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Research Article

Risk Management in Micro, Small, and Medium Enterprises: An Empirical Analysis of SMEs Dried Fish in Bengkulu Province

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Abstract

Every business always faces risks, including micro, small, and medium enterprises processing dried fish. Thus, it is crucial to examine the risk's sources, impacts, and response to risk. This research aimed to analyze the risk management process by identifying the risk sources, analyze the probabilities and risk effects, and design alternative strategies to prevent and control business risk that might be faced by MSMEs dried fish in Bengkulu Province. A total of 273 dried fish processing MSMEs were surveyed and interviewed. The data were analyzed using descriptive statistics and risk management approach. The main risk faced by dried fish producers was the production, included the raw material availability,input prices, and output prices. Each type of dried fish had different probability of risk occurrence where Kerong, Teri, and Gaguk had a high probability of risk occurrence despite their low impact on the scarcity of raw material availability. Moreover, Teri, Kepala Batu, and Bleberan had a high probability and impact risk in the input price. Considering the output price, only Kepala Batu is observed to have the probability and risk impact. Three strategies were designed to prevent and control risk, namely the establishment of joint business groups, introduction of business risk insurance, and downstream processing of dried fish products. SME fish processing does not encounter significant business risks. All risk sources are still regarded as moderate, with the exception of the production risk, which has a high-risk level.

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1. Introduction

Dried fish is a type of raw food materials which are sun-dried and preserved using salt, also known as salted fish. Drying is carried out to reduce the water content of fish while salting is intended to prevent and control bacterial growth in fish (Halimahtussaddiyah, 2011). Dried fish business is normally run by micro, small, to medium scale household businesses. Profile of these home industries have been examined by, among others, Yusra (2016) and Masrifah *et al.* (2015). In general, these studies conclude that traditional processed fish products so far have a poor image because of their low quality and nutritional value. Nevertheless, as revealed by Heruwati (2002), traditional fish processing still has prospects of development as seen from the percentage of processed fish production at the scale of home industry which remains high despite its "less prestigious" image and simple technology, yet wide distribution and relatively stable production. Data published by the Ministry of Marine Affairs and Fisheries Republic of Indonesia (2019) informed that the amount of processed fish production by micro small-scale industries has annually increased by 7.20% during the year of 2010 - 2017. Java remained as the center of processed fish production area followed by Sumatra which averagely contributed to 23.45% or 1,077,928 tons of total production in 2017. Májková (2012) also concluded that SMEs were an important element of economic and social stability.

Fish processing at the scale of home industry exists in all provinces in Sumatra including Bengkulu Province. Although this province only contributes to 3% of the total processed fish production at micro-small scale, this home industry has an excellent development prospect by reason of fish catch potential in Bengkulu Province. Romdhon *et al.* (2019) reported that Bengkulu Province has a long coastline of approximately 500 km with Indonesian Economic Exclusive Zone (ZEE) potential of 80,071 tons per year with various big and small pelagic and demersal fish besides other marine biota. However, the abundant potential of capture fisheries has not been able to improve the fishermen and fish producers' welfare. This is due to many factors, such as weather uncertainty and simple technology use, faced by fishermen and dry fish producers. These conditions indicate that micro, small and medium enterprises (MSMEs) deal with uncertainty in their business. In other words, MSMEs cope with business risks which is necessarily managed to ensure business sustainability.

Businesses in the field of salted fish processing also face increasingly high and challenging business risks as a result of globalization and intense business competition in terms of both resource utilization and product competition. Risk is often defined as the possibility of a potentially adverse event or uncertainty in a situation faced by a person or company and has a detrimental impact as well as business continuity (Djohanputro, 2008). Risk, according to William and Heins (1985), is also defined as a variation of the results that can occur during a certain period under certain conditions. Chen (2010) stated that business risks can be categorized into four types namely financial, operational, strategic risk, and externality risk which can be caused by external and internal factors. Therefore, examining the source of risk, analyze and respond to the risks faced by MSMEs is very important to survive in the business. It means that risk management which is aimed at managing every problem that arises is needed to be able to run a sustainable industry. Along with the existence of risk management, salted fish entrepreneurs can apply good industrial governance to micro and medium scale home industries, deal with changing industrial environments, measure industry risks, perform systematic risk management, and maximize profits.

