Commercial Seaweed Farming in Zanzibar Coastal Villages: Potential for Innovative and Competitive Economic Growth

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Abstract: *The study was on "Commercial Seaweed Farming in Zanzibar Coastal Villages: Potential for Innovative and Competitive Economic Growth". It aimed at assessing the competitive potential of Zanzibar seaweed farming for the purpose of improving the crop commercial aspect. The study assessed business management capacity; economic return; business model and level of value addition initiatives on seaweed farming. It applied both descriptive statistics and regression analysis in order to achieve results.*

This study was conducted in Unguja and Pemba Islands, Zanzibar, Tanzania. The study applied survey design using structured questionnaire. Questions and variables were tested by interviewing a small sample of farmers prior to commencement of enumerators' training. A minimum sample of 400 respondents were picked out of 23,000 farmers through the application of Slovan's formulas (n = N / (1 + Ne2). However, the study managed to interview 592 farmers from 48 seaweed producing villages. Systematic random sampling was used to pick villages and interviewed farmers were randomly selected.

The study found that farmers were significantly not realizing economic returns due to most of production being below breakeven point (1,439 kgs of dry seaweed per cycle). This is contributed by various constraints such as small farm size, lack of technology, and low innovation up scaling and low entrepreneurship skills. The industry is not linked to multi stakeholders (e.g. Financial Institutions, Research, Science and Technology) and as a result it lacks support from other sectors due to farmers consistently dependence on exporters for seaweed market (Farmer-Exporter Model). Value addition activities in seaweed farming lack scaling up mechanisms compared to other seaweed producing countries such as the Philippines, Indonesia and Solomon Islands. Despite the challenges, there is still potential for commercializing Zanzibar Seaweed farming and that the sector is key for competitive economic growth if: development of seaweed policy and strategic plan are developed; entrepreneurship, research, technology and innovative up scaling system are promoted; mult-stakeholder business model is enhanced; youth and men are engaged in seaweed farming; and access to seaweed market information and financing are increased.

Key words: business model, seaweed, innovation, competitiveness

INTRODUCTION

Zanzibar began exporting seaweed as early as 1930s when the red seaweed, under the genus *Eucheuma*, was harvested from the wild and exported to Europe (Mshigeni, 1983, 1992; Msuya, 2012). However, commercial seaweed farming started in 1989, following initial experiments by Professor Keto Mshigeni of University of Dar-es-salaam (UDSM). In early 1990s the crop was exported to different parts of the world including France, USA and Denmark. According to Zanzibar Socio-Economic Survey (OCGS, 2013), until the year 2012 seaweed production for export arrived at the maximum of 15,087 tons per annum, but the industry experienced fluctuation in its productivity in 2004 and 2006 where productivity went down to 8,000 tons per annum due to climate change and diseases.

Until recently, the largest part of seaweed produced has been exported unprocessed. The crop also experienced low scale of value addition initiatives in terms of processing until early 2008's where value addition initiative began under Zanzibar Seaweed Cluster Initiative (Msuya 2011; Msuya et al, 2014;). Currently a small fraction of the produced seaweed is transformed into powder which assumes higher value compared to former unprocessed one. For instance 1kg of seaweed powder is sold at TZS 10,000/= (USD 6) compared to a TZS 500/= (USD 0.3) for 1kg of raw seaweed (Msuya, 2011a). However, the challenge is how to upscale value addition initiatives in order to accommodate both local and international market demands. Therefore, seaweed sector requires not only increased production for high export volume but also embracing value addition initiatives for increasing crop economic returns and farmers income.

Conversely, seaweed farming has been shown to be a substantial provider of socio-economic development to people of marginalized coastal communities in Philippine, Indonesia, India and Solomon Islands (Valderrama, 2013). The industry proves to be an alternative strategy for increasing enterprise revenue, personal income, country economic growth and poverty reduction in coastal villages and towns.

Comparatively, if well managed, Zanzibar seaweed sector can be an effective commercial activity for improving economic growth and poverty reduction for people living in coastal areas due to its simple farming process, short time farming cycle, requirement of low capital, use of inexpensive technology, provision of frequently- stable cash flows and can be used as gender empowering tool.

In addition, Zanzibar seaweed sector is estimated to employ over 23,000 farmers, 80 percent of whom are women. It also holds the first position among marine export produce, and a second position among the foreign currency earning crops (RGoZ, 2005; MACEMP, 2009; RGoZ, 2010; Msuya, 2011a; MANR, 2011; Msuya et al, 2014).

Despite its contribution, commercial seaweed farming in Zanzibar is largely untapped and has not brought the desired results on income to the level of poverty reduction to the people living in coastal villages. The sector is dominated by smallholder farmers, subsistence agriculture, and infancy agribusiness sector. In addition the dried seaweed produce has been experiencing low price compared to other seaweed producing countries. It also faces deficiency for input supply, poor diseases controlling techniques and poor enterprise management. However, based on these facts, need to commercialize the sector in order to enhance the crop contribution to economic growth and reduction of poverty for people living in coastal villages is paramount. This study therefore assesses competitive potential of seaweed farming for economic growth and poverty reduction for people living in Zanzibar coastal villages.

Material and Methods

Study covered all Regions of Zanzibar namely Unguja North, Unguja South, Urban West, Pemba South and Pemba North. It included four Districts of Unguja; North A, North B, South and Central, the three Districts of Pemba; Micheweni, Wete and Mkoani (See Map below), the study took a period of two years between September, 2013 to September, 2015.

Survey and data collecting instruments were designed and facilitated by collaborating institutions Zanzibar Institute of Financial Administration (ZIFA), Institute of Marine Science (IMS) and Zanzibar Business and Academic Consultancy (ZABACO). This stage involved extensive consultation with seaweed farmers and extension officers (experts) from Ministry of Fisheries and Livestock.

Figure 1: Map of Research Study Area

Structured questionnaires with mainly closed questions aligned with study objectives, research questions, concepts and constructs were tested by interviewing small sample of farmersô prior to commencement of enumeratorsô training. The rationale for testing the questionnaire was to ensure the logic and authenticity of questions to be asked. The sample frame was estimated from list of farmers amounting to 23,000 people. The study, however, managed to interview 592 farmers from 48 seaweed producing villages with an average of 12 interviewees per location. Systematic random sampling was used to pick respondents from list of farmers in each village.

The completion of field work initiated data processing exercise which involved a set of tasks taken to ensure validity of information. The first task was designing CSpro 5.0 entry form which was used for data entry. In this case, raw data contained in the questionnaires were converted into electronic data and transferred to Statistical Package for Social Science (SPSS) version 20 for screening and analysis based on instruction provided in dummy table.

This study applied breakeven point and regression model analysis to find out economic returns of seaweed farming enterprises. The processes to find breakeven point and regression model were as shown in the following section:

A. Breakeven Point Analysis

a. Formula

[BEP = (TFC) / (SP - VC)]

Where;

BEP- Break Even Point
TFC- Total Fixed Cost ï Short run
SP- Selling Price/Unit
VC- Variable Cost/Unit

Establishing Fixed Cost Figure

In order to calculate total fixed costs of all assets used by farmers, the following guidelines from the field and FAO have been considered as input (see Table 2.1 for details). Average farm size contains 756 ropes; One year contains seven cycles; Every farmer has one fibre boat costing $260 (TZS 436,800/=) at conversion rate of 1USD: TZS1,680 with five year economic life; A farmer can harvests 10 lines per trip and it is possible to harvest 10 lines of mature seaweed every day; Every farmer has 5 drying racks; Plastic cover for protecting seaweed during rainy season; 5 drying rack occupying total area of 60m2 (12m* 5m); One line utilizes two (2) pegs; and One farming cycle = 45 Days.

Table 2.1: Annual Estimated Fixed Assets Cost

Equipment	Counts	Unit Cost (TZS)	Total Cost (TZS)
Fibre Boat	1	436,800/5	87,360
Drying Rack	(5*1.5) =7.5m	5000	37,500
Plastic Cover	12m*5m	1000	12,000
Pegs	756*2=1512/50	3000	90,720
Rolls of ropes	((756*10) /82) m	4500/2	207,439
Total Fixed Costs			**435,019.00**

Establishing Unit Selling Price Figure
Selling Price per Unit Kilogram of dry seaweed: Spinosum TZS 500/=

NB:
This study used Spinosum species as principal variety for calculation and bases of discussion because the variety attract a majority of farming population in Zanzibar. Although cottonniò variety of seaweed commands a higher farm gate price than the ñSpinosumò variety, Spinosum is more widely grown within the country at present than cottonni which faces the die-off problems (Crawford and Shalli, 2007) The authors believe that if innovative practices are engaged on this variety, significant economic impact will be realised.

