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Research Article

CHARACTERISTICS OF FARMERS BEHAVIOR TOWARD THE RISK OF SEAWEED FARMING IN THE BUNGIN PERMAI VILLAGE, SOUTH KONAWA REGENCY, INDONESIA

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ABSTRACT

This research was conducted at Bungin Permai Village, South Konawe Regency. The purpose of this research was to determine the behavioral characteristics of farmers toward the risk of seaweed farming. Samples in this study were taken by using simple random sampling method. The numbers of samples in this study were 37 seaweed farmers. The analysis technique used is the quadratic utility function to analyze farmer's behavior against the risks. The analysis showed that characteristics toward age-based risk for all behavioral categories are dominated by productive age categories. The behavioral characteristics based on education for risk averse behavior (dominated by the primary school education category (56.25%), based on farmers' experience in farming to risk averse behavior is dominated by farming experience category with > 10 years farming experience (62.5%). Behavioral characteristic based on construction size, risk-averse and risk neutral behavior is dominated by a narrow category, with 81.25% and 100% respectively, whereas for risk lover behavior, is dominated by the moderate category (100%). Characteristics of a risk-based behavior are dominated by the low-income category (75%), for risk-lover is dominated by high revenue category (100%), and for neutral risk behavior is dominated by a very low income (66.7%).

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INTRODUCTION

Seaweed farming plays an important role in improving the socio-economic conditions to fishers' communities, and to increase the income for millions of farmers (Meeuwig & Hehre 2016), the multiplier effect, the opportunity to improve the economic feasibility. The successful marketing of seaweed as food for humans, and the development of biorefinery concept can increase the value of seaweed production (Teniwut et al 2016; Van den Burga et al 2016; Jansen et al 2016; Pellizzari & Reis, 2011) and increase the participation of families and communities, especially women.

There are several obstacles in seaweed cultivation. These constraints include diseases and post-harvest difficulties, the ownership issue of agricultural land, shifting season and marketing limitations (Zamroni et al, 2011). There are still

many challenges to be addressed in relation to science and social acceptance.

Challenges include development strains with thermo tolerance, disease resistance, fast growth, high concentrations of needed molecules, reduction of fouling organisms and the development of a more robust and cost-effective (Kim et al, 2017). According Rebours et al (2014), aquaculture of seaweed in growth and development period has to overcome various challenges at different levels (ie technology, biology, policy).

Fausayana et al (2017) reported that the behavior of farmers against the risks categorized into averse farmers 86.48%, risk lover farmers 5.41%, and neutral risk farmers 8.11%. Farming experience and broad farming construction will increase farmers' aversion to risk, while revenue will increase the *courage of farmers on farming risk and there is influence of knowledge and motivation toward the behavior of farmers in*

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seaweed cultivation (Tokan et al, 2014; Acquah & Dadzie, 2012).

Another research on how to manage risk is done by Mulyati and Geldermann (2017) result that quality, price, and infrastructure in one part of the supply chain are uncertainties that can affect the whole chain. Knowledge of farmers' perception of risk, risk aversion, and preferred risk management strategies is essential for creating policy instruments to support agricultural risk management, and for the development of training programmes tailored to the needs of farmers (Sulewski & Gajewska 2014)

Research on the behavioral characteristics of farmers toward seaweed farming risk is still rare, and this is become important because the research on this filed can farther affect farmers' behavior toward the risk and decision making in seaweed cultivation.

RESEARCH METHODS

Location and Time of Study

This study was conducted in Bungin Permai Village, Tinanggea District, South Konawe Regency, Indonesia. The location of this research is purposively chosen regarding the location is one of the centers of seaweed farming in South Konawe. The study was conducted on October 2017 to January 2018.

Population and Sample

The population of this study were 233 seaweed farmers (NF). The samples in this study were taken by using simple random sampling method. The numbers of samples are 37 respondents, the sample size is determined by reference to the Slovin formula (Sevilla 2007). The confidence level used is 85% ($\alpha = 0.15$). According to Steel and Torrie (1993), sampling of farmers in the socio-economic study which is not less than 5% of the total population is considered representative.

Types and Data Sources

The data used in this study are primary data and secondary data. The primary data obtained directly through systematic interviews prioritizing the elements of accuracy, consistency and objectivity of information from seaweed farmers. Secondary data were obtained through a literature search of information derived from the literature books, articles, journals and institutions that are relevant to this study.

Data analysis

Farmers' behavior against the risks analyzed by using quadratic utility function model approach. The utility is a description of a person's behavior related to the selection of the activities of some alternative opportunities by using Von Neumann Morgenstern technique (Soekartawi et al 1993). According to Soekartawi that utility function is mathematically can be written as follows:

$$U = b_0 + b_1 M + b_2 M^2$$

Annotation:

U = Value of utility

M = Receipts earned at the proposed alternative balance point (CE)

b0 = Intersep

b1 = Indifference reception coefficient (*certainty equivalent*)

b₂ = Risk coefficients

Terms:

b₂ = 0 : Means decision-makers are neutral to risk (*risk neutral*)

b₂ < 0 : Means decision-makers are averse to risk (*risk averse*)

b₂ > 0 : Means decision-makers are bold to the risk (*risk lovers*)

Behavior of seaweed farmers in this study were tested at each individual which made the choice become the expectation value of seaweed farmers on alternative balance point encountered. Point of balance between the value under conditions of uncertainty with a definite value of the condition can be detected by using *Von Neumann Morgenstern* technique.

RESULTS AND DISCUSSION

Seaweed Farmers Identity

Characteristics of seaweed farmers in Bungin Permai village, Tinanggea District of South Konawe Regency include age, education level, dependent of family members, farming experience, construction size and revenue.

Age

Age is one factor affecting the level of the respondent's ability to determine the behavior toward the risk of farming. Most of the respondents who are young and healthy relatively have stronger physical ability and energetic to work compared to old farmers. General overview of the respondent's age can be seen in Table 1.

Table 1 Characteristics of Respondents by Level of Age, in Bungin Permai Village South Konawe Regency.

Age (Year)	Number of Respondents	(%)	Annotation
<20	0	0	Unproductive
20-54	36	97.29	Productive
>54	1	2.71	Unproductive
Total	37	100	

Table 1 shows that no respondents who have not been productive. Respondents were dominated by a fairly productive age that as many as 36 people or 97.29%. Respondents aged unproductive is only one person or amounted to 2,71%. From this point, it can be explained that the farmers who are in unproductive age are no longer play a role as decision makers in farming. They have transferred responsibility for farming to children or other relatives who are considered capable and willing to continue the seaweed farming.

Education Level

The education levels of respondents in Bungin Permai village are vary among farmers who only educated at primary school to secondary education. No respondents were uneducated or never been through formal school. Respondent's characteristics distribution by education level in Bungin Permai Village is presented in Table 2.

Table 2 Respondents Characteristics by Education Level at Bungin Permai, Tinanggea District of South Konawe.

Education	Number of Respondents	Percentage (%)
Elementary School (ES)	19	51.35
Junior High School (JHS)	16	43.24
Senior High School (SHS)	2	5.41
Total	37	100

Table 2 shows that most of the seaweed farming respondents have a relatively low level of education. The level of education is considered affecting respondents' mindset in facing risks in the farming (Jin *et al*, 2016; Abdullah, 2015). The higher the level of education, are expected to have a mindset that is more rational to define the behavior towards risks.

The Family Dependents

Family dependents are number of family members who become burden /dependent to the respondents related to daily necessity fulfillment, including respondent themselves. The number of family dependents of respondents varied, ranging from a small number of dependents (only 2) to the medium number (4-6). Distribution of the number of dependents to the respondents can be seen in Table 3.

Table 3 Characteristics of Respondents Based on Number of Family Dependents in Bungin Permai Village, South Konawe Regency.

Family Dependents	Number of Respondents	Percentage (%)	
Small	0-3	13	35.14
Medium	4-6	24	64.86
Big	>6	0	0
Total	37	100	

Table 3 shows the majority of respondents have a medium number of dependent family members, it can be seen where the number of respondents who have a dependent family of 4-6 people, as many as 24 people (64.86%). This would result in the higher expenditure for the purposes of fulfilling their daily needs. Respondents who have dependents 0-3 people are 13 people (35.14%). The expenditure is fairly standard for the cost of dependents, because the costs spends for dependents daily needs is fairly low.

Farming Experience

Farming experience is the length of the respondents pursues their farming activities. Seaweed farming in Bungin Permai Village is a hereditary job. Respondents' experiences are commonly long enough because they are being involved in seaweed cultivation from the age of children to adult. Farming experience of the respondents is divided into three groups, those are respondents with less than 5 years farming experience, farmers with 5-10 years farming experience and respondents who experience more than 10 years farming. Characteristics of respondents based on the farming experience can be presented in Table 4.

Table 4 Respondent' Characteristics Based on the Experience of Seaweed Farming in Bungin Permai Village, South Konawe Regency.

Farming experience	Number of Respondents	Percentage (%)
<5	2	5.40
5-10	17	45.95
>10	18	48.65
Total	37	100

Based on Table 4, it can be seen that the respondents' farming experience in seaweed farming commonly quite long, most of seaweed farmers have 5-10 years and > 10 years of farming experience. Respondents with farming experience > 10 years amounted to 18 people or 48.65%. Respondents who have 5-10

years experience amounted to 17 people or 45.95%, while the respondents who have experience <5 years of farming only amounted to 2 people or 5.40%. Farming experience will influence farmers behavior in decision making at farming.

Construction Area

The area of least farming construction owned by the respondent are 0.15 ha and the largest construction area are 0.6 ha. The distribution of construction area can be seen in Table 5.

Table 5 Characteristics of Respondents by Size of Construction at Bungin Permai Village, Tinanggea District of South Konawe.

Construction Area (Ha)	Number of Respondents	Percentage (%)	
Narrow	<0.5	29	78.38
Medium	0.5-2.0	8	21.62
Large	>2.0	0	0
Total	37	100	

Table 5 shows that most of the respondents have a narrow construction area where there are 29 farmers with this size of construction (78.38%). Another few farmers have a medium construction area that is as many as 8 farmers (21.62%). No respondent has large construction area.

Revenue

The revenue of seaweed farmers who became respondents in this study varied. The revenue data used is, the sale of seaweed in the last planting season (for one planting season). The distribution of respondents' revenue can be seen in Table 6.

Table 6 Characteristics of Respondents by Revenue in Bungin Permai Village, South Konawe Regency.

Revenue (USD)	Number of Respondents	Percentage (%)	
Very low	> 36	26	70.27
Low	36 – 101	9	24.32
Medium	109 – 217	0	0
High	> 217	2	5.41
Total	37	100	

Based on Table 6 as many as 26 people or 70.27% of seaweed farmers are in a very low revenue category. Revenue with lower categories only gained 9 or 24.32% farmers. Other 5,41% or 2 seaweed farmers get a revenue in high category. Low revenue is strongly influenced by low number of production and low price. It is caused by harvest failures experienced by seaweed farmers in the village of Bungin Permai in the last growing season or the fifth planting season (from the first planting season to the fourth planting season, farmers revenue > 217). At the fifth planting season farmers usually plant for only the need for seed. Only few farmers who sell their crops at this season (the fifth season).

Characteristics of Farmers Behavior toward the Risk

The respondents whom are seaweed farmers in this study amounted to 37 farmers. 32 seaweed farmers in Bungin Permai Village behaved as *risk averse*, 2 people behave dare to risk (*risk lover*) and 3 others behave in a *neutral* risk. The behavioral characteristics of farmers toward seaweed farming risk influenced by some factors include age, education, number of dependent family, farming experience, farming construction size and revenue.

Table 7 Characteristics of Farmers Behavior towards Risk.

