged themselves in seaweed farming to increase their income.

### 4.1.3 Age of Seaweed Farmers

The researcher saw age as an important variable in the study because it helps to predict groups dealing with seaweed farming in the East Coast Region. Age also shows women categories that are most active in seaweed farming activities. Basing on this fact, ages of the respondents were categorized into 5 groups ranging between 18 years to 50 years. The results showed that, those between 31-40 years of age were the majority who dealt with seaweed activities in East Coast Region which involved 24 people (48%). This was followed by those aged 41- 50 which involved 18 (36%) while 21-30 and 18-20 years of age both have 4 people (16%). There was no respondent whose age above 50.

**Table 4.3: Age Groups of Seaweed Farmers**

Age Interval	Frequency	Percentage
18 – 20	4	8
21 – 30	4	8
31 - 40	24	48
41 – 50	18	36
Above 50	0	0
<b>Total</b>	<b>50</b>	<b>100</b>

**Source: Research Findings (2013)**

Table 4.3 shows that majority of respondents were found at age of 31- 40 (48%) reasons behind is they were more active and high capabilities of doing work.

#### 4.1.4 Marital Status of Respondents

Marital status was used in this study in order to understand which category of people involved in seaweed farming activities. Researcher perceived this as an important variable because marital status is associated with the responsibilities as Coulter (2005) argued that many married people are faced with responsibilities of taking care of family expenses. With this regard, respondents were also asked to identify themselves as whether they were single, married or divorced.

The study discovered that 26 (52%) respondents were married; 22 (44%) were divorced and only 2 (4%) respondents were single. This was supported by Komba (2010) who argued that married women can get initial capital and ideas from their husbands. This could probably suggest that married women were engaged in seaweed activities in order to get socio-economic necessities to support their families.

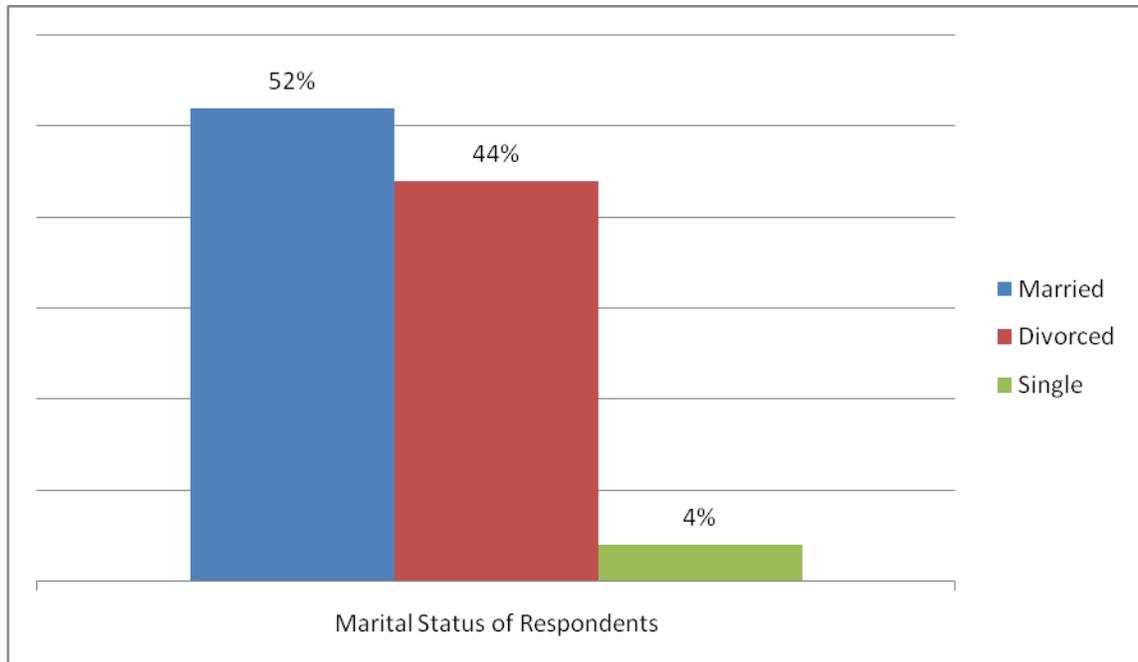
**Table 4.4: Marital Status of Respondents**

S/N	Marital Status	Frequency	Percentage
1.	Married	26	52
2.	Divorced	22	44
3.	Single	2	4
<b>Total</b>		<b>50</b>	<b>100</b>

**Source: Research Findings (2013)**

Table 4.3 indicates that most of the respondents were married women, they were probable involved in seaweed farming because they got support from their husbands in terms of financial support and ideas while divorced women engaged in seaweed activities because they lack support so they struggle to make their income.

**Figure 4. 1: Marital Status of Respondents**



**Source: Research findings, (2013)**

The figure 4.1 shows that 52% of the respondents were married and 44% were divorced while only 4% of them were single. Therefore it concludes that unmarried individuals were little involved in seaweed farming activities because they have little responsibilities compared to married and divorced women.

#### **4.1.5 Education Level of Respondents**

Respondents were also asked to state their level of education. This is due to reason that level of education tends to define one's ability of solving problems and handling things including business, farming and other economic activities. This is also supported by Komba (2010) who argued that level of education tends to determine level of awareness and ability to handle responsibilities, where one will work in confidence level. The main reason was to understand the educational level of farmers who were engaging in the seaweed farming in East Coast Region.

The study found that 12 (24%) respondents had primary education, 32 (64%) had secondary education while 6 (12%) had diploma.

Generally, it found that most of seaweed farmers had secondary education. This finding was further supported by Komba (2010), who found that most of women who have secondary school level of education tend to be engaged in activities which need minimal skills.

**Table 4.5: Education Level of Respondents**

<b>Education Level</b>	<b>Frequency</b>	<b>Percentage</b>
Secondary	32	64
Primary	12	24
Diploma	6	12
Above Diploma	0	0
<b>Total</b>	<b>50</b>	<b>100</b>

**Source: Research findings, (2013)**

The Table 4.5 shows that 64% of respondents had secondary education and there were no respondents with education above diploma. This is because those who above diploma level of education tend to pay no attention on farming activities.

#### **4.2 Influence of Price on Seaweed Farming Growth in East Coast Region of Zanzibar**

The first objective of this study was to determine the influence of price on seaweed farming growth in East Coast region of Zanzibar. With this fact in mind, farmers were

asked to mention the type of seaweeds they mostly grow, they were also asked to mention the price of 1kg of dried seaweed and whether they are satisfied with it or not and lastly they were asked to articulate their views regarding with the influence of price of seaweed farming growth.

#### **4.2.1 Types of Seaweeds Cultivated by Respondents**

During the conduct of the study, the researcher was interested to know the types of seaweed that were mostly been cultivated by the respondents. Many farmers responded that they cultivate spinosum type of seaweed due to its tolerance of environmental changes compared with cottonii type which is very sensitive to environmental changes and many sites do not have appropriate condition to support this type of seaweed and mostly died off during Kiangazi (Local name for hot and humid Season) which occur from December to March. Although Spinosum grows well due to its tolerance of environmental changes but has no price value as cottonii in the world market.