Most businesses are decided and conducted under conditions of uncertainty which occurs during the business development process and in the results. Aven (2012) and COSO (2004) explained that uncertainty can be caused by internal or external factors where the impact can be positive or negative for the company. COSO (2004) further elucidated the internal factors included infrastructure, human resources, process, and technology, whereas external factors involved economic, environmental, political, social, and technological factors. Besides, uncertainty is often caused by a lack of information or understanding related to an event, the consequences of an event, or its possibility so that it affects the company's performance (Miles *et al.*, 1978). A measure of the probability of deviations from the actual process and the result from the expected level is often called business risk. Simply stated, risk can be interpreted as the possibility of an adverse event. There are three important elements of something that is considered a risk: a) an event, b) the possibility of an event happening, c) and when it does occur, it will cause loss (Kountur, 2008). Risk is the possibility that the results obtained deviate from what is expected. From this understanding, it can be concluded that risk is an uncertainty associated with the possibility of undesirable adverse effects (Hanafi and Halim, 2009). According to Sutanto (2012), the risk is a combination of the likelihood and severity of an event. The magnitude of the risk is determined by various factors, such as the amount of exposure, location, users, quantity, and vulnerability of the elements involved. Concerning the magnitude of the impact of risk for business continuity and sustainability, risk man-

agement is an absolute necessity in every business decision-making, including SMEs.

Risk management consists of management and risk terms. Management refers to the process of coordinating and integrating work activities to be completed effectively and efficiently to achieve a certain goal (Hasibuan, 2006). Meanwhile, risk is the possibility of the results obtained to deviate from what is expected. In other words, risk is an uncertainty associated with the possibility of undesirable adverse effects (Hanafi and Halim, 2009). Risk can be divided into various types depending on the impact on the business and its environment. According to Harland *et al.* (2003) and Belás *et al.* (2015), risks faced by businesses can be in the form of operational, supply, customer, asset impairment, competitive, reputation, financial, fiscal, and regulatory and legal risks.

Risk management has become an intensive issue and debate. In organization issues, risk management has been discussed, among others by Beasley *et al.* (2005), Mesjasz-Lech (2012), Gorzen-Mitka and Wieczorek-Kosmala (2013), and Zoghi (2017). In the business area, risk management has been widely deliberated by Hopkin (2010), and Kozubíková *et al.* (2015). Hence, world business practice shows that risk management currently becomes an integral part of business activities run by the company for creating value to the organization and shaping the effectiveness of undertaken actions. Even so, research on risk management in Indonesia is still very limited, especially those related to risk management in micro, small, and medium businesses. Several risk managements studies that have been conducted in Indonesia include research by Sari *et al.* (2017) on rattan in Malang City, East Java, and Wajdi *et al.* (2012) at SMEs in Surakarta, Central Java. Using the SWOT approach, Sari *et al.* (2017) found that supply and marketing risks were high (in the red zone) and suggested the importance of cooperation and support from stakeholders, including the government. Meanwhile, research by Wajdi *et al.* (2012) using the AHP and descriptive statistics consisting of frequencies and cross tables, concluded that the management of SMEs cannot be separated from the threat of business risk, and this is not only the responsibility of SMEs but also other stakeholders including banking, insurance, and government.

The discussion above will lead to the importance of studies aimed at developing strategies to adopt an effective risk management system in the salted fish household industry in Bengkulu. Related to this goal, this study is aimed at identifying the source of risk, analyzing the probability and impact of risk occurrence, and designing alternative risk management strategies.

Figure 1. Research location (source: https://www.worldatlas.com/maps/indonesia and https://peta-hd.com/peta-bengkulu/)

2. Materials and Methods

2.1 Material

2.1.1 Research location

The area sampling or cluster sampling method is used to determine the research location based on the fact that research location is the center of fish production in Bengkulu Province. Two regions which are the centers of dried fish production are Mukomuko Regency and Bengