Seaweed value chain upgrading:
a tool for improving the livelihoods for women
in Jambiani, Zanzibar

By
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degree of Master in Urban Planning and Management of the Ardhi
University, Dar es Salaam, Tanzania

Ardhi University, Dar es Salaam, Tanzania

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I, Karina Machado Dávila, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

________________________________________
Karina Machado Dávila

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Dedication

This work is dedicated to the women in Jambiani, hoping that they get better chances in the near future in order for them to improve their livelihoods through seaweed farming.

A special dedication goes to my mother who always supported me in every decision I made.

Many thanks go to Clemens who during this year gave me constant support and help! Thank you for being by my side.

This work is just a part of the whole learning process acquired during these two years of studies. The most important lessons learned, as in Germany and Tanzania, will remain in my heart together with the memories of all the nice people met during this time.
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
</tr>
<tr>
<td>IMS</td>
<td>Institute of Marine Science</td>
</tr>
<tr>
<td>KMFRI</td>
<td>Kenya Marine and Fisheries Research Institute</td>
</tr>
<tr>
<td>NIC</td>
<td>National Investment Centre</td>
</tr>
<tr>
<td>SCS</td>
<td>Paje Seaweed Center Society</td>
</tr>
<tr>
<td>SDSP</td>
<td>Seaweed Development Strategic Plan</td>
</tr>
<tr>
<td>SIDA</td>
<td>Swedish International Development Cooperation Agency</td>
</tr>
<tr>
<td>SL</td>
<td>Sustainable Livelihoods</td>
</tr>
<tr>
<td>TSH</td>
<td>Tanzanian Shillings</td>
</tr>
<tr>
<td>WIO</td>
<td>Western Indian Ocean</td>
</tr>
<tr>
<td>ZANEA</td>
<td>Zanzibar East Africa Seaweed Company</td>
</tr>
<tr>
<td>ZASCI</td>
<td>Zanzibar Seaweed Cluster Initiative</td>
</tr>
</tbody>
</table>
Abstract

Key words: seaweed farming, value chain upgrading, women empowerment

Upgrading is crucial for creating competitive value chains and, in turn, providing a primary source of income for all those women who are engaged in seaweed farming in Zanzibar. Upgrading means to act in response to changing market conditions or new market opportunities, which could include the creation of new products or production processes with added-value and the definition of new market channels. Women play a key role in seaweed farming and therefore are instrumental in upgrading the value chain. Why does the seaweed value chain need to be upgraded? To improve the economy and livelihood of women and to fully exploit the potential and opportunities that seaweed farming has shown in other countries.

The development promotion of the seaweed industry in Zanzibar has to be understood as a continuous dynamic process in which key elements such as entrepreneurship, innovation, flexibility and empowerment are important. Poor coastal communities have to be empowered in order for them to participate actively in the economy and society. Empowerment is a driver of development, particularly in the case of women. Many activities such as credit promotion, education, health and trainings are more efficient when women participate effectively. In the case of Jambiani-Zanzibar, women empowerment can be considered as a goal in itself since it is crucial for equity and justice in the society. The creation of job opportunities for women not only improves their position in the society but it has a major impact on development effectiveness. Hence, seaweed farming can be regarded as a tool for continuing on empowering women and at the same time bringing sustainable development to Jambiani.

Source: Author, 2013 (Jambiani-Zanzibar)
# Table of Contents

Acknowledgments ........................................................................................................ III  
Dedication .................................................................................................................... IV  
List of Acronyms .......................................................................................................... V  
Abstract ...................................................................................................................... VI  

Chapter One .................................................................................................................. 1  
1.  Background and Research Issue .............................................................................. 1  
   1.1.  General Introduction ......................................................................................... 1  
   1.2.  Research Issue ................................................................................................. 3  
   1.3.  Research Objectives ......................................................................................... 4  
      1.3.1.  General Objective ...................................................................................... 4  
      1.3.2.  Specific Objectives ..................................................................................... 4  
   1.4.  Research Questions ........................................................................................... 4  
   1.5.  Significance of study ......................................................................................... 4  
   1.6.  Limitations of the study ..................................................................................... 4  
   1.7.  Report organization .......................................................................................... 5  

Chapter Two .................................................................................................................. 7  
2.  Literature Review ...................................................................................................... 7  
   2.1.  Aquaculture and mariculture industry, an overview ......................................... 7  
      2.1.1.  Best practices examples ............................................................................ 11  
   2.2.  Seaweed farming in the Western Indian Ocean (WIO) ...................................... 15  
   2.3.  Seaweed farming in Tanzania .......................................................................... 18  
   2.4.  Emerging issues in seaweed farming ................................................................. 23  
   2.5.  Summary ........................................................................................................... 24  

Chapter Three ............................................................................................................... 28  
3.  Theoretical and Conceptual Framework ................................................................ 28  
   3.1.  Sustainable Livelihood ...................................................................................... 28  
   3.2.  The Livelihood System ..................................................................................... 30  
   3.3.  Value Chain Approach ..................................................................................... 33  
   3.4.  The role of women in value chain upgrading and empowerment ..................... 35  
   3.5.  Conceptual Framework ..................................................................................... 37
Chapter Four ........................................................................................................................................... 42

4. Research Methodology .................................................................................................................... 42
   4.1. Choice of research strategy ......................................................................................................... 42
   4.2. Research design and process ...................................................................................................... 42
   4.3. Study area ................................................................................................................................ 43
   4.4. Data collection and protocols .................................................................................................... 44
   4.5. Unit of analysis ............................................................................................................................ 48
   4.6. Reliability and validity of data collected .................................................................................... 48
   4.7. Data analysis and presentation .................................................................................................. 48

Chapter Five .......................................................................................................................................... 49

5. Analysis of the Case Study ............................................................................................................... 49
   5.1. Case Study: Jambiani, Zanzibar ............................................................................................... 49
   5.2. The Livelihood System in seaweed farming in Jambiani, Zanzibar ........................................ 50
   5.3. Vulnerability Context ................................................................................................................ 51
   5.4. Capital Assets ............................................................................................................................. 55
       5.4.1. Human Capital .................................................................................................................. 56
           5.4.1.1. Training and demonstration farming ........................................................................ 56
           5.4.1.2. Women health conditions ....................................................................................... 58
       5.4.2. Natural Capital .................................................................................................................. 58
           5.4.2.1. Seedlings and varieties ............................................................................................. 58
           5.4.2.2. Integrated Mariculture ............................................................................................. 59
           5.4.2.3. Inputs for farming seaweed ....................................................................................... 60
       5.4.3. Financial Capital ................................................................................................................ 60
           5.4.3.1. Market price of seaweed ......................................................................................... 60
           5.4.3.2. Credit institutions available in Jambiani ................................................................. 62
           5.4.3.3. Cost of production ................................................................................................... 62
       5.4.4. Physical Capital .................................................................................................................. 65
           5.4.4.1. Processing factories ................................................................................................. 65
           5.4.4.2. Communication ....................................................................................................... 66
           5.4.4.3. Availability of technology ........................................................................................ 66
       5.4.5. Social Capital ...................................................................................................................... 70
           5.4.5.1. Seaweed organizations in Zanzibar .......................................................................... 70
           5.4.5.2. CBO’s in seaweed farming ...................................................................................... 70
           5.4.5.3. Partnerships ............................................................................................................... 70
Figures

Figure 1: Kappaphycus alvarezi (cottonii) ................................................................. 8
Figure 2: Eucheuma denticulatum (spinosum) .......................................................... 8
Figure 3: Euchema and Kappaphycus seaweed production in the WIO region (tons) according to FAO ........................................................................................................ 17
Figure 4: Seaweed farming and marketing origins .................................................... 19
Figure 5: The livelihood System .............................................................................. 31
Figure 6: Value Chain ............................................................................................... 33
Figure 7: Determinants of Empowerment .................................................................. 37
Figure 8: Conceptual Framework ............................................................................. 38
Figure 9: Research Design ....................................................................................... 43
Figure 10: Study Area ............................................................................................... 43
Figure 13: Off-bottom method .................................................................................. 68
Figure 14: Seaweed dried in palm frond ................................................................. 68
Figure 15: Drying seaweed ...................................................................................... 69
Figure 16: Drying racks ......................................................................................... 69
Figure 17: Triple Helix .............................................................................................. 71
Figure 19: Seaweed weighted ................................................................................... 74
Figure 20: Seaweed storage ..................................................................................... 74
Figure 21: Seaweed compressed ............................................................................. 84
Figure 22: Seaweed bulks ....................................................................................... 84
Figure 23: Seaweed export structure ...................................................................... 93
Figure 24: Seaweed value chain ............................................................................. 94
Figure 25: Seaweed adding value process ............................................................. 96
Figure 26: Women’s role in seaweed farming ....................................................... 98
Figure 27: Women expenditures ........................................................................... 100
Figure 28: Upgraded value chain ......................................................................... 102
Figure 30: Added value chain ................................................................................. 104
Graphics

Graphic 1: Seaweed production in percentages ........................................................................ 9
Graphic 2: Seaweed production in tons ..................................................................................10
Graphic 3: Secondary education-seaweed farmers .................................................................56
Graphic 4: Awareness of seaweed initiatives ..........................................................................57
Graphic 5: Seaweed production in Zanzibar in MT .................................................................73
Graphic 6: Seaweed earnings ..................................................................................................103

Tables

Table 1: Global aquaculture production in 2009 by continent (including plants, wet weight
metric tons) .............................................................................................................................15
Table 2: Chronology of seaweed farming development in Tanzania .....................................20
Table 3: Data collection matrix ...............................................................................................47
Table 4: Production Parameters .............................................................................................62
Table 5: Variable Costs ...........................................................................................................64
Table 6: Type of Structures ....................................................................................................76

Boxes

Box 1: Sustainable Livelihood core principles ......................................................................29
Box 2: Vulnerability Context examples ..................................................................................31
Box 3: Gender definition .........................................................................................................36
Box 4: Seaweed farmer, Jambiani .........................................................................................53
Box 5: Male seaweed farmer ................................................................................................54
Chapter One

1. Background and Research Issue

This chapter provides the background of seaweed farming and its origins in Zanzibar. It also presents the research issue that will be analyzed throughout this investigation based on the predefined research objectives and research questions. This section will also detail how the research will be designed and the way it was conducted.

1.1. General Introduction

Seaweed farming has become an important industry that is practiced around the world. It is a source of food as an export commodity for producing agar, alginate and carrageenan products. From some red seaweed they extract a gelling substance known as hydrocolloids that is used as an emulsifier and binder for a variety of products in the food processing, pharmaceutical and cosmetic industries (Valderrama 2012). Seaweed is even currently considered as a potential source of bioethanol. Global utilization of seaweed as food, fodder, chemicals and pharmaceuticals is increasing; hence seaweed is among the most important cultivated marine organism. Moreover, people are becoming aware of the benefits and potentials of the seaweed and new algae products and uses are encouraging the research and development of seaweed cultivation.

Seaweed has been traditionally farmed for a long time in many Asian countries such as China, Korea and Japan. Until 1980 most of the seaweed production came from the Philippines and Indonesia where the varieties *Euchema, Glacilaria, Porphyra*, among others were harvested. Nowadays, the *Euchema (or red algae)* variety is still the major component of seaweed exports from these countries and one of the leading fishery export products (Crawford 2002). Unlike other forms of aquaculture, seaweed farming does not require the use of fertilizers or expensive technology and the capital requirements are very low. Moreover, the growing time cycle is short lasting, about two months. Giving these conditions, seaweed farming is currently cultivated as a cash crop and generates significant socio-economic benefits for women in coastal communities in developing countries and is already a livelihood strategy. On a global level, the import and export of seaweed is a $200 billion business, with the United States importing nearly $50 billion worth each year (Lipper, 2010). Considering these potentials many international development organizations decided to promote seaweed farming in order to alleviate poverty in coastal areas.
In Tanzania seaweed farming is mostly farmed in the island of Zanzibar where since 1989 an aquaculture industry based on it has established. Zanzibar has evidenced an interesting evolution considering its economic forces including international trade, slavery, revolution and socialism that with time have shaped Zanzibar as the most cosmopolitan regions in Africa. Islam came to Zanzibar in the 10th Century with the Shirazi settlers from Persia and today Zanzibar is about 99% Muslim. During the 18th and 19th Centuries, slaves and cloves were Zanzibar’s most profitable exports. Zanzibar grew to become a leading producer of cloves which was considered a precious spice, highly valued for its flavoring and medicinal healing properties. Slavery was finally abolished in Zanzibar in 1876 and with this the production of cloves severely diminished. After the revolution of 1963, Zanzibar came under the rule of the socialist African Nationalist Party and was subjected to many embargoes, causing food shortages. All economic growth stopped and during this period of stagnation some foreigners referred to Zanzibar as “The Cuba of East Africa” (Lipper, 2010). These historical forces and political changes occasioned that Zanzibar was increasingly cut off from the highly competitive global economy. Consequently, Zanzibar has not been able to sustain important economic growth. Women in Zanzibar are particularly isolated as they have very few educational and professional opportunities available. In this regard, seaweed farming is a potential economic activity that with a proper management might improve the circumstances of many poor villagers.

Seaweed farming in Zanzibar started with ideas developed by Mshigeni in the 80’s from the University of Dar-es-Salaam who documented seaweed farming practices. His ideas were imported from the Philippines for commercial farming when the local varieties of the same species failed to grow. Mshigeni understood the bad situation of many women in coastal areas that for generations were farming maize and cassava in a rocky coral soil and making big efforts to carry water to the plots. He helped women in Zanzibar to learn a new way of farming by teaching them seaweed production by locating sticks at low tide, following by harvesting, drying and baling them for sale. Soon after, seaweed farming had already improved life in Zanzibar and an important industry had evolved. In 2006 the production from Eucheuma and Kappaphycus varieties ranged from 6.000 to 10.000 tons per year (Msuya 2006) Nevertheless, the production is mainly exported in bulks reducing the price paid to farmers and increasing the dependence to the international markets.

Seaweed has the characteristic that is a sustainable form of aquaculture and the environmental impacts are minimal. The farming has been recognized by the government as a high potential economic practice for improving the livelihoods of coastal communities.
The study area of the present research is Jambiani, a mainly fishing village with a population of about 8,000 inhabitants. Jambiani is located on the south east side of Zanzibar (Zanzibar Action Project, 2012). The main economic activities are seaweed farming, fishing and tourism. On the outside, Jambiani looks like a tropical paradise, but the reality is shocking. For instance, malaria is an ever-present threat, particularly among young children, mortality in childbirth is high, and the treatment of serious diseases limited. In Jambiani as in many other villages in Zanzibar, seaweed farming has proved to be potential for improving the incomes of many women involved in this practice. Yet, the prices they get from selling seaweed are low and not enough for covering the expenses. It is a big contradiction considering that international seaweed prices are increasing, but the price paid to farmers is continuously decreasing. The seaweed prices are dictated by the middle men who are buying the dried seaweed from the farmers. Normally, the farmers do not have any say in the marketing, do not know the international prices and do not have any means to ask for a better price.

In light of the challenges women are facing in seaweed farming, the upgrading of the value chain is an interesting tool to improve employment opportunities, market access and export levels through productivity increase and particularly value added. Seaweed can be semi-processed by extracting a crude gel or fully processed by creating new products like soap, crèmes, etc. The seaweed processing and value addition is possible in Zanzibar; however it requires that all stakeholders are familiarized with the techniques and knowledge. The value chain perspective will be helpful in the case of Jambiani for capturing the real economic structures and thus guiding in an efficient manner the development interventions rather than only sectoral perspectives.

1.2. Research Issue

Despite the potentials of seaweed farming as a cash-generating, economically empowering occupation for women in coastal areas; women in Jambiani however commercialize the seaweed without any added value. This fact reduces their economic benefits turning seaweed farming into a potential activity but not fully exploited. Seaweed farmers in Jambiani are badly paid and as a consequence their livelihood source is not enough for improving their living standards.
1.3. Research Objectives

1.3.1. General Objective
To explore the opportunities and challenges of upgrading the value chain of seaweed farming in Jambiani, Zanzibar

1.3.2. Specific Objectives
  i. To document the existing livelihood conditions of women involved in seaweed farming in Jambiani
  ii. To determine the current structure of the value chain of seaweed farming in Jambiani
  iii. To assess the reasons for the lack of value-adding of seaweed in Jambiani,
  iv. To assess the actors involved in the value chain in seaweed farming
  v. To suggest policies options based on the research findings

1.4. Research Questions
  I. What are the current livelihood conditions of women involved in seaweed farming in Jambiani?
  II. How is the value chain of seaweed farming in Jambiani currently structured?
  III. Why is the potential of the value chain of seaweed farming not fully exploited in Jambiani?
  IV. Who are the main actors involved in the value chain of seaweed farming?
  V. What are the policy implications related to seaweed farming?

1.5. Significance of study
This study aims to learn from the women experiences, understand their livelihoods and define in which extent the value chain upgrading might be able to improve the seaweed farming outputs in Jambiani. This research will describe how the seaweed farming practice is currently organized and based on that identify the main opportunities and challenges that are influencing the seaweed farming sector. Based on those findings significant recommendations will be proposed in order to upgrade the seaweed farming value chain and at the same time improve the livelihoods of women in coastal areas.

1.6. Limitations of the study
The language barrier is the biggest challenge since women in Jambiani have a very basic English knowledge and the author is not a Swahili-speaking. This factor is always a barrier for getting information and particularly it makes difficult to interact with the community in
Jambiani. Even though the interviews were conducted with the help of a local translator, there is always the risk that some information gets lost or is not well interpreted. Some other limitation is the difficulty to get quantitative information from public offices which are not displaying any information online. Another limitation is getting in contact with the main seaweed companies that are buying the product from the farmers. Information about those companies is not available online and their location in Zanzibar is difficult to find, especially in Stone Town where locals are not familiar with seaweed companies. Even though the limitations mentioned, women in Jambiani were willing to share their experiences and stories, moreover there is sufficient literature available related to the topic which makes it easier to have a complete understanding of the situation.

1.7. Report organization

The following research will be organized in six chapters.

The first chapter is referring to the background of seaweed farming and it will describe the main issue to be investigated throughout the research. It also contains the main objectives as the research questions that are to be addressed during the analysis of the research.

The second chapter will explain in detail all the literature review concerning the issue of seaweed farming and the value-addition upgrading. This section will organize the information at the global, regional and national level. Moreover, this chapter will present some practical examples of successful practices of seaweed farming, like the case of Philippines, Indonesia, India and China.

The third chapter will focus on the theoretical and conceptual framework which will assess the research issue based on some theories and concepts like the Sustainable Livelihoods Framework which will analyze the livelihood assets of women in Jambiani and based on that formulate possible livelihood strategies in order to improve their socio-economic situation. Moreover, the concept of the value chain will be explained and adapted to the case study in Jambiani. Some theoretical inputs regarding women empowerment will be explained regarding the current situation in Jambiani. It is important to mention that the conceptual framework comprises all the variables and sub-variables extracted from some relevant aspects from the literature review linking with the theoretical concepts used for the present research. The conceptual framework displayed in this section will illustrate in brief the key elements object to study.
The fourth chapter will describe the research strategy, design and process. Particularly, it will specify the selected study area and the data collection methods used during the field work. It will also display the type of variables that will be studied and the sources of information.

The fifth chapter will concentrate on the analysis of the case study based on the theoretical concepts previously explained and the variables displayed in the conceptual framework. This chapter will present all the results and findings from the field work through tables and diagrams. Together with the analysis of the findings this chapter will describe briefly the pilot project conducted in Paje, Zanzibar where a Seaweed Center has been established in order to give value-addition to the seaweed.

Finally, the sixth chapter will be dedicated for the conclusions of the present research and recommendations as policy implications of seaweed farming in the future.
2. Literature Review

2.1. Aquaculture and mariculture industry, an overview

Aquaculture has been one of the fastest growing food production systems worldwide. The FAO defines aquaculture as the farming of aquatic organism including fish, mollusks and aquatic plants. Fisheries and aquaculture all together play an important role in the livelihoods of millions of people involved in this sector. According to the FAO around 540 million people or nearly the 8% of the world population rely on the sector as an economic support. The FAO member countries adopted in 1995 the Code of Conduct for Responsible Fisheries, which is a set of principles and methods related to all aspects in aquaculture. The main goal of this document is to achieve a sustainable development of the aquaculture sector. (FAO 2012).

Mariculture is a branch of aquaculture that nowadays is in continuous growth. It came as a latecomer in the food industry and became important after the success of salmon farming industry in northern European countries. Mariculture refers to “farm the sea” and produce the food and livelihood’s generation of many coastal communities that are dependent on this sector. Seaweed farming is included in the mariculture industry, which in the last years has received the public concern considering that the coastal resources are limited and there is a need to assess the environmental impacts as a sustainable and competitive food production sector. Mariculture has had in the previous years an emphasis for rapid expansion, however nowadays the tendency is in the direction of a sustainable mariculture. This concept means in other words less utilization of energy, natural resources and not causing harm to the environment (Katavic 1999).

Aquaculture and mariculture are important industries since they offer an essential opportunity for improving food security to many people around the world. The increase in global population and the gradual depletion of coastal resources requires that awareness of the communities involved in this sector and a sustainable expansion of it.

Seaweed farming is part of the mariculture sector and FAO controls the best use of this resource. Seaweeds grow in every sea and ocean from the equator to the artic where big beds of seaweeds raise above the beach line. Seaweeds can be classified into three broad groups based on their color: brown, red and green. The three most important seaweeds that are used as food are: *Porphyra* (commonly known as nori), *Laminaria* (kombu) and
Undaria (wakame). The nori is highly valuable in Japan where it is usually eaten uncooked and used for the outer part of the sushi wraps. Additionally, it has a high content of useful edible protein (FAO 2001). The varieties Kappaphycus alvarezii (also called “cottonii”) and Eucheuma denticulatum (“spinosum”) have been successfully cultivated and are the main raw materials for carrageenan production. The cultivation of these two species started in The Philippines but has spread to other warm water countries with low labour costs like United Republic of Tanzania and Indonesia. These two species now comprise about 85% of the raw materials used by the industry (FAO 2001).

**Figure 1: Kappaphycus alvarezii (cottonii)**

Source: Msuya, 2007

**Figure 2: Eucheuma denticulatum (spinosum)**

Source: Msuya, 2007
The earliest records of seaweed farming are evidenced in Japan and China where seaweed was already used as food back in the fourth century (FAO 2001). Today those two countries together with the Republic of Korea are the largest consumers of seaweed as food and have shaped an industry that is harvesting more than 6 000 000 tons of wet seaweed per annum (FAO 2001). Therefore, seaweed production is nowadays a major industry especially in the Asian-Pacific mariculture.

Aquatic plant or algae global production has been dominated by marine macroalgae and particularly seaweeds. According to FAO the total value of farmed aquatic algae in 2010 is estimated at USD 5.7 billion while that for the year 2008 was estimated at USD 4.4 billion: The algae culture concentrates some species like for example about 98.9% of the world production is coming from the *Laminaria japonica*, which is mainly cultivated in the coastal waters of China; *Euchema* seaweeds (farmed in Zanzibar), *Gracilaria* spp, nori/laver (*Porphyra* spp.), wakame (*Undaria pinnatifida*) and unidentified marine macroalgae species (3.1 million tons, mostly from China). However, it has been observed an increase in the farming of *Euchema* (FAO 2010).

In comparison with fisheries, which is more propagated worldwide, algae production is farmed in far fewer countries. In 2010 there were only 31 countries reported with algae practices; 99.6% of the production came from just eight countries as illustrated in Graphic 1.

**Graphic 1: Seaweed production in percentages**

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>58.4 %</td>
</tr>
<tr>
<td>Indonesia</td>
<td>20.6 %</td>
</tr>
<tr>
<td>Philippines</td>
<td>9.5 %</td>
</tr>
<tr>
<td>Indonesia</td>
<td>20.6 %</td>
</tr>
<tr>
<td>Philippines</td>
<td>9.5 %</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>4.7 %</td>
</tr>
<tr>
<td>Democratic People’s Republic of Korea</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Japan</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.1 %</td>
</tr>
<tr>
<td>United Republic of Tanzania</td>
<td>0.7 %</td>
</tr>
</tbody>
</table>

Source: Own construction based on FAO 2010
As shown in Graphic 1 and Graphic 2 China is the largest producer of edible seaweed, where hundreds of hectares of seaweed of *Laminaria japonica* are cultivated on suspended ropes in the coastal area. Korea, on the other hand grows three different varieties which are grown in a similar way as in China.

The market for seaweed products is very diversified like: agar, carrageenan and alginate. One important characteristic from seaweed is its ability to form colloidal systems in the water, which means that seaweed can give viscosity, gel strength and stability to liquids. Therefore, seaweed plays an important role in the production of many products such as: processed and unprocessed food, toothpaste and paints, plant fertilizers, animal feeds, bioactives for health, medicine and cosmetics and energy and biofuels.

The industrial uses of seaweed extracts expanded rapidly after World War II. Nowadays, it is expected to increase the demand in countries such as China, Korean and Japan where seaweed products are highly appreciated. This might help that the price of seaweed stays high and production increases. Seaweed farming in the future can gain importance for several reasons: the spatial location where seaweed is farmed is not yet saturated, secondly the seaweed production does not require of expensive inputs and the labour for farming is not that intense which means farmers can dedicate from other mariculture activities at the...
same time. Finally, the impacts on the environment from seaweed farming are minimal (Katavic 1999).

During late 2007 and through the summer of 2008, the carrageenan industry was severely affected by unprecedented rapid price rise in the *cottoni* variety. This period was known as the “seaweed crisis”, however tropical carrageenan was not affected. In fact cultivated *Spinusum* and *Gracilaria* were readily available and attractively priced for processors. This crisis has been characterized as a supply failure caused by global warming, diseases and mostly by the sudden rise in *cottoni* demand which mainly came from China. It seemed that the failure was related to market governance value chains whereas farmers and processors were disconnected and the standards of seaweed quality were dramatically reduced (Neish, 2008).

Nowadays, an increasing number of people are becoming aware of the many potentials and benefits of algae products which has at the same time stimulated more research and development of seaweed culture. Moreover, feed or animal aquaculture is a flourishing industry but with the big disadvantage that discharges heavy nutrients loads into coastal waters (Lüning, Pang 2002). A possible solution is to integrate seaweed into fish farming. According to the last researches, seaweed was successfully able to remove up to 90% of the nutrients discharged from intensive fish farming. Hence, seaweed farming has the advantage that functions as an effective biofilter to alleviate the impact of animal aquaculture and furthermore to alternate fish with seaweed farming according to the seasons for a better resource management (Lüning, Pang 2002).

### 2.1.1. Best practices examples

**The case of China**

Seaweed is farmed throughout the world and in many cases it has been a successful story for supporting coastal communities’ livelihoods. China is the largest seaweed producer worldwide and has probably the most advanced methods and development in seaweed farming. The main variety China is producing is *Laminaria* which was first introduced in Japan but then later on brought and researched in China. Currently, in China there is a new proposal of using seaweed farming as a way to alleviate the problems of eutrophication of waters which is the result of intensive marine aquaculture in coastal areas. It has been observed that seaweeds have a big capacity to absorb these materials. Therefore, an integrated aquaculture concept is been introduced in order to complement seaweed production with fishing activities. The concept of integrated mariculture has emerged as a
mitigation approach against the excess of nutrients and organic matters generated by intensive aquaculture activities particularly in marine waters. According to the FAO, integrated farming systems are described as an output from one subsystem in an integrated farming system, which otherwise may have been wasted, becomes an input to another subsystem resulting in a greater efficiency of output of desired products from the water area under a farmer's control (FAO 2009). Yet this practice is not valued in its real social and economic potential, however in Asia it has acquired some importance since it has been widely practiced by small households especially in freshwater environments. In China the fact that the use of coastal areas has increased coupled with the rapid growth and expansion of mariculture is demanding constantly a demand for more sustainable practices in coastal areas. The practice of integrated mariculture in marine environments is however still less known and understood with an untapped potential. This new concept offers a big advantage by diversifying the product portfolio and increasing the resilience of the production like for example when facing changing prices or natural disasters. China is the one of the few countries which has started pilot projects combining seaweed production and fishing. The large scale cultivation in the north of China has already helped to balance the negative effects of some fishing practices (FAO 2001).

As an example, in the northern Yellow Sea, the company Zhangzidao Fishery Group Co. is presently cultivating scallop, sea cucumber and abalone. In order to improve ecological conditions and the sustainability of the practice, the company is thinking to develop seaweed cultivation and the construction of artificial reefs in more offshore environments which might be able to optimized the production, up to date about 13 300 ha have been enhanced with integrated aquaculture methods.

**The case of the Philippines**

Philippines is an important seaweed producer worldwide. The exports of seaweed have been an important item in their economy over the last two decades. The first seaweed farm was established in the south of the Philippines in 1969 where a native *Euchema* variety was found to produce high-quality carrageenan (Valderrama 2012). According to the Bureau of Fisheries and Aquatic Resources of the Philippines more than 800 varieties are found there, particularly the commercial ones such as: *Eucheuma, Kappaphycus, Gracilaria* spp. and *Caulerpa lentillifera*. Philippines has a wide coastal areas which makes suitable the cultivation of *Euchema cottoni*, which is better paid in the market. Furthermore, the country has already technology for processing and extracting carrageenan from seaweed, about 3
refineries and 12 semi-refined processing plants. The private sector forged a partnership agreement to develop the seaweed industry.

Specifically in the south of the Philippines seaweed farming is considered as an alternative livelihood for all those coastal areas. The main seaweed export destinations are France, Korea, China and Hong Kong. In the case of the Philippines, the Government has enhanced seaweed farming by conducting free trainings, providing free seedlings and establishing techno-demo farms. Moreover, the areas where seaweed is farmed are highly suitable since they are relatively free typhoon-free, wide reef areas and extended marine coastlines (Department of Environment and Natural Resources Philippines, 2008).

The success factors of seaweed farming in the Philippines relate to the commitment and willingness of local authorities to provide assistance. Furthermore, the community has already formed cooperatives and organized themselves for receiving trainings and workshops. Additionally, women are getting trainings on how to add value to seaweed. They are producing noodles and pickled seaweeds. The case of the Philippines has shown that many small-scale fishers have switched to seaweed farming because of the high profit and fast return on investment. However, seaweed farmers face still challenges regarding price instability, lack of financial loans and post-harvest facilities and processing plants. The general success of seaweed farming in the Philippines was rapidly replicated in Indonesia.

**The case of Indonesia**

Indonesia has interesting advantages when it comes to seaweed farming, since its coastline is extensive and has warm water highly suitable for seaweed production. Seaweed farming nowadays is taking place all over the archipelago. Seaweed is a major source of income for small Indonesian farmers, collectors, traders and exporters. Therefore, the government and NGO’s established seaweed processes comprising planting, harvesting and post-harvesting handling and encouraged the development of farmer cooperatives and local value-added seaweed processing facilities.

In Indonesia there are mainly two varieties produced: *Kappaphycus alvarezii* (commonly known as ‘cottonii’) and *Eucheuma denticulatum* (‘spinosum’), which currently represent for approximately 80 and 10 percent of the world production of carrageenan seaweeds, respectively (Valderrama 2012). Surprisingly, since 2007 the production of Indonesia surpassed the one from the Philippines; as a result global supply of seaweed is expected to come mainly from Indonesia. The cultivation of seaweed is well established, particularly in Bali and Lombok. All the seaweed produced is exported; however the local carrageenan
processors have difficulties for obtaining the raw material at a competitive price. Some agar-extraction is also produced from the *Glacilaria* variety, nevertheless the low quality of the agar in this specific seaweed variety is a challenge. There is the need to propagate better seed material that will grow faster and yield better quality. Generally, in Indonesia the seaweed production functions through cooperatives called *kelompok tan* (group of farmers) which currently are encouraged to participate in production techniques for increasing the production, adding value to the product and lastly to commercialize the end product in the international market (AusAID 2004).

**The case of India**

For the case of seaweed farming in India it stands out as an example of community based coastal resources management that has up-lifted the livelihoods of many communities. In India seaweed farming of *cottoni* started in 2000 by the initiative of PepsiCo. The fishers were motivated, after some time, to form self-help groups and institutional financial support was provided. The members of the group normally belong to the same family but could include also other members from the same community. Basic infrastructure is provided by the company and the harvest is purchased on a buyback basis and payments are processed by the company through the bank accounts of each member of the group. The main advantages of such a system are that farmers have the opportunity to become entrepreneurs and improve their economic situation, moreover the approach was done participatory and gradually the performance of the value chain improved. Currently, about 50 such groups are successful in seaweed practice and the activity is gradually expanding to other districts (Krishnan, Narayanakumar 2010).

**Other countries**

There are some other countries which are experienced in seaweed farming such as Mexico in Latin America, Salomon Islands and the Pacific Islands. The evidence collected throughout the different countries has demonstrated that socio-economic impacts of seaweed farming in coastal communities are considered positive and encouraging. The production system favors small-scale, family operations over corporative presence and generates important employment opportunities in comparison to other aquaculture activities. At the global level seaweed farming could be a profitable venture for coastal areas with little access to other income activities.
2.2. Seaweed farming in the Western Indian Ocean (WIO)

Aquaculture in counties in the WIO has become a main industry and an important income generator activity. However, unlike many Asian countries historical tradition in aquaculture has been limited despite the region’s natural endowments, including the untapped land, water, coastlines and human resources. Both East and West Africa have rich coastal ecosystems and productive zones which are essential to develop the industry. However, African aquaculture still remains largely undeveloped (Troell et al. 2009). Though, in the last years aquaculture has gained importance because of a strong emphasize on private sector involvement. Historically, the dominant sector within WIO aquaculture has been commercial shrimp farming which is characterized for being a big-scale business with high investments from the public and private sector. Nevertheless; there are other smaller-scale initiatives that gradually are being successful, like seaweed culture. Still, African countries have not yet explored all the potential they have and contributed only by 1.3% to the global aquaculture production (Troell et al. 2009) as shown in Table 1.

Table 1: Global aquaculture production in 2009 by continent (including plants, wet weight metric tons)

<table>
<thead>
<tr>
<th>Continent</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>1,103,492</td>
</tr>
<tr>
<td>America</td>
<td>2,609,930</td>
</tr>
<tr>
<td>Asia</td>
<td>66,670,226</td>
</tr>
<tr>
<td>Europe</td>
<td>2,484,585</td>
</tr>
<tr>
<td>Oceania</td>
<td>176,370</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>73,044,603</strong></td>
</tr>
</tbody>
</table>

Source: Troell et al. 2009 from FAO 2010

Aquaculture was introduced about 50 years ago in the African region and its potential for bringing new livelihoods to coastal dwellers is undeniable, nevertheless the goal is to follow a sustainable direction since it is a sensitive area depending from the coastal resources. Hence the question is if aquaculture will expand in the coastal zones of Africa but rather how it will be achieved and what are the resulting environmental and socio-economic consequences resulting from such development. Therefore there is the need to develop a sustainable mechanism that considers the local and global perspectives of such an emerging industry. In the 1980’s a large-scale development in the WIO region begun for exported-oriented seaweed and prawn aquaculture which currently are the primary aquaculture products produced in the region (Bryceson 2009). Full development of the aquaculture sector in the WIO requires effective governance and like the example in Tanzania where
aquaculture is being differentiated from fisheries which encourages a development of a specific industry, in this case all what aquaculture comprises (Troell et al. 2009).

The two varieties \textit{Eucheuma denticulatum} (‘spinosum’) and \textit{Kappaphycus alvarezii} (‘cottonii’) are economically important seaweeds in the Western Indian Ocean (WIO) region. Seaweed farming has provided a source of income and employment opportunity to many coastal communities, especially women who otherwise would not have any other occupation. Like in the case of Jambiani, Zanzibar around 98% of women is engaged in seaweed farming. However, the industry in the WIO has had many setbacks and challenges that need to be addressed in order to improve the conditions of many families engaged in this activity.

\textbf{The case of Mozambique}

Mozambique is involved in the production of seaweed as a small-scale business since 1998. This is normally conducted in Cabo Delgado and Nampula. Seaweed farming has been introduced by NGO’s as part of the projects to assist women in coastal communities. The seaweed species \textit{Kappaphycus alvarezii} (\textit{Eucheuma cottonii}) and \textit{Eucheuma denticulatum} (\textit{E. spinosum}) were introduced from Zanzibar. It is estimated that about 2000 farmers, 80% women, are involved in this practice (Semesi 2009). However, the marketing part still remains as a challenge for the community which is not gaining sufficient profit. In 2006, farmers earned in the region about USD 60 per month (Omar, Hecht 2009). Nevertheless, the country has big extensions of suitable water culture that might bring up an interesting seaweed farming business.

\textbf{The case of Madagascar}

In Madagascar aquaculture occupies an important place in the economy because of its contribution to foreign exchange revenues. The industry is mainly concentrated by shrimps production and seaweed farming. Seaweed farming is practiced since 1990’s by family groups specifically in the North of the country. In 2007 about 256 farmers were involved in seaweed culture and local communities are supported by NGOs. Tropical marine seaweed (\textit{Eucheuma striatum}) Zanzibar strain is currently being farmed in the coastal zones and afterwards exported through private companies who are interested in producing high-quality carrageenan (Iltis, Ranaivoson 2009). Madagascar still remains as one of the leading countries in producing shrimps and the government is more focus on stimulating this sector. Mariculture in general is in Madagascar still undeveloped. However, there has been an important input by different international organizations on developing techniques and promoting seaweed farming.
On the WIO region, Tanzania and Madagascar are the countries which are leading in seaweed production. Mozambique has decreased its production lately as in the Figure 3 is shown.

**Figure 3: Euchema and Kappaphycus seaweed production in the WIO region (tons) according to FAO**

![Chart showing seaweed production](chart.jpg)

Source: Semesi, 2009

**The case of Kenya**

In Kenya seaweed farming started in the mid 90’s through trials initiated by the Kenya Marine and Fisheries Research Institute (KMFRI) conducted in the north and south coast. The initiative started with the support of KMFRI, a seaweed buying multinational company and coastal community-based organizations. They started a demonstration and commercial farms with two seaweed varieties. The project goes with the Government of Kenya’s vision 2030 to improve the economic conditions of the coastal communities and to make Kenya a middle income country. The project was funded by the Government and KMFRI is providing technical support. Under the current arrangements the produce from the seaweed farmers in the south coast will find a market in Zanzibar with a seaweed buyer. Currently, there are over 150 established farmers from the two farming villages. Moreover, additional sites have been identified in other parts of the South Coast and the process of assisting the prospective farmers to establish farms is ongoing. Suitable sites for seaweed farming are to be mapped in other areas of the South and the North coast with the goal of expanding commercial
Seaweed farming represents an important income earner in the WIO region. Normally, exporters purchase the seaweed previously dried and then sell it to the world market. Though many successful experiences in seaweed farming, there are setbacks that affect the expansion of this practice in the WIO. For instance, the presence of corporative monopolies assures high profits only to few firms and on the other hand falling prices to the farmers. Natural factors like diseases and poor farming techniques affect the quality of seaweed and as an end result to the price that a farmer receives from her production. The value chain in most of these countries is too long which affects in the price paid to the farmers. The seaweed farming value chain is known for having many actors involved with an unequal distribution of the earnings gain from the production.

In the WIO region seaweed farming has been identified as a good initiative for social and economic development of coastal areas. The main goal is to diversify the livelihood opportunities for poor fishing communities whose source of income have been put at serious risk by diminished capture fisheries and in many cases women are just unemployed. However, there are still many challenges and bottlenecks that are hindering seaweed farming to become a flourishing industry that finally benefits not only the big companies but also and especially the farmers who are every day dedicating their time for such practice. For that matter the value chain of seaweed has to be reassessed in a manner that benefits all the stakeholders involved in an equal share.

2.3. Seaweed farming in Tanzania

In Tanzania, marine aquaculture is dominated by the cultivation of seaweed. Seaweed farming started in the year of 1989 in Zanzibar and later on it spread to mainland Tanzania and other countries like Madagascar. Seaweed farming was encouraged since it was considered as an environmentally and sustainable practice. Seaweed farming techniques were introduced to women in Zanzibar in the 1970’s, where more than 90% of farmers are women. In 2006 the production of *Euchema* and *Kappaphycus* ranged from 6,000 to 10,000 tonnes annually (Msuya 2006). In the year of 2011 the Zanzibar Exporters Association said its members collected and exported about 11,000 tonnes of dry seaweed, most of it going to the United States, France, Denmark, Spain, China and Chile (Thomsons Reuters Foundation 2013). Tanzania is the fifth world largest exporter of red seaweed, Philippines and Indonesia are by far the largest producers.
The following Graphic displays the chronology of how seaweed farm started and how did the marketing line developed. As observed seaweed started to be collected only in the wild, but then the potential of seaweed farming was identified and documented. Some pilot plots were established and the coastal communities got involved in the practice. Zanzibar was considered the best place to farm seaweed because of its climatic and water conditions. At the beginning only fishermen were engaged in farming since the profits were higher and it was initially introduced to them. It was observed that the main problem of wild harvesting of seaweed was the low production of around 600-800 tons per year when with seaweed farming the production can reach minimum 10,000 tons. Therefore the potential of farming seaweed in bigger quantities was identified and together with that the private sector got progressively involved. The untapped potential of increasing the production of seaweed was consolidated when the private sector came and invested in seaweed production in Zanzibar in the late 80s. In that way, an industry started to develop based on the export of a raw commodity to international markets.

**Figure 4: Seaweed farming and marketing origins**

![Seaweed Farming and Marketing Origins Diagram]

Source: Msuya, 2011

The farmed seaweeds are sold as cash crops to Belgium, France and USA. Dry seaweed exports represent about 20% of the Zanzibar export earnings (Mtolera et. all 2009). Seaweed has developed as a small-scale family own farms involving normally two family members per
Seaweed farming has improved the standards of living of the women in coastal areas involved in it. It has provided them an opportunity to contribute to the household budget. This fact has brought empowerment to the villages where seaweed is practiced and has increased gender quality since women are many times excluded from economic activities, particularly because of cultural issues. However, due to price volatility, lack of capital and know-how seaweed farming is not fully exploited as it could be. The following table portrays the chronology of seaweed farming in Tanzania.

**Table 2: Chronology of seaweed farming development in Tanzania**

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980’s</td>
<td>Seaweed farming experiments in Zanzibar</td>
<td>Keto Mshigeni</td>
</tr>
<tr>
<td>1990’s</td>
<td>Commercial seaweed farming starts in Zanzibar</td>
<td>Private sector</td>
</tr>
<tr>
<td>Mid 1990’s</td>
<td>Environmental and socio-economic impact studies on seaweed production</td>
<td>IMS sponsored by Canadian International Development Agency</td>
</tr>
<tr>
<td>1992-1994</td>
<td>Seaweed farming introduced to Tanga region and Bagamoyo</td>
<td>Private sector</td>
</tr>
<tr>
<td>1995-1996</td>
<td>Seaweed production introduced to Mtwara, Mafia Island and Kilwa</td>
<td>IMS sponsored by Rural Integrated Project Support</td>
</tr>
<tr>
<td>2006- to date</td>
<td>Value addition to seaweed products</td>
<td>IMS, Innovation Systems and Clusters Program sponsored by Sida.</td>
</tr>
</tbody>
</table>

Source: Mmochi, 2009

The production of seaweed in Zanzibar decreased in the last years because of many factors. One of them is the market price which is not enough considering the effort farmers invest in the production. Middlemen buyers are the ones who set the price and according to the field trip conducted by the author in February 2013, women in Jambiani are getting 400Tsh (0.25 USD) for 1 Kg. of dry seaweed. The market price is also very much linked with the absence of infrastructure and equipment needed to process crops and extract valuable algae. This means that farmers have to sell seaweed as a raw material. As a consequence, they become totally dependent on the middlemen and the companies who are buying the raw seaweed paying a very low price. Many seaweed farmers are illiterate and have limited influence when it comes to negotiations with local brokers. These factors contribute to low prices for the raw commodity and farmers getting frustrated from seaweed business. It seems the seaweed business is controlled by a few individuals who benefit more when farmers sell the seaweed raw.
As a commodity seaweed is subject of price volatility and constant fluctuation which affects the farmers directly. This was particularly evident during the “seaweed price bubble” when prices reached an exorbitant level and then collapsed in a few months. Due to the prices increased many farmers rushed to harvest immature or low-quality seaweed and as a consequence the market was flooded and accelerated the price crash (Valderrama, 2012).

In Zanzibar seaweed farms are own individually, by groups or by families. There is no land ownership and farmers are free to establish their farm where there is space and especially where the seaweed can get always water, even during tide. The local brokers provide women with tools free of charge such as ropes and pegs in order for them to farm the seaweed. Part of the deal is that the seaweed farmers sell their seaweed exclusively to them in exchange of all the inputs provided. Currently, in Zanzibar there are four companies that purchase the dried seaweed: C-Weed Company Ltd., Agro Weed Company, Birr Seaweed Company and Zanzibar East Africa Seaweed Company (ZANEA).

Once the seaweed has been harvested it is laid out in the sun to dry, normally outside the houses of the farmers or even at the coastline. After the seaweed is dry, farmers take it and sell it to the brokers who are in charge of weighting it and putting the seaweed in bags of 50 Kg. Later than the seaweed is transported to Stone Town and from there it is exported to Europe and the United States. Considering that seaweed represents at the global level a $200 billion business, it is difficult to believe the prices that are paid to the farmers. On the other hand, carrageenan prices ranged in 2006 from 30-35 USD per kg. This example displays that the farmers are getting extremely lower prices comparing to the price of the final and processed product.

Another constraint in the seaweed farming is the expansion of tourist hotels along many coastal lines and as a consequence many farmers have lost important farming areas in the shoreline. In the case of Zanzibar this phenomenon is spreading since the tourism industry is highly important for the island. Particularly, Jambiani and its surroundings are very well-known for its touristic attractions and many resorts and hotels are located in this area.

In response to the challenges that seaweed farming is facing, women in Tanzania are starting to organize themselves through cooperatives, for example the Chloe Society for Women’s Development on Mafia Island or the Seaweed Center in Paje.

Seaweed farming has been recognized by the Government as an important activity for social and economic development since it has confirmed to support livelihoods of coastal communities, particularly women. However, there is limited capacity for export expansion
due to international marketing arrangements that prescribed a quota system that restrict Zanzibar to annual supply of only 7,500 metric tons (Zanzibar Agricultural Transformation Plan 2010-2020). The Government efforts to support the seaweed industry have been evidenced through the Seaweed Development Strategic plan launched in 2005 by the Ministry of Natural Resources and Tourism. This Plan aims to provide a framework for seaweed farming and intends to expand the seaweed farming industry with a sustainable perspective. The Plan is focusing on developing the production of cottoni and to reach a sustainable management of the industry together with all the actors involved. This initiative intends to be a guideline for expansion of the seaweed industry and in that matter improve the livelihoods of all those coastal women involved in the practice. In the Plan it is foreseen that the production of cottoni will increase and by that farmers will become more productive and independent in the sense that they can negotiate better prices and even self-finance their business or ask credits from financial institutions. The technical assistance and trainings will be provided by seaweed development partners who did elaborate the Plan. Nevertheless, after the Plan time period not much has been done, especially because in Zanzibar most of the seaweed production comes from the other variety, Eucheuma denticulatum (E. spinosum). The production of cottoni is very limited in the island due to the sensitivity of the seaweed type. It has been observed that the cottoni cultivation is not successful in shallow waters, close to the shore. This variety should be farmed in cages in the deep sea about 1 to 2 meters under the surface. This initiative, however, has not been encouraged in Zanzibar yet, only in the area of Pemba.

Regardless the challenges and bottlenecks of seaweed farming practice, the government has already recognized the importance of promoting seaweed farming for improving the socio and economic conditions of coastal communities and it is regarded as the best way to use coastal resources concerning the well-being of the coastal areas. The Ministry of Natural Resources and Tourism thus developed the Seaweed Development Strategic Plan as a useful guideline for promoting seaweed farming and at the same time alleviating poverty in coastal areas. This plan was covering a five-year period from 2005 to 2009. The plan specifies the strategies and actions that all stakeholders involved have to be taking in consideration and emphasizes on increasing the production of the Kappaphycus alvarezii variety also known as cottonii.

As seen in Tanzania, particularly in Zanzibar, the potential and the economic role of seaweed farming is important because of the employment opportunities and the possibility of women to earn a small income that might help the family’s condition considering that seaweed farming provides a rapid and high return on investment and the growth cycles are short.
However, the practice is not fully exploited since women in the coastal communities are still facing poverty and limited access to basic infrastructure. Although seaweed farming requires a relatively simple technology and a small start-up capital, women in Zanzibar are mostly not organized neither are they cooperating to each in order to improve the productivity and the prices paid. The upgrading of the value chain in this regard might represent a potential for improving the organization of the seaweed chain and an equal distribution of the earnings among the actors involved.

2.4. Emerging issues in seaweed farming

Aquaculture in the Western Indian Ocean has become an important sector that is in constant development and expansion. Particularly, seaweed farming represents an interesting income-generator since it does not require high capital input and the environmental impacts are minimal. Over the past decade seaweed farming in Tanzania has become a successful activity that promises to lift the livelihoods of women in coastal areas. However, lately low returns have discouraged farmers as a consequence productivity and quality has been affected.

Since 2006 there has been the initiative to give dry seaweed an added value in order to improve the prices that farmers receive from seaweed. The Zanzibar Seaweed Cluster Initiative is working with farmers in Zanzibar and on Mainland to improve the production of seaweed and particularly start with a small-scale industry of seaweed products, such as: soap, cookies, body cream, jellies, juice, salad, etc. Workshops and trainings have been conducted to improve seaweed quality, its production and the commercialization of the final product. Many NGO’S as the National Government has recognized the potential of seaweed industry to be developed for the benefit or many coastal communities’ livelihoods. However, still not many communities are involved in the process due to many factors. The potential of improving the value chain of seaweed in Jambiani remains as main questions since it is not as easy as producing derivate products. There is the need to find future markets and demands that will be willing to buy such products.

Moreover, there is the initiative of women organization in the Island of Mafia where the Chloe Society for Women’s Development is creating cooperatives in order to organize women engaged in seaweed farming. This idea was based on the successful experience in the Philippines where seaweed farming cooperatives are emerging and asking for better prices for dried seaweed. Actually, the farmers in the Philippines are getting better prices than the ones in Tanzania. Another example of women organization is the Seaweed Center in Paje, a village close by Jambiani, which has founded a center where women are giving added value
to seaweed by producing artisanal soaps and creams that are further commercialize in Stone Town or at their own shop in Paje. This initiative originated by a Swedish Venture in 2011 has organized and empowered the women of the community and gave them the opportunity to improve their livelihoods though an upgrading of the seaweed value chain.

In the year 2013, as a visible result of warming conditions and climate change, the Island of Zanzibar has experienced a substantial increase on the water temperature. This fact affects seaweed cultivation since the algae is very sensitive to temperature changes. Due to this fact Zanzibar's seaweed production has decreased sharply in recent years, from 14,040 tonnes in 2007 to just under 10,800 tonnes in 2012 (Thomsons Reuters Foundation Service 2013). Farmers and researchers now hope to create new farms in deeper water, at the lower temperature the seaweed prefers. This initiative is already in place in the Island of Pemba where some deep-water cottoni cultivation is ongoing. However, this requires of more technology and new methods of farming.

Furthermore, currently there is an initiative of promoting integrated aquaculture which tries to integrate seaweed with shellfish and pearl farming. The integrated coastal aquaculture focuses on developing different innovative cultivation designs that are appropriate for the environment as for the people (Msuya 2009). This initiative brings in an ecological use of seaweed; however the real potential of seaweed is in improving and adding value to the chain, which currently is not working fairly for every actor, especially the farmer.

2.5. Summary

Seaweed farming is practiced around the world and it is considered as a potential alternative to uplift the livelihoods of coastal communities. Seaweed is harvested as a food source as well as an export commodity for the production of agar and carrageenan products. In the present chapter it was presented an overview of the mariculture industry, especially focusing on the production of seaweed. Many best practices examples illustrate the potential of seaweed farming as an important tool to improve the livelihood conditions of many women involved in this practice. For the matter of this study it is significant to determine the main concepts that are deriving from the literature review which are essential to consider since they are important aspects that are enhancing livelihoods in different countries where seaweed is widely farmed.

Below a brief review of the relevant concepts illustrated in Chapter Two:

**Processing Factories**: As illustrated in the case of Indonesia, seaweed farming has been recognized as an important source of income for small Indonesian farmers. The industry of
seaweed in Indonesia is developing fast and as data demonstrates the country is the second biggest production of seaweed worldwide after China. The Government has recognized the importance of seaweed industry in the livelihoods of coastal communities and as part of promoting sustainable economic activities farmers are encouraged to process the seaweed and give it an additional value. The same case is evidenced in the Philippines where the technology for processing seaweed and extracting carrageenan and agar is existent and in constant development. The best practices of Indonesia and Philippines show the opportunities and potentials of seaweed farming in a bigger scale. Moreover; they illustrate that international markets are available and in need of competitors that can offer good quality of processed seaweed. In this regard, Tanzania faces an opportunity that has not been exploited yet and if managed well might bring a good source of income for small-scale farmers.

Marketing activities: In the seaweed industry and specifically talking about value chain it is not only essential to give the raw product an added value, but it is also important to find the proper markets and channels for commercializing it. As previously exemplified, the Philippines has already developed an industry out of seaweed whereas the raw commodity is being processed and just after that exported abroad to France, Korea, China and other countries. In order to enhance the creation of an industry in bigger scales, the definition of potential markets and future clients is basic for succeeding and making the value chain operative. Marketing in itself is a critical function for attracting customers therefore the importance of it. Worldwide the need for carrageenan and agar extracts is increasing since these two substances are used in many products that are daily consumed. In this regard, seaweed acquires importance and particularly an economic value considering that import and export of seaweed is a 200 USD billion business. The key of upgrading the seaweed value chain is not only relying on creating a proper infrastructure for processing it but also finding the target markets and understanding the consumer buying behavior.

Community based organizations: Tanzania seaweed production is characterized by being individual and at a very low scale. Farmers are not organized or associated and all the materials required for seaweed farming are provided by local companies. However, as evidenced in some other countries like India, the tendency is that farmers are starting to work together and joining forces in order to increase their production, have a bigger influence in the local markets and create social networks. In India farmers are encouraged to form self-help groups for obtaining financial support and basic infrastructure for their production. This system has shown advantages since farmers slowly increase their power of negotiation and develop a sense of entrepreneurship. Farmers have being able to improve their economic
situation by working together and sharing resources. This concept of associating the farmers has been applied for other value chain products like coffee in order to help the farmers to get a better price for their production and provide them with communal infrastructure.

**Partnerships:** For developing an industry and particularly to enhance the value chain upgrading it is essential to have identified partnerships. In some of the best practices examples previously described, the main partner is the Government who is providing financial support and extension services for improving and increasing the production. Local seaweed companies, like in the case of India are as well important partners that are providing basic infrastructure. If partnerships are well established between the private and public sector it is feasible to develop an industry in good terms. Ideally not only the Government is responsible of support financially but other partners such as the private sector, NGO’s and some investors are in place to cooperate and work together with the farmers and the public sector. In this way resources are optimized and all stakeholders involved are benefitted.

**Seedlings and seaweed varieties:** Even though seaweed is farmed worldwide, not in every country the seaweed is the same. There are many varieties and some of them are most appreciated like for example *cottoni*. In the case of the Philippines it has being found around 800 varieties of seaweed of which three of them are particularly important at the commercial level. In China, on the other side, it is produced the *Laminaria* variety which initially came from Japan. Each country specializes according to the varieties found but there is still always the opportunity to start producing new varieties that are more demanded internationally and especially have a better price on the market. In the case of Tanzania, just as Indonesia, there are mainly two varieties, *cottoni* and *spinosum*. Those are important for the world production of carrageenan, particularly *cottoni* is highly appreciated. However, in Tanzania mostly the *spinosum* variety is farmed since it is easier and not as sensitive as the other variety. On the other hand, seedlings are important as well for improving the quality of the production. As evidenced in the Philippines the Government has programs for providing free seedlings to the farmers. This fact is essential in order to guarantee a continuous quality production and renewal of the plants.

**Trainings and demonstration farming:** Seaweed farming does not require many inputs or highly skilled labour, however in order to guarantee a quality production and especially to be able to compete worldwide, it is essential that seaweed farmers get periodical trainings and workshops for improving the seaweed production. The Government in the Philippines has been conducting free trainings and establishing demonstration farms for introducing new
methods of harvesting and drying. Normally, seaweed farmers learnt this practice without any training or workshop; however for further processing and elaboration of derivate products an extra training is needed. Like evidenced in the Philippines, one of the success factor of seaweed farming is the assistance provided by the Government in capacity building and basic infrastructure provision.

Cooperatives: The formation of cooperatives in the seaweed industry has being a successful practice for bringing farmers together and by that increasing their influence in the local markets. Indonesia illustrates a good example in this regard since the government has encouraged farmers to organize themselves and form cooperatives that are giving added-value to seaweed and have already some processing facilities in place. This concept of organization has shown positive effects in coastal communities since they are working together to increase the production and as a result getting higher prices. As in many other countries seaweed producers, the formation of cooperatives is the trend for avoiding individual farming and encouraging entrepreneurship, active participation of the community and its integration on the seaweed industry.
Chapter Three

3. Theoretical and Conceptual Framework

The theoretical and conceptual frameworks are essential elements in every research since they define the main variables that will be studied and the relationships between them. Moreover, they streamline the focus of the research and identify the dependent and independent variables. In this part, it will be analyzed the main theories that are connected to the topic and based on them develop variables for further study.

3.1. Sustainable Livelihood

The present research will intend to analyze the seaweed farming industry combining the tools and concepts of the Sustainable Livelihoods (SL) approach which is a theory that is helpful for determining livelihoods strategies according to the existing frame conditions and externalities. A key word is livelihood which comprises people, their capabilities and their means of living which includes food, income and tangible and intangible assets (Chambers, Conway 1991). A livelihood is environmentally sustainable when it maintains the local and global assets on which livelihoods depend and brings benefits to other livelihoods. A socially sustainable livelihood is the one who can cope and recover from stress and shocks and still provide for future generations (Chambers, Conway 1991).

SL approach is based on poverty reduction and considers carefully the way people live and the importance of structural and institutional issues (Ashley, Carney 1999). Particularly important in the SL concept is the stress on the link from the micro to the macro aspects, rather than working only at the community level. Policy framework and governance are thus very much reflected on SL.

SL is an important instrument since it perceives people not as vulnerable and victims but as engines of their own change and progress. The sustainable framework is proposed to be flexible and dynamic in order to have a better use in planning and management of future projects. The core of SL relies on the people, their capabilities and their resources such as income and assets. This approach has centered its attention on the priorities of the poor population and their needs and it presents a big change on what normally is discussed at the international arena when talking about the efforts done by the government and the donors. If they provided a facility or service, nevertheless SL tries to focus on the people themselves. The approach questions if sustainable improvements in people’s livelihoods have been
actually taken place. As a consequence, a significant difference will be done in matters of poverty elimination goals.

**Box 1: Sustainable Livelihood core principles**

**People-centered**: External support should focus on the real needs of the people and understand their current livelihoods, social environment and ability to adapt.

**Responsive and participatory**: people themselves should be the key actors by any development process. Outsiders need only to establish clear processes that allow them to hear the people´s voice.

**Multi-level**: poverty has many levels and will be only alleviated if the development combines the needs and priorities at the micro level and the already existing structures at the macro level.

**Sustainable**: a balance between the four key dimensions of sustainability-economic, institutional, social and environmental sustainability- has to ensure during the process.

**Dynamic**: the strategies derived from SL have to be flexible and understand the nature of people´s livelihoods and develop a long-term commitment

Source: Own construction based on Ashley, Carney 1999

Seaweed farming is very much related to Sustainable Livelihood since it is a practice that is contributing to the livelihoods of many women and families in Zanzibar. As the theory mentions people do not live in isolated communities but keep always influences with multiple stakeholders which is the case of seaweed farming where women are in constant connection with agents, seaweed companies, suppliers, etc. The concepts of SL are applied for many different levels but frequently they are used for the household level attempting to enhance the local and global assets on which livelihoods depend (Chambers, 1991). Seaweed farming is mostly a sustainable practice, since it does not create any impact for the environment and it is considered as a way to reduce the pressure on marine areas and coral reefs.

Moreover, the main idea behind SL is to enhance the participation of the community and particularly to maximize their potentials and reduce their constraints and weaknesses (Department for International Development, 1999). For the case of seaweed farming this is exactly the main goal, once the challenges are identified, to maximize and exploit the potentials in a way that people can make a living out of it. Interventions and strategies can be formulated according to a carefully livelihood analysis.
3.2. The Livelihood System

The livelihood system is a tool that helps organizing the complex issues around poverty and the local circumstances of a specific community. This method is tailor made according to the local needs and priorities. This framework was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee based also in a previous work of the Institute of Development Studies (Department for International Development 1999). The livelihoods framework presents in a comprehensive diagram the main factors that affect people’s livelihoods and the typical relationships between these. This method can be used in planning new activities or assessing the contribution to sustainable livelihoods by activities already in place. The framework emphasizes important issues and their links as the central influences and processes. It also depicts the diverse factors that have an influence on the livelihoods. It is important to consider that the model is people-centered and doesn't work in a linear manner. The main objective of the livelihood system is to help the different stakeholders to engage in a coherent and structured debate about the factors affecting the livelihood, their importance and the way they interact to each other. By this it might be easier to identify appropriate strategies to support and promote livelihoods in a specific area (Department for International Development 1999).

The case study of upgrading the seaweed value-chain can be analytical studied with the Sustainable Livelihoods framework (See Figure 5), a SL strategy that contains special elements that are helpful to determine the livelihoods strategies according to the existing frame conditions. Moreover, it shows that livelihoods are shaped by a multitude of different factors that are constantly shifting (Department for International Development 1999). Therefore the framework is intended to be a flexible tool for use in planning and management since it helps to organize all the factors and complexities that affect a livelihood.

The Livelihood System will provide an interesting study and particularly an understanding of the different elements that influence the seaweed farmers for make their living. This method helps adapting the different views on a livelihood and determines how households combine their assets for their daily survivor. In this sense, the main objective in developing this matrix for the specific case study relies on depicting the reliable resources the community has in a vulnerable environment and on the other hand the role played by structures and processes influencing the access to assets for the households.
As shown in Figure 5 the Vulnerability Context frames the external environment in which people exist. Normally the livelihoods of people are affected by critical trends, shocks and over which they have limited or no control at all. The following Box describes some examples:

**Box 2: Vulnerability Context examples**

<table>
<thead>
<tr>
<th>Trends</th>
<th>Shocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population trends</td>
<td>Human health shocks</td>
</tr>
<tr>
<td>National/international economic trends</td>
<td>Economic shocks</td>
</tr>
<tr>
<td>Technological trends</td>
<td>Natural shocks</td>
</tr>
<tr>
<td>Trends in governance</td>
<td></td>
</tr>
</tbody>
</table>

Why is the Vulnerability Context important to analyze and adapt to every case study selection? Because it has a direct impact on the people’s assets and the option they have to pursue beneficial livelihood outcomes. Shocks can be described as forces that can destroy assets directly (floods, storms, political conflicts, etc) or even the international economic shocks like rapid exchange rates and terms of trade. Trends on the other hand are more
predictable and have a more global influence. It is important to mention that all the trends are negative; they can also bring favorable influences.

The asset pentagon or capital assets refer to the resources that a household can use. There are five different types of assets:

**Human capital:** represents the skills, knowledge and ability to labor that enable people to fulfill their work. It is essential in order to make use of the other three assets.

**Social Capital:** refers to social resources required for the people to pursue their livelihood objectives. Variables such as social networks, formation of groups and relationships of trust are the main variables. It is also linked as a sub-capital to the political one which means access to power holders.

**Natural Capital:** represents the natural resource stocks from which livelihoods are derived. There are tangible and divisible assets that are used directly for the production.

**Physical Capital:** comprises the basic infrastructure and goods needed to support livelihoods. It refers to affordable transport, shelter and buildings, available and affordable energy and adequate water supply.

**Financial Capital:** defines the financial resources that people need in order to achieve their livelihood objectives. There are two main sources of capital: available stocks which refer to the savings and regular inflows of money which could be any external money excluding earned income.

The structures and the processes refer to the institutions, organizations and policies that shape livelihoods. They are important because they determine the access to the various capitals and especially because they are decision-making bodies. Structures refer to formal institutions which are present at the village and processes refer to the “rules of the game” that are used in the village/town.

Finally, the livelihood strategies are the ones developed by the households to organize their daily survival in order to achieve some outcomes. Livelihood strategies adapt to gradual trends and cope with short-term shocks.

The SL approach is about supporting people to achieve their own livelihood goals. Therefore, the Livelihood System Matrix presents a useful tool in order to analyze the current situation of one specific community and prepare the best possible interventions that are suitable. The Matrix for the present case study will be practical to determine the context on women
engaged in seaweed farming, their main assets and the relationships between all important factors that influence their performance.

### 3.3. Value Chain Approach

Value chains are known for describing the sequence of productive processes from the provision of specific inputs for a particular product to primary production, transformation, marketing and up to final consumption. It is an economic model that pretends to combine the selection of a specific product and the appropriate technology with a form of organizing the actors in order to access the market (Bäumer, 2012).

The value chain approach was built upon the idea that an organization is more than a random compilation of machinery, equipment, people and money. Only if these factors are organized into systems and systematic activities it will be possible to produce something for customers who are willing to pay a price. Porter argues that the ability to perform particular activities and to manage the linkages between these activities is a source of competitive advantage (Recklies, 2001). The basic model of Porters Value Chain is as follows:

**Figure 6: Value Chain**

![Value Chain Diagram]

The value chain approach is a key point in this research since it will evaluate the way the value chain for seaweed farming is organized, its opportunities and its bottlenecks. The value

Source: Bäumer, 2012
chain analysis is a useful concept for applying pro-poor economic development strategies and addressing market development issues. Moreover, it intends to determine if the value chain approach is the one appropriate for improving seaweed practice. For the further research, some variables related to the value chain approach are required for determining the usefulness of this approach in the seaweed farming sector. For instance, a main element is mapping how the seaweed farming chain is currently operating and the actors involved. A main variable is the technical capacities that are used for producing the commodity and commercializing it. Determining the inputs required for seaweed farming and if they are accessible. In the production phase, it is important to identify how much is produced and the quality assessment. Also the time dedicated to farm and the plot sizes. For the marketing phase, it is also important to identify the transportation system and the commercialization channels. As an institutional framework, regulations and policies have to be identified as the extension services provided for the activity.

Since seaweed farming is a practice predominantly done by women, it is important to consider them as main actors within the value chain approach. In this regard, it is crucial to fully integrate women in the value chain. In general understanding the dynamics and mindset of the actors involved, in this case women from Zanzibar, might help to get the right incentives in order to improve the production and start benefiting from it. Most of the times, in many different value chains; women are represented disproportionately in comparison with men, this aspect is a particularly strong characteristic of globalized export chains (Coles, 2011). For the case of seaweed farming, women belong to the lowest nodes of the chain while main have higher positions and bigger influence on the business. However, this system is not necessarily the right one, since women as main producers are essential actors that have to be inserted in the chain dynamic. No disproportionality should be accepted in a value chain upgrading.

Furthermore, for upgrading the value chain is required to create competitiveness which means meeting standards in quantity, quality, size, etc. Upgrading, according to Coles and Mitchell 2011, may include some processes described below:

- Process upgrading: increasing the production efficiency resulting in reduced unit costs. It can involve improvement of technology or re-organization of the production process.
- Product upgrading: improvement of the quality of the product or more variety resulting in higher value.
- Functional upgrading: shortening of the chain and small steps in processing the product
- Channel upgrading: new marketing channel that leads to a new end market, for example export market.

For enhancing the participation of women within the value chain approach it is essential to enhance social capital, which is defined as the ability of actors to secure benefits by virtue of membership in a social network (USAID, 2011). Social capital is based on social networks which have as fundamentals trust, reciprocity and shared norms of action. It is a helpful tool since it facilitates access to information, resources and market opportunities. Moreover, social capital may help women particularly in seaweed farming in articulating better their needs and negotiating with other actors involved in the chain. Improvements in processes, products and functional distribution in value chains can improve chain-level outcomes leading to women’s empowerment and, in the end, to improved household poverty outcomes.

3.4. The role of women in value chain upgrading and empowerment

Women play a key role in many economic sectors and are instrumental in upgrading value chains. However, in some cases the way societies and cultures are organized regarding economic activities, allocating and spending household income makes it challenging for women to save some money for future investment in upgrading. Normally, the earnings from women are expected to be used for household expenses and there is no room for future investments and savings.

In seaweed farming the role of women is essential in order to have a clear perspective of their livelihoods and the responsibilities they have in their Swahili society. Value upgrading requires that actors change their behavior which could mean that they have the desire to change, the required know-how, a conducive climate for change and the rewards (ACDI/VOCA 2011). For instance, in the value chain, which is related to the production, harvesting, processing, marketing and business management, there are social norms that shape, drive, and enforce business practices. These comprise women’s time constraints, mobility constraints and especially in the case of seaweed the limited bargaining power due to a lack of knowledge and alternatives. It might be the case that socio-cultural norms could limit women’s ability to interact with male commercial agents that are part of the value chain, even with institutions and organizations. As in every economic sector there are some differences in men’s and women’s access to information and other inputs; therefore it is essential to understand the social and cultural behaviors in order to design appropriate plans and projects that will bring benefits for the society as a whole.
In this regard in the context of gendered economies, women and men participate at multiple levels in value chains, often in different tasks, and with different opportunities for upgrading. The participation of women and men is decisive to production and growth, yet, there is limited understanding of the gender dynamics related to upgrading. While men and women may face similar constraints to upgrading, their capability and incentives to overcome them often vary. Understanding these dynamics can help to get the right incentives to the right actors to promote upgrading.

Even when women may not directly control assets and income, they and their households can benefit from their engagement in value chains, for instance through better nutritional outcomes and increased food security resulting in an aggregate household production and income. In particular, the benefits of women's participation in value chains are determined by their control of productive resources and household level decisions (Coles and Mitchell 2010).

**Box 3: Gender definition**

Gender describes the socially constructed characteristics of women and men in a given society/culture. Through interaction, socialization and family roles, women and men learn to be different in behavior. Therefore, gender is learned, dynamic and changes over time.

Source: ACDI/VOCA, 2011

Moreover, empowering people—women—means ensuring an actively participation in the economy and the society which is central for an effective development strategy. Empowerment is defined as at the individual level as having the ability to shape one’s life (Stern et al. 2005). The concept focuses on increasing the capabilities of the poor people to enhance their health, education and security by participating in the decisions that shape their lives. The issue of empowerment emerges largest on gender issues. Women empowerment is seen in many cases as a goal in itself since it is an essential part of equity and justice. There is no doubt that opportunities for women have a major impact on development effectiveness. For instance, wages and salaries directly paid to women give them the control over the household income and the productive assets considering that women generally tend to increase household spending on food and clothing and reduce spending on alcohol and tobacco (Stern et al. 2005). The determinants of empowerment are the following:
As seen in the Figure 7 empowerment is determined by external and internal constraints and what the person owns and possesses. If all the constraints are in some way managed and positively influenced the individual will be able to be empowered and be capable of taking his or her own decisions regarding assets, preferences, etc. Empowerment also increases the person willingness and ability to take risks and start innovating, which is exactly what is required in the seaweed farming industry in order to improve the income women in Jambiani are getting. Women empowerment together with the concept of Sustainable Livelihoods is for the matter of this research an important point which can help to understand the aim of development and especially the goal of external interventions in villages such as Jambiani. Empowerment means that the voices of women are heard and having security over assets such as land, houses, etc.

3.5. Conceptual Framework

The conceptual framework is a useful tool for presenting, in a graphical manner, the variables that the research will be based on. Furthermore, the conceptual framework is a convenient instrument for connecting the research issue, literature review, theories, data collection and analysis. Conceptual frameworks act as a map for giving coherence to empirical enquiry. For the case of the present research a conceptual framework was carefully elaborated with the main concepts and issues to be tackled throughout the investigation. Moreover, it establishes the relationship between dependent and independent variables which will be subject of analysis in the next chapters. In this regard, the value chain
upgrading of seaweed farming which equals to livelihood improvement and employment opportunities is a dependent variable since it will change in response to the other variables like financial, social, human factors, etc. The success of the dependent variable depends on how positively the independent variables influence to each other and if they are in place. The conceptual framework was elaborated according to the main livelihood assets that are determine in the Sustainable Livelihood theory. These factors are very useful for finding out if seaweed can be a successful livelihood option for women in Jambiani and considers women as a unit of analysis. Moreover, as sub-variables some concepts derived from the literature review were taken into consideration. These aspects have being helping to enhance livelihoods based on seaweed farming activities at the international level. The following conceptualization of the value chain approach in seaweed farming contains several factors that have being systematically identified for future analysis. For time reasons it is not possible to study them all, however in the next chapters the main variables object of study will be enumerated, explained and linked with the theoretical concepts of the Sustainable Livelihoods and Value Chain with the aim of answering the research questions listed at the beginning of the study. Below, the conceptualization of value chain approach in seaweed farming in Jambiani, Zanzibar.

**Figure 8: Conceptual Framework**

<table>
<thead>
<tr>
<th>Financial factors</th>
<th>Human factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Market price of seaweed</td>
<td>- Training and demonstration</td>
</tr>
<tr>
<td>- Credit institutions available in</td>
<td>farming</td>
</tr>
<tr>
<td>Jambiani</td>
<td>- Women health conditions</td>
</tr>
<tr>
<td>- Cost of production</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Seaweed organizations in</td>
</tr>
<tr>
<td>Zanzibar</td>
</tr>
<tr>
<td>- CBO’s in seaweed farming</td>
</tr>
<tr>
<td>- Cooperatives</td>
</tr>
<tr>
<td>- Partnerships</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value chain factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Production</td>
</tr>
<tr>
<td>- Selling</td>
</tr>
<tr>
<td>- Processing</td>
</tr>
<tr>
<td>- Marketing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Natural factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Seedlings and varieties</td>
</tr>
<tr>
<td>- Integrated mariculture</td>
</tr>
<tr>
<td>- Inputs for farming seaweed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Accessibility Jambiani-Stone</td>
</tr>
<tr>
<td>Town</td>
</tr>
<tr>
<td>- Processing factories</td>
</tr>
<tr>
<td>- Communication</td>
</tr>
<tr>
<td>- Availability of technology</td>
</tr>
</tbody>
</table>
o **Financial Factors:** These factors refer to the resources that people have for fulfilling their livelihood objective. In this case what is meant to study is mainly two sources of financial capital. On one hand there is the available stocks which refer to the savings that women might have for investing in their business. These could also come from credit institutions if they are available in the area. The second factor refers to the earnings and wages women receive from their economic activities. For this matter, it is important to consider the market price of seaweed and how much money are women getting from this practice. Furthermore, the economic side should not be forgotten, therefore it is essential to revise the costs of production of the raw commodity and an average of the possible costs of an upgrading. The financial asset is crucial in any introduction of new economic activity and will determine its success. If seaweed farming is not paying enough, women might stop farming. It is normally the asset that tends to be the least available to the poor. Actually is because the poor lack of financial capital that other types of capital are so important to them.

o **Social Factors:** In this regard the main variables object to study is the network and connectedness currently existing in Jambiani. This means all the organizations in Zanzibar that are involved in seaweed practices directly or indirectly. Furthermore, the analysis under social factors will highlight the existent social capital in Jambiani meaning the networks and the types of relationships that seaweed farmers maintain with each other; not necessarily these have to be formal but they are facilitating cooperation, relationships of trust for reducing transaction costs. For instance, it will be meaningful to analyze the possible existence of CBO’s, like evidenced in other countries, and its responsibilities regarding the seaweed industry. The formation of cooperatives is considered as well as another sub-variable since it is considered a successful factor for the development of a small-scale industry. Finally, under social factors the variable of partnerships acquires importance particularly for upgrading the value chain and counting on external investment and capacity building processes.

o **Value Chain Factors:** A main part of the present research relies on the existent organization of seaweed farming. For that matter, it is important to consider the whole chain from the production, storing, processing and marketing. Marketing as a concept that refers to the customers and markets where seaweed is exported. In this regard, it is interesting to examine the type of markets where the seaweed is exported and study the consumer’s behavior. Moreover, the analysis of actors involved in seaweed farming, directly and indirectly, is included in the value chain. Additionally, the value chain aspect will be examined and adapted to the reality of seaweed farming whereas women are main actors and potential agents of change.
o **Human Factors:** These factors are represented by the skills and knowledge people have. For that matter, the main variables focus to study in this regard will be the level of knowledge that women have in seaweed farming meaning trainings, workshops and demonstration farming provided by public or private organizations. These variables provide as well a sign of motivation of women to invest in their own learning process and develop more skills. Under another human factor it is important to consider the health conditions of women as a main variable since seaweed is mostly a practice done by hand and a high demand of labour.

o **Natural Factors:** The seedlings and varieties count as an important factor because they can improve the quality of seaweed. The introduction of new varieties can be regarded as a potential for diversifying the production and responding to the worldwide demand. The natural factors are as well determined by the natural resources available useful for livelihoods. For seaweed farming, it is essential to consider the coastal resources and if seaweed is not affecting them. For this matter a main variable object to study is integrated mariculture which refers to a concept used by the FAO as a conception to combine the farming of seaweed with other marine water activities in order to avoid overexploitation of resources. This concept yet new has a big potential to be untapped and is internationally highly appreciated. Another aspect object of study is the materials used in farming seaweed and its impacts on the environment and on the industry.

o **Physical Factors:** These factors capture the basic infrastructure needed to support a livelihood. In this regard, it is crucial to analyze the transport options for seaweed. Another point is the availability of infrastructure for seaweed, like for example processing, storing and drying facilities which have a big impact in the quality of the end-product.. The access to information through communications is considered as well as an essential factor which can give the farmers new ideas of the latest tendencies. Moreover, the technology required for a good value chain upgrading has to be carefully analyzed since it has a big impact for the value chain. Physical factors are important to consider because the lack of many of them may be the core dimension of poverty. For instance, without adequate supply of water and energy people normally spend longer periods of time in non-productive activities such as water collection and fuel wood. It is evidenced that the opportunity costs associated with poor infrastructure can prevent education, access to health and particularly income generation.
After the analysis of the conceptual framework and its different variables that are also specified in the methodology chapter, it will be possible to determine if seaweed farming is a successful income-earner activity and mostly an alternative for uplifting the social and economic conditions of women in Jambiani in order to improve their livelihood. The conceptual framework as mentioned before is based on the Sustainable Livelihood matrix and the variables identified in the literature review. Moreover, the combination of two theoretical concepts like livelihoods and value chain offers an interesting blend since it seeks to promote choice, opportunity and diversity in a systematically and well organized process of production, harvesting, processing and commercializing. Both concepts are part of a dynamic process in order to meet the various needs that people have at different times and under different circumstances. Furthermore, the concept of empowerment is also integrated within the value chain upgrading since it refers to including the people and ensuring their actively participation in the economy and in the value chain in order to improve their livelihoods opportunities. The value chain concept together with empowerment might encourage the person willingness and ability to take risks and start innovating and change their role to entrepreneurs. For that matter, it is required to have wider context and a clear and accurate picture of the structures which is the goal of the value chain. The concepts of livelihoods and value chain are helpful for decision-making processes and for drawing preliminary conclusions according to the variables identified.
Chapter Four

4. Research Methodology

This chapter will focus on explaining the procedures for the empirical data gathering of the present study. It will described the tools and methods used as the selected study area and the unit of analysis object of this study.