**Figure 4. 2: Pictures of Spinosum and Cottonii seaweeds**



**Cottonii types of Seaweed**

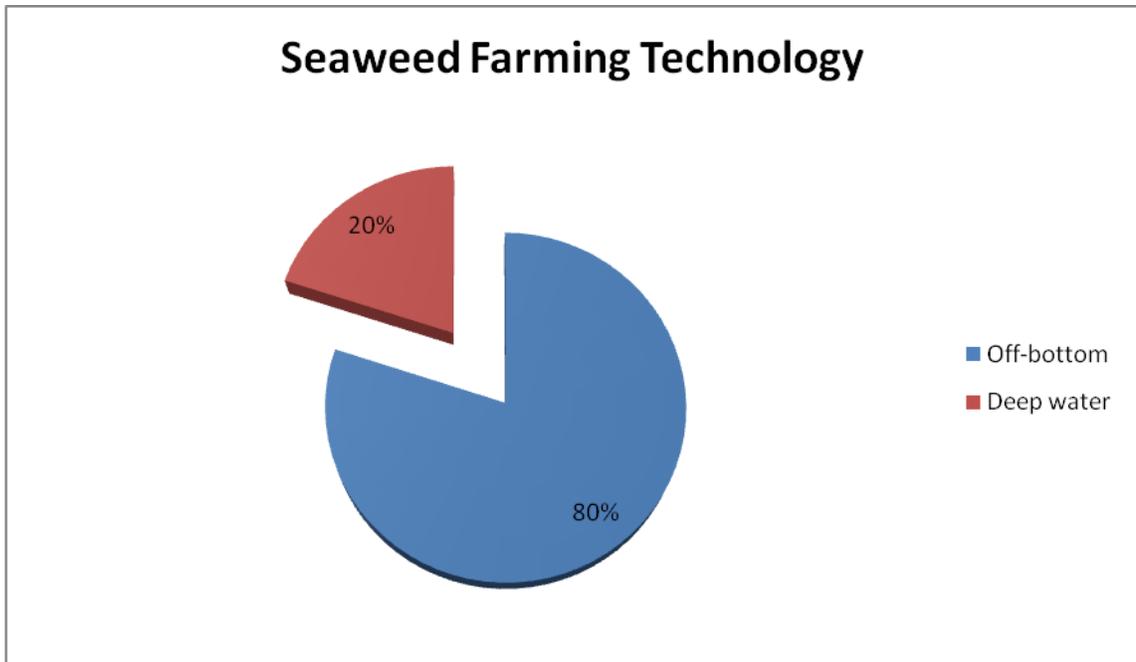
**Spinosum types of Seaweed**

Figure 4. 3 show the pictures of Spinosum and Cottonii types of seaweed that normally cultivated in East Coast Region of Zanzibar.

#### **4.2.2 Seaweed Farming Technology**

There are various techniques for seaweed farming in East Coast Region; but the respondents used two ways in growing seaweed these include off bottom technique and deep water technique (floating method). The off-bottom method is used in the shallow subtidal water of one foot depth at the lowest tide, while the floating line method is used in deeper water of at least two meters depth at mean sea level. The off-bottom technique is the easiest technique which involves ropes, tie-tie, sticks or stones and thus most women use this technique for seaweed farming. Among 34 (80%) of respondents said that they used off-bottom method as compared to only 6 (20%) who used deep water technique.

**Figure 4. 4: Seaweed Farming Technology**



**Source: Research findings, (2013)**

Figure 4.3 shows that the off-bottom technique is the most common technique used by seaweeds farmers in the East Coast Region compared to deep water technique. The reason behind of this preference was that, women were more comfortable with this technique as it's easy to practice for them compared to deep water technique which was mostly practiced by men.

#### **4.2.3 Price of Dried Seaweed**

Zanzibar has been farming seaweed and exporting it in bulk since the start of the industry in 1989. Seaweed farmers have depended exclusively on the price paid by the exporting companies for a kilo of dry seaweed. The farming process was based on agreements that involve the farmers being given some farming inputs (mainly ropes) by the seaweed exporting companies once a year and farmers are required to sell the

seaweed to the provider of inputs. In this way, farmers have no negotiating power over seaweed prices.

When respondents were asked to mention the price of one kilo of dry seaweed they unanimously responded that it was TZS 400 per kilo. But altogether, they were not satisfied with the current price. Among the reasons that caused their dissatisfaction as mentioned by the respondents were:

- (i) Given the prices of other commodities are rising, for example, the price of a kilo of dry seaweed cannot buy even a half kilo of rice or wheat flour. This makes their life to be very difficult.
- (ii) Farmers themselves buy other inputs, which very expensive compared to the income they get from their sale of seaweed. For example, some of respondents said that they buy a bulk of tie-tie for TZS. 12,000 and a bunch of sticks used in growing seaweed are bought at TZS. 8,000.
- (iii) There is an increased cost of living, such as in health and education, which does not go hand in hand with the increase of seaweed price, as farmers' income are much depending of seaweed farming. For example, one respondent said that

*“.....The current price of dried seaweed is not satisfying as the income we get from seaweed sales is not enough to cover our children's school fees, uniforms and books.”*

- (iv) They use greater efforts during cultivation compared to the benefit they get after harvesting.