Characteristics of Farmers'	Behavior towards Risk		
	Averse Risk	Lovers Risk	Neutral Risk
Age	unproductive (<20 Year): 0%	unproductive (<20 Year): 0%	unproductive (<20 Year): 0%
	Productive (20-54 Year): 96.88%	Productive (20-54 Year): 100%	Productive (20-54 Year): 100%
	unproductive (>54 Year): 3.13%	unproductive (>54 Year): 0%	unproductive (>54 Year): 0%
Education	ES: 56.25%	ES: 0%	ES: 33%
	JHS: 40.63%	JHS: 50%	JHS: 66.7%
	SHS: 3.13%	SHS: 50%	SHS: 0%
Family	Small 37.5%	Small 0%	Small: 33.3%
Dependents	Medium 62.5%	Medium 100%	Medium 66.7%
	Big (>6 people): 0%	Big: 0%	Big 0%
	< 5 year: 0%	<5 year: 50%	<5 year: 33.3%
Experience	5-10 year: 37.5%	5-10 year: 0%	5-10 year: 33.3%
	>10 year: 62.5%	>10 year: 50%	>10 year: 33.3%
Construction Area	Narrow (<0.5 ha): 81.25%	Narrow (<0.5 ha): 0%	Narrow (<0.5 ha): 100%
	Medium (0.5 ha-2.0 ha): 18.75%	Medium (0.5 ha-2.0 ha): 100%	Medium (0.5 ha-2.0 ha): 0%
	Large (>2.0 ha): 0%	Large (>2.0 ha): 0%	Large (>2.0 ha): 0%
	Very low (> USD 36.-): 25%	Very low (>USD 36.-): 0%	Very low (> USD 36) : 66.7%
Revenue	Low (USD 36- 101): 75%	Low (USD 36-101): 0%	Low (USD 36-101): 33.3%
	Medium (USD 109 - 217) :0%	Medium (USD 109 - 217): 0%	Medium (USD 109 - 217): 0%
	High (>USD 217): 0%	High (>USD 217): 100%	High (>USD 217): 0%

Table 7 shows that behavioral characteristics of age-based risk for all behavioral categories are dominated by productive age categories. Risk-averse behavior 96.88%, 100% risk lovers behavior, and 100% risk neutral. Characteristics of behavior based on education for risk-averse behavior (dominated by ES education category (56.25%), risky behaviors have a balanced percentage between JHS education category (50%) and high school education (50%), while risk neutral behavior is dominated by SHS education category (66.7%). Characteristics based on family dependents for three behaviors toward risk (risk averse, risk lovers, and risk-neutral) are dominated by the moderate category. Percentages for each behavior are 62.5%, 100%, and 66.7% respectively. Characteristics of behavior based on farming experience for risk-averse behavior is dominated by category of farming experience > 10 years (62.5%), risk lovers behavior has 50% percentage for farming experience category <5 years and 50% for category of farming experience > 10 years, while risk neutral behavior has 33.3% for each characteristic category (<5 years, 5-10 years and > 10 years).

The behavioral characteristics of risk based on size of construction area for risk-averse behavior and risk neutral behavior are dominated by narrow categories, with 81.25% and 100% respectively, while for risk behavior, dominated by medium category (100%). Risk-based behavioral characteristics are dominated by low revenue categories (75%), for risk lovers dominated by high-revenue categories (100%), and for neutral risk behavior dominated by very low revenue (66.7%). Income status, age, education and household size are significant determinants to farmer risk attitude (Dadzie & de-Graft 2012).

CONCLUSIONS

Characteristics of age-based risk for all behavioral categories are dominated by productive age categories, characteristics of behavior based on education for risk-averse behavior is dominated by ES education category, based on farming

experience for risk-averse behavior is dominated by category of farming experience > 10 years, The behavioral characteristics of risk based on construction area for risk-averse behavior and risk neutral behavior are dominated by narrow categories, while for risk lover behavior, dominated by medium category. Risk-based behavioral characteristics are dominated by low revenue categories, for risk lovers dominated by high-revenue categories, and for neutral risk behavior dominated by very low revenue.

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