4.1. Choice of research strategy

The present research study will be a case study of seaweed farming in the village of Jambiani in Zanzibar. The research strategy was chosen based on the contextual analysis that case studies provide. A case study is a useful approach for elaborating a descriptive analysis of any kind of situation or event. Normally, cases studies are used to explore causation in order to find underlying principles. This kind of research strategy is very useful in investigating phenomena within a real-life framework. For the case of seaweed farming it was important to select a specific case study in order to concentrated resources and tools only in one defined area. Since there are time limitations there was only one case study selected which for the matter of seaweed farming is particularly important since Jambiani is an important seaweed producer and women are still on the first stages of a possible industry development. Cases studies provide the basis for application of ideas, theories and concepts. Additionally, in order to analyze carefully the value chain of seaweed it was necessary to observe the daily activities of producers, agents and companies in order to be able to have reliable and consistent findings, therefore the method of real-life analysis was the adequate in order to collect the required data.

4.2. Research design and process

The research design depicts the sequence of the activities that will be followed during the period of research. It is important to mention that as the literature review as the conceptual framework are influencing the phase of the research methodology by giving background information and by defining the key variables that are meant to be studied during the research.
4.3. Study area

The study area of the present study is Jambiani, a mainly fishing village located on the south east side of Zanzibar. Jambiani is a rural fishing village with an average population of 8,000 (Zanzibar Action Project, 2013). The village is long and narrow and has about 5 km of coastline. The distance from Stone Town, due to improved road, is about 1 to 2 hours. Bicycles are the main means of transport in the village and along the beach. The two main accesses to Jambiani are a sandy main street and the beach itself.
This area was selected because seaweed is farmed along this coast and there are some small seaweed companies already settled nearby. Moreover, Jambiani is considered as an important seaweed producer in the area. At low tide, the wide beaches provide a big surface for seaweed culture and the place is full of racks like low washing lines staked out on which the farmers peg the seaweed. Moreover, this zone caught my attention since it shows on one hand a combination of beautiful landscapes with a high growing potential on tourism and seaweed farming, but on the other hand a visible level of poverty and lack of infrastructure and services. How is it possible that such a rich area is indeed so poor? The growth of tourism in this area might represent a threat as an advantage since many tourists visit the area which is injecting money into the village but at the same time not everybody is benefitting from this development. Therefore, Jambiani is the perfect location to research since it can illustrate the potential of seaweed farming in place where value-chain upgrading and women empowerment is possible as a proposal to push the industry and improve the livelihoods of the community.

4.4. Data collection and protocols

For the present research different data collections methods were used. For instance, the field trip lasted 10 days in February 2013 and it was divided in three sections in order to have structured data and organized information:

1. Observation:
   The first two days were dedicated to observe the surroundings of the area, check the conditions of the village, how people live and specially see the activities of the women engaged in seaweed farming. In this time, the seaweed practice was held between 10:00 AM to 14:00 PM, during low tide. This factor changes according to the moon position. All what was observed was documented in the Observation Report.
2. Interviews with key informants:
The interviews with key informants were done based on questionnaires which were previously prepared. The interviews conducted to women engaged in seaweed farming were at individual basis and the selection was random. During the field trip 12 questionnaires were conducted to women and 1 man. This sample intended to cover about 15% of the whole seaweed farmers within 2.5 km of the coast line belonging to Jambiani, particularly the south part of the village. The questionnaires were designed to obtain information on perception of seaweed farming as income generating activity in the area and the current challenges and bottlenecks farmers are facing. Moreover, it was important to determine their knowledge level in seaweed farming and their awareness in value-addition. The key informants were on the other hand selected according to their involvement in seaweed farming practices and their importance for future value chain upgrading. From the field work mostly qualitative data was obtained from the interviews conducted. Some of the interviews, particularly with seaweed farmers were conducted with the help of a local translator since the author is not a Swahili-speaking and the respondents did not feel comfortable with English.

3. Collaboration in seaweed activities: For understanding the reality of women working in seaweed farming, it was required that the author to take part in the daily activities with the farmers. The author was invited to collect the seaweed ready to harvest and to sow the next
seaweed to be collected in approximately 6 weeks. Furthermore, in the Seaweed Center in Paje the author had the opportunity to prepare seaweed soaps and participate in the process of its elaboration.

The collection of primary data had the following structure:

<table>
<thead>
<tr>
<th>Organizations</th>
<th>Private Sector</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Zanzibar Seaweed Cluster Initiative (ZaSCI)</td>
<td>- Switch Organization</td>
<td>- Chief of the Village of Jambiani</td>
</tr>
<tr>
<td>- Zanzibar Action Project</td>
<td>- Seaweed Companies in Zanzibar: ZANEA Seaweed Company Ltd, C-weed Corporation</td>
<td>- Women engaged in seaweed farming: 12 random respondents from the area of Jambiani + 1 man seaweed farmer</td>
</tr>
<tr>
<td>- Seaweed Center Paje</td>
<td>- Local buyer ZANEA Seaweed Company Ltd.</td>
<td>- Community leader from Jambiani</td>
</tr>
<tr>
<td>- University of Dar-es-Salaam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Institute of Marine Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ministry of Natural Resources and Tourism, Fisheries Division</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional to the Observation Reports and Interviews, to support the information collected photographs and videos were taken particularly from the daily seaweed practice.

Moreover, besides the empirical data this study is based on secondary data as well which is based in census reports, official documents, previous studies, articles and publications related to seaweed farming in the region and particularly in Tanzania. Both methods used for gathering the information are in the direction for addressing the research questions established in Chapter One as the main variables object of study defined in the Conceptual Framework. Below the data collection matrix which illustrates the main sub-variables that were considered for gathering the data and later on for the analysis comprised in Chapter Five. The matrix shows the type of information required and where to obtain it, like for example through key informants interviews or questionnaires. The table comprises primary and secondary data collection.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Sub-variable</th>
<th>Source of data</th>
<th>Data collection method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Factors</td>
<td>Market price of seaweed</td>
<td>-Women Jambiani, -Seaweed Companies</td>
<td>Interviews with key informants</td>
</tr>
<tr>
<td></td>
<td>Credit institutions available in Jambiani</td>
<td>-Women Jambiani -Chief of the village</td>
<td>Literature review+ interviews with key informants from the Ministry</td>
</tr>
<tr>
<td></td>
<td>Cost of production</td>
<td>-Women Jambiani -Seaweed companies</td>
<td>-Interviews with key informants in the community -Literature review</td>
</tr>
<tr>
<td>Social Factors</td>
<td>Seaweed Organizations</td>
<td>Zanzibar Seaweed Cluster Initiative</td>
<td>Interview with Dr. Flower Msuya, Senior Researcher</td>
</tr>
<tr>
<td></td>
<td>CBO’s in seaweed farming</td>
<td>-Women in Jambiani -Chief of the village -Zanzibar Action Project</td>
<td>-Interviews with key informants -Literature review</td>
</tr>
<tr>
<td></td>
<td>Cooperatives</td>
<td>Women in Jambiani</td>
<td>Interview with community leaders</td>
</tr>
<tr>
<td></td>
<td>Partnerships</td>
<td>Zanzibar Seaweed Cluster Initiative</td>
<td>Interview with key informants</td>
</tr>
<tr>
<td>Value Chain Factors</td>
<td>Production</td>
<td>Seaweed farmers, Zanzibar Seaweed Cluster Initiative</td>
<td>Questionnaires, stratified sampling, observation, interview with key informants</td>
</tr>
<tr>
<td></td>
<td>Selling</td>
<td>-Seaweed farmers -Seaweed companies</td>
<td>Interviews with key informants</td>
</tr>
<tr>
<td></td>
<td>Processing</td>
<td>Agents</td>
<td>Interviews with key informants</td>
</tr>
<tr>
<td></td>
<td>Marketing</td>
<td>Agents Seaweed companies</td>
<td>Interviews with key informants</td>
</tr>
<tr>
<td>Human Factors</td>
<td>Training and demonstration farming</td>
<td>-Seaweed farmers, -Zanzibar Seaweed Cluster Initiative</td>
<td>Questionnaires, stratified sampling, interview with key informants</td>
</tr>
<tr>
<td></td>
<td>Health conditions women</td>
<td>-Seaweed farmers -Zanzibar Cluster Initiative</td>
<td>Interview with key informants</td>
</tr>
<tr>
<td>Natural Factors</td>
<td>Seedlings and varieties</td>
<td>Institute of Marine Sciences, University of Dar-es-Salaam</td>
<td>Interviews with key informants</td>
</tr>
<tr>
<td></td>
<td>Integrated farming</td>
<td>-Zanzibar Cluster Initiative</td>
<td>Interview with key informants, literature review</td>
</tr>
<tr>
<td></td>
<td>Inputs for farming seaweed</td>
<td>-Women -Agents</td>
<td>Interview with key informants, observation</td>
</tr>
<tr>
<td>Physical Factors</td>
<td>Processing factories</td>
<td>Women, companies, Seaweed Center, Zanzibar Seaweed Cluster Initiative</td>
<td>Interview with key informants, observation</td>
</tr>
<tr>
<td></td>
<td>Availability of technology</td>
<td>Women, companies, Seaweed Center, Zanzibar Seaweed Cluster Initiative</td>
<td>Interview with key informants, observation</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td>Women, companies, Seaweed Center, Zanzibar Seaweed Cluster Initiative</td>
<td>Interview with key informants, observation</td>
</tr>
</tbody>
</table>

Source: Own construction, 2013
4.5. Unit of analysis

The smallest unit of analysis is the major entity that will be studied in the research; it is the “what” or “who” that is object of the study. For instance it could be individuals, groups, geographical units, social interactions, etc. (Trocim, 2006). For the case of the present research women are the unit of analysis since they are mostly the ones involved in seaweed farming and they are the object of study in many of the variables defined in the Conceptual Framework. The value chain of seaweed starts with women and with the final consumer in some developed country. For the present research, it is central to analyze the conditions women have as they take part in the seaweed practice.

4.6. Reliability and validity of data collected

In research validity has two components: internal and external. The first one refers whether the results of research have been legitimate and appropriate on their selection and the external factor refers to the transferability of the results to other groups of interest (Handley, 2001). In this regard, the data collection methods for this present research will be clearly defined in order to have a criteria and above all objectivity during the data gathering. Moreover, the interviews and observation will be recorded in daily reports in order to have all the information structured. Validity of the data will be ensured by using only legitimate and reliable sources, not only for secondary data but for primary data collection as well.

4.7. Data analysis and presentation

Data analysis refers to the processing and transformation data into useful information for decision-making processes. Data gathered during the field and throughout the investigation was analyzed, interpreted and intended to give answers to the research questions established at the beginning of the research. Data analysis under the present study is carried out mostly qualitatively mainly filling data collected during the field work into reviewed models and theories. This due to the fact that the type of data required for addressing the objectives of the research is qualitative. In order to make the data easy to understand and visualize it will be presented in matrixes, tables, diagrams and pictures which will show the main issues analyzed.
Chapter Five

5. Analysis of the Case Study

The present chapter will analyze the case study based on the guidelines of the Sustainable Livelihood concept explained in Chapter Three. The tool used is the Livelihood System which will help to organize the complex issues of the case study with a structured and clear diagram. Additionally, the concepts identified after the literature review are important inputs for the following analysis and are combined with the Livelihood System. The main purpose of this analysis is to show the main factors that currently are affecting the women’s livelihoods in Jambiani keeping always a link with their occupation in seaweed culture. It is important to mention that for supporting this analysis, part of the observation and the information gathered during the field trip to Zanzibar will be illustrated and described. After presenting the analysis, and according to what the Livelihood System proposes, some possible strategies that might lead to a possible improvement of the seaweed industry with special considerations on the working conditions of farmers will be drawn. The chapter will as well analyze the value chain of seaweed; identify the main actors involved as the challenges and bottlenecks. It is important to mention that the following analysis considers women as main actors of the analysis and will link both conceptual aspects of livelihoods and value chain with some input regarding women empowerment through seaweed farming.

5.1. Case Study: Jambiani, Zanzibar

Jambiani is a small village located in the island of Zanzibar. Its population main activities are mainly fishing, seaweed farming and tourism. It is interested to see the development that Jambiani has been going through according to the information gathered with some key informants in Zanzibar. About 10 years ago, Jambiani was a rural an isolated village without any important growing industry, like nowadays tourism is. Later on, the main road that comes from Stone Town to the south-east of the Island was upgraded and progressively many coastal villages along the road started to develop. Close to Jambiani there is another village called Paje which has a bigger development in comparison with Jambiani, even though both villages have similar characteristics. Paje is not subject of study in this present research; however it is interesting to see the development trends in order to have a wider perspective for further analysis, researches and especially for planning new projects in Jambiani. Furthermore, Paje presents an interesting case because since 2008 it has been established a Seaweed Center where seaweed is processed and getting an added value. Moreover, the
tourism industry in Paje had a boom and new infrastructure was built around the village turning it into a touristic hub. There is such an unprecedented touristic development in Paje that from inside of the village it is quiet difficult to get to the beach because of the hotels buildings and infrastructures. In this regard, considering the trends and already the fame that Zanzibar has, how will Jambiani adapt to the touristic development that every village in Zanzibar is experiencing? And particularly how will this influence the livelihoods of coastal communities that currently are profiting from small-scale activities like seaweed farming?

All these factors are an essential part in the analysis of the future seaweed development, since it comprises not only the human capital but also other elements such spatial, natural and financial factors. Currently, the population of Jambiani, as observed during the field trip, is very poor and lacksthe main services such as tap water and energy. The village has a health center and primary and secondary schools, however education and health, both are areas that need improvement. The main economic activities in the village like fishing and some agricultural practices are not enough to support the households; therefore women are also required to engage in economic activities to increase the income of the family. Seaweed farming represents a good option for them since it is a part-time job, only during low tide; apart from that they can still dedicate their time to other activities and chores, particularly to take care of their children and the household. Seaweed has become an important economic alternative considering that in most of the cases without this practice many women would be unemployed. However, as mentioned throughout the investigation women are getting low prices from the seaweed they harvest. It is evident that the income does not compensate the effort they put in the cultivation, nevertheless it is the only practice they are used to perform.

In this regard upgrading the value chain of seaweed is a possible alternative that might have a big impact on women and specially may improve their income. Giving the conditions of Jambiani, where seaweed is farmed in big extensions and mostly all women of the village are engaged in this practice; it is the perfect location for a case study for analyzing the feasibility of restructuring the value chain and creating and added value combining it with a notion of women empowerment which in the long-term can bring more development and particularly an equal inclusion of women in the society´s economy.

5.2. The Livelihood System in seaweed farming in Jambiani, Zanzibar

The Livelihood System is a useful tool for analyzing all the factors that influence a livelihood. It is particularly a good method since it can be adapted to every case according to its characteristics and specifications. For the case study, this analysis will determine the
behavior of the individuals and the community itself under specific frame conditions. The analysis will focus its attention on the capital assets of the women in Jambiani according to the Five Capital Assets proposed by the Livelihood Strategy, which include: natural, human, physical, financial and social capital.

The Vulnerability Context will be also part of the analysis showing the main frame conditions and particularly externalities which affect livelihoods the most.

5.3. Vulnerability Context

This element represents the part of the framework that lies furthest outside people’s control. The aim of analyzing the Vulnerability Context is to identify those trends, shocks and aspects of seasonality that are of particular importance to livelihoods. The Context is defined by the current frame conditions which determine the vulnerability of the livelihood considering some dimensions such as: economic, social and ecological, which will be followed explained:

**Political Dimension:** In Tanzania the central Government is the one that has the power to formulate policies and regulations although some of the powers are been delegated to local government authorities. The administrative control and management of agriculture and mariculture in Tanzania is under the Fisheries Division at the national level. This department is responsible for formulation and implementation of the Fisheries Act, the National Aquaculture Sector Overview of Tanzania which determines that aquaculture is managed under the Fishers Policy of 1997 (Alieth, 2008). The development of alternative income generating activities, especially in the coastal communities, has become a well-known policy in order to improve the living standards of small-scale fishers and specially to reduce the pressure on fishing. Seaweed farming has been, in this regard, incorporated for achieving better management in mariculture activities in Tanzania. For instance, the government has been raising awareness of sustainable aquaculture practices through workshops and seminars to the community and as an incentive low interest loans and a three-year tax-free period for investors interested in financing commercial aquaculture though the National Investment Centre (NIC) (Alieth, 2008). There are not extended administrative bodies at the district levels; hence District Councils as fisheries officers are responsible for mariculture activities. Although seaweed farming activities are still at low stages, they have been recognized by the Government as important for the future of coastal communities. Moreover, the Government launched the Seaweed Development Strategic Plan (SDSP) in 2005 which intended to develop seaweed farming with the cooperation of different stakeholders with the aim of contributing to poverty alleviation and economic development in the coastal communities of Tanzania.
For the case of seaweed farming, developers or seaweed companies need to obtain licenses or permits from governmental authorities in order to be able to farm and set their business, especially to have a control of the investments and at the same time for avoiding establishing farms in no-take zones such as Marine Reserves and other protected areas. Developers have the responsibility to pay taxes every time they export seaweed. In the case of Jambiani, the main public organ that has been supporting the seaweed activities is the University of Dar-es-Salaam through the Zanzibar Seaweed Cluster Initiative (ZASCI). This organization has offered few trainings and workshops on value addition; however the community of Jambiani has still not be completely reached and covered. However, in general there is a lack of institution attention and low priority in national planning and financial support for alternative practices with a high potential in livelihoods improvement. Even though, the Government launched the SDSP the problem still remained by the implementation and monitoring of the activities and the partners contributions, hence as the situation of the seaweed industry in Jambiani shows, there is the need for government intervention and support.

**Economic Dimension:** The population in Jambiani is mainly dedicated to the fishing sector, seaweed farming, tourism industry and some agricultural practices. It is usual that men work as fishers but also give some services in hotels and restaurants. For the case of seaweed farming, the main economic externality is the market price of seaweed. Currently, women are getting 400 Tsh. for 1 Kg. of dried seaweed (0.25 USD). This amount is too low considering the time and effort dedicated to the practice. During the field work, all women interviewed affirmed that the biggest problem they have in the seaweed business is the price paid through the commercial agents.

The seaweed companies are the ones who are setting the price and the farmers do not have any influenced on it. In Jambiani there is only two seaweed companies buying seaweed from the farmers ZANEAand C-weed Corporation, both of them pay the same price for dried seaweed. Additionally, ZANEA and C-weed Corporation are giving women free material for their seaweed cultivation, like for example rope, bags and small plastic boats. This fact automatically obliges women in exchange to sell their production to the companies. In this regard, even if women put some extra effort in their production the price they are getting will still be the same. This fact has led to quality decrease of the product, since women do not feel motivated to give seaweed a better treatment. For instance, after harvesting it is advisable that seaweed is dried for 2 to 3 days under the sun avoiding any contact with sand or any other external material. However, women in Jambiani, as observed during the field trip, place the wet seaweed at the beach or in front of their houses where it is easily
accessed by animals, sand and dirt. Nevertheless, since there is not a differentiation of prices determined by the quality of seaweed women do not feel encouraged to improve their drying methods and produce better seaweed. In this sense, as many women affirmed the main problem they face is the local market price of seaweed.

Farmers in Jambiani are very much vulnerable at any change or fluctuation of the seaweed price, since they are not part of any structured value chain. Women sell only the raw product and represent the most exposed actors in the whole seaweed value chain. Furthermore, women do not have any access to credit facilities in case they will like to invest some money in improving their business or for any emergency it might come up. The seaweed system is currently organized in a way that appears to support the farmers by giving them the materials required for the production, however intrinsically it contains an obligation in exchange for the farmers. At the economic level, seaweed farmers are limited to expand and are to believe that this is the only way to work. They do not learn how to make their own business prosper since within this system they are just earning for the day. In this regard, they are quite vulnerable, particularly because it is a familiar small scale business.

Box 4: Seaweed farmer, Jambiani

Salma has been engaged in seaweed farming for already 5 years. She never had a training or workshop, she learned by watching her family farming seaweed. Salma did not finish secondary school; she decided to start working in seaweed right away and start earning a bit of money. She is not part of any women or seaweed organization; she comes alone every day during low tide for about 4 hours and works by herself in her plot. She admits that seaweed is not a good business and that prices are too low. She tells once, women in Jambiani complained to the company for better prices, instead they were advise not to talk to loud if not they would not get any free material anymore. Salma says even though she likes farming seaweed, she will be happy to have a new job, maybe in the tourism industry.

Social Dimension: Jambiani is a small village with about 8,000 inhabitants. During the field work it was observed that the village has many children, about 5 kids per household. If the population growth rate continues like that, in the future it will not only be more space for living required but also more infrastructure like schools, health centers and water and electricity services. For the case of seaweed farming it is evidenced that it is an important activity considering a social dimension since it already gives women an occupation whereas otherwise they will be unemployed. The money that they earn in seaweed is used for their
children’s education and school materials. The fluctuations of the price is affecting them since it makes them difficult to continue paying for the education and clothing of their kids. Moreover, seaweed is considered as a good occupation for women since it does not keep women working for the entire day. They still have time to complete their daily chores that otherwise no one else could do.

However, considering the findings of the interviews conducted to farmers, all of them will be happy to engage in the tourism sector. In this regard, they will earn more but at the same time it will required more compromise from their side. It is important to consider that the tourism sector fluctuates as well and in Zanzibar during the rainy season few tourists visit the island. In that sense, women would be in a vulnerable context and most certainly without any proper planning their livelihoods will not improve. Therefore, it is vital that seaweed farming still runs as a main occupation but with an upgrade on the value chain in order to receive better prices and as direct effect improve the livelihoods of women in Jambiani.

Another aspect in the social dimension is the fact that seaweed farming has affected the health of many women. Since they have to work under the strong sun in the sea for some hours, their skin tends to have some adverse reactions. Moreover, since they have to carry bags of the harvested seaweed from the coast to the drying place, normally outside their house, they have presented some back problems since the bags are quite heavy. In this regard, women are vulnerable to get sick which will mean they have to go to the doctor and expend money in medicines and treatments.

Box 5: Male seaweed farmer

Musa is the only male seaweed farmer in Jambiani. He has two wives and 11 kids to feed. All his family works in seaweed. Every day he and his two wives come and work on their plots. Musa did not finish secondary school; he decided to get engaged in seaweed farming when the Company gave him some training back in 1998. He believes seaweed farming is not a good business as the way it is now, when he started the business was profitable and offered better conditions. Sadly, he says there is not enough employment opportunities in Jambiani therefore he keeps on working in this activity. He has heard of initiatives in Paje about producing soap and creams but he believes in Jambiani people are not organizing themselves in order to make a real industry out of seaweed. Musa affirms that nowadays life is too expensive, 1 Kg. of sugar is 1000 Tsh. (0.61 USD) and the price of fish has also increased. What he wants to say is that the price paid to the seaweed farmers is not enough even to cover basic expenses in the household. The fishermen prefer to sell the fish to the hotels and restaurants instead to the community. He says he does not care that seaweed is characterized as an activity for women because of the small wage. He likes seaweed farming but the only way to make it a better business is to increase the price.
**Ecological Dimension:** In seaweed farming, the coastal conditions play an important factor for its proper development. For instance, in the last months, January to February 2013, seaweed farmers observed that seaweed was not growing as it should since some of the cultivations crops were burning. The temperatures of the water highly increased which directly affected the seaweed. Such events that come without any notice affect women and leave them totally in a vulnerable condition. Nowadays, climate change is not only affecting seaweed farming but many other economic activities and even our daily lives, however in the case of the poor this issue acquires another dimension since it literally means that their earnings are reduced. In the case of seaweed farming it is difficult for the farmers to prevent such situations; they are already lucky that unlike other economical practices seaweed is farmed and harvested throughout the whole year, nevertheless they are still vulnerable regarding natural effects. On the other hand, the rainy season affects as well seaweed since it can bleach it. It is therefore advise that seaweed is not dried on the floor but instead in wooden beds where it can dry without any contact to the floor and rain. However, this requirement is difficult to carry out since farmers in Jambiani do not have any kind of drying infrastructure and they are constantly vulnerable, during the three months of the rainy season, that the seaweed might get bleached which means a loss in the production. Once again farmers are vulnerable towards nature, yet vulnerability can be decreased if farmers are organized enough and are aware of prevention methods.

### 5.4. Capital Assets

The livelihoods approach is mainly centered on the people and it seeks to have a realistic understanding of what people consider as their assets and endowments and how do they endeavor them in order to have a positive livelihood outcome. The approach assumes that people require a set of assets in order to achieve positive livelihood outcomes, no single category of assets on its own is sufficient to yield all the livelihoods outcomes that people seek. In the particularly case of poor people whose access to any given category of assets tends to be quite limited therefore they normally seek ways of combining all assets and endowments that they have in creative ways in order to achieve their survival. Below each of the capital assets which are part of the livelihood approach and essential elements of the Conceptual Framework of the present research will be analyzed based on the current livelihoods of women in Jambiani and the findings collected from the field trip.
5.4.1. Human Capital

5.4.1.1. Training and demonstration farming

Women that are engaged in seaweed farming learned this practice by observing their family members. In Jambiani, as in many other areas in Zanzibar, seaweed is a generational activity passed from mother to daughter. From the information gathered during the field trip, women engaged in seaweed practice normally did not finish secondary school; they started at an early stage since they needed to start contributing money to their family. As observed in the next Figure, only a 31% of the respondents finished secondary school, the rest 69% did not finish and started with seaweed right away after finishing primary school.

Graphic 3: Secondary education-seaweed farmers

<table>
<thead>
<tr>
<th>Education</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished</td>
<td>31%</td>
</tr>
<tr>
<td>Not finished</td>
<td>69%</td>
</tr>
</tbody>
</table>

In this regard, the education level of women engaged in seaweed farming is mostly characterized for being low which also stops them from performing other activities that might entail some higher educational requirements. During the interview conducted to women engaged in seaweed, they affirmed that they have not received any kind of training or workshop in order to improve their skills and knowledge in seaweed farming. Only one of the respondents affirmed that she took part in only one training organized in the village of Kidoti where they learned the process of elaborating seaweed soap. However, she affirmed that the soap process is a hard work and she has not been motivated to teach her other colleagues from Jambiani to start with this initiative. The main problem is that women do not have the financial resources to buy the inputs required to produce soap. Yet, the main reason why
they are not involved in seaweed processing is because they ignore that seaweed can be used for other purposes and they are not encouraged to work together as an organization. Most of the women in Jambiani are not aware that the nearby village (Paje) is involved in adding value to the seaweed. The following Figure displays the results from the questionnaires conducted and confirms that most of the seaweed farmers are not aware of seaweed processing initiatives in the close by villages.

**Graphic 4: Awareness of seaweed initiatives**

![Awareness of seaweed initiatives](source)

Source: Own construction, 2013

During the interview with Flower Msuya, Director of the organization Seaweed Cluster Initiative in Zanzibar, she affirmed that in their training programs two persons of every village in Zanzibar were invited to join. Afterwards, the Ministry of Trade was supposed to follow up if the participants are putting in practice and transmitting what they learned, however the Ministry did not conduct a proper monitoring of such trainings and workshops. The aim was to train women as a matter of multiplier effect so they can serve as local assistants for further development of innovative activities. Yet, the main intention was not successful and as women in Jambiani reported they did not take part in any seaweed farming training. The methods and techniques for farming seaweed are the traditional ones used in almost every village in the island. The Seaweed Cluster Initiative has as main goal to foster innovative farming. About 9 villages are already part of the program; however Jambiani has not been included yet.
5.4.1.2. Women health conditions
Seaweed farming is physically a hard work. It is common to hear that women heart their backs because they are standing bent over in the low water for many hours, moreover the sun beats down on them. In many cases women have problems with their eyes since the strong sunlight reflects from the water and most of them do not wear any kind of protection like sunglasses. Additionally, they usually get bad cuts on their fingers and feet from the sharp corals, shells and sea urchings lying in the beach. The salty water also damages their hands and their skin, but still women in some of the cases cannot afford specific protection equipment to avoid these problems. Even though the rough conditions, women are used to them and as they affirm agricultural practices are as well tough work. Still, considering the effort and the negative effects that seaweed might produce on women’s health, the price seaweed farmers are getting is too low considering their effort and their work dedication.

5.4.2. Natural Capital

5.4.2.1. Seedlings and varieties
The most important inputs for seaweed farming are the seedlings or planting materials that usually come from the best selected plants of the previous harvest. Seedlings must be transported to the farm site quickly and protected from exposure to sun and air. Approximately 100-250 grams of cuttings are attached to a line with soft plastic tying material called a “tie-tie” (GIZ Philippines 2007). When a farm is affected by natural calamities like typhoons or plant diseases including a common disease called “ice-ice”, the demand for replacement seedlings is high. Limited access to seedlings can therefore be a serious constraint to expanding production. The seaweed variety used in Jambiani and in most of the villages in Zanzibar is *Euchema* (spinosum), the other variety *cottoni*, even though it has a higher value on the market, is not farmed since it is environmental sensitive and easily catching diseases such as ice-ice and facing often die-offs. Some farmers in Jambiani have farmed *cottoni* using the peg and line method but the mortality rate is high and it was evidenced that farmers spent up to 6 months trying to reproduce the seed instead of farming seaweed regularly. Some programs have been introduced in order to combat the problem of *cottoni* die-offs such as the deep-water floating line, particularly in Pemba Island and Bagamoyo District (Msuya et al. 2007). This method has been recommended as a way to increase seaweed production in Tanzania; however it requires an initial capital that farmers cannot afford. The floating line method is economically superior to the traditional used off-bottom method of farming since there is a significant difference in the productivity. Additionally, the floating line method has a big advantage since it creates a seed bank that minimizes the amount of time farmer spends trying to produce seed after a die-off. Many
organizations advise to use both farming methods, however in Jambiani seaweed farmers are using only the off-bottom method because it is easier to manage and cheaper.

It has been registered that in the Philippines there are more than 800 of different seaweed varieties found, however only three are important at the commercial level. In Tanzania, the seaweed industry mostly works with two varieties, *spinosum* and *cottoni* since other varieties have not been commercially introduced yet. The Zanzibar Seaweed Cluster Initiative organization has been researching two new seaweed species, *Gracilaria salicornia* and *G. edulis* which are known to have up 50% higher agar content, however they have not been introduced yet. Normally, the seedlings as other materials are provided by the local companies and they do not have any further interest in introducing more varieties then the ones are already demand by international markets.

### 5.4.2.2. Integrated Mariculture

Seaweed is known as a sustainable form of aquaculture, it has been evidenced that the environmental impacts of seaweed farming are minimal and in some cases even beneficial by increasing production of herbivorous fishes and shellfish. Seaweed farming in Tanzania is regarded as potential economic activity for coastal communities and a way to reduce pressure on marine resources and coral reefs. For farming seaweed it is not required to use any kind of fertilizer or any other chemical therefore the practice is not affecting the shores on the beach as the animals that are living there. Particularly, the floating line plots also act as fish-aggregating devices and by some devices, seaweed farmers can also harvest a substantial amount of fish at the time they are farming seaweed (Msuya *et al.* 2007). Initial experiments on using basket traps also known as “dema” at Pande village have estimated fish catch of about 10 kg per dema or 30 kg of fish for three dema every second day. Giving this additional advantage, some farmers have been interested in farming seaweed with the floating line method in order to catch more fish. Unfortunately, this situation has also led to conflicts between farmers and fishers who like to fish within the seaweed farm plots (Msuya *et al.* 2007).

Integrated mariculture is a concept introduced by FAO which proposes the mitigation of intensive aquaculture activities specially in marine waters through the integrated farming of other species like for example seaweed. In Tanzania the first intend to introduce integrated mariculture took place in 1996 at Makoba Bay in Zanzibar where finfish, shellfish and seaweeds were combined. As a result it was evidenced that seaweeds were able to act as biofilters and improved the quality of the water (Msuya 2009). Currently there are research programs on the future of integrated coastal aquaculture in Tanzania, whereas the main
focus is to integrate seaweed, particularly the commercial varieties \textit{(spinosum and cottoni)} with shellfish and pearl farming (Msuya 2009).

5.4.2.3. Inputs for farming seaweed
The materials that women use for seaweed farming like ropes and bags are used in a sustainable manner as well. It was observed in Jambiani that women re-use all the materials that the company gives them so they do not have to buy them. For instance, they require an initial set of materials for initiating with the business, but then all the materials are re-used and the same floating lines are used throughout the entire production cycle. The bags where the wet seaweed harvested is collected are also used more than once, since the company has its own bags. On the other hand, often the pegs that are used are mangrove poles which have raised concerns of impact on mangrove stands in proximity to seaweed farming areas. Therefore, it has been advised to use the floating-line method since this one does not require pegs but empty recycled bottles that are used as floats. Some trials have been done with bamboo floating rafts however they were not fully successful since the rafts were not that durable and had to be replaced more frequently which increased the costs of production. Furthermore, bamboo is not available at the costs areas, therefore it was suggested to use recycled plastic bottles which worked better.

5.4.3. Financial Capital

5.4.3.1. Market price of seaweed
Seaweed farming is for traditional dwellers of marine and coastal resources deeply embedded within their livelihoods and cultural identity. Seaweed farming is an important economic activity for coastal areas like Jambiani, since it has increased the purchasing power of women engaged in this sector. However, the prices paid are too low which is totally discouraging women to continue with this practice. In this regard, this cash-generating economically empowering occupation for rural village women runs the risk of gradually disappearing and “get eaten” by the big fish- tourism-. The thin thread that connects seaweed farmers to the global economy is becoming more fragile and gradually as poverty levels increase economic activities like seaweed farming becomes unsustainable and unable to provide enough for the livelihoods of poor coastal communities. Currently, local companies pay to the farmers 400 Tsh. (0.25 USD) for 1 Kg. of dried seaweed, \textit{spinosum} variety. For the \textit{cottoni} variety the prices are higher, around 800 Tsh. (0.50 USD) per Kg., however in Jambiani women only farm \textit{spinosum}. The prices paid are really low and seaweed farmers affirm that the money they get is not enough for covering their household expenses. As
obtained during the questionnaires conducted in Jambiani, women earn an average of 15,000 to 20,000 Tsh. (9.37 to 12.5 USD) per month by harvesting about 50 Kg. every week.

The seaweed prices are dictated by the world market through the exporters to the farmers. Farmers have no say in the marketing, do not know the market prices, and have no means of changing the value of the product that they are selling. The seaweed local companies affirm that it is not possible to increase the prices paid to the farmers since they have to cover costs of transportation and export fees. Additionally, seaweed farmers do not buy their own inputs because they are provided by the seaweed companies in exchange for selling their production to the company at a fix price. In economic terminology, this situation in which there is only one buyer with the power to set the price is known as monopsony. Without monopsony the prices that farmer could expect from an open market will be higher. Additionally, seaweed companies affirm since Zanzibar is not the only seaweed producer; there are many competitors that produces *spinosum* even in more quantities and with better quality and in order for them to participate in the market they have to offer good prices to the international companies. Zanzibar is as well far from the countries where seaweed is exported therefore the fleet costs are expensive. In this regard, all these costs have to be covered making it difficult to increase the prices paid to farmers. Moreover, there have been some cases of predatory buying where small companies start buying the seaweed from the villages at a slightly higher price which they can afford since they did not incurred in the seaweed costs like farming inputs, etc. This situation as a result affects the legal seaweed companies that provided inputs to the farmers.

The Government does not intervene by setting a minimum price for farmers. In this regard, the most disadvantage ones from the industry are farmers which do not have an option other than sell their production at very low prices. The main problem relies on the fact that seaweed industry in Zanzibar is unprocessed and exported in bulk thus reducing the price paid to the farmers and increasing the country’s dependence on international markets.

Even though the big potential that Jambiani has for developing a seaweed value-addition industry, this is not fully exploited. When seaweed started it did uplifted the economic situation of many coastal households. According to Flower Msuya, people got the chance to buy furniture, renovate and build new houses with the earnings of seaweed. Through the years (1989-2010) people changed the roofs of their houses, added rooms and particularly women used the money for buying pen and books for their children. Msuya considers that currently the low price of seaweed is forcing for innovative farming and better farming systems that may increase the price in the local market. Msuya mentions that although the
challenges Jambiani is consider as an important seaweed producer location even more than Paje. Seaweed companies mentioned that the south part of the Island including Jambiani produce around 1500 tons per year. Whenever there is less tourism development it is more suitable for seaweed farming activities. Furthermore, Msuya affirms that poor people have the ability to take up an activity very fast if this one brings profits. Seaweed has enabled them so far to have an income, still small, but they are counting on it.

5.4.3.2. Credit institutions available in Jambiani

Credit facilities are limited in Jambiani. In Zanzibar there are some cooperatives that provide loans as Sarcos (small credit organization) and Vicoba where some members are also seaweed farmers. FINCA, a micro-credit lending group that is supporting some seaweed farmers in the mainland are charging an effective annual interest rate of approximately 48%. However, usually villagers ask for loans for buying a boat, open a shop, etc. Nevertheless, in general there is not an efficient organization located in every village that is in charge of providing credit facilities to the community, neither one that is helping particularly women in getting loans. As a consequence, if a woman wants to invest in their own business it is difficult to start without an own capital. In this regard, that is the reason why seaweed is a feasible business since it does not require any high start-up capital.

5.4.3.3. Cost of production

The costs of producing seaweed will vary depending on the size of the plot, the type of seaweed variety and the farming method used. For the matter of this study an average cost of production will be elaborated based on the following conditions:

<table>
<thead>
<tr>
<th>Table 4: Production Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total lines per plot</strong></td>
</tr>
<tr>
<td><strong>Number of cycles per year</strong></td>
</tr>
<tr>
<td><strong>Length of a cycle (days)</strong></td>
</tr>
<tr>
<td><strong>Price (kg dried seaweed)</strong></td>
</tr>
<tr>
<td><strong>Seaweed variety</strong></td>
</tr>
<tr>
<td><strong>Seaweed method</strong></td>
</tr>
</tbody>
</table>

Source: Own construction, 2013

Normally, seaweed farmers have between 20 to 40 lines of 10 meters in their plot. The production costs are calculated based on an average of 30 lines per plot. There are eight production cycles per year however there is estimated at least one die-off in the annual cycle in the off-bottom method. This normally occurs in the rainy season (March to May) when the
water changes its temperature and the salinity increases. Therefore, for the economic analysis it was estimated 7 cycles per year.

In the variable costs it is estimated that rope has a value of 10,500 Tsh. (6.56 USD) which is based on the unitary cost of 1 meter of rope which is 35 Tsh. (0.02 USD) per meter. A seaweed farmer needs an average of 300 meters of rope for covering the whole plot.

One roll of tie-tie is required for every three lines of 10 meters rope. In average a woman requires 10 rolls of tie-tie. In average, a roll costs 350 Tsh. (0.21 USD). Furthermore, a woman requires 2 stakes or pegs per line in order to set the lines. For a plot it is then needed about 60 stakes which cost around 50 Tsh. (0.03 USD).

As observed in the Table, there are no costs for seeds since they are obtained during each production cycle. Each time farmers harvest their seaweed leaving three lines of wet seaweed in the water to be used as seed stock for the next season. Therefore, neither the company nor the farmers are investing in new seeds. Additional, for farming seaweed it is required equipment such as knives and machetes for cutting and sharpening the stakes. These however, are difficult to quantify as part of the costs.

Seaweed farmers also required a boat in order to bring to the shore the harvested production of the day. Normally, the seaweed companies provide a small plastic boat that can be used only for cargo but not for transporting people. It is estimated that about a total of 58 farmers can use the boat at different times for bringing their seaweed. The boat represents a big cost, however this is provided as well by the companies. Since it is a big investment not every farmer has her own boat and they have to share.

After being harvested, seaweed has to be dried. Traditionally, seaweed has been dried on palm fronds 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. However, farmers in Zanzibar in general do not use any kind of drying racks since there is not a price differential for seaweed quality. Therefore, farmers are not encouraged to improve the drying methods. The product’s poor quality is due to sand and animal manure being mixed into the dried product that then needs to be cleaned by processors at an added expense at the factory. A drying rack frame can be easily constructed by the men of the village. The cost of building one of these racks would not be higher than 10,000 Tsh. (6.25 USD) and the materials can be easily be found on the village. Nevertheless, as explained before seaweed
farmers do not feel motivated to improve their farming methods since the price they get is too low.

Finally, the last item on the list refer to the bags women use to collect the harvested seaweed. It is estimated that each woman requires about 10 bags. Each bag costs about 300 Tsh. (0.18USD). It is important to mention that the bags are used more than once, in fact in some cases the farmers have to buy additional ones because the ones they were given are already broken and the companies are not providing bags for every cycle.

Table 5: Variable Costs

<table>
<thead>
<tr>
<th>Variable Costs</th>
<th>Farmer</th>
<th>Seaweed Company in Tsh.</th>
<th>Seaweed Company in USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rope</td>
<td>10.500</td>
<td>6.56</td>
<td></td>
</tr>
<tr>
<td>Tie-tie</td>
<td>3.500</td>
<td>2.18</td>
<td></td>
</tr>
<tr>
<td>Stakes (mangrove)</td>
<td>3.000</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>Seed</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Non-motorized boat</td>
<td>470.000</td>
<td>293.7</td>
<td></td>
</tr>
<tr>
<td>Bags</td>
<td>3.000</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>490.000</td>
<td>306.25</td>
<td></td>
</tr>
</tbody>
</table>

Source: Own construction, 2013

An important aspect of the production cost is the labour. This item however, does not appear as an explicit cost of production since it is mostly family labour. But still it is important to know that seaweed farmers work in their plots during low tides and when possible every day a woman visits her farm in order to give it maintenance and to collect the seaweed ready to be harvested.

Even though farmers do not have to invest for growing seaweed and all materials are provided by the companies, they price paid to farmers is quite low. It seems that the distance to the processing centers is one key factor influencing the prices received by farmers. In a comparative analysis between Tanzania and other countries such as Philippines and Indonesia, farmers located closer to processing facilities get higher prices. For instance, low prices totally hinder the revenue-generating potential of seaweed farming particularly in Tanzania and Solomon Islands. While Philippines and Indonesia reported prices from 0.60 USD to 1.40 USD. (Valderrama,2012). Therefore, low prices, as observed in Jambiani, has discouraged women from farming seaweed. Another problem that affects the prices is the highly dependence farmers have on processors and traders for the sourcing of farming
materials. On one hand, farmers get all what they need “for free” but on the other hand the cost of these materials is discounted from the price paid to farmers at the end of the production cycle. As long as farmers continue to depend on local companies for the procurement of their seaweed materials, their leverage to negotiate higher prices will be compromised.

Despite low prices seaweed farming is a profitable venture for coastal communities with little access to other income opportunities. Seaweed farming is a beneficial activity since it does not require high investments and technology. Moreover, the grow out cycles are short and seaweed can be farmed throughout the year. However, in order to increase the prices farmers require scaling up their farming and starting value-adding processes.

5.4.4. Physical Capital

5.4.4.1. Processing factories

In Jambiani there is a lack of large-scale infrastructure and hardware required to process seaweed and extract valuable algae or produce derivate products such as soaps, creams, etc. As a consequence, the production from Jambiani is characterized for being only primary (raw material). The incapacity of giving any value addition to the seaweed forces women to be totally dependent on the companies and commercial agents that buy their production for few Schillings. The lack of processing facilities is not only a problem of Jambiani, it is an issue of the whole Island. Even though, the knowledge is available in Tanzania this has been limited and difficult to disseminate. In the mid 1990’s there were studies that showed to install and run a semi-processing plant seaweed production should be at least 15.000 tons per year but the current production has not reached that level yet.

Just recently there have been small initiatives supported by the Zanzibar Seaweed Cluster in order to create small processing facilities in some villages. Currently, there is only one location in the whole Island that has the machine to extract the powder out of the seaweed. This village is located in the north of the Island and it is presently distributing seaweed powder to all to the communities where seaweed soap is produced. Concerning the extraction of gel and other substances from seaweed there is not in Zanzibar any processing facility with that kind of technology.

On the other hand, an important semi-processing facility is the Seaweed Center in Paje where soaps, crèmes and other products are elaborated based on seaweed. They have the equipment and technology necessary to extract seaweed powder; however the machine is currently under reparation in Dar-es-Salaam.
Furthermore, in Jambiani the farmers do not have any storage room for the communal use. The only one available is from ZANEA Company which is sometimes used by the community as part of the deal between the buyer and the seller. Once the seaweed is dried, women take their production to the company center in the village and sell it. The workers from the seaweed company weight it and collect it in bags of 50 Kg. It is estimated that 1 Kg. of dried seaweed equals about 4 Kg. of wet seaweed. Afterwards, the company is in charge of transporting the production to Stone Town where the seaweed is packed and exported in bulks abroad.

5.4.4.2. Communication
In Jambiani very few farmers are aware of initiatives on seaweed value-addition. During the field trip it was evidenced that only a 25% of farmers affirmed to have heard about seaweed soaps and derivative products. Nevertheless, farmers do not seem to be motivated or encouraged to follow one of these initiatives especially because they do not have the financial means and until now any organization or private investor has shown interested to support them in further projects. In theory it is important that some members of every village receive trainings and last updates at least twice a year in order to keep them informed about market trends, local prices, better practices and uses and technology transfer. For this matter, however, it is required that the community itself is organized and has already a defined structure, but this is not the case of Jambiani. Women collecting seaweed work for themselves and do not belong to any other organization; therefore it is difficult to reach them. Extension services are very limited in the whole area since there is not enough personnel trained on farming techniques, construction of drying racks and on value addition. There is as well a great need to develop extension materials and programs that explain the different farming methods, farm standardization, integrated mariculture and financial factors of seaweed farming.

5.4.4.3. Availability of technology
The physical capital that women in Jambiani possess is not good enough for developing an industry. For instance, farmers do not use any kind of technology during the production, harvesting and drying cycle in which they are involved. Seaweed is farmed with the off-bottom method (See Figure 13) in shallow subtidal waters of 30 centimeters depth at the lowest tide. Each woman owns off-bottom plot which has about 20-40 lines of 10 meters (m) each, resulting in an average of 30 lines per plot. It was observed that in general the plots are located about 500 meters from the shore, in between there are the plots of senior women closer to the shore which are also smaller since they cannot carry heavy loads.
estimated that on the average two persons per family are involved in seaweed farming and many farmers have more than one farm (ranging between 1-5 farms).

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 in the beach or in the village, there is not any demarcated area and the drying process is very basic. The quality of the seaweed can be improved through proper drying methods, i.e. the use of drying racks as opposed to palm fronds/clothes used in the villages. When seaweed comes into contact with rainwater, it gets bleached and rots thereby losing its quality therefore racks will be useful in protecting seaweed particularly during the rainy season. In Figure 14 and 15 it is visible that seaweed is dried inappropriate and even with the contact of domestic animals. Since the drying process is so important in order to guarantee a good quality, the Seaweed Center in Paje has special racks easy to use that allow good ventilation and efficient drying process (See Figure 16). The Center also has a solar dying oven which has as main purpose to make seaweed crispy. The concept of the oven is very simple, it has concrete pillars and on the sides there is transparent Plexiglas. The sun light passes through the glass, creating an insulating effect and drying the seaweed in a very short time. Crispy seaweed is then used for the elaboration of soap.

Post-harvesting and handling technology are in general poor and as a consequence they reduce the quality of local seaweed production which makes difficult for smallholder producers in Zanzibar to capitalize on the opportunities provided by the growing local and export markets. In relation to energy supply, the village has regular service but with some electricity cuts during the week. The villagers, most of them, do not have electricity at home only the hotels and restaurants have electricity connections. In this sense, for any kind of industry development there is the requirement that there is power supply.
Figure 11: Off-bottom method

Source: Author, 2013 (Jambiani-Zanzibar)

Figure 12: Seaweed dried in palm frond

Source: Author, 2013 (Jambiani-Zanzibar)
Figure 13: Drying seaweed

Source: Author, 2013 (Jambiani-Zanzibar)

Figure 14: Drying racks

Source: Author, 2013 (Seaweed Center Paje)
5.4.5. Social Capital

5.4.5.1. Seaweed organizations in Zanzibar

In Jambiani there is not any kind of organization that is working for improving seaweed farming and looking for the betterment of conditions of women. The only organization that has tried to connect women from Jambiani with others from close by villages regarding seaweed farming is the Zanzibar Seaweed Cluster Initiative; however Jambiani has not been reached yet. Women interviewed affirmed that they are not aware of any kind of organization even in Paje which is only 5 km. away. The Cluster Initiative is the currently the only organization that offers trainings and workshops in seaweed issues, particularly in value upgrading. The organization understood that the price paid to farmers is too low therefore there is the need to start innovating and bringing value to the raw commodity in order to get a better payment. At the same time the Cluster proposes to include women in the economy’s dynamic and help them to empower and take actions for improving their living conditions.

5.4.5.2. CBO’s in seaweed farming

Seaweed farming has increased in many villages in Zanzibar the purchasing power of women which at some extend has empowered them. In Jambiani, many of the seaweed farmers are illiterate and have limited leverage when it comes to negotiations with local brokers, which contributes to depressing the prices for the raw commodity, therefore there is a big need to organize seaweed farmers in order to increase their influence on the local market and help them by getting better prices. According to Flower Msuya, before seaweed farming, women stayed in the house and did not have any contribution and no say in the household’s economy. Nowadays, women have more power since they have some money and they are getting more recognition from the society. Members from the Seaweed Cluster Initiative are often community leaders that are bringing change to their villages by opening cooperatives and supporting new initiatives and even meeting with governmental authorities. Still, the community in Jambiani has not been reached and at the moment there is not any community based organization. This is not the case for the close by village in Paje where seaweed farmers are organized and have founded a NGO that brings all women engaged in seaweed together. This has brought big advantages since women now are aware of the different uses that seaweed has and they are part now of entrepreneurship initiatives that with have improved their livelihoods.

5.4.5.3. Partnerships

The main partnerships that are active regarding seaweed farming in Zanzibar are the triple helix (See Figure 17) that the Seaweed Cluster Initiative is trying to support. The helix is
formed by developers which are the companies and individuals that buy seaweed from the farmers. These actors are important since they provide the farming materials that women used for seaweed. Other essential stakeholders are the farmers who are responsible of the seaweed production and should ensure quality to the local companies. Farmers are essential for any kind of value upgrading since they will be the actors of change since they are the human capital. Another partner is the Government which is represented under the Department of Fisheries and has responsibilities like for example giving licenses to developers or providing extension services. Finally, the third member of the helix is the Academia through the Institute of Marine Science of the University of Dar-es-Salaam which is responsible of research and development of new methods and knowledge transfer. The IMS also helps to keep a link between stakeholders like for example farmers and government authorities.

**Figure 15: Triple Helix**

5.4.6. Value Chain Factors

These factors are not part of the Sustainable System analysis and do not belong to the Capital Assets, however for the present study they are very important to be considered. They are going to be briefly discussed, but the main value chain analysis containing the totality of its factors and aspects are explained in the second part of the Chapter Five.
5.4.6.1. Production

The production of seaweed is divided in two main elements. The first one refers to the specific input providers and the second one to the primary producers. As mentioned before, the seaweed industry in Zanzibar is organized in a way that local seaweed companies provide to the farmers all the materials required to grow seaweed without any additional cost. Farmers do not need to worry to buy ropes, pegs or bags since they get it all from the company they work with. In exchange, however, they have a tacit agreement and farmers are obliged to sell their harvested seaweed to the company and not to any other buyer. The price is already fixed and there are no quality requirements. The seaweed is farmed every at low tide, which according to the moon position changes every month. The grown variety is *Euchema spinosum* farmed with the off-bottom method which is characterized for growing the seaweed in a line between two sticks. These sticks are buried deep down in the sand bottom. Normally, the seaweed grows fast because the amount of sunlight and the effective feeding of nutrients coming from the tide. After about three weeks the seaweed is ready to be harvested and dried in the shores of the beach. Normally, seaweed does not have any predators only sensitivity when the warm gets too warm.

The production of seaweed in Jambiani remains unknown, since the farmers do not have any records neither the local seaweed buyers. However, it is known that Jambiani is an important producer in the east coast. According to information from the Ministry of Natural Resources and Tourism, the seaweed production of *spinosum* in Zanzibar is developing well but is still low in comparison to other countries. For instance, in 2009 the Philippines production registered 61 thousand tons and Indonesia surpassed by large with 85 thousand tons of dried seaweed (Valderrama 2012). In Graphic 5 it is illustrated the production of *spinosum* in Tanzania, according to data from the Government in 2005. The production from 2005 to 2007 is based on a target.

There have been efforts and plans to increase the production, particularly in Zanzibar. However, it is difficult since the farmers are not encouraged to increase the farming since the prices paid are too low and unattractive.
5.4.6.2. Processing

Zanzibar lacks of processing facilities for the seaweed industry. The majority of the production is only exported in bulks abroad but without any processing or transformation. Through the Seaweed Cluster Initiative there have been some small initiatives to start processing the seaweed and getting powder and gel out of it. Nevertheless, this process is still on its first stages and a real industry is not yet developed. The need for investment in machinery, equipment and infrastructure is high and until now neither the Government nor other private investors have showed any interested in constructing processing facilities.

On the other hand, the Seaweed Center in Paje is a private initiative that is giving value addition to the seaweed. The community of Paje is organized and is producing now cosmetic products that are commercialized in the local markets. It is a pilot project, however based on the observation during the field trip, women members of the Center are happy and motivated and encouraged to continue with seaweed farming and create innovative products on its basis.

5.4.6.3. Marketing

All the seaweed that is collected and harvested in Jambiani is sold to the local seaweed companies after being dried. These traders are located within the community and buy directly from farmers. They collect all the seaweed bought in small warehouses within the village where initial cleaning and further drying process is carried or. Local companies normally weight the seaweed in bags of 50 Kg. (See Figure 19). The bags are stack up and afterwards transported to the head offices in Stone Town.
Figure 16: Seaweed weighted

Source: Author, 2013 (Jambiani, Zanzibar)

Figure 17: Seaweed storage
In the warehouses in Stone Town, the seaweed is compressed and prepared in bulks that will be exported abroad. The main customers are China, USA and Denmark. Once the product reaches the next buyer abroad, the seaweed is processed and carrageenan and agar are extracted out of it. Refined carrageenan is eventually used as hydrocolloid ingredients in the manufacturing of a wide range of food and industrial products. The global carrageenan market is valued at $375 million (GIZ Philippines, 2007). For instance, the largest semi-refined carrageenan processor worldwide is Shemberg Corporation based in the Philippines. Carrageenan and agar are substances that are widely used in pet food, meat, and dairy products, etc. Besides they bear excellent sources of dietary fiber. They are also recommended for clearing the digestive system and reducing cholesterol.

In general, the marketing sector is dominated mostly by the countries that have processing facilities like Philippines, Indonesia and China. In the case of Tanzania, the trade of seaweed is only characterized for being a merely raw commodity that is transformed to valuable substances abroad.

5.5. Structures and Processes

This part belongs to the institutions, organizations, policies and legislations that shape livelihoods. These structures operate at the international and at the livelihoods level. The term structures refers to the organizations themselves, private and public, that set and implement policy and legislation, deliver services and perform all types of services that affect livelihoods (Department for International Development, 1999). Usually, these institutions determine some essential factors within the livelihoods:

- Access: to different types of assets previously explained and to decision-making bodies as well
- Returns: they could be economic or otherwise to any given livelihood strategy

Additionally, such structures have a direct impact upon whether people are able to achieve a feeling of inclusion and participation. In the case of seaweed farming it is also related to issues of empowerment and creating leadership in the community. For a proper analysis it is then essential to consider the roles and responsibilities of the structures involved in the matter and seek to identify those who are of greatest importance to livelihoods.

For the analysis of the importance of structures and processes for seaweed value chain upgrading it is essential to consider on one side the public organizations and on the other
hand the private ones who have been supporting the industry. The following table outlines the main structures found in Jambiani that affect their livelihoods. It is important to mention that for illustrating the importance of the role of structures in a value-chain upgrading, the case of Seaweed Center in Paje will be described.

**Table 6: Type of Structures**

<table>
<thead>
<tr>
<th>Type of Structure</th>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sector</td>
<td>Institute of Marine Sciences of the University of Dar-es-Salaam</td>
<td>To undertake research in all aspects of marine sciences and provide advisory and consultancy services in marine affairs</td>
</tr>
<tr>
<td>Public Sector</td>
<td>Ministry of Labour Economic Empowerment and Cooperatives, Zanzibar</td>
<td>To mobilize, promote and support the community development through empowering the economic activities and jobs creation.</td>
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<td></td>
<td></td>
<td>To accelerate the economic growth and poverty reduction in the Island of Zanzibar</td>
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<tr>
<td>Public Sector</td>
<td>Zanzibar Seaweed Cluster Initiative</td>
<td>To introduce new methods of farming, give value addition to seaweed and also create social networks in order for women to cooperate and create social networks</td>
</tr>
<tr>
<td>Public Sector</td>
<td>Ministry of Natural Resources and Tourism</td>
<td>To ensure sustainable conservation of natural and cultural resources and ensure full participation of local communities, NGO’s and the private sector.</td>
</tr>
<tr>
<td>Private Sector</td>
<td>Seaweed companies located in Zanzibar</td>
<td>To buy the dry seaweed production from farmers</td>
</tr>
<tr>
<td>Civil Society</td>
<td>Seaweed Center, Paje</td>
<td>Development of the seaweed industry by value addition and elaboration of soaps, crèmes and other products.</td>
</tr>
</tbody>
</table>

Source: Own construction, 2013
Even though methods for conducting cost effective, linked policy and institutional analysis at various levels are not well developed within the concept of Sustainable Livelihoods, the starting point to analyze the influence of structures and processes on the livelihoods of the community selected is to consider four main points:

- Roles: what is the institution main objectives and what is it in the reality doing
- Responsibilities: what responsibilities do organizations have and how are they enforced and established.
- Rights: how aware are different groups and organizations regarding basic human and political rights
- Relations: what is the current state of relations between different groups

5.5.1. Public sector structures analysis

Institute of Marine Science:

This Institute plays an important role in the seaweed industry development. Through other small organizations they are supporting many women in Zanzibar to upgrade the seaweed value chain by giving them trainings and workshops. The Institute of Marine Science (IMS) was established on 1978 and is part of the University of Dar-es-Salaam. The main mandate for the IMS is to undertake research in all aspects of marine sciences. The Institute is also involved in exploitation of marine resources as part of merging theory and practice and additionally it provides advisory and consultancy services in marine affairs. The Institute activities are financed partly by the National Government and another part is through the support of donors. According to the budget from 2004-2005 the Institute received about 520.092.919,00Tsh. and 470.228,70 USD from different donors (Western Indian Ocean Marine Science Association). The Board of the Institute is formed by members of the University and representatives from some ministries such as the Ministry of Tourism, Natural Resources and Environment, Ministry of Agriculture, Livestock and Natural Resources, etc.

The University of Dar-es-Salaam has as well a division of aquaculture within the Department of Marine Resources, which has had some projects to help some farmers to sell their seaweed and to discuss the price. According to Flower Msuya from the Zanzibar Seaweed Cluster, there was formerly a project called MCEM together with some governmental institutions which intended to help seaweed farmers. The project was part of a governmental initiative for providing proper farming practices, boats for seaweed harvesting, infrastructure for drying and storing the seaweed and management trainings. The project intended to progressively finish the dependence that currently farmers have with seaweed companies by
receiving free materials in exchange of the production. Originally, the idea came from one initiative in Bagamoyo where one village that farms seaweed started to buy their own material for growing seaweed. This village requested better prices to the seaweed company if not they made business with other company, in that sense the farmers were not dependent anymore and did not have the compromise to sell their production to a specific company. The Government of Zanzibar intended to try this initiative in the Island. Through the governmental departments in charge they bought the required material and seaweed was announced as a free business. The Government was interested to see the effects of this policy in the seaweed industry. When women received the money from what they have sold, instead of reinvesting in new materials for seaweed they bought clothes, food and paid their debts. There was not any money left to continue with the business, therefore women were forced to accept the conditions of the seaweed companies again and agree with the low price. This example illustrates the importance that structures and processes have in the livelihoods of people. This shows as well that future measures have to be done as a process and not as an action to make women independent since they have to understand and be involved during all the process.

The ISM has a department which works in seaweed farming issues, the Living Resources and Ecology Section. This department is in charge for training and research in the fishery sector. The Institute has elaborated interesting researches regarding economically important seaweeds and how to develop them in Zanzibar considering the environment and the conditions. The ISM takes into consideration as well that many women in the Island live from seaweed that is why they are interested in socio-economic researches in this matter.

The main responsibilities of the Institute are enhancing regional collaboration and networking in marine sciences research and development, technology and training. Particularly important is their duty as organization that enhances socio-economic development of communities in the coastal areas and around larger water bodies in the region. In this regard, this structure is crucial in developing projects and programs with the aim of improving the livelihoods of many poor coastal families that for instance are particularly involved in seaweed farming, since this practice is quite common in the coastal areas. The Institute has set some priority themes for further research and trainings. Climate change, impacts and adaptation is an important area and has influence in seaweed farming since lately this industry has been suffering from extreme changes in the temperature of the water which is affecting the production and as a consequence influences directly the livelihood of the communities. On the other hand, there is another priority area regarding poverty alleviation and sustainable coastal and marine resource management; which means that researches
and trainings are conducted in important seaweeds varieties and aquaculture with the aim of poverty reduction and sustainable resource utilization. There have been initiatives for alternative livelihoods activities however, poverty in the coastal areas still persist since not all communities are reached.

The relationship between the community of Jambiani and the Institute is not quite established yet. There have been some researches about seaweed farming techniques and particularly socio-economic reports that mention the importance of this practice as a livelihood. However, trainings and knowledge transfer to women engaged in seaweed farming are still missing. Most of the communities involved, like Paje are getting more trainings and people are more aware of the potential of seaweed. Jambiani, in that sense, has not been reached yet and has not had that kind of exposure to leadership and entrepreneurship initiatives.

**Ministry of Labour Economic Empowerment and Cooperatives, Zanzibar:**

The Ministry of Labour Economic Empowerment and Cooperatives is a new Ministry established on 2010. Its main functions are mobilizing, promoting and supporting the community development through empowering the economic activities and jobs creation. This Ministry has the main goal to accelerate the economic growth and poverty reduction in the Island of Zanzibar. The Ministry is concerned on implementing effective and efficient mandates in order to enhance activities that enable a proper development (Ministry of Labour Economic Empowerment and Cooperatives 2013). The Ministry has as main mandate to create and facilitate access to decent work and empowerment programs for sustainable livelihoods. The programs and projects implemented are based on the strategies that the Ministry has adopted. For instance, in 2000 the Ministry adopted Vision 2020 which intends to improve the standards of living of people in Zanzibar. This Vision is also linked to the Millennium Development Goals that, in general, intend to improve the well-being of the population through fostering sustainable economic activities.

There are two main frameworks developed at the medium term as instruments to operationalize the vision explained before: the Zanzibar Strategy for Growth and Reduction of Poverty. Both frameworks intend to improve the livelihood of people through empowerment initiatives and they act as main mandates for poverty alleviation in Zanzibar. The main role of the Ministry relies on assisting the community to initiate, develop and improve economic activities in production of goods and services. All groups should acquire and opportunity to improve their livelihood and as a consequence their income by using available resources. The importance of this Ministry regarding the present study relies on its current link with the seaweed industry. The Ministry of Labour has created a steering
committee, the Commission for Science and Technology, which is coordinating the initiatives that the Zanzibar Seaweed Cluster Initiative is conducting in order to give added value to the seaweed chain and create innovative farming. According to Dr. Flower Msuya, Director of the Zanzibar Seaweed Cluster Initiative, the Ministry of Labour is part of the triple helix organization within the Cluster and through the Commission they financially support with 1% of the budget in order to conduct researches and provide assistance and trainings to the community of Zanzibar.

In this regard, the importance of this structure in relation to the case study is crucial considering that the Seaweed Cluster is intended to upgrade the value chain of seaweed through innovative farming and community empowerment. However, as explained before the community and women of Jambiani have not been yet reached or fully included in project. Therefore, there is still plenty room for further programs regarding seaweed in the area.

**Zanzibar Seaweed Cluster Initiative (ZaSCI):**

The Zanzibar Seaweed Cluster Initiative is the closest structure to the coastal communities and seaweed farmers. This organization that receives financial support from the Government was formed under the Innovations Systems and Clusters Program in Tanzania (ISCP-Tz) now called the Pan African Competitiveness Forum. The Seaweed Cluster started its functions in 2006 and currently is working with seaweed farmers in nine villages in Zanzibar and one in the mainland. ZaSCI is coordinated by the “Cluster Facilitator” who is based in the Institute of Marine Sciences of the University of Dar-es-Salaam. The main objectives of the organization are to introduce new methods of farming, give value addition to seaweed and also create social networks in order for women to work together and intend to organize them in every village. The Cluster has as well created a triple helix which is comprised by the Academia which is the Institute of Marine Sciences from the University of Dar-es-Salaam, the Government side represented by the Department of Agriculture and Fisheries and the last partner the business side which includes the seaweed farmers, the seaweed buyers and the Zanzibar Chamber of Commerce and Investment as the main structure that supervises the exports of seaweed abroad. This type of structure has made possible that farmers even have access to meet with government authorities and discuss future improvements for the industry. Currently, the Cluster is providing technical assistance for upgrading the value chain of seaweed and produce seaweed powder, soap, body creams, cookies, juice, etc. in order to improve the livelihood conditions of about 15,000 to 20,000 women engaged in this practice in the whole Island. The Cluster has identified that upgrading of the seaweed value chain is essential for getting better prices and at the same time empower coastal
communities to start their own small-scale business. Moreover, the ZaSCI is working on introducing techniques for farming the cottoni variety through deep water floating systems that combat the problem of seaweed die-off and also increase the production. The farmers are getting better prices for the dried cottoni in comparison to the other variety; furthermore, this technique of farming seaweed offers the possibility to improve the quality of the seaweed harvested. However, even though the recognized potential on seaweed development in Jambiani, the ZaSCI has not yet provided enough technical assistance to start with innovative farming projects as seeing in Paje and other villages in the north of Zanzibar.

Ministry of Natural Resources and Tourism:

This Ministry has some influence in the seaweed industry as well. In 2005 the Ministry launched the Seaweed Development Strategic Plan which had as main goal to support seaweed farming and foster the production growth of the cottoni variety and improve the livelihoods of all coastal communities engaged in this practice. As main mandate the Ministry has to ensure sustainable conservation of natural and cultural resources and ensure full participation of local communities, NGO´s and the private sector. The Ministry recognizes the importance of seaweed farming, especially in Zanzibar as a mean of providing an economic opportunity to the coastal areas. Therefore, the Ministry elaborated, together with the support of other stakeholders, a guide for development of the seaweed industry in Tanzania. The Strategic Plan covered a period from 2005 to 2009 and it was designed as a framework to expand the seaweed industry in a financial, social and environmental sustainable manner.

Even though this Plan is already outdated it reflects the seaweed farming was regarded as an important industry and as a central economic activity of many coastal communities. The main idea of this guideline was to increase the production and by that seaweed farmers become more productive and generate a higher income. The key was to make the farmers independent producers, able to negotiate better prices and have the opportunity to either self-finance or get loans from financial institutions. After the five-year period, it is evident that the plan has not been fully successful and has not reached its main objectives and goals. The production of seaweed is stagnant and women engaged in seaweed farming are getting low prices which are discouraging them from continuing in the business. The Plan proposed to increase the production of cottoni, however it has been observed that in the Island it is mainly farmed the other variety, Euchema spinosum. It was intended as well to introduce to farmers new and efficient production methods for increasing the production, however as observed in Jambiani the methods that are used are the traditional ones, the same as in other parts of the Island. Some new techniques have been introduced to improve seaweed
production like for example deep-water cultivation, however the coverage of the initiative is very low and many villages claim no to be part of such programs. The Strategic Plan is consistent with the Government of Tanzania’s poverty reduction strategy that promotes economic development through investment of the poor and formulation of poverty reduction policies. It offered a vision to improve the livelihood of coastal communities through the use of mariculture opportunities in an environmental-friendly manner (Seaweed Development Strategic Plan 1995). Even though the plan was comprehensive and proposed a good coordination between actions from the government and other stakeholders, the effects as observed in Jambiani and many other villages in Zanzibar where seaweed is cultivated were not what the plan foresaw and there is still many actions required in order to improve seaweed production and specially reach remote villages with trainings and workshops in order to give them the tools to improve their livelihoods.

5.5.2. Private commercial structures analysis

Seaweed farmed in the mainland and in Zanzibar is purchased by local seaweed agents that buy the dried seaweed for further export to USA and Europe, being France and Denmark the main markets. These dried seaweeds are used then for extraction of carrageenan as gelling, thickening and emulsifier in foods, cosmetics and pharmaceuticals. Currently there is another large corporation in USA (FMC-Biopolymer) that developed interests of purchasing farmed seaweed from Tanzania. The local seaweed agents located in Zanzibar have as main role to buy the dried seaweed from the producers and then export it abroad where they already have their partners. There are many seaweed companies in Zanzibar like:

- ZASCOL (Eucheuma Resources Ltd)
- ZANEA Seaweed Company Ltd
- C-Weed Corporation (Mwani Mariculture Ltd)
- Birr Company Ltd.

Local seaweed buyers are potential and very useful link between the seaweed producers to international markets. The buyers provide production inputs under the agreement that the farmers are obliged to sell the produce to the input provider. When buyers provide production inputs the farmer receives less money per each kilo of dried seaweed and additionally the buyers are normally the ones who set the price. The local agents and developers are the ones who have established progressively in Zanzibar mostly a market only for raw seaweed and therefore farmers are not seeing any benefits. Seaweed companies mention that the Government asks for high taxes, hence they cannot increase the price paid to the farmers in the villages. The national system of royalty fees on seaweed purchases needs to be
standardized. In some cases, seaweed companies are paying 5% of fees on the value of seaweed purchased at multiple levels of government like village, district and national (Seaweed Development Strategic Plan 2005). Governmental intervention might be required in order to have a price regulation that benefits farmers and developers at the same time.

In Jambiani, there are two seaweed companies: ZANE A and C-weed Corporation. The role of the companies is for instance to collect the seaweed from farmers and transport it to their warehouse located in Stone Town. According to data gathered, only C-weed Corporation owns trucks that transported the seaweed collected from every village; ZANE A on the other hand has to hire trucks for transporting the seaweed. Both companies agree that transportation costs are very high, therefore they collect the seaweed from Jambiani and other villages located in the area not all the time and only when the truck will use its whole capacity. For the case of C-weed Corporation they have a determined quantity they export annually. This is specified by their branch office company located in Denmark. If by any chance they happen to have surplus, only in that case is the seaweed exported to other countries but normally their seaweed in only commercialize to Denmark. For ZANE A the main export markets are Europa, USA, Asia specifically China. Once the seaweed is transported to their warehouses, starts the process of cleaning and taking all the sand out. After that the seaweed is prepared in bulks that weight 100 Kg. done by a special machine that compresses the seaweed (See Figure 18). Afterwards the bulked seaweed is transported to the port where is shipped in containers to its next buyer.
Figure 18: Seaweed compressed

Source: Author, 2013 (Stone Town)

Figure 19: Seaweed bulks

Source: Author, 2013 (Stone Town)
Another important role the seaweed company plays is the assurance of buying seaweed from the farmers which means that women produce already for a specific buyer. However, this makes the farmers dependent on the company, without having any opportunity to ask for improvements. On the other hand, the company provides the farmers with all what they require to grow seaweed which makes the idea of seaweed farming very easy but in the long-term creates a dependence circle and draws a predetermined system that does not allow any initiatives from the people to improve the industry. In general, from the observation and key informants’ interviews, seaweed farming stopped to be a profitable business because the local agents and seaweed companies are structures with a big influence on farmers and are not giving them any benefits to encourage the production and quality improvement. Currently, women farm seaweed because otherwise they will be unemployed, at least with this practice they receive a small income; however considering the conditions of the work the price paid is too low. For that matter, the upgrading of the value chain pretends to reorganize the stakeholders involved in the chain and increase the benefits for the farmers but for that step it is require to give seaweed an extra value that makes it worth it to pay extra money.

5.5.3. Civil society structures analysis

As mention before, in the assets analysis, in Jambiani there is not any social structure already organized regarding seaweed farming. This lack of leadership and self-organization has made it impossible for women to ask for better prices to the local companies. The production of only one household is obviously not enough in order to convince the developers to improve the buying conditions. Therefore, the power of negotiation still remains with the seaweed companies all around Zanzibar while women do not have a say in this matter.

In this regard, it is interesting to analyze the case of the Seaweed Center in Paje. This relatively new project might have an influence on Jambiani in the short-term period. The Seaweed Center started in 1999 and is a business initiative that started with the support of Switch Responsible Ventures with the purpose of becoming a social responsible business. The situation of Paje was similar to the current situation in Jambiani. Seaweed farming was an unstructured and family business and lacked on household economics and entrepreneurship. As Frederick Alfredsson, East African Manager of Switch Responsible Ventures explains that the Center had to start from the bottom with the development of seaweed farming. Paje is a pilot project that has a period of 3 to 5 years. The organization does not have any social motives but is still supporting people and at the same time running
a good business. They created the Seaweed Center which now employs 36 women and the center is the place now where value to the seaweed is added. The center has a small factory where soap, creams and other beauty products are produced based on seaweed. Furthermore, the place has a separate space for drying seaweed in proper racks and solar construction for drying the seaweed faster. Moreover, the center has a space that women can use for meetings and where classes are held. The advantage for women is that currently they have the space to learn English or other kind of lessons and workshops that improving their business. Every woman in the community in Paje is welcome to join the workshops and to bring their seaweed to the installations.

The Seaweed Center has multiple owners, both foreign and local. One of the stakeholders is a non-governmental organization, Paje Seaweed Center Society (SCS) which is representing all the 36 women working for the center. They together own 15% of the business due to a joint decision of the owner group (Hageby, Rönmark 2012). The idea is that all profits generated should be reinvested in the business in order to make the project sustainable.

The role that the Center has played in relation to the community is mainly an income generator activity and has led to women empowerment. Seaweed farmer’s members of the center have developed a strong ownership feeling. They regard the center as their own and want to continue developing it. Furthermore, the formation of the NGO is linking the community and creating networks. Women are proud to participate in this initiative and they are collecting an experience of how to organize and work for themselves.

According to Erik Gulbrandsen, CEO of Switch Responsible Ventures, the program of seaweed value upgrading started as a pilot project in Paje since they already had some local partners. However the main goal is to create a sustainable value chain on Zanzibar that is connected to the tourism industry. Seaweed industry is foreseen as a potential industry that might be able to bring development to all those coastal areas engaged in seaweed farming. In this regard, Jambiani is the next location where it is expected to become a value addition industry. The main idea is to start organizing the community and build a small center where seaweed can be processed as in Paje in order to produce soap and other cosmetic products. Women have to be trained and particularly learn the importance of giving value to the seaweed for getting better returns. Such a structure in Jambiani will for sure reshape the current seaweed farming situation and if well managed could be the source of livelihood improvement of more than 5,000 women.
5.6. Proposed Strategies

The livelihoods approach seeks to promote choice, opportunity and diversity. The strategies are an essential part since they present a combination of activities and choices that people undertake in order to achieve their livelihood goals. Strategies are supposed to be the result of a proper analysis and are part of a dynamic process in which various activities are combined to meet community’s needs at different times. It is important to mention that for a proper analysis it is essential to see the household within their wider context. Since goods, financial resources and people are mobile, an accurate picture of livelihoods cannot be gained if artificial boundaries are drawn. The links between urban and rural required to be explored as the implications for decision-making in planning (Department for International Development 1999).

After having analyzed all the essential elements that influence the livelihoods of all those small-holders seaweed farmers it is pertinent to find suitable strategies that mainly help people to become more resilient to external changes and maximize the potentials and assets that is to be found in the region. In this sense, it is important to keep in mind that the SL approach looks into the poverty notion in three insights; for instance the realization that economic growth does not mean that the poor are not poor anymore, the relationship between these two concepts relies on the capacities of the poor to actually take advantage of the economy in expansion. The second understanding is that poverty is not only an issue about low income it should also include other dimensions such as health, social services, security, etc. The third point emphasizes the importance of involving the poor in the planning activities since they are the ones who better know their needs and problems. With this perspective strategies easy to adapt to the circumstances and with a sustainable dimension have to be implemented based on the capital assets, trends and shocks.

Furthermore, it is essential to consider the important contribution that spatial planning has in the proposed development since it helps to identify the potentials, constraints, problems and trends with a broad and integrated perspective. Plans and projects can be implemented based on appropriate strategies that are based in a deep inter-sectoral analysis that comprises major development planning fields.

- **Creating the proper environment** - The first strategy that has to be put in place starts with the community itself and its own environment and capacities. Women, who are the main actors in seaweed production, have to be aware of the potentials they have in their area and have to be willing to contribute to a new development process. Relationships within the community have to be established based on trust knowing
that it is more beneficial to work in associations as individual. In order to improve the price of seaweed it is essential to consider the quality of the product and particularly the added value that it has, however the quantity of the production is also important for the markets. If seaweed farmers work in associations they might be able to handle a better price since they have more capacity to produce as a group. By creating organizations, associations or groups, members will be well-represented at meetings or other forums to address problems and together find proper solutions as situations arise. As proposed in the Seaweed Development Strategic Plan formulated by the Ministry of Natural Resources and Tourism, there is the need to establish Village Seaweed Groups that facilitate communication among producers, developers and other actors from the value chain. The group should be community-based and be open to all the farmers in the area that are interested in joining. In this way, the power of negotiation of farmers will increase as they become a stronger group. Consciousness-raising activities are required to be carry-out in order to make people understand that seaweed can still be a good source of income.

- **Women empowerment**: Women are essential economic actors within the economy. In the case of seaweed farming they are the ones who are running the business and therefore they should be empower in order for them to gain knowledge of better alternatives to manage a business and as a consequence improve their livelihood that will affect the whole household unit. Nearly 90% of seaweed farmers are women and with this practice they have progressively become more independent and have helped to the household economy by already paying some of the expenses like education fees, medicine, etc. Moreover, the successful and fully integration of women in the value chain of seaweed will bring a new understanding of their real contribution in the society. Women will have an identity in their society and particularly they will get the knowledge of giving extra value to their production. In this case, it is mostly economic empowerment through an upgrading of the seaweed value chain; however this type of empowerment has without question impact on other fields such as in the social aspect. The household requires now that both, men and woman, are engaged in economic activities to bring more money to the household. Women in villages were they have been empowered have now a voice, they are able to intervene in the family business.

- **Capacity building and technology transfer**: These two activities are essential for improving seaweed quality. For upgrading the seaweed value chain it is required
some new methods and techniques that women have to learn in order to transform seaweed in something else with more value. Periodical trainings in themes like for example site selection, seedling selection and retention, planting and cultivation, harvesting, drying, processing and elaboration of soaps and creams are very useful for keeping the farmers updated with the best techniques to be used. Important is as well to train them in economics and business planning to encourage them to start their own initiatives with already some basics background. Currently, the main problem not only in Jambiani but in Zanzibar as well is that there is a lack of machinery for processing seaweed and transforming it to valuable algae. There is only one location in the whole Island that possesses the machine to grind the seaweed and transform it into powder. In the Seaweed Center in Paje they were supposed to have one but it has not been operational for more than a year. If Jambiani gets to acquire new technology it can become the next processing hub of seaweed in the whole area. It is a potential advantage that is open if the community organizes themselves and starts working together. The main objective is now that the seaweed farmers stop producing seaweed as a raw material but instead it should be with an added value that in the end will mean higher income for the farmers and will significantly improve their livelihoods. Furthermore, in this regard it is important as well to train the women in deeper water cultivation techniques so they are able to produce higher-quality seaweed. For instance, the cottoni variety which is much more valued on the market could be produced with such techniques and increase the income of seaweed farmers.

- **Improved post-harvest handling**: If the quality of the seaweed is improved the prices paid will also increase. Therefore, there is the need to adapt the production to quality standards such as proper drying methods, not exposition to water, limited storage time prior to sale, etc. A better quality also guarantees that in cases of oversupply, the highest quality produces are often sold over the less high quality ones. The price paid to farmers is currently very low and there is not a price differentiation for higher quality seaweed, the same price is paid everywhere which is a disincentive to farmers to improve their post-harvesting methods. This situation, if continues, will seriously affect Tanzania’s seaweed industry resulting in lower prices and subsequently will have a negative effect on Tanzania’s seaweed farming reputation worldwide. Buyers and farmers need to be aware of this situation since it has a main influence on the industry.
- **Development of basic infrastructure** - Infrastructure has always an important influence in every economic activity. For the seaweed farming sector it is vital that some basic infrastructure has to be built in order to store the production. Ideally, it will be recommendable to build a similar Seaweed Center as the one is Paje, where the processing-machineries are and a special area where women from the community can meet and discuss business matters as to get trainings and workshop. It does not need to be a big infrastructure but a place where women can feel comfortable by working and specially a place that is communal. In that sense, there is not an authority organization but on the opposite all workers are at the same level and have the same rights. It is important for women that they get a specific and appropriate place for “doing their business”. This will encourage many small-farmers to get involved in the project and realize that there are now facilities provided for them to keep on producing.

- **Credit facilities and small-investment attraction** - The main idea behind starting a business is about the capacity, the capacity to produce and to finance the start production. Many farmers are involve in seaweed farming mainly because it does not require any big investment, however if the case is an upgrading and not producing and selling the raw product anymore, this might require a little bit more start-up capital. Very few seaweed farmers have the financial means to begin seaweed farming on their own and even if they had some savings they will feel overwhelmed with the high-risk involved, therefore they require some credit facilities. The community of Jambianineeds in general credit access that currently is not available. Although there is bank financing available for micro enterprises, most financial institutions prefer to lend money to established groups or producers. Therefore, it is advisable to create a cooperative where the money can be safely deposited. Not only for seaweed farming business but for any other expense, the cooperative will be able to help with micro-credits and loans. In this way the investment activities are enhanced and at the same time the seaweed production is profiting with this potential capital flowing every month in the villager’s pocket.

5.7. Seaweed value chain

Most products change hands several times before reaching the final consumer. There are input suppliers, producers, processors, wholesalers, etc. all of them that add its value at each step in the process. The value chain refers to this range of activities and actors that bring a product from its conception to its end use. Worldwide the poor earn their income through
micro and small enterprises, however most of these firms fail to uplift them from poverty, leaving families unable to meet their basic needs, particularly feeding, educating the children or having access to an adequate health care system. Determining what makes some business succeed while others fail is critical in order to help the poor to improve their livelihoods. The value chain concept is this regard very helpful since it captures the real economic structures and therefore is more useful in guiding development interventions than a sectoral perspective, it also maximizes the economic opportunities and identifies and addresses the system constraints that impede a proper development of the industry. One of the most important ingredients of a successful business is the ability to respond to market opportunities and to new tendencies, “what the consumer wants”. Often, this response comes in the form of upgrading which can bring high returns to small and family businesses. There are five ways in which a firm can upgrade regardless its size (Parsons, undated):

- Improving its efficiency
- Improving the quality of its products
- Specializing in new functions or activities
- Finding new markets
- Developing new products or services for a unique market

For the case of seaweed farming, considering the current price conditions and particularly the potential of seaweed for further development, the feasibility of upgrading the value chain comes with developing new products based on the raw commodity that are more valuable in the local market. This is in response of a change in the market demand, mainly considering that Zanzibar is a touristic hub and the market therefore should be versatile. Even though upgrading can generate profits and improve the livelihoods of poor people, this option requires as well a substantial initial investment and risk. The best way to reduce risk is by strengthening relationships among the community members, in this case women, and also between suppliers and buyers. If all actors within the value chain are well organized and linked the upgrading of the value chain becomes more easy, efficient, sustainable and in the end more profitable. Through upgrading it is possible that small-scale firms are able to increase their income, however it is essential to analyze the value chain as a whole, including the relationships among suppliers, buyers and market consumers and identify the possible and constraints and incentives.

5.7.1. Main actors of the value chain

A value chain describes the full range of activities which are required to bring a product or service from conception, through different phases of production, delivery to consumers and
final disposal after use. To understand the challenges and potentials of upgrading the seaweed production it is essential to analyze the value chain from the basis together with its actors. Furthermore, the value chain analysis seeks to understand the various factors that drive the incentives, growth and competitiveness as it makes more clear and easy to determine the opportunities and constraints to increase the benefits for micro, small and medium-scale enterprises.

For doing a pertinent value chain analysis it is essential to identify the main actors that are involved in the chain and play a key role in its development. The main stakeholders are:

- **Seaweed farmers:** In the Island of Zanzibar there are around 15,000 to 20,000 women engaged in seaweed farming. In the village of Jambiani there are not accurate estimations of how many women are involved in this practice, however according to key informants; in the village about 90% of women are involved in seaweed farming. Their main roles are farm the seaweed, dried it and sell it to the local buyers. Seaweed farmers in Jambiani currently do not process seaweed neither do any algae extraction.

- **Buyers/Exporters:** These actors refer to the seaweed companies located in Zanzibar such as ZANEA; BIRR; C-WEED, etc. These companies are the ones in charge of providing materials to the farmers such as ropes, plastic boots and bags. In some cases, especially when seaweed farming was initiated, they provided extension services and trainings for farmers. The companies buy the dried seaweed from the farmers through their local agents and afterwards they export it in bulks to their “sister” multinational companies abroad, mainly to USA, Denmark, France and Spain. The multinational companies are the ones that process the seaweed and extract a phycocolloid gel, the carrageenan which will be used as thickener and emulsifier in many products like in dairy, pet food and meat.

- **Seller or local agents:** These agents are located in every village and it is usually local people employed by the export companies. In Jambiani, there were two local offices of the company ZANEA where farmers could sell their production. These agents buy the dried seaweed, weight it and collect the seaweed in big bags of 50 Kg. which subsequently will be transported to Stone Town where the seaweed is compressed and exported.

- **Government departments:** The are some government departments and institutions involved in the industry for example the Zanzibar Seaweed Cluster Initiative which coordinates trainings and workshops in value adding for 9 villages in Zanzibar. There
are as well some ministries in charge of collecting taxes from the exporters, providing licenses and general policies for the industry and trade sector.

**Figure 20: Seaweed export structure**

![Seaweed export structure diagram]

Source: Own construction, 2013

*Figure 10* displays how the seaweed industry is currently organized in most of the villages in Zanzibar, like for example Jambiani. The value chain in itself is not very long like comparing it to other commodities like coffee. Nevertheless, there is disproportionality in the earnings in the chain considering that the farmers are the ones that are getting the lowest returns. The seaweed industry in Zanzibar and the seaweed companies have developed a market only for raw seaweed and the inequalities on the profits is discouraging many women to continue in the industry and rather move to the tourism sector. In this regard, the potential of seaweed as a tool for upgrading the livelihoods of many households in the coastal areas is unexploited. Therefore, the need to upgrade the value chain is essential in order to not only to develop a new industry but to use this as a mean to alleviate poverty, empower women and in general improve the income of poor families.

### 5.7.2 Seaweed value chain dynamics

In the value chain the farmer or producer is in charge of farming, harvesting and drying the seaweed that will be sold to the local agents located in every village. These agents are as well in charge of providing to the farmers all the farming materials they require for the seaweed production. Local agents transport all the seaweed production to their companies.
in Stone Town and then these ones are the responsible for exporting the seaweed abroad to their multinational partners. In this model it is clear the monopsony of the market whereas there are only few buyers that dictate terms to its suppliers since they have the market power. This phenomenon is quite evident in Jambiani where only two seaweed companies are existent and as observed they have the power to set the price of the seaweed. Figure 24 illustrates the functioning of the current value chain in Jambiani.

In mid to late 1990’s it was already suggested by the government and some organizations to install a plant for processing seaweed in Zanzibar and start giving a value instead of only selling it abroad in bulks. Nowadays, it has been recognized that small-scale processing is possible and what is most important it has been proved that it is more profitable than only selling dried seaweed. According to Flower Msuya from the Cluster Initiative, there is already semi-processing facilities located in the north of the Island of Zanzibar where seaweed powder is extracted. They sell 1 Kg. of seaweed powder for 10,000 Tsh. (6.25 USD) which is produced with 2 Kg. of dried seaweed which normally costs 800 Tsh. (0.50 USD). The Cluster where the processing facility is located is currently distributing seaweed powder for all the small-scale industries that require the powder for producing soap, juice, crèmes, etc. It is evident that the processing of seaweed brings more returns that only farming and drying it, this cluster, in the north part of the Island is making a profit of more than 100% by going one step further in the processing line. Why Jambiani cannot be the next cluster giving that this village has all the required characteristics?

Figure 21: Seaweed value chain
Given the low prices of dried seaweed, the Seaweed Cluster Initiative started encouraging coastal communities to give seaweed an additional value and provided trainings and workshops for soap production. In 2008 the initiatives were finally becoming real and seaweed powder was possible to extract, packed and sell it for production of soaps, crèmes, scrubs, massage oils, seaweed juice, cake, pudding, etc. The idea of creating cosmetic products from an algae is indeed very interesting, however if initiatives like these are supported it is essential to consider the future market perspectives of derivate products from seaweed. The representative from Leo Switch affirms that the market of cosmetics is potential; currently the main market is concentrated in Stone Town giving its high tourism development. In the future in general East Africa could be a target for commercializing such products, particularly to up-middle class. The international arena is possible as well, maybe through the creation of a local brand that identifies and recognizes the quality from the seaweed products elaborated in Zanzibar. A feasible future market considering the current trends will be the elaboration of organic products, like organic soaps and crèmes which are highly demanded in the international market with better prices than normal products. The main goal should go in the direction of improving the quality of the production rather than increasing the quantity itself. However, as Msuya affirms for now the market for seaweed products still needs development and expansion that will come as more seaweed villages join value-addition initiatives.

As observed in Figure 25 the upgrading of the value chain has already given the first steps in Zanzibar, however this field should prove to be profitable and especially feasible to implement in villages like Jambiani. The seaweed, as observed, is a useful raw material that can serve as basis for many other products that at the same time are highly appreciated in the international markets.
Since 2008, the initiative of upgrading the seaweed value chain in Zanzibar has been in place. An example of this is the Seaweed Center in Paje where there is already an established organization for processing and marketing the new products elaborated on the base of seaweed powder. In this regard, the value chain has as well changed in order to provide more benefits to the small-scale producers. For the case of Jambiani, there is a need of restructuring the value chain and organizing the community for a successful upgrading.

5.7.3. The role of women in the value chain

The analysis of the value chain has to be done with a gender perspective remembering that seaweed farming is in Zanzibar mostly a woman business. Women as main actors in every
value chain are essential for any kind of change and improvement. As the organization Care mentions, of the 1.3 billion people who live in absolute poverty worldwide, about 70% are women. For them poverty does not only mean scarcity and want, it means rights denied, opportunities reduced and voices silenced (Care, 2005). It is also estimated that women earn only 10% of the world’s income since they are limited to a set of jobs supposed suitable for women, mostly low-paid and with low status position. That is the case of seaweed farming in Zanzibar, where men do not want to get involved in this practice anymore since they consider the earnings are too few and thus is a “suitable” work for women. However, is in that point that a change is required and the upgrading of the value chain is even more appreciated since it does not only improve the incomes of women but also empowers and inserts them in the society and its economic dynamics.

It is essential to consider that women alone cannot empower themselves, men as power holders within the family are supposed to act and accept the new roles women are acquiring. As observed in Jambiani, women participation and inclusion have increased though seaweed farming but still there is plenty of room for empowering women and making them aware that they are the actors of their own change. As Flower Msuya from ZaSCI affirms women are coming up slowly and in Africa, in general, women are still considered in a lower position, but there are opportunities to change that fact. Women in Jambiani require to be empowered in order to have power to negotiate and make their business profitable in a sustainable and independent way. However, women empowerment in Jambiani has not progressed much as it should have comparing it to Paje, where women are completely organized and have already a structure for giving added-value to seaweed. Empowering women has not only help them to improve their livelihoods but women in Paje for instance are more self-confident and secure since they were already given the tools to communicate their ideas better and to be entrepreneurs.

Women are part of the population that is living under the poverty line, additionally they have a low educational level and sometimes they do not even have the opportunity to work. Women are important actors for creating development by sharing their knowledge, paying the education of their children, creating networks and cooperatives. Gender differences in many cases shape our identities, attitudes, roles, relationships and resources more deeply and persistently than class, race or other social constructs (Care 2005). It is important to consider that another challenge that women face is the growing urbanization and rural-urban migration. Normally, husbands leave the home in search of a better job, leaving women in charge of the household but still with limited decision-making power and vulnerable to poverty (UNFPA undated). That is also the case in Jambiani, where many men left the village
to work in the tourism area in Stone Town or in the north of the Island. In this regard, women have to take the responsibility of their family and have to find ways to sustain it economically.

**Figure 23: Women’s role in seaweed farming**

As shown in *Figure 26*, women are essential and central actors for the present research since they are the ones who are involved in seaweed practice. About 90% of seaweed farmers are women and they have made seaweed their business, even though the challenges and difficulties. Seaweed has become part of their culture and the tool for a successful empowerment and inclusive development. The importance of promoting particularly economic empowerment in villages like Jambiani is essential to understand since as many studies have recognized economic empowerment is able to improve the status of impoverished women. Furthermore, the most straightforward vehicle to empower poor women is to increase their productivity in home and market production and the income they obtain from work (Buvinic from UNFPA 1996). Therefore investments in human capital such as trainings for productive employment and women empowerment through organization can uplift their livelihoods and in general alleviate poverty. Seaweed farming has showed throughout time that it is a potential tool for improving livelihoods of women in coastal areas; nevertheless it requires a reorganization that will lead to better prices and improvement of the industry.
The importance of analyzing the value chain with a gender perspective relies on its wide view as a pro-poor economic development that can address gendered market development issues for two reasons: firstly its economic viability and sustainability aims for win-win outcomes for all participants and secondly it is useful qualitative tool for identifying critical issues and obstacles for specific target groups and based on that generate effective policies and development strategies (Coles, Mitchell 2011). The current discourse on gender and value chains are mainly focusing on economic empowerment of women which in the context of value chain development, empowerment itself is view as a process of reducing inequalities in people´s capacity to make choices regarding their manner of participation. In the case of seaweed farming in Jambiani it has been observed that there is an unequal access to capital and property and in many cases women tend to participate in value addition activities as employees while men dominate management roles, like in fishery. Women are more likely to manage their own work and income where capital barriers to entry are lower and where physical product transformation involves simple and relatively low equipment. This is clearly visible on the seaweed industry. Women are employed in this practice mainly because the initial investments are low and men are not interested since the earnings are too low. Women get the seaweed seeds from the family and friends and the rest of materials from the seaweed company. There is not any need for further investment and after 4 weeks of having planted they are able to harvest and get some money for the household. In Zanzibar in general seaweed production is regarded as a marginal, small-scale and low intensity activity suitable only for women, while in the Philippines algal culture is a larger scale and commercially important activity that provides labour not only to women but men and the whole family is engaged in the practice. Returns are more attractive than in Zanzibar, where men consider the opportunity cost of shifting resources from agricultural, fishing and touristic activities to seaweed production as being too high.

Seaweed farming offers women an alternative practice besides their normal activities like cassava, rice and banana farming and gives them a reliable monthly income, even if it is low. As long women keep on producing and selling the product raw they would not be able to really uplift their economic standards since such value chains, like seaweed, is organize in that way that only the product already processed has more value. It has been evidenced in many studies that even where women may not directly control assets and income they and their households can benefit from their engagement in value chains since they assure better nutritional outcomes, food security, etc. As evidenced during the field trip in Jambiani, women normally use the money they earn from seaweed for the household expenditures. While, on the other hand, men tend to use the money for other purposes that do not
correspond to the household. In the next Figure it is displayed the expenditures of women in Jambiani:

**Figure 24: Women expenditures**

Everything that results from increased aggregate household production and particularly income. Thus, the upgrading of the value chain in the seaweed production is not only a tool for improving the livelihoods of many coastal communities but also is a mean to empower women and progressively insert them in the local economy. Moreover, empowerment of women and increasing their ability to make strategic life choices is an intermediate step towards improving poverty impacts for whole communities.

Seaweed production is the perfect industry to include a gender dimension in value chain since women are the main actors and there has been identified on women in Jambiani essential factors that might bring successful in the value chain upgrading such as:

- Desire to change: Women interviewed mentioned frequently they are willing to change and improve the current conditions of the industry
- Basic know-how: Women in Jambiani already have the knowledge about seaweed farming, they required only trainings for soap and crème production
Conducive climate: factors like availability of time, geographic distance to services providers and access to communication technologies are important for a proper upgrading.

Rewards: these will come as higher prices and income improvement, since soaps and crèmes will have a better price in comparison to dry seaweed.

Jambiani has already some of the factors required for a successful value chain upgrading, but still there is no universal rule and is important to keep in mind that gender drives behavior, norms of behavior and of economic participation. It also shapes how individuals use and invest their income, conduct business and maintain and develop relationships with other economic actors. In order to integrate successfully women into wealth-creating activities it is required to have an understanding of gender and how the value chain interrelates with it, the relationships between men and women and the response on different kinds of incentives and particularly changes in their current activities.

5.8. Upgrading the seaweed value chain

As previously explained in Figure 12 the current organization of the seaweed value chain is export-oriented and does not encourage the farmers to improve the quality of the seaweed neither to use better techniques and methods to dried it. The upgrading of the value chain, like observed in Paje, should reorganize the roles of the actors and make them more linked and equal. For the matter of this research, it is interesting to analyze and compare how the value chain can be upgraded and restructured looking for equal benefits for all the actors involved. The upgrading of the value chain should include the following main actors:

- **Seaweed farmers:** Besides their roles as farming and drying seaweed, in the upgraded value chain seaweed farmers also are able to process the seaweed and elaborate new products that they will be selling to different several buyers including the touristic sector. It is aimed that seaweed farmers are not isolated anymore but on the other hand they are organized and work together as groups in order to increase their productivity and also negotiating power. They have gained as well knowledge in giving seaweed additional value.

- **Buyers/Exporters:** Even though farmers are now processing and using the seaweed for other purposes they still sell a part of their production to the seaweed companies. Since farmers are organized in groups they are able to agree on the terms and on the price paid to the dried seaweed.

- **Seaweed Cluster Initiative:** The institution plays an important role in providing extension services and trainings to the villages where an upgrading of the value chain
is feasible. Furthermore, the Cluster connects the farmers with government representatives.

- **Government departments**: As in every value chain the Government is part of it in a direct or indirect manner. For an upgraded value chain, government should be providing extension services and creating, through policies, a proper environment for investment and entrepreneurship.

- **Private investors**: They play an important role for bringing new investments and technology transfer to the area. Like in the case of the Seaweed Center in Paje, the creation of it is through the funds and investments of the private sector. In Jambiani as well it is possible to create a seaweed center with the support of private investors who also have identified profit in seaweed and its derivate products.

In the following Figure it is displayed how the upgraded value chain should be organized.

**Figure 25: Upgraded value chain**

![Figure 25: Upgraded value chain](source: Msuya, 2011)

As observed, the farmer is in charge of harvesting and drying with appropriate techniques the seaweed. After this process, dry seaweed will be transformed in seaweed powder which is the main ingredient for producing soap, crèmes and scrubs. The products elaborated on the base of seaweed are currently sold in the local market like hotels in Zanzibar, stores in Stone Town and directly to tourist through the Seaweed Center in Paje. For the future, as a market
expansion, the products can be distributed in other cities in the mainland and even be exported to other countries within the East African Community. It is estimated that the price of soap is around 2,000 to 8,000 Tsh (1.25 to 5 USD).

But what are exactly the earnings that women make from an upgraded value chain? First of all, women that are employed at Seaweed Center in Paje have little experience from formal business. None of them have had a formal employment before but they still do “small business” like selling things, for example handicrafts, soaps they make in their homes and vegetables they are growing. They are also selling their seaweed to the local companies. It is estimated that women members of the Center earn around 100,000 Tsh. (62.5 USD) monthly for half time. On the other hand, women in Jambiani earn about 60,000 Tsh. (37.5 USD) per month for a bit more than half time. They go their plots and spend an average of 4 hours daily farming seaweed and afterwards they spend some time drying, packaging and separating rope and tie-tie which is done routinely. Women in Jambiani will be able to earn more if they could use the rest of the time that they are not farming in productive activities, however in many cases they just dedicate time to their domestic chores. Therefore, in comparison women from the Seaweed Center in Paje earn about 40% more than the women in Jambiani since products with value-addition have higher prices (See Graphic 6).

Graphic 6: Seaweed earnings

[Chart showing average monthly wages for women in Jambiani and Paje]

Source: Own construction, 2013

Women in the Seaweed Center are not only getting a better income but they have developed a sense of security since they have a fixed job and they believe in any case of personal problems they can always ask for support. Therefore, women think of the Center not only as their employee but also as their second home. The social capital that has emerged from this
initiative is essential and cannot be calculated in numbers but it does not mean that it is not important. Women are regarded as human beings and not as machines or merely human capital.

Furthermore, the pilot project in Paje has shown a good progress on improving the uses of seaweed and the cultivation methods. Harvested seaweed is now dried on drying racks or platforms so that dirt coming from sand and domestic animals will not affect seaweed. This, in contrast to, the traditional methods used in Jambiani for drying seaweed on sand, palm fronds and clothing materials has improved the end quality of seaweed that later on will be used for the elaboration of derivate products. However, most importantly, the project in Paje has shown that it is possible to organize women and insert them in a new economic dynamic within the value chain that might uplift their economic situation and specially empower them to actively participate in the household's decisions and in the society.

Figure 26: Added value chain

![Figure 26: Added value chain](image)

*Source: Own construction based on Msuya, 2011*

*Figure 30* displays the value addition on seaweed farming with some data regarding market prices. The profit that farmers can make once they process the seaweed is big, especially because the seaweed powder is also a good business and many other villages require it for elaborating soaps. In this regard, the earning from making soaps is also important because the market is available. In the case of Jambiani, it will not be a problem to sell the soaps and other seaweed products to the tourists that visit the area. In fact, this will be a good business since Jambiani is a main touristic point in the east side of Zanzibar. Besides giving seaweed an added value, seaweed farmers can still commercialize their dried seaweed as usual to the
local buyers, however it is expected that the prices improve since women have already a higher handling power and the quality is better.

5.9. Concluding Findings

The findings of the present research were carefully analyzed based on the concepts of the Sustainable Livelihoods and the Value Chain theory. Furthermore, the data collected was in every stage considering the main variables object of study established through the objectives and the Conceptual Framework.

To summarize the findings and the analysis of the present research it will be structured according to the main variables defined in the Conceptual Framework:

Financial factors: The evidence collected throughout the present research indicates that the socio-economic impacts of seaweed farming on coastal communities have been positive to a very significant extent. In addition, seaweed farming is often undertaken in remote areas where coastal communities face a reduced number of economic alternatives. 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 socio-economic status of female farmers as it allows them to engage in an income-earning activity that can be undertaken without neglecting traditional household chores. However, the prices paid to seaweed farmers are too low which is totally discouraging women to continue with this practice. In Jambiani there is a lack of large-scale infrastructure and equipment required to process seaweed and extract algae or elaborate derivate products such as soaps, creams, etc. As a consequence, the production in Jambiani is characterized for being only primary (raw material). Additionally, seaweed farmers in Jambiani are totally dependent on the local companies and commercial agents for getting free farming materials in exchange of the harvested seaweed. The way the system is currently organized and structured gives not space for entrepreneurship initiatives as for giving seaweed an extra value and therefore getting a better price for farmers.

According to the information collected in the field, women earn an average of 37,600 Tsh (23.5 USD) every six weeks by harvesting and drying seaweed and selling it to the local buyers. However, women in Paje who are already involved in a value chain upgrading earn an average of 100,000 Tsh (62.5 USD) per month half time by elaborating soaps, crèmes and other products based on seaweed. The pilot project in Paje is a clear example that the
upgrading of the seaweed value chain is possible with the cooperation of the private sector and the community itself for improving the livelihoods of women engaged in this practice.

**Human factors:** Women engage in seaweed farming learned this practice by observing their family members. This activity is a generational and has been in the Zanzibari culture for more than ten years now. Women engaged in seaweed farming, according to the information collected, normally did not finish secondary school; they started at an early stage since they needed to contributing money to their family. In this regard, the education level of these women is quite low which also makes it difficult for them to perform other activities that require more skills. Moreover, since seaweed farming is a part time job, women are still able to complete their household chores. Moreover, in the culture it is more appreciated if women start to engage in some small economic activities rather than continuing studying. Nevertheless, seaweed farming is a hard practice and many women face health problems since they have to lift heavy weights and half of their time they spend in the water under the strong sun. In many cases they have problems with the eyes because of the water reflection and some skin allergies.

Women in Jambiani affirmed they did not receive any trainings or workshops regarding seaweed farming techniques or methods. All what they learned was through their family members. It has been observed that extension services in seaweed farming are quite limited and mostly concentrated in other villages along the coast of Zanzibar; Jambiani has not been reach yet.

**Social factors:** Women are the main focus of the present research since seaweed farming in Zanzibar is mostly practiced by women. Moreover, this research intends to address the upgrading of the value chain with a perspective on women since they are the primary producers. This study analyzed the cases study of Jambiani with a perspective of economic viability and sustainability of an upgrading trying to aim for win-win outcomes. As a main social factor it is essential to identify the type of formal or informal organization already existing in the community and community based organizations. However, currently in Jambiani, there is not any organization or association coming from the women themselves trying to organize them for seaweed matters. Every farmer works at an individual base which as evidenced in Jambiani has not helped them in improving seaweed prices or getting a better handling power.

In general throughout the years, it has been documented that seaweed farming has increased in many villages in Zanzibar the purchasing power of women which at some extend has empowered them. In Jambiani, many of the seaweed farmers are illiterate and
have limited influence when it comes to negotiations with local brokers, which has contributed to the low prices they get for the harvested seaweed. Before seaweed farming, women were supposed to stay at home and did not have any contribution and no say in the household’s economy. Nowadays, women have more power since they have some money and they are getting more recognition from the society. More importantly, as many respondents in Jambiani affirmed currently women are the ones who are paying for the education and the materials for their kids with the money they earn from seaweed. Still women empowerment in Jambiani is still in the beginning phase; however it is already visible that seaweed farming has been a useful tool to increase their leadership and participation within the society.

Natural factors: The seaweed variety used in Jambiani is *Euchema* (spinosum), the other variety *cottoni*, even though has a better price on the market, is not farmed since it is environmental sensitive and easily catching diseases such as ice-ice and facing often die-offs. In Jambiani, from all the farmers interviewed affirmed that they do not like to farm *cottoni* since it is quite difficult to grow it and it takes more time and effort. The ZaSCI has done some researches regarding two new seaweed species, *Gracilaria salicornia* and *G. edulis* which are known to have up 50% higher agar content, however they have not been introduced yet in Zanzibar. Seedlings as other materials are provided by local companies who do not seem to have any further interest in introducing more varieties then the ones are already demand by international markets.

Seaweed farming is considered relatively benign compared to other mariculture farming practices, it has been evidenced that the environmental impacts of seaweed farming are minimal and in some cases even beneficial by increasing production of herbivorous fishes and shellfish. Seaweed farming in Tanzania is regarded as potential economic activity for coastal communities and a way to reduce pressure on marine resources and coral reefs. Currently there are research programs on the future of integrated coastal aquaculture in Tanzania, whereas the main emphasis is to integrate seaweed, mainly the commercial varieties (*spinosum and cottoni*) with shellfish and pearl farming.

For farming seaweed it is not required to use any kind of fertilizer therefore the practice is not affecting the shores on the beach as the animals that are living there. However, as observed in Jambiani many of the farmers, almost the majority use wooden sticks to fix the plot lines where seaweed will be attached. This sticks come usually from mangroves which in a long term could be prejudicial giving that mangroves are protected areas and very much sensitive.
Therefore, it is recommended nowadays to use sticks from other materials that do not harm the environment.

**Value chain factors:** Most products change hands many times before they get to the final consumers. Every actor involved in the value chain, from input supplier, producer, processor, wholesalers, adds its value at each step in the process. The value chain refers thus to the process of bringing a product from its conception to its end use. In seaweed farming, the value chain is not particularly long, however the structure identifies that the producers or seaweed farmers are the ones who are getting the smallest piece in the earnings cake. In the case of seaweed farming, an upgrading of the value chain can be reflected in many matters, however following the current trends as projects already ongoing in Zanzibar, the semi-processing of seaweed for further elaboration of derivate products is progressively a reality.

Value adding involves processing and semi-processing of the seaweed to produce the gel and seaweed powder locally and reduce the bulkiness of the sold product and start elaborating soaps, crèmes, food products, etc. To be able to add value to the seaweed, there is a need to mobilize and create awareness on semi-processing technologies, marketing of the semi-processed seaweed, and the marketing and commercializing of new products. In Zanzibar there is already one location that process the seaweed for extracting its powder, moreover the Seaweed Center in Paje has already established a new way of commercializing seaweed with an added-value and at the same time helping to improve the livelihoods of many seaweed farmers. The Seaweed Center in Paje is part of a private sector investment that is interested in expanding the seaweed business and creating value-addition. Jambiani is on the list as future seaweed processing center, therefore the importance of analyzing the influence of a value chain upgrading in the livelihoods of women engaged in the seaweed practice.

**Physical factors:** The physical capital that women in Jambiani use is not good enough for developing an industry. Seaweed is characterized for being farmed very basic and without almost any equipment or infrastructure during production, harvesting and post-harvesting phase. The method seaweed is cultivated in Jambiani is the off-bottom in shallow waters. As observed, the quality of seaweed can be highly improved only by using better drying methods such as drying racks and proper storage places to avoid any contact with rainwater and domestic animals. Even though, seaweed farming requires a relatively simple technology with grow out cycles as short as six weeks it is essential to start improving the quality of seaweed for making it a competitive commodity. However, seaweed farmers, as
observed in Jambiani do not feel encouraged to invest and put some extra effort in drying techniques since the prices they get is always low. In Jambiani, there is only one storage room that belongs to the seaweed company which means the community cannot store their production independently.
Chapter Six

6. Conclusions and Recommendations

6.1. Conclusions

The value chain approach addresses the major constraints and opportunities that actors face at different levels within the chain. The importance of upgrading the value chain in seaweed farming comes together with a concept of women empowerment -“a world which people are empowered to succeed in the global economy”- which in the case of Jambiani is essential in order to improve the livelihoods of many women that are currently part of the seaweed industry.

For the present study it was proposed to study the feasibility of upgrading the seaweed value chain in Jambiani in order to improve the living standards of women engage in this practice. Since currently, seaweed is practiced by around 90% of women in the village of Jambiani is therefore a main economic activity, nevertheless the prices they get for the raw commodity is very low discouraging them to continue practicing it. However, seaweed in itself is a potential activity that has already improved many livelihoods in its beginnings. It is important to consider that since it does not require any high initial investments, seaweed is the perfect economic activity for poor coastal communities. Seaweed farming represents an earning of foreign exchange for the countries of eastern Africa.

The coastal population in Tanzania is growing at an average rate of 2.8 to 6 percent annually. In Tanzania, just like in other parts of the world coastal populations increase very rapidly at the same time living conditions are very poor, particularly in rural areas like Jambiani. The inhabitants of these areas are poor and lack public services like potable water, electricity, schools and equipped hospitals which hinder development and limit in many cases income generating alternatives. This situation has accelerated poverty which in some cases has influenced on the high rates of coastal resources depletion, like for example overfishing. In this regard, seaweed farming offers an alternative practice for coastal communities which is considered to be profitable, easy to manage and productive without increasing pressure on the fisheries wild stocks and affecting the natural resources. Social and economic benefits from the farming of seaweeds have been evidenced since the industry started twenty years ago. Real examples are visible in Zanzibar Island and in the coast of Bagamoyo.
However, currently the success of seaweed farming is mainly dependent on the market prices. Seaweed farmers are getting 400 Tsh. (0.25 USD) for every dried seaweed Kg. they sell to the local buyers located in every village. This price, set by the seaweed companies, nonetheless is very low and it is not enough to cover the household expenses. Therefore, the importance of upgrading the value chain in order to increase the prices and in general the conditions of the women engaged in the practice. There are different ways for upgrading the value chain:

- Improving the efficiency
- Improving the quality of its products
- Specializing in new functions or activities
- Finding new markets
- Developing new products or services for a unique market

For seaweed farming, the chosen upgrading mechanisms is to develop new products and sell them in special markets and tourists taking the advantage that Zanzibar is a big touristic hub. The innovation opportunities, like these will not only raise the prices paid to the farmers but will also open channels for domestic market and make the seaweed farming industry more competitive with value-added products that will benefit Zanzibar and the local community, especially women.

On the other hand, the rapid transformation of Zanzibar’s coast as a result of tourism development remains as a critical issue that might bring advantages but also disadvantages concerning coastal communities and the way they are adapting themselves to this new wave of foreigner’svisitors. For instance, widespread development seen on Unguja’s East Coast, in areas such as Kiwengwa, are changing the face of Zanzibar. Jambiani is many of the coastal villages exposed towards this situation. Many women involved in seaweed farming want to work in hotels and restaurants where they can earn more money in comparison to what they earn in seaweed. Nevertheless, normally they are unable to fill the requirements since their English knowledge is quite low. The development of tourism in rural areas such Jambiani can bring advantages likes for example infrastructure and services provision, however such development should not be touristic-driven but consider in every step the development of the village itself. As seen during the fieldwork many local teenagers do not want to continue studying since they already earn some money with the tourists. This situation has a big long-term impact since coastal communities are not educating themselves and are not developing any other skills different from offering touristic activities. For every society education should be the basis for future development.
The seaweed value chain upgrading is able to progressively create a small-scale industry and stimulate the expansion in market linkages to different services and trade sectors. These will create employment and support livelihoods of coastal communities in order to achieve an economic well-being and poverty reduction. Nowadays, the demand for high-value primary and processed products is rapidly increasing, driven by rising incomes, faster urbanization and market segmentation, liberalized trade, foreign investment, and tourism. These developments are expanding both internal and external market opportunities, which are important for fostering mariculture practices such as seaweed farming which might bring employment and improve rural incomes. However, it is important to consider that these new market opportunities categorically demand stability of supply, quality, timely deliveries, and a basic structure. These are the very challenges that face Jambiani and in general Zanzibar.

Moreover, based on the findings of the present research, in Jambiani, there is a low level of knowledge of seaweed farmers on opportunities either in the internal or the external markets. Seaweed farmers are not aware of the market opportunities and the fact that seaweed can be used and sold in other ways and thus get a better profit. In this regard, farmers are virtually disconnected from the seaweed industry even though they are main actors in the value chain. This situation can easily be improved by better availability of information and extension services, as well as by stimulating levels of seaweed farmer organization that may be better equipped to take advantage of market opportunities. The opportunities exist for widening the scope and volume of Zanzibar’s local commodities into the domestic and export markets as well as in exploiting untapped potentials for secondary and tertiary processing.

The value chain of seaweed in Jambiani is not involving many actors. Farmers are not able to discuss the price and their leverage in quite low, since local companies have in a way institutionalized the seaweed business. The business is being following a specific cycle since it started and every actor has a determined role that is difficult to change. Farmers are cultivating the seaweed, drying it and then selling it to the local companies. Only women are involved in the practice since men affirm that the earnings are too low for them. Local companies, on the other hand, give in exchange farming materials for free but under the condition farmers should sell them the harvested seaweed. In this never ending cycle, there is no room for creativity, leadership and entrepreneurship. In Jambiani women believe that that is how the seaweed business works and in a way there is a feeling of conformism difficult to change.

Nevertheless, the initiative in Paje shows another reality under the similar conditions. With the support of the private sector, women in Paje have created a Seaweed Center where they
are able to bring their production, dry the seaweed with proper techniques and afterwards elaborate derivate products like soap and crèmes. Analyzing this with an economic perspective, women in Paje are getting better incomes, thus the upgrading of seaweed has served as a toll for improving their livelihoods. Furthermore, in a social perspective, every visitor that goes to the Center can perceive that women there are different in comparison to women in Jambiani. They are self-confident and more open and reflect a feeling of security, trust and proudness on what they are selling and doing. Since they have already acquired basic knowledge in English they can express themselves and communicate their ideas, aspirations and share their stories. They have been more exposed to communication, external visitors and knowledge that have helped them in the process of learning “how to make business”. On the other hand, the majority of women in Jambiani are still closed to this kind of exposure and they are hard to reach. But just as Paje was ten years ago, is Jambiani now, which means the potential of organizing women and creating a sustainable industry out of seaweed is existent and feasible, just waiting to be untapped.

6.2. Recommendations

Based on the present research it has been observed that the seaweed industry in Jambiani is very basic and does not involve any processing or transformation of the product. Farmers sell seaweed as a raw commodity and in small quantities. The central problem that seaweed farmers face is the low price they get from selling their seaweed. Therefore in order to increase seaweed prices and help women to improve their livelihoods based on seaweed it is recommended the following:

- **Creating a conducive environment**– Women are the main actors in seaweed farming and they have to be aware of the potentials they have in order to find better ways to exploit them. Seaweed farmers need to realize that the seaweed business is not only about selling the raw commodity but also giving it an additional value and start innovating. In this regard, the main step is that women in Jambiani understand and recognize that they can be actors of change if they start with small initiatives.

- **Organization promotion** - Relationships within the community have to be established based on trust realizing that it is more beneficial to work in associations as individual. If women organize themselves they will be able to have a better selling power with local companies. They will also be in the position to negotiate better since the production will not only be individual but communal with means more quantity. As proposed in the Seaweed Development Strategic Plan formulated by the Ministry of
Natural Resources and Tourism, there is the need to establish Village Seaweed Groups that facilitate communication among producers, developers and other actors from the value chain. The group should be community-based and be open to all the farmers in the area that are interested in joining. Consciousness-raising activities are required to be carry-out in order to make people understand that seaweed can still be a good source of income.

- **Empowering women** - For seaweed farming women are essential actors since they are the primary producers. Women should be empowered in order to gain knowledge and information about better alternatives to manage their business which will influence their income. In Jambiani more than 90% of women are engaged in seaweed farming which has progressively give them independency and an income for the household. The fully integration of women in the value chain of seaweed will bring a new understanding of their real contribution in the society. Women will have an identity in their society and particularly they will get the knowledge of giving extra value to their production. In this case, it is mostly economic empowerment through an upgrading of the seaweed value chain; however this type of empowerment has without question impact on other fields such as in the social aspect. Women in villages were they have been empowered now have a voice and they are able to decide in the family business.

- **Capacity building and technology transfer** - In order to improve the seaweed quality it is essential to give proper training to farmers and also have some technology available. It is recommended that women have periodical trainings in areas like seedling selection and retention, planting and cultivation, harvesting, drying, processing and elaboration of soaps and creams. Important is as well to train them in economics and business planning to encourage them to start their own initiatives with already some basics background. Furthermore, the need to improve the cultivation and drying methods is essential for getting a better quality which at the end has a higher price. Jambiani should progressively acquire processing machines in order to start developing an industry. Additionally, giving the potential of the *cottonii* variety it is recommended to train women in deep water cultivation techniques so they are able to produce other varieties avoiding die-offs.

- **Improved post-harvest handling** - The price of seaweed can increase if the quality improves; therefore there should be an adaptation of the production standards such
as proper drying methods not like they are done currently and a limited storage time
prior to sale. Presently there is no price differentiation which means even if a farmer
produces seaweed with a better quality she will not get necessarily a better price. In
this sense, standards of quality should become part of the industry as soon as
possible because otherwise it could affect the whole industry in Tanzania

- **Development of basic infrastructure** - Infrastructure is essential for developing any
kinf of economic activity. In this case, seaweed in Jambiani requires some basic
infrastructure like storing rooms, drying racks and a space where women can meet. It
will be recommendable to build a similar Seaweed Center as the one is Paje, where
the is space for the processing-machineries are and a area where women from the
community can get trainings and workshops. It does not need to be a big
infrastructure but a place where women can feel comfortable by working and specially
a place that is communal. This will encourage many small-farmers to get involved in
the project and realize that there are now facilities provided for them to keep on
producing.

- **Credit facilities and small-investment attraction** - Seaweed business in general
does not require a big initial capital, since the materials are provided by the
companies and the plots are free. However, in the case of an upgrading it will require
an investment for the machinery and extra equipment. Very few seaweed farmers will
have the financial means to begin seaweed processing on their own and even if they
had some savings they will feel overwhelmed with the high-risk involved, therefore it
is required the participation of some private investors that finance the initial capital.
Additionally, the community of Jambiani needs in general credit access that currently
is not available. Therefore, it is advisable to create a cooperative where the money
can be safely deposited. Not only for seaweed farming business but for any other
expense, the cooperative will be able to help with micro-credits and loans.

### 6.3. Policy Implications

For the seaweed industry there are some important policies related that are important to
consider. In Zanzibar there is more than one Ministry that in a way is supposed to be in
charge of promoting mariculture activities such as seaweed farming. For instance, there is
the Ministry of Labour Economic Empowerment and Cooperatives which is a new Ministry
established on 2010. The main functions are related to promoting and supporting community
development through empowerment of the economic activities and jobs creation. This is very
much related to seaweed farming, since this occupation gives work to many women which otherwise would be unemployed. Additionally, the Ministry looks for empowerment which is exactly what is required in order to create a successful industry. Empowering women in seaweed practices might lead to an improvement of their livelihoods. As the Vision document refers, “poverty eradication could be synonymous to empower people to successfully manage their lives and have a say on the course of their development” (Vision 2020).

In 2000 the Ministry adopted Vision 2020 which is a number of policies that intend to improve the living standards of the people in Zanzibar. The overall objective of the Vision is to eradicate absolute poverty which according to the document it does not only mean the lack of income but also the lack of accessibility to the basic needs. The Ministry is striving for eradicating poverty in the urban and rural areas in order for them to have food, shelter, decent clothing and social security.

The eradication of poverty, as mentioned in the document, requires employment creation, education and training opportunities in order to promote sustainable livelihoods through freely chosen employment. This is very much in line with what the seaweed industry might be able to achieve in Jambiani. However, much is been said and written about policies at the governmental level but still the community of Zanzibar faces poverty and unemployment. The main problem is that even though there are policies that match with the ultimate objectives that seaweed farming might achieve if well managed, the support provided by the State in Zanzibar is still not enough. As many organizations and the community itself affirmed, the Government is not giving any financial to the farmers in order for them to improve productivity, production methods and knowledge-transfer. Jambiani, is still a community that has not been covered by any public organization yet.

In the efforts of supporting the seaweed industry, the Ministry of Labour created a steering committee, the Commission for Science and Technology, which is coordinating the initiatives that the Zanzibar Seaweed Cluster Initiative is conducting in order to give added value to the seaweed chain. Ministry of Labour is as well part of the triple helix organization that the Cluster has proposed in order to institutionalize the value-addition process in Zanzibar. The Commission for Science and Technology is support financially with 1% of the budget in order to conduct researches and provide assistance and trainings to the community of Zanzibar. However, as explained throughout the present research, the community of Jambiani has not been yet reached or fully included in projects of value-addition. Therefore, there is still plenty room for further programs regarding seaweed in the area.
Another important policy document is the Seaweed Development Strategic Plan which was launched in 2005. This document was elaborated by the Ministry of Natural Resources and Tourism with the support of other public and private partners, like international NGO´s and seaweed companies. The main goal of this political instrument is to provide a framework for future expansion of the seaweed industry of Tanzania. This growth is projected to be financial, social and environmental sustainable. As objective the Plan proposes to increase the production of seaweed, specifically of the *cottoni* variety. The idea behind is to introduce seaweed farming as a main source of income in order to have a faster and bigger expansion of the industry. As mentioned in the Plan the idea is to become more productive which will increase the income and the negotiating power of seaweed farmers. Since currently mostly the majority of farmers are dependent on buyers for farming inputs they are not yet independent and their leverage is quite low.

The SDSP presents an interesting proposal for uplifting the seaweed industry. However, according to observation the Plan which had a 5 year period, were not fully successful. The main challenge is the fact that seaweed farmers are used to cultivate mainly *spinosum* and not *cottoni* since this variety is quite sensitive and difficult to cultivate. The *cottoni* can be cultivated trough other methods, which are not the traditional ones and that might require some small capital from the side of the farmer. Moreover, the farmer needs trainings and workshops on this matter. All this initiatives are very difficult to find in Zanzibar and most of the villages, like Jambiani, still cultivate with the traditional methods.

The Plan offers mechanisms for helping seaweed farmers to become eventually independent from local companies and self-reliant on inputs and other needs. Nevertheless, as observed in Zanzibar this reality is very difficult to change especially because the local companies have a big influence on the market as on the farmers. Therefore, if farmers are to become independent it is required the strong commitment of the Government and other partners in order to make it work.

The SDSP does not mention anything about value-addition even though this is the last trends also seen in other countries like Philippines and Indonesia where not only the seaweed is harvested but also processed. In this regard, the aims and objectives of the Ministry of Labour through the Zanzibar Seaweed Cluster have not been matched and coordinated in only one document which should be the Strategic Seaweed Plan.

On the other hand, as the Ministry mentions in its Vision 2020 about the importance of empowering the society in order for them to increase their opportunities, the Plan does recommend as a main mechanism to have gender considerations. The Ministry should
provide in this regard equal opportunities to men and women for trainings, workshops and financing schemes for inputs provision. The SDSP is assuming that men will be interested in joining seaweed farming, however as observed in Zanzibar, seaweed is still an occupation mostly done by women.

To summarize there are some policies that support seaweed farming in different sectors. Nevertheless, until now these policies have not been quite visible and efficient. As the Government recognizes, seaweed farming is an important economic practice for coastal communities in Zanzibar. Therefore, some financial support should be provided in order to exploit the real potentials that seaweed has and that have been already visible in other countries where farmers have been able to improve their livelihoods. Policies should be general guidelines in order to direct the development process of a country, community, organization, etc. In this case the policies are there but still the implementation of them are missing which makes it difficult for small farmers to really start taking advantage of the market opportunities that are available and might bring development for them.

6.4. Further areas of study

In the future it will be required to know if the Zanzibar Seaweed Cluster initiated at some point the value-addition project in Jambiani and what are the main effects on the livelihoods of coastal communities, particularly women.

It will also be interesting to know, since the Seaweed Center in Paje, has an expanding strategy to create small centers of value-addition in specific areas. Jambiani is on the list as future location where seaweed value-addition will be developed. In this regard it will important to research about the feasibility of a future expansion and the potentials as challenges of this initiative.

Furthermore, as general interest, especially personal, it will be interesting to see how the touristic industry develops in the east coast of Zanzibar, particularly in Jambiani. If this new sector will replace the other economic activities such as seaweed farming and agriculture and how the tourism will progressively shape the community.
Chapter Seven

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Appendix A

Questionnaires conducted to seaweed farmers

Name: Age:
Civil status: Occupation:
Number of children: Husband Occupation:

1) Since when are you engaged in seaweed farming?
2) How you became familiar with seaweed farming?
3) How many hours per day/per week do you dedicate for seaweed farming?
4) Did you finish primary school?
5) Did you finish secondary school?
6) Do you think seaweed farming has helped you and your family to improve your socio-economic conditions?
7) What is the price for 1 Kg. of dried seaweed?
8) How much do you earn weekly from seaweed?
9) In what do you expend the money you earn from seaweed?
10) Are you a member of an organization related to seaweed farming?
11) Does your husband agree that you farm seaweed?
12) Do you want in the future to keep on working on seaweed farming?
13) Have you received any training or workshops on how to improve seaweed farming?
14) Have you heard of any people producing soaps, cookies and creams out of seaweed?
15) How can seaweed farming be a better business?
Appendix B

Interview chief of the village

1) Are you from Jambiani?
2) What are you responsibilities as chief of village?
3) How started seaweed farming in Jambiani?
4) How many women are involved in seaweed farming in Jambiani?
5) Do you think, from your experience, seaweed farming has uplifted the socio-economic situation of the households in Jambiani?
6) What does the company provide the women normally?
7) Do you think women like to be engaged in seaweed farming?
8) Are men involved in seaweed farming?
9) Why do you think men are not involved in seaweed?
10) What do women do with the money they earn in seaweed farming?
11) Is the Government giving any support to the seaweed farmers?
12) Is there a NGO for seaweed in Jambiani?
13) Are seaweed farmers organized?
14) According to your experience, what are the main problems and challenges of Jambiani?
Appendix C

Interview manager Seaweed Center

1) How did seaweed farming start in Paje?
2) How is the seaweed value chain organized in Paje?
3) How is the soap produced?
4) Are you using endemic products for soap packaging?
5) What are the benefits for women from Paje to me members of the Seaweed Center?
6) How many women are working for the Center?
7) How is the work force in the Center organized?
8) How many soaps bars do you commercialize monthly and where?
9) How do you commercialize your products outside the Center?
10) What are the main strengths and challenges of the Center?
11) Does the Government give any support to the Center?
12) According to your experience, are women satisfied in seaweed farming or do they want to change to other sectors?
13) What other products can be derivate from seaweed?
## Appendix D

### Table of interviewees

**Field trip Zanzibar, February 2013**

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<th>Name</th>
<th>Name of Organization</th>
<th>Position</th>
<th>Date</th>
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<tr>
<td>Mr. Pingo</td>
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<td>Chief of the village of Jambiani</td>
<td>27/02/2013</td>
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<td>Mr. Alli</td>
<td>ZANEA Company</td>
<td>Manager local office Jambiani</td>
<td>27/02/2013</td>
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<tr>
<td>Fredrik Alfredsson</td>
<td>Leo Switch Responsible Ventures</td>
<td>East African Manager</td>
<td>01/03/2013</td>
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<tr>
<td>Erik Gulbrandsen</td>
<td>Leo Switch Responsible Ventures</td>
<td>CEO of Switch Ventures</td>
<td>01/03/2013</td>
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<td>Thecla Mchomba</td>
<td>Seaweed Center Paje</td>
<td>Manager</td>
<td>02/03/2013</td>
</tr>
<tr>
<td>Dr. Flower Msuya</td>
<td>Institute of Marine Science</td>
<td>Facilitator</td>
<td>07/03/2013</td>
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<td>Director</td>
<td>03/04/2013</td>
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<td>Zuber Khames</td>
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Seaweed value chain upgrading:
a tool for improving the livelihoods for women
in Jambiani, Zanzibar

By

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