#### **4.2.4 Views of Farmers Regarding the Influence of Price on Seaweed Farming Growth**

Regarding the influence of price on seaweed farming growth, farmers were asked to give their views on the influence of price on the growth of seaweed farming in East Coast region. Different views were given and among the most frequent were

- (i) Farmers are locked into fixed-rate sales with agents, as a result this severely limiting the value of their seaweed, and eventually demoralize their effort of farming.*
- (ii) Most men perceive seaweed farming as women's work as men need to get cash immediately when they are done with the work which is contrary to the seaweed farming. As a result men do not engage at all in seaweed farming.*
- (iii) Since the work done by women farmers was not equal to the money that they are paid when selling the seaweed, this make their husbands or their relatives, pity them and express their bad feelings about it. As a consequence they become discouraged.*
- (iv) Since most of seaweed farmers were women, farmers were unable to farm the higher-value variety because cultivation takes place in deep water, training them in deeper water cultivation techniques so they are able to produce higher-quality seaweed*
- (v) Developing processing facilities that would add extra value to harvests by drying the seaweed, and by extracting products such as agar (a thick clear*

*seaweed powder comes from seaweed which used for growing microorganism in Laboratories and thickening food) and carageenam (extracted from seaweed used in food industry mainly in diary and meat products) that can be sold for extra income. One kg of seaweed powder is sold 10,000TZS so would help to get the better price compared by one kg of dried seaweed which is 400TZSper one kg.*

*(vi) Helping women farmers form groups that could make or access small loans to members so as to afford buying seaweed inputs and negotiate collectively to get better prices for their seaweed.*

#### **4.3 Steps Taken by Seaweed Farmers in order to get Competitive Price**

The second objective of the study was to identify step taken by seaweed farmers in order to get competitive price. Thus the respondents were asked to mention different strategies they used to get competitive price. The steps taken, as given out by the respondents, were as mentioned below:

- **Establishment of Farmer Groups Committees**

Seaweed farmers have organized their own committees which help to make negotiations with the seaweed companies so that they could buy seaweed at a better price. These committees also convince the government to make policies that will have long term benefits to the seaweed farmers.

- **Mutual Assistance by Group Members**

Seaweed farmers help each other in such activities as harvesting when there are large amounts of seaweed to be harvested, carrying wet seaweed from the farms to the drying places and carrying dry seaweed to the points of sale, members separate tie-ties from the ropes. Children help in such activities as tying branches to lines at home or harvesting during weekends and school holidays. Thus, seaweed farming is more of a family activity than the work of an individual. This was done together for the purposes of

getting dry and clean seaweed because the dirty seaweed cause price to fall up TZS 300 dry kg of spinosum. Drying process needs carefulness because determines the quality of the seaweed hence the price from buyers.

- **Establishment of Value-added Products**

The way, seaweed farmers have no negotiating power over seaweed prices. They had been produced the value-added product was under the ZaSCI as the only way of gaining income from seaweed farming, One of the most remarkable results of adding value to seaweed is the production and sale of seaweed powder. One kg of seaweed powder is sold at 10,000 TZS. Other products produced by seaweed farmers in East Coast Region are seaweed bar soap, seaweed body cream and seaweed gel. This was boost the income of seaweed farmers and an encouragement that may keep them in the industry and probably bring men back to the seaweed industry in Zanzibar.

#### **4.4. Challenges that Face Seaweed Cultivators in Zanzibar.**

In spite of many advantages that the nation and society get from seaweed cultivation but also local cultivators face a lot of problems or challenges that hinder or discourage them, the following are some challenges that the respondents were faced:

- (i) Low price of seaweed to compare with the cost that the cultivators incur in processing and cultivating seaweed, this challenge discourages them in continuing with their daily activities.*
- (ii) Stealing of seaweed during cultivation and drying season, this disappoint the cultivators in achieving sustainable progress in their day after day activities.*

*(iii) Presence of seaweed diseases such as fungal disease and epiphytes and other marine harmful organism such as fishes that attack seaweed and destroy the growth of seaweed.*

*(iv) Presence of conflict between seaweed cultivators and other people who use marine for their economic purposes, for example fisherman and tourism investors.*

*(v) Increase in investment of tourism hotels in the area of seaweed farming*

*(vi) Lack of basic farming inputs to enhance the production of seaweed.*

*(vii) Lack of knowledge for the competitive price of seaweed in the world market*

#### **4.5 The Intervention Between Buying Companies and Seaweed farmers**

Five representative staffs from the seaweed buying companies were interviewed to gain information on how their involvement in supporting seaweed farmers to get competitive price and their challenges face from seaweed seller.

The interviewee said they had a good relation with seaweed farmers but they were not able to buy seaweed with high price compared with current price because of the low price of seaweed in the world market but they understand the difficulties of seaweed farming activities

The interviewee from **C-Weed Corporation** said that, inputs given to the farmers were not enough, but it is very important for farmers to buy themselves.

*“.....It’s time for seaweeds farmers to be independent for finding inputs of seaweed production themselves but they didn’t like to use their money, unfortunately depending on Seaweed Companies.....”*

Also the interviewee explained the challenges faces from the seaweed farmers and their opinion to the government. The following were some challenges:

*(i) Due to changes of the government policies and open market system for seaweed industry do not fit to private seaweed investor’s environment since it creates much trouble to the seaweed investor’s business operation which results of declining the production.*

*(ii)Also investors experience miscellaneous problems in the port and it especially affect the entire transportation process from one point to another, where there is only one suitable ship per week.*

*(iii) Lack of reasonable facilities to store at the port of Zanzibar while waiting for allocation of containers which is usually not given in case any big cargo ships are already alongside, in such cases high damages charges are requested by the port authority..*

*(iv)Government treats the seaweed business in political way rather than business.*

Lastly the interviewee recommended that government should help seaweed farmers by giving them seaweed inputs such as ropes and tie-tie, either to treat seaweed farming as business rather than politics.

#### **4.6 Efforts Taken by the Government to Promote Seaweed Cultivation**

Five representative officers from the Department of Marine Resources Zanzibar were interviewed to gain information on the government's perspective on promoting seaweed cultivation, three officers responded as follows:

- (i) Government provide sustainable training concerned with seaweed cultivation including growing, harvesting, drying sorting, storage and packaging of dry seaweed
- (ii) Improve and encourage seaweed farmers on cultivating of seaweed which result to the increasing of seaweed farmer groups from 40 groups in 2007 to 80 groups up to may 2013 Unguja and Pemba.
- (iii) Government bargaining with seaweed companies so as to raise the price of buying seaweed
- (iv) Government starts to formulate seaweed farming policies which will be implemented in next year.

#### **4.7 Summary of Result or Findings**

The overall objective of the study was to assess the influence of price on seaweed farming in East Coast Region. The study identifies the age, sex, marital status and education level of respondents.

The findings show that most women were engaged in seaweed farming. Although is a tough farming with low price, but men have more alternative for employment than women such as going to fishing or work in construction boosted by development of tourism. Majority of women engaged in seaweeds farming have secondary education because these activities need minimal skill.

Also the study was interested to find out step taken by seaweed farmers in order to get competitive price and effort taken by government to promote seaweed farming. In addition to that, findings show that majority of women who engaged in seaweed farming were married because they want to be independent, for that case they work hard since they have responsibility of supporting their family in terms of foods, education and other social obligation in order to improve their standard of living without depending their husbands. Therefore seaweed farming has created more social empowerment for women

The findings also indicate that in East Coast Region the most cultivated seaweed type is *spinosum* compared to *cottonii*, whereby *cottonii* is the world market currently preferred variety over *spinosum* variety. This preference is based on the fact that when exported seaweeds are processed to extract carrageenan, which is used as an emulsifier, stabilizer and gelling substance in the food, pharmaceutical and cosmetics industries.

The gel extracted from *cottonii* is stronger than that extracted from *spinosum*, As a result, the price of *cottonii* is the higher than *spinosum*. In spite of the failure of the higher priced species *cottonii* to grow, some farmers have kept trying to farm it, so it is better for the government to conduct research about *cottonii* types of seaweed and helps farmers to grow *cottonii* so as to get competitive price. Different strategies may be taken in order to mobilize seaweed farmers to grow this *cottonii* types of seaweed.

Furthermore, on the side of farmer's views regarding the influence of price on seaweed farming growth, respondents' views show that government has not been properly recognized seaweed farming as an important alternative income generating activity. As such activity is not a priority and not factored in to government planning and development. Therefore alternative strategies are needed to combat this situation.

Moreover, findings shows that despite many efforts made by government to promote Seaweed cultivation there are some ways that farmers proposed in order to improve performance as the way of enhancing them like, providing loans with low interest,

improvement of infrastructures which simplify means of transport such as boats for transporting seaweeds, improvement of services through advertisement, plans to increase capital of the business through loans from micro finance institutions and finding markets for their products and services .

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATION**

#### **5.0 Introduction**

This chapter presents concluding remarks and recommendation on the Influence of price on Seaweed farming in East Coast Region of Zanzibar.

This study attempted to assess the influence of Price on seaweed farming growth, steps taken by seaweed farmers to get competitive price and how government helps seaweed farmers to get competitive price for the purpose of solving macroeconomic problems such as unemployment and poor performance in seaweed production.

#### **5.1 Conclusion**

Based on the above conclusion and discussion of the study, the researcher comes up with the following conclusion.

The study revealed that most of the people who engaged on seaweed farming activities were females rather than males and most of them were either married or divorced. This shows that males and single persons were not attracted in seaweed farming. Apart from that most of the farmers had secondary level of education which implies that this farming does not require much skill and expertise.

The study shows that from the selected cases of seaweed farmers group from East Coast Region, there is “direct influence of price to the seaweed farming growth and indirect effects to the economics of Zanzibar”. Directly, the low price of seaweed provides low income to the farmers compared with hard work they do so they become disappointed and the production also decrease. A part from that, disappointment of farmers in engaging in seaweed activities causes the growth of seaweed farming to decrease, as a

result the government missing foreign currency and revenues. Indirectly, employment generated by seaweed sector would also decrease as well as the standard of living of the people of East Coast Region,. Although the speed in provision of employment becomes too slow it is promising to people of this region.

Also the study found that farmers have adapted different strategies in order to get competitive price. Among these strategies were establishment of farmers group committee which helps to make negotiation with buying companies. Furthermore farmers had produced value added products which helped to boost their income from their farming

Despite of all these strategies that the farmers have taken they have faced a number of challenges in their cultivation. Among of these challenges were low price of dry seaweed compared to the high cost of production also lack of knowledge of the competitive price of seaweed in the world market and theft of seaweed during harvesting season.

To the government side, the study revealed that, government had taken many efforts in order to promote seaweed farming. Such efforts were bargaining with seaweed buying companies to raise price of a kilo of dry seaweed, provision of education on sustainable seaweed cultivation and formulation of seaweed farming policies.

## **5.2 Recommendations**

Based on the findings of the study, some recommendations are hereby put forward. These recommendations if implemented are expected to improve the seaweed farming in Zanzibar.

- **Encourage Males in Seaweed Farming**

Since it was observed that most of seaweed farmers were women compared to men because of low price of seaweed, it's advised that government should put strategies that will attract men in seaweed farming activities especially cottonii type of seaweed which is highly priced in the world market and grow in deep water which is difficult to practice for women.

- **Persuade Singles**

The study revealed that married and widowed women were participated in seaweed farming activities as compared to single. Effort should be made to persuade singles to engage in seaweed farming in order to reduce the unemployment rate so that they can improve their standard of living.

- **Encouraging Investment**

Zanzibar needs to intensify her effort in encouraging investment on marine sub-sector especially in seaweed investment by engaging in aggressive promotion strategy, this is critical to influence potential investors in order to increase bargaining power of the farmers so as to sell their products at a competitive price to enable farmers sustain their agricultural activities.

Zanzibar should encourage local and foreign investment that have internal linkages which will create more job opportunities for Zanzibaris, this could be done by targeting incentives in seaweed industry. Moreover efforts are needed to simplify the procedures to start and run business and improve necessary infrastructures for seaweed farming growth in the country.

- **Government Support**

Although it was observed that the government of Zanzibar has contributed in the seaweed farming growth but still there is a room of increasing these efforts especially in the following areas;

- **Training**

Since it was observed that education to local seaweed cultivators is another area that needs more attentions, by educating them in terms of skills and knowledge can help the country's unemployment problem and income distribution of its citizen. The Government of Zanzibar should combine their efforts in delivering technical assistance (e.g. training materials, training workshops), encourage the type of agency collaboration already in place as well as to maintain a program of 'training-the-trainer' type courses. Regional efforts could be coordinated through a regional posting (organize training, share country experiences, technology). On this Position one could be located with the central Government but would be working closely with seaweed buying companies.

- **Develop Market Strategies**

Since the study uncovered that there is inadequate market for dried seaweed, it is very important for the government of Zanzibar to use Tanzanian diplomatic missions abroad to find reliable market for the seaweed products as well as to lobby donors such as European Union (E.U), World Bank (WB), African Development Bank (ADB) to support where necessary the development of seaweed farming.

- **Developing and Improving Technology**

The study findings indicated that quality control in harvesting, cleaning, sorting, washing, drying and semi-processing have not been given greater attention. Priorities should be given to selection of species with higher growth rates, higher yield and better quality through encouraging cutting or pruning when harvesting from natural seaweed

beds so as to preserve the natural resources. Government should conduct research to develop fast growing, high yielding varieties through biotechnology.

➤ **Processing**

The study finding revealed that processing of dried seaweed is practiced at a minor level. The government of Zanzibar has to explore the benefits of in-country processing at a large scale versus exporting raw products. In this regard the government should find the way on how to establish small-scale processing project for the sake of the Zanzibar economy.

### **5.3 General Recommendations**

In order for Zanzibar to succeed in growth of seaweed farming there should be national development plans for the seaweed industry and share this plan with other producing countries as a means to communicate their future intentions and targets in terms of production levels. Thus the government must have policy guidelines on seaweed farming and trade that will safeguard seaweed farmers from dishonest investors and traders. The market should be open to increase competition between buyers.

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**Appendix 1: QUESTIONNAIRE**

Please put a mark (√) into the brackets and answer the question and explain your answer if needed.

1.Ward ..... District ..... Region .....

Age: 18-20 ( ) 20-30 ( ) 30-40 ( ) 40-60 ( )

Sex: Male ( ) Female ( )

Education: Primary ( ) Secondary ( ) Diploma ( ) Degree ( )

Work : Farmer ( ) Fisherman ( ) Small business ( ) Employee ( )

1. What do you understand about seaweed farming?

.....  
.....

2. What is the procedure in seaweed farming?

.....  
.....  
.....

4. Is seaweed farming is an economic work in this region?

.....  
.....

5. What types of seaweed do you cultivate?

.....

6. How much dry seaweed per kg

.....

7. Are you satisfied with this price? Yes ( ) No ( )

If yes why, if no why

.....  
.....

8. What are challenges facing in seaweed farming?

.....  
.....  
.....

9. Is the government support to the seaweed farmers? Yes ( ) No ( )

If yes how

.....

**Thank you for your cooperation**

**Appendix II: INTERVIEW GUIDE FOR GOVERNMENT MINISTRIES**

**Name of Government ministry.....**

**Name of Officer interviewed.....**

**Date and Time of interview.....**

1. How many seaweed farmers group were registered since 2012?
2. How many seaweed farmers group are continuing doing cultivation & how many fail to continue with cultivation? Why?
3. How does your Organization/government contribute to the seaweed farming growth in Zanzibar?
4. What are the challenges most of Seaweed farmers group facing in their farming operations?
5. Do you think the government support is enough support for the growth of seaweed farmers? Do your organizations offer any? elaborate beneficiary since 2012
6. Does your organization provide any training/building capacity to seaweed farmers group in East coast region of Zanzibar?
7. To what extent did your Organization/government has seaweed policy in Zanzibar? If no Do you think there is a need of seaweed policy?
8. What approaches/techniques is used by the government to ensure there is improvement of price of seaweed in Zanzibar?
9. How much does the seaweed farming contribute to the Growth of GDP of Zanzibar? Can you tell me the exact percentage of contribution since 2012?

**Thank you for your cooperation**

**Appendix III: INTERVIEW GUIDE FOR SEAWEED COMPANIES OFFICERS**

**Name of Company.....**

**Location Found.....**

**Name of Officer interviewed.....**

**Date and Time of interview.....**

1. What are the intervention between your organization and seaweed farmers group? Strong? Weak?
2. Does your organization offer any capacity building or any training to the seaweed farmers group?
3. Is there any challenges faced to seaweed sellers? Mention
4. Did you offer any support to seaweed farmers?
5. What effort taken by your company to raise the price of seaweed?
6. What is your suggestion/opinions to improve the performance of seaweed farming growth in Zanzibar?
7. For your experience what are the factors limiting growth of seaweed in Zanzibar? Is there any way forward for that challenge?

**Thank you for your cooperation**