Establishing Variable Cost Figure
One farm per cycle fixes 756 ropes
One rope (10m) contains 30 nodules, each nodule reach 1.5 kg to time of harvest.
Conversion of wet to dry seaweed is 10:1 that is (756*30*1.5) =34,020 kgs wet seaweed.

Note: 10kgs wet seaweed =1kg dry seaweed then 34,020 kgs is equal to?
(34,020*1)/10=3,402 kgs
Total Variable Cost per cycle = (Material Costs + Labour Costs)
(TZS 272,070/= + TZS 401,200/=) = TZS 673,270/=

Variable cost per unit Kilogram = (673,270/3,402) = TZS 197.90/=
Total variable cost per unit is TZS 197.90/=

b. Calculation;
BEP = (TFC) / (SP - VC)
(435,019)/ (500-197.90) = 1,439.98 kg of Dry seaweed

Not only Break Even Point but also Regression Analysis model was developed to approve the most contributing factors to quantity sold.

B. Regression Analysis
Linear regression was an approach for modelling the relationship between dependent variable Quantity sold and independent variables Farm size (Fs), Age (Ag) and Experience (Ex). The study tested the relationship between dependent variable Qs and the independent variables Fs, Ag and Ex for the purpose of determining the effect of independent variables on Quantity of seaweed at selling point. The study assumes that, independent variables explain dependent variables, however, the running of the regression analysis established the following model;
Regression Model: [Qs = 0.097 Fs + 8.1 Ag+ 1.25 Ex]

Where;
Qs = Quantity Sold = (Sales/Price)
Fs = Farm Size
Ag= Age
Ex= Experience

Quantity sold (Qs) represents the quantity of dry seaweed at the point of sale, Qs obtained by dividing Sales by Selling Price (Sales/Price). Farm size (Fs) represents the number of ropes which automatically determine the quantity of seaweed produced, while Age (Ag) represents the stage of human life in relation to family size, and Experience (Ex) represents

the number of years a farmer engaged in seaweed farming. After running the regression analysis the following results were obtained.

RESULTS AND DISCUSSION

Key findings of the study include farmers profile, business management capacity, economic return, social economic benefit, business model and value addition initiatives.

Farmers' Profile

The study found that 77.5 percent of seaweed farmers are women. It revealed that 67.1 percent of farmers are aged between 36-60 years. Also it was revealed that, 42.6 percent of farmers had not attended formal education while more than half (54.6%) had 10 years' experience in the industry (Table 3.1). This implies that Zanzibar seaweed industry is female dominated and attracts less young generation. About half of the farming population have not attended formal education and conduct farming activities based on long term experience, Table 3.1 below shows the details.

Table 3.1: Respondent's Education Level

Education Level	Frequency	Percent
Degree	1	0.2
Diploma	3	0.5
Certificate	4	0.7
Secondary	196	33.1
Primary	136	23
None	252	42.6
Total	**592**	**100**

Business Management Capacity

On assessing the famer's capacity to carry out business activities, the study found that 44.49 percent of the farmers are good in traditional seaweed planting technics. Only 28.1 percent of farmers had sales and marketing skills, 25.1 percent of farmers had entrepreneurship skills, and 2.38 percent of them possessed financial management skills.

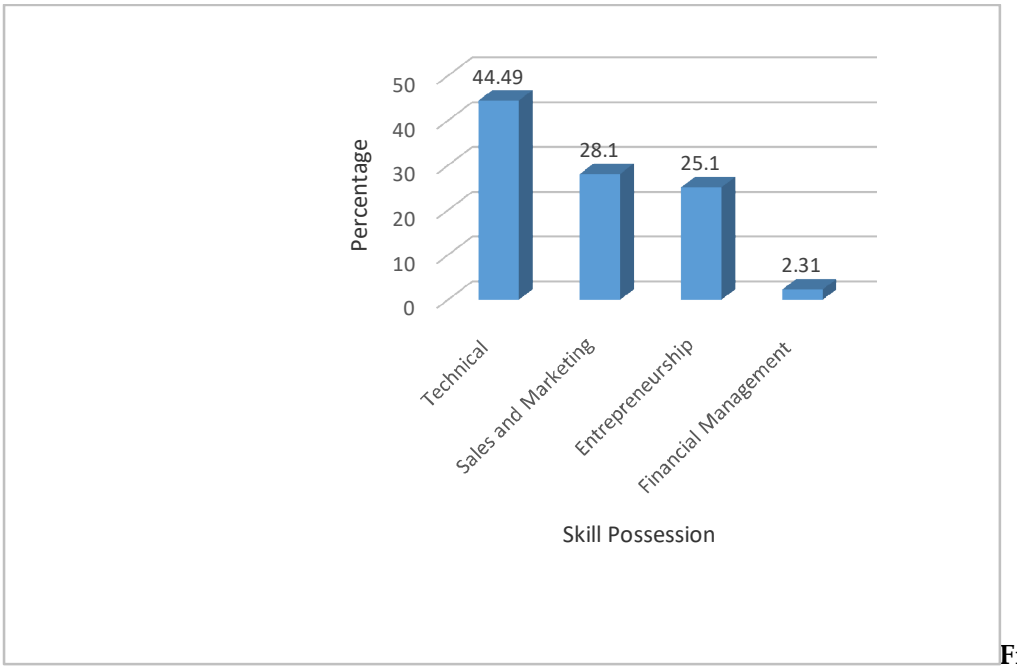

Figure 3.1
Farmers' Skills Profile

This situation indicates that the farmers had low ability to think entrepreneurially and are able to apply business techniques to improve the business of seaweed farming. Therefore, seaweed farming in Zanzibar is not commercially run as signified by presence of very low entrepreneurship and capacity to manage their enterprises commercially. See figure 3.1 for summary.

3.1 Economic Return

On the assessment of whether seaweed brings back returns on investments and whether which are the most influencing factors to higher profit as a result of high quantity sold, the study showed that 42.7 percent of the farmers make sales of dry seaweeds below TZS 100,000/= per farming cycle (45days) as shown in the table 3.2. This level of sales is not adequate for covering living and farming costs. There are many factors which have contributed to this low sale, among them include; various farming constraints for instance, lack both sea and in-land transport facilities (81.9%), poor storage facilities (58.3%) and inadequate drying facilities (66.9%) resulting low return, productivity and price, Table 3.2 below illustrates. To further approve the extents of economic return on seaweed farming the study calculated the Breakeven Point to realise the actual cut-off point for one to realise returns and in addition to that it developed a Regression Model to realise the most influencing factors towards higher sales. The results are as shown in Table 3.2

Table 3.2: Range Of Sales Per Cycle

Range of Sales (TZS)	Percent
<100,000	42.7
100,000-249,0000	27.0
250,000-399,000	13.5
400,000-549,000	8.3
>550,000	8.4

Breakeven Point Analysis

The calculated breakeven point was 320 ropes per farmer equivalent to 1,439 kg of dry seaweed per cycle (45 Days) which is equal to a sale of TZS 719,500/= at price of TZS 500/= per kg. Moreover, varies conversions indicated the breakeven point in kilogram of wet seaweed is 1,439kgs *10 =14,390 kgs; and in sales is I, 439 kgs*TZS 500/= TZS 719, 500/=

The findings show that only 8.4 percent of farmers made above the breakeven point. In this case, large number of seaweed producers sale below breakeven point. For them or their enterprises to realise profit, they are forced to increase the size of their farms (ropes) or manage other deficiencies to get high quantity of sale. However, engagement into value addition is the most possible way for them increasing produce value in order to achieve higher prices.

Regression Analysis
The results of regression model analysis were categorised as follows:

Result 1: The Analysis of Model Strength
The result shows that the model was statistically adequate in approving the existence of relationship between dependant and independent variables. Referring to adjusted R^2 the model showed that independent variables explain dependent variable by 63.1 percent. Table 3.3 Summaries Model Strength.

Table 3.3: Model Summary

Model	R	R Square[b]	Adjusted R Square	Std. Error of the Estimate
1	.796[a]	.633	.631	377.36502

a. Predictors: Experience (Ex), Farm Size (Fs), Ages (Ag)
b. For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This cannot be compared to R Square for models which include an intercept.

Result 2: Significance of the Model
The interpretation of the analysis of variance (ANOVA) indicates that independent variables have implication on the dependent variable and that the model is significant. In table 3.5 the results of analysis imply that the model is significant because the value of significance is 0.000 and at least there is one independent variable explaining the dependent variable. Table 3.4 indicates the analysis of variance (ANOVA).

Table 3.4: Analysis of Variance (Anova A, B)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	138903820.421	3	46301273.474	325.139	.000[c]
	Residual	80458460.579	565	142404.355		
	Total	219362281.000[d]	568			

(a) Dependent Variable: Quantity Sold (Qs)
(b) Linear Regression through the Origin

(c) Predictors: Experience (Ex), Farm size (Fs), Ages (Ag)
(d)This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.

Result 3: Effect of Coefficients on Dependent Variable
As it is indicated in the ANOVA table above, the regression model showed at least one independent variable that explain the dependent variable. In the case of analysing the coefficients the model goes further explaining the relationships between independent and dependent variables. The results in the regression model indicate that only Farm size (Fs) and Age (Ag) have effects on the dependent variable as they possess 0.000 significance values. On the other hand independent variable-Experience (Ex) does not have direct effect on dependent variable - Quantity sold (Qs) as its significance value is greater than zero (1.25). Therefore, by suppressing (Ex) i.e. removing it from the regression equation the model is reduced to; [Qs = 0.097 Fs + 8.1 Ag].

Result 4: Interpretation of Coefficients
Farm Size: Results indicate that the effect of adding one unit of Farm size on Quantity sold is 0.097 kgs. Despite the famer's efforts to increase farm size, yet the Quantity sold is low. This little effect of farm size on Quantity sold is attributed to inefficiencies in the whole value chain of seaweed farming. Inefficiencies include high levels of die-off due to impact of climate change; drifting of seedlings due to sea waves; poor techniques in harvesting, transportation, drying and storage. These factors determine the amount of dry seaweed sold at the point of sale and therefore affecting farm economic return and the amount of seaweed the farmer's sales at the final market.

Age: Results indicate that effect of age on Quantity sold is 8.1. This means age contributes more than farm size. The main reason being that, 67.1 percent of seaweed farmers have middle to upper age between 36 to 60 years, hence, categorically, people of this age group have extra capacity in terms of increased number of family members critical for cheap labour supply.

Availability of cheap labourers encourages large farm size cultivation which then reveals high levels of quantity produced and sold to the market. This regression result concurs with the study finding that 75 percent of seaweed farmers use family labour for production which suggests low cost of production and automatically influence high quantity of seaweed produced and sold in the market. Table 3.5 shows details.

Table 3.5: Coefficients (A, B)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	Farm size (Fs)	.097	.009	.320	11.062	.000
	Ages (Ag)	8.105	.900	.568	9.009	.000
	Experience (Ex)	1.298	2.863	.028	.453	.650

(a) Dependent Variable: Quantity Sold
(b) Linear Regression through the Origin

The results of regression analysis concur with the results of breakeven analysis on the fact that Zanzibar seaweed farmers realize low economic return compared to investment. Despite the fact that farmers can increase their farm size they will still realise low returns. Therefore, in order to increase quantity sold they need to invest in labour intensive mechanisms of which under normal circumstances is not realisable. Suggestions are, therefore, to encourage technology and Innovation up scaling systems to enhance high productivity levels for higher returns.

3.2 Social Economic Benefits

In evaluating the revenue impact of seaweed on social economic development, results on this study show that 68.2 percent of the farmers regard seaweed as dependable income generating activity. On expenditure basis, study revealed spending priorities on the income generated from seaweed as follows: Food received first priority among the five categories of expenditure (26.82%), Health occupied the second position (25.02), investment took third position (17.26%), the fourth was education which took (16.76%) and the fifth was investment on housing which took (14.14%). Figure 3.2 summarise the details.

Results also imply that, seaweed farmers spend their income mostly on food and health. Less priority is given to economic investment, education and housing. This situation signifies that income generated out of selling seaweed produce was much spent on social needs rather than economic development, which is an indication of poverty and that seaweed income is for fighting food security. In addition, the situation undermines sectorial growth and development as a result of low priority recapitalizing on the enterprise asset accumulation making the sector un-attractive to youth employment.

