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JUDUL: CONNECTION BETWEEN PRICE SATISFACTION DIMENSION ON SEAWEED PRODUCER TOWARS THEIR LOYALTY AND BUSINESS RELATIONSHIPS : A CASE STUDY IN BUM BUM ISLAND, SEMPORNA

IJAZAH: DEGREE OF BACHELOR OF AGRICULTURE SCIENCE WITH HONOURS

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CONNECTION BETWEEN PRICE SATISFACTION DIMENSION ON SEAWEED PRODUCER TOWARDS THEIR LOYALTY AND BUSINESS RELATIONSHIPs: A CASE STUDY IN BUM BUM ISLAND, SEMPORNA

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DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF AGRICULTURE SCIENCE WITH HONOURS

CROP PRODUCTION PROGRAMME
SCHOOL OF SUSTAINABLE AGRICULTURE
UNIVERSITI MALAYSIA SABAH
2014

DECLARATION

I hereby declare that this dissertation is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that no part of this dissertation has been previously or concurrently submitted for a degree at this or any other university.

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ABSTRACT

Sabah is the only state in Malaysia which commercially produces seaweed. Problem of price instability for seaweed tends to have negative impacts on seaweed producers. This study which used a Price Satisfaction Dimension Model (with five elements such as price reliability, price fairness, relative price, price-quality ratio and price transparency) was to investigate seaweed price satisfaction among producers towards buyers and its linkage relationship on producer's loyalty in term of business performance (financial and non financial). A total of 50 seaweed producers were selected and interviewed face to face at Lok Buton village and Gelam Gelam village on Pulau Bum Bum, Semporna. Demographic characteristic of respondents were summarized using descriptive statistics. Factor analysis was conducted and three components (price reliability, relative price and price-quality ratio) were identified in price satisfaction dimensions. K-mean clustering analysis further revealed there were three producer segments namely satisfied, unsatisfied and neutral groups and their demograhic characteristics also explained from this dimensions. Partial least square method was used and Structural Model of relationship between price satisfaction towards loyalth and business relationships was predicted. This model successfully met the goodness of model fit requirements from its composite reliability, convergent validity, discriminant validity and R^2 for loyalty, financial, non financial performance showed 0.579, 0.832 and 0.698 respectively. Overall, it is hoped that this study would be able to offer a managerial options for local and foreign seaweed buyers to meet seaweed producers' satisfaction towards their loyalty and promote sustainability of business relationship.

PENYAMBUNG ANTARA DIMENSI KEPUASAN HARGA TERHADAP PENGUSAHA RUMPAI LAUT DENGAN KESETIAAN MEREKA DAN HUBUNGAN PERNIAGAAN: SATUKAJIAN KES DI PULAU BUM BUM, SEMPORNA

ABSTRAK

Sabah merupakan negeri yang menghasilkan rumpat laut secare komersial di Malaysia. Tetapi masalah harga yang tidak stabil menyebabkan kesan negatif terhadap pengusaha rumpai laut. Melalui kajian ini, Dimensi Kepuasaan Harga (Kebolehpercayaan Harga, Keadilan Harga, Harga Relatif,Nisbah Harga Kualiti dan Ketelusan Harga) telah digunakan untuk mengenalpasti penyambung antara kepuasan harga terhadap pengusaha rumpai laut dengan kesetiaan pengusaha and hubungan perniagaan. Jumlah 50 pengusaha telah ditemu bual di Kampung Lok Buton and Kampung Gelam Gelam, Pulau Bum Bum. Maklumat asas pengusaha dan latar belakang ladang telah diringkaskan. Faktor analisis menunjukkan terdapat tiga komponen (Kepercayaan harga, Harga relatif dan Nisbah Harga Kualiti) terlibat, dan K-mean kluster analisis menunjukkan terdapat tiga kluster (puas hati, tidak puas hati dan berkecuali) dan demografi pengusaha dinyatakan. Kaedah "partial least square" digunakan dan satu model diwujudkan dimana memenuhi keperluan model yang lengkap dari segi kebolehpercayaan komposi dan kesahihan tumpu. R^2 untuk kesetiaan, prestasi dari segi kewangan and bukan kewangan menunjukkan 0.579, 0.832 dan 0.698. Secara kesimpulannya, kajian ini memberi pilihan kepada pembeli untuk memenuhi kepuasan pengusaha dan mencapai kekelan dalam hubungan perniagaan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ARREVIATIONS

ATC	Alkali treated chips
DOF	Department of Fisheries
DOFS	Department of Fisheries Sabah
FAO	Food and Agriculture Organization
FP	Financial Performance
GDP	Gross Domestic Product
IMTA	Integrated Multi-Tropic Aquaculture
JPM	*Jabatan Perikanan Malaysia*
NFP	Non Financial Performance
PF	Price Fairness
PQR	Price Quality Ratio
PR	Price Reliability
PT	Price Transparency
RP	Relative Price
RM	*Ringgit Malaysia*
SEAFDEC	Southeast Asian Fisheries Development Center
SME	Small and Medium Enterprise
SRC	Semi-refiend carrageenan

CHAPTER 1

INTRODUCTION

1.1 Background

Sabah is the only state that commercially produced seaweed in Malaysia. Seaweed cultivated in four districts on large scale, namely Semporna, Lahad Datu, Kudat and Kunak. Main cultivated species are *Kappaphycus alvarezii* and *Eucheuma spinosum* which are mainly for export purpose. Biusing (2008) reported that the downstream industry comprised of three players, which are Jaygee Sendirian Berhad in ATC (alkali treated chips) production at Semporna; and two in SRC (semi-refined carrageenan) production. These two companies are Tacara Sendirian Berhad based in Tawau (food grade SRC) and Omnigel Sendirian Berhad based in Semporna (non-food grade SRC).

Like in the Nineth Malaysia Plan, seaweed farming is also one of the essential high value agriculture including swiflet farming, ornamental fish, herbs and spices, organic fruit and vegetables, mushroom and floriculture to support and contribute our national Gross Domestic Product (GDP) in Tenth Malaysia Plan. There is growing demand for these high value products which provide opportunities for farmers to increase their income. However, one of the major constraints faced in seaweed industry is instability of seaweed market price. The price of seaweed fluctuates seasonally, which range from minimum RM0.80 to maximum RM6.30 per kg dried weight (JPM Sabah, 2009). Seaweed farming in Semporna has been going through a "bubble about to burst" phrase of production, as many traders controlled the price determination of seaweed and bid up the wholesale price to extraordinary level. Thus, the study of how the price being determined and its price satisfaction linkage to

relationship between seaweed producers and processors has becomes an important aspect to the seaweed industry in Semporna.

1.2 Justification

The justification for this study is that is would provide effective support and equitable farming agreements between producers and buyers. Most seaweed farm are financed under informal agreements with local traders or processing plants who provide the farm materials and financial assistance. It is therefore pertinent that a standard format for farming agreements to be established so that both sides can benefit equitably. In addition, price of seaweed can be determinated more reliable, fair and transparent to meet both satisfaction from producers and buyers. Thus, linkage relationships between buyers and producers can be strengthened and enhanced the socio-economic of the farmers. Seaweed producers can get stable monthly income and hence job is secured and lack of manpower can be solved. Subsequently, production of seaweed would continue to increase and contribute to Malaysia's Gross Domestic Product (GDP).

1.3 Objectives

There are three objectives that need to be achieved from this study:

1) To investigate the price satisfaction dimensions of seaweed industry in Pulau Bum Bum, Semporna;

2) To investigate the business relationships between seaweed producers and seaweed buyers which related to price satisfaction dimension, loyalty, financial performance and non financial performance; and

3) To identify the demographic and socioeconomic characteristics of seaweed producers in Pulau Bum Bum, Semporna.