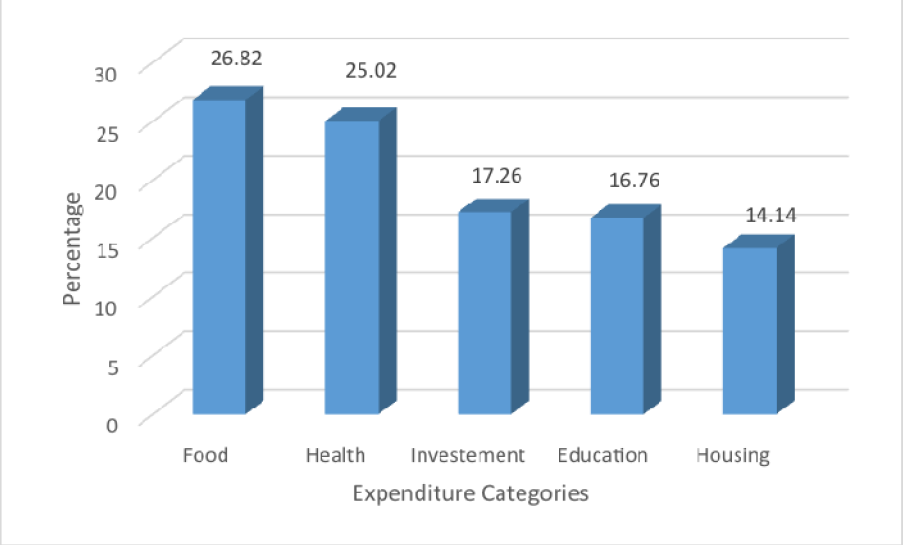

Figure 3.2: Priority on Income Expenditure

Moreover, in support to this idea, results indicate 92.6 percent of farmers had supplementary economic activities other than seaweed farming just to increase extra income and cope with life hardships. These economic activities include Agriculture (65.7%), Retail business (21.5%), Fishing (18.4%), Handcraft (14%), Livestock (12.5%), Tailoring (4.6%), Employees and Stone quarries (2.4%) and Carpentry (1%).

3.3 Business Model

In trying to assess how Zanzibar seaweed sector is supported and interlinked with technical know-how of the business, the study identified the influence of technical institutions and

other sectors supporting services on growth and development seaweed farmers or their enterprise. The study found that 97.3 percent of farmers' depend on exporters for selling their produce while 71 percent of farmers' access market information through exporting companies. This situation shows that exporters are major buyers and have monopoly on market information and sector growth and development.

It was revealed that key partners in Zanzibar seaweed industry include; Ministry of Fisheries and Livestock, Cooperative Society, Exporting companies, Research Institutions (Institute of Marine Science), Local executive offices and Retail suppliers.

Each of these partners had role to play in promoting growth and development of Zanzibar seaweed industry. However, majority of these institutions had weak bonds with the sector except for exporters who have dominated the roles of various stakeholders. Figure 3.3 portrays existing and ideal farmer entrepreneur business models.

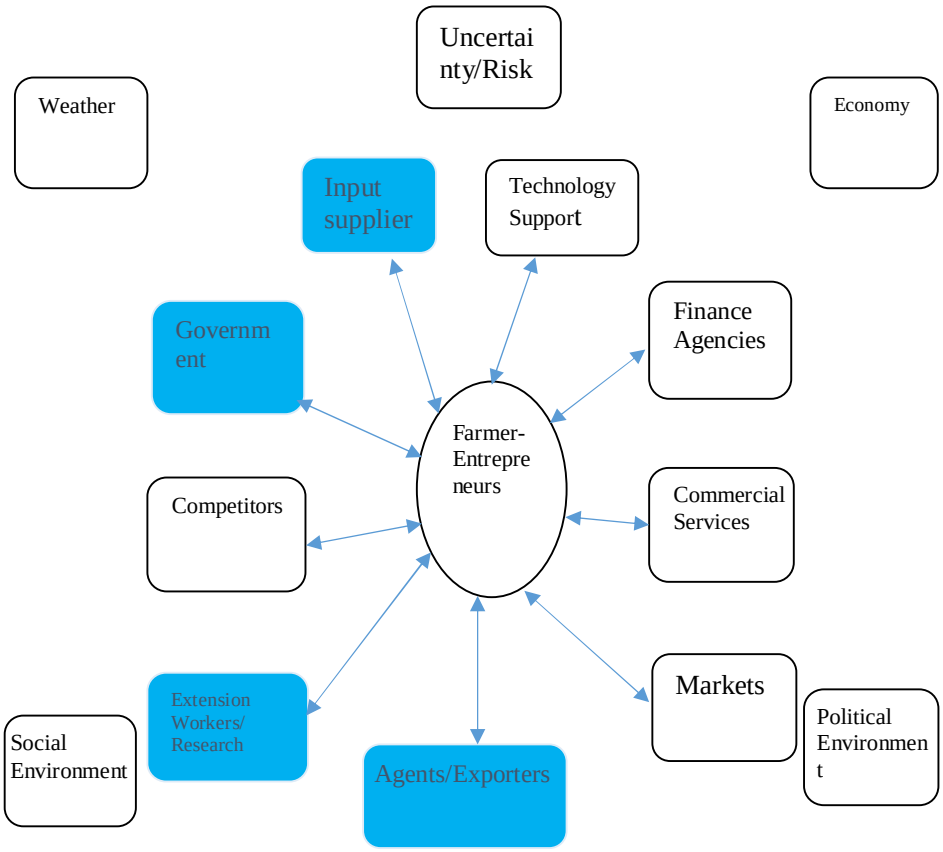

Figure 3.3: Farmer Entrepreneur Model
Source: Modified from Kahan (2013)

The highlighted boxes represent the existing Zanzibar seaweed farming business model while the whole figure represents an ideal farmer entrepreneur model, that is to say how a farming entrepreneurs should be linked with other actors in the sector. The highlighted boxes (Blue Coloured) connected with arrows to the farmer entrepreneur indicate the existing interlinks in Zanzibar Seaweed farming, while all boxes (Blue and White Coloured) indicate the required interlinkage. The peripheral boxes represent external factors influencing the sector and the rest players.

The only implication we get when comparing the two models, is that, Zanzibar seaweed business model involves few players as demonstrated by a short value chain (Farmer – Exporter), this type of model represents low linkage of the industry with technical know-how and other sectors of economy. The industry is dominated by exporters and facing daunting challenges for which solution can be obtained from other sector actors, such challenges include; shortage and unavailability of quality seedlings (90.4%) – Ministry of Agriculture and Fisheries, inadequate capital (90.2%) for expanding the enterprise- Microfinance Banks and high cost (80.9%) of inputs – Ministry of Trade. Inadequate extension services signified by (70%) of farmers not able to access the service- Ministry of Agriculture and Fisheries, otherwise, there are few farmers (36.7) who are members of cooperative societies- Ministry of Cooperatives and Economic Empowerment and others.

3.4 Level of Value Addition

Innovation and supply chain coordination are two approaches applied for defining value addition in agricultural value chain. In a nut shell, innovation is a process of translating an idea or invention into a good or service that creates value for which customers will pay for (Schumpeter, 1930). On the other hand, supply chains is a system that is composed of numerous activities spread over multiple functions and organizations (Khatib, 2000 and Arshinder and Deshmukh, 2008).

In assessing this aspect, study determined level of value addition by considering innovation and coordination processes occurring in the seaweed sector. It focuses on techniques and farming procedures, product processing, market opportunities, distribution channels and forms of business organisations within seaweed sector.

Results indicated that 70 percent of farmers did not apply value addition techniques in farming procedures and neither of product processing, new channels of distribution, and exploitation of new market opportunities was tried. Generally there is poor specialization as almost all farmers only concentrates on farming leaving other chain activities not attended. The following is specific explanation of each value addition (Innovation) component.

Farming Procedures

Adoption of new farming procedures is critical in attaining productivity and managing cost of farming. The study revealed 26 percent of farmers applied techniques for planting seaweed in different water levels and directing farms to avoid breaking and drifting of seaweed by sea waves. Others farmers located in stony geographical areas of the sea land tied ropes on rocks instead of using pegs. Cost reduction was vital for increasing revenues and profit to seaweed producers. Observation showed that farmers did not apply cost reduction strategies due to limited basic knowledge in production economics and financial management. For instance, farmers drag 25-30 kgs of wet seaweed from plantation to off-shore while it could be less costly to carry 400 kgs of wet seaweed by plastic canoe (Kihori) at a time (See Photo Below).

Product Processing

Processing assists in transforming seaweed produces into various forms of products. In order to simplify transformation, adoption of simple technologies is required. Despite low development of small manufacturing industries in Zanzibar, there is little linkage between the manufacturing sector and seaweed farming. This situation brings low impact into seaweed processing as evidenced by only 2.7 percent of farmers engaged in processing, meaning that large volume of seaweed is exported in raw form resulting to farmers earning lower prices. For instance 1Kg of raw dry seaweed is sold at TZS (300-500)/= while the same weight of seaweed powder is sold TZS 10,000/- (Msuya, 2011a).

Market Opportunities

Identifying markets for seaweed products is an aspect of consideration for assessing farmer's ability in applying value addition techniques. Spotting market opportunities assist seaweed farmers to create demands for the produce. The results of study indicate only 0.3 percent of farmers had ability to spot additional market openings within and outside Tanzania. It is fact that, in Tanzania farmers failed to spot local markets and demand for seaweed materials for food processors, manufacturers and individual citizens. Instead, farmer's sale dry seaweed to exporting agents as solely market for their produce. This situation weakens farmers' bargaining power as they continue to rely on local exporters for sale and inputs supply. This is different from Indonesia where the market system extends from farmers to middlemen to district trader to whole seller to/or manufacturing companies (Zamroni, et al ,2011)

Distribution Channels

Distribution channels are key for ensuring movement of seaweed from farm to final consumers, therefore an effective distribution channel requires not only enough number of players but also well-coordinated value chain system. The current trade relationship of Zanzibar seaweed sector is largely limited to farmer – exporter model, which brings low interaction of seaweed farmers with other stakeholders. In that case, an ideal seaweed farmer is supposed to identify various distribution channels for increasing bargaining power on price. Up to now, Zanzibar seaweed farmers have stuck to only one distribution channel (Producer-Wholesaler) which deprives their opportunity to use other profitable channels like connecting with manufactures. These challenges are results of weak seaweed farmers' cooperatives which fail to play their critical role of linking farmers with various stakeholders and improve farmers' bargaining powers for competitive prices and access to financial services. Experience from other countries show farmers organizations help farmers in price bargaining and credit linkage (Rathsman, 2014).

Business Organisations

A business organisation could be an individual or group of people who collaborate to achieve a certain commercial goal. In Zanzibar seaweed sector, there are few enterprises specializing in various seaweed value chain activities. The study found that only 0.7 percent of farmers knew the existence of other forms of specialization that could engage in, therefore, a need to build enterprising and enterprise specialisation is paramount.

Observations indicate that farming is the main form of organization that consists of large number of people. Other forms of business specialization that include storage structures, manufacturing, financing and input supplying are very weak and involve very small number of people. For instance, the study found that dried seaweed is stored in homes where there is limitation of space and moisture control. Local manufacturers whose products consume seaweed as material for production import large amount of seaweed in the form of carrageen from overseas. Also there is no specialized financial institution with financial services targeting seaweed enterprise promotion. Input suppliers are very few and unspecialized. However, there is different experience in value chain specialisation from other countries such as Indonesia and Philippines which brought a significant impact in the sectoral development and economic development (Valderrama, 2013).

Conclusion

Despite the fact that Zanzibar is exporting large volume of raw seaweed, the producers have not yet realized economic returns that significantly transform their livelihoods. The industry is dominated by women and middle aged farmers who have low capacity in managing enterprises profitably and not linked to different stakeholders for immediate support. Innovation in Zanzibar seaweed is at low level compared to innovation development in other seaweed producing countries (e.g. Solomon Islands) due to persistent traditional farming system and lack of upscaling mechanisms. This situation has triggered low economic returns, low prices and little involvement of youth and men in the sector. It is fact that the sector can become among the activities of higher impact on Zanzibar economic growth and poverty reduction if the sector is carefully managed and its potentials revealed to increase its competitiveness. Therefore, there is potential in Zanzibar Seaweed farming and that the sector is key for competitive economic growth if innovation is considered paramount.

Recommendations

1. **Seaweed Policy, Strategic Plan and Programme**: The government should develop seaweed policy to address sector challenges, design strategic plan for sectoral growth and programme for implementation.
2. **Research, Entrepreneurship, Innovation and technology:** Promote research and innovation in seaweed science and business; promote entrepreneurship culture among seaweed farming communities; promote technology transfer and up scaling of existing innovation.
3. **Seaweed Development Trust Fund:** Establish seaweed trust fund to finance the development of seaweed sector.
4. **Seaweed Sectoral linkage**: Promote linkage of seaweed industry with Financial Agencies, Markets, Technology, Research, Extension and Commercial Services.
5. **Local Seaweed Industrial Development**: Promote the local use of raw seaweed into local manufacturing industry aimed at creating local consumption.
6. **Youth Employment**: Promote engagement of youth in seaweed value chain activities in order to reduce unemployment and increase sector production.

7. **Clusters and Cooperative Societies:** Strengthen seaweed clusters and cooperative societies to enhance access to market information, lobbying and advocacy

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