1.4 Research Questions

1) How the price is being developed by the agreement between seaweed producers and buyers in Semporna?

2) How the price satisfaction dimension influence the loyalty of producers towards buyers in Semporna?

3) How the loyalty of producers towards buyers influence the non-financial and financial relationship performance in Semporna?

4) What is the demographic characteristics of seaweed producers in Semporna?

1.5 Significance of the study

One of the significance of the study is to aid the seaweed buyers to have a better insight to the perception of the seaweed producers based upon their demographic characteristics, loyalty towards buyers and non-financial and financial performances. Since the price of seaweed always fluctuated, thus the elements of price satisfaction dimension, producer loyalty towards buyers and non-financial and financial performance are crucial to be understand to promote long-term business relationship sustainability.

In addition, seaweed buyers can use this study as references to confront upon the elements of price satisfaction dimension which does not meet producer's satisfaction. Therefore, seaweed buyers should promote price satisfaction dimension towards seaweed producers to meet their price, loyalty and performance satisfaction. Overall, it is hoped that this study would be able to offer a managerial options for local and foreign seaweed buyers to meet seaweed producers' satisfaction towards their loyalty and promote sustainability of business relationship.

1.6 Hypothesis

From the objectives of the study, a main hypothesis was proposed:

H_o: Price satisfaction dimension of seaweed producers shows there is not significant in business relationship between seaweed producers and buyers in Semporna.

H_a: Price satisfaction dimension of seaweed shows there is significant in Business relationship between seaweed producers and buyers in Semporna.

Nine sub-hypotheses are proposed to achieved the main hypothesis of this study. These hypothese including price reliability (H1), relative price (H2), price-quality ratio (H3), price fairness (H4), price transparency (H5), price flexibility (H6), relationship between producer's loyalty to non-financial performance (H7), relationship between producer's loyalty to financial performance (H8) and relationship between non-financial performance and financial performance (H9). In the next chapter, numerous literature reviews regarding seaweed industry, price satisfaction dimension, producer's loyalty and business relaitionship will be discussed in further.

H_1: Price reliabilty has a positive influence on the loyalty of producers towards buyers.

H_2: Relative price has a positive influence on the loyalty of producers towards buyers.

H_3: Price-quality ratio has a positive influence on the loyalty of producers towards buyers.

H_4: Price fairness has a positive influence on the loyalty of producers towards buyers.

H_5: Price transparency has a positive influence on the loyalty of producers towards buyers.

H_6: Loyalty of producers towards buyers has a positive influence on the non-financial performance.

H_7: Loyalty of producers towards buyers has a positive influence on the financial performance.

H_8: Non-financial performance has positive influence on the financial performance

CHAPTER 2

LITERATURE REVIEW

2.1 Seaweed Background

Seaweeds are macro-algae which in form appear like terrestrial plants (Lee, 2008). Seaweed contains three main component parts: the root like part named holdfast, the stem part called stipe and the leaf part called blade or frond. Holdfast usually function as anchor to protect the seaweed while the blade and frond parts used to absorb the nutrients seawater. Generally, seaweed has two reproduction processes, which are either sexual reproduction through fragmentation, or asexual reproduction based on spores and gametes.

During 1978, an American company based in Hawaii named Aquatic Resources Limited was the pioneer which introduced seaweed farming to the district of Semporna in Sabah, Malaysia. Since 1980, the management of seaweed farming project in Semporna has been solely under the responsibility of the Sabah Department of Fisheries (SDOF). This government agency plays an important role in continously promoting seaweed farming to the local people as their promising and reliable source of income.

Main seaweed cultivation sites in Sabah are Semporna which contributes of 95 percent of total cultivation site; while Kudat, Kunak and Lahad Datu contributes the remaining five percent. Most of the seaweed farms have been concentrated on islands located in the districts which include islands of Bum-Bum, Omadal, Sebangkat, Karindingan, Sepanggau, Tanduan, Selakan, and Bodgaya. Seaweed farms in Kudat associated on Banggi island. Seaweed farms in Kunak are located in Kunak Jaya and Pababag island and seaweed farms in Lahad Datu are located at Silam and Bakapit.

McLachlan *et al.* (1972), in his comprehensive review of some of the examples of major genera of seaweeds are *Sargassum*, *Eucheuma*, *Caulerpa*, *Gracilaria*, *Hypnea*, *Padina* and *Hydorclathrus*. According to McHugh (2003), only two main species namely *Kappaphycus alvarezii* and *Euchema denticulum* are widely cultivated in Sabah. *Kappaphycus alvarezii*, or formerly known as *Eucheuma cottonii*, has been widely cultivated in the east coast of Sabah which included Semporna, Kunak, Lahad Datu and Tawau. Meanwhile, *Eucheuma denticulum* or formerly known as *Eucheuma spinosom* is found to be more resistant to disease and widely cultivated in the northern part of west coast of Sabah namely in Kudat.

2.1.1 Cultivation System

There are three main types of seaweed cultivation systems which have been widely used in Sabah, namely stake system, longline system and raft system. Different types of seaweed cultivation system used will depend on water depth, operation cost and estimation growth rate, as shown in Table 2.1. Among these three culture methods, longline method is the most popular system used in Semporna because of its inexpensive production cost and easier installation (Ahemad *et al.*, 2004).

Table 2.1 Seaweed culture methods in Sabah

Culture Method	Water Depth (meter)	Operation Costs (RM/acra)	Growth Rate (%)
Long line	2.0 – 5.0	600 – 1,000	4 – 8 %
Stake	0.3 – 1.5	600 – 1,000	2 – 4 %
Raft	3.0 – 15.0	1,300	4 – 8 %

Source: Biusing, 2008

The recommended duration of culture for *Kappaphycus* species varies among agronomic manuals and protocols. For instances, Trono Jr and Ganzon-Fortes (1989) reported that duration of culturing *Kappaphycus* species required eight to twelve weeks, while Barraca (1990) argued that only a duration of six to eight weeks for culturing was needed. While studies of Trono and his partners claimed that *Kappaphycus* species required ten to twelve weeks to harvesting stage (Trono Jr *et al.*, 2000). In the year 2000, the Southeast Asian Fisheries Development Center (SEAFDEC) specifically reported the suggested period for harvesting *Kappaphycus* species was after cultured for 8.5 weeks.

There are two kinds of drying method which have been widely practiced in Sabah, namely the platform method and hanging method. Different types of materials such as wood, cement or bamboo material have been used to make the platform. Basically the drying process will take between three to five days, or up to seven days, depending on climate conditions. Moisture content of fresh wet seaweed will be reduced from 90% of moisture content to range of 30% till 40% of moisture content. Hanging method is not so popular used due to its slow drying rate. Paradoxically, platform method promote fast drying rate as compared to hanging method and is more economically.

Seaweed farmers usually use eye inspection as guideline to grade the dried seaweed. However, this grading method often causes fuzziness and ambiguity, due to several reasons such as subjective sense of inspection, eye fatigue during a long period of inspection and different perceptions on "colour", "gloss" and "flavour" of seaweed (Mao *et al.*, 1993).

2.1.2 Environmental characteristics of seaweed farming

Several seasonal factors including planting time, light intensity, salinity and water temperature would affect the growth rate of seaweed. In a previous study, Hanelt *et al.* (1997) gave one of the examples that light was one of the main abiotic factors that affected the growth rate of seaweed, as seaweed needed light to undergo photosynthesis process. In addition, poor seawave movement would delay the growth rate of seaweed.

Thus, seaweed farms with high productivity can be summarized as characterized with stable seawave movement, appropriate salinity level in between 30 to 35 parts per million (ppm), good water quality and temperature in range 25 to 30 °C, free from pest and disease and sandy seabed with corals, reported by Biusing (2008).

Nevertheless, Biusing (2008) reported that seaweed farming is not encouraging in Marudu Bay, Pitas, Tuaran and Kota Belud due to poor site suitability, turtle grazing and poor participation from the local community.

2.2 Status of Seaweed Industry

According to Sabah Department of Fisheries (SDOF) records year 2011, the seaweed production increased in year 2011 by 15.18% to 239,450.00 tonnes (wet weight) from 207,892.40 tonnes in year 2010. Its value also showed an increase of RM670.46 million from RM83.16 millions the previous year. This increment was related to the increase of the seaweed wet price per kilogram. Meanwhile, the total acerage under seaweed culture recorded an increase of 15.97% to 9,208.23 hectares in 2011 compared to 7,940.50 hectares in 2010. In the previous study, factors that lead to increasing seaweed productions in year 2006 was due to the improvised farming methods, government incentive support and new opening farms in Lahad Datu and Kunak (Biusing, 2008).

2.3 Economic Importance of Seaweed

Hydrocolloids are micro-polymer particles which disperred in a aqueous mixture. Most of the hyrocolloids are applied in many industries due to their gelling properties, thickening, stabilizing, emulsifying and anti-caking characteristics, depending on its polysaccharides of the seaweed.

Extraction of seaweed will produce various types of hydrocolloids, namely agar, alginate and carrageenan. Carrageenan extracted from the seaweed is valuable. For instance, agar or carrageenan extracted out from *Gracilaria changgi* and *Eucheuma* can be used as stabilizer in food industies and production of tissue culture media (Glickman, 1987; Jahara and Phang, 1990; Bradford and Bradford, 1996). In fact, agar in gel form is capable to bind with large amount of water, it can be used as stabilizer in various food ingredients which included ice cream, jellies and processed meats (Lee, 2008).

Despite of some edible seaweeds are rich in sources of vitamins which include A, B1, B2, B6, B12, niacin and C, nevertheless they are as well as good sources in essential minerals, such as iodine, potassium, iron, magnesium and calcium (Mondragon and Mondragon, 2003; Norziah and Ching, 2000; Wong and Cheung, 2000). Characteristics of low calories but rich in vitamins, mineral and dietary fibers

had lead the seaweed become potential of nutritional interest (Ito and Hori, 1989; Chapman and Chapmam, 1980).

Several previous studies showed that certain edible seaweeds comprised fundamental amount of nutrition that needed by human, such as protein, vitamins and minerals (Jensen, 1993; Noda, 1993; Oohusa, 1993). Jensen (1993) reported that seaweed species, geographic area, season of the whole year and water temperature are all factors that affected the nutrient content of seaweed. Meanwhile, Honya and Kinoshita (1993) claimed other than factors that reported by Jensen (1993), seaweed element is also affected by oceanic residence time, physicological factors, type of processing and method of mineralization.

Agar is commonly used as solidifying agent for culture media in tissue culture application because of many microorganisms incapable to decompose agar. Over the past decades, seaweed have been well recognized and used as fertilizer in agriculture practice. Seaweed can be applied either added directly to the soil or mixed with compost. In addition to seaweed as sources of plant fertilizer, seaweed have also been used broadly in food feeds for animal.

One of the previous studies was examined by Neori *et al.* (1996) about a integrated fish and seaweed culture system of *Sparus aurata* L. and *Ulva lactuca* L. to test the bioremediation ability of seaweed biofilters. This study result showed seaweed oxgenated the water through process of photosynthesis and removed most of the amnonia. This integrated system offera a solution to solve major environmental pollution in mariculture. However, Daume (2006) argued that function of seaweed in Integrated Multi-Tropic Aquaculture (IMTA) should not only bio-filter of waste products but also effective as feed material for abalones.

2.4 Issues faced in Seaweed Industry

2.4.1 Diseases

Andrews (1976) defined seaweed disease as "a continuing disturbance to the plant's normal structure and function, such that, it is altered in growth rate, appearance, or economic importance". Apparently, the "ice-ice" disease has become familar topic

when discussing disease affecting the *Kappaphycus* sp. and *Eucheuma* sp. among farmers. However, little information and knowledge causes the mindset restricted. Conversely, other cultivated seaweed species including *Porphyra*, *Gracilaria* and *Laminaria* in Asia, also possess various types of disease, depending on their causative agents (Largo, 2002). Largo (2002) had summarized various seaweed species cultivated around the world affected by disease and their suspected causative agents, as shown in Table 2.2.

Since recent years, there have been two problematic seaweed diseases namely "ice-ice" disease and epiphyte infestation which can be detected on cultivated farms of *Kappaphycus* sp. and *Eucheuma* sp. particularly in Asia including Malaysia.

Generally, "ice-ice" disease is caused by unfavourable environmental conditions in cultured site, which refers to level of temperature, level of salinity, level of light intensity and level of nutrients sufficiency (Largo, 2002). But to be more specific, the resident bacteria attached on the seaweed is the original key factor leading "ice-ice" disease development, as these bacteria could become opportunistic pathogens under certain imperceptible environmental conditions.

Largo *et al.* (1995) reported that there was a seaweed-bacteria interaction between two bacterial pathogens namely *Vibrio-Aeromonas* complex and *Cytophaga-Flavobacterium* complex and *Eucheuma* species. Subsequently, "ice-ice" disease can be induced by strains of these two bacteria groups when the seaweed cultivated in suboptimal level. In year 2007, outbreak of *El Niño* and *La Niña* seasons result in high rate of "ice-ice" and epiphytes being produced and in the end abundance of seaweed yield had been depletion. Epiphytes can be define as a group of microorganisms formed colonization on the surface of seaweed.

Table 2.2 Diseases in commercial seaweeds caused by bacteria and other microorganisms

Host seaweed	Name of Disease	Suspected causative agent	Environmental condition prior to outbreak	Author
Porphyra tenera	White rot disease	*Beneckia* (= Vibrio)	exposure to low temperature at extended low tide period	Tsukidate, (1983)

Porphyra sp.	"suminori" disease	*Flavobacterium* sp.	high temperature	Kusuda *et al.*, (1992)
P. yezoensis	"anaaki" or "pin-hole disease"	*Flavobacterium* sp.	low summer temperature	Sunairi *et al.*, (1995)
Laminaria sp.	malformation disease	unidentified bacteria	high H_2S content	Uchida and Nakayama, (1993)
Gracilaria sp.	"rotten thallus syndrome"	*Vibrio* sp.	reduced flow rate in culture tank	Lavilla-Pitogo, (1992)
	"white rot"	amoeba-like organism		Correa and Flores, 1995
G. conferta	"white tips disease"	unidentified bacterium	exposure to high temperature and high light intensity	Weinberger *et al.*, (1994)
G. chilensis	lesion/ bleaching	agarolytic bacterial strain		Craigie, (1995)
Chondrus crispus	"green rot" or "green spot disease"	deep orange coloured bacteria	surface wounds by mechanical or biological activities	Craigie and Correa, (1996)
Kappaphycus/ Eucheuma	"ice-ice"	Vibrio sp. P11, *Cytophaga* sp. P25	low salinity, low light intensity	Largo *et al.*, (1995a and 1995b)

Source: Largo, 2002

2.4.2 Occupational health hazards

The recent literature suggested that seaweed farmers need to improve their working conditions to avoid occupational health hazards such as fatigue, musculoskeletal pain, hunger, respiratory problems, eye related problems, injuries from hazardous animal and skin allergies in Zanzibar (Fröcklin *et al.*, 2012).

Long period of intensive working under hot sun may cause body temperature of farmers easily rise, resulting body dehydration, electrophyte imbalance, multi-organ failure and even death (Belsito, 2005). Cole *et al.* (2009) claimed that a basic understanding regarding occupational health hazard programs need to be better organized and broadened around the world in order to improve working condition and reduce injuries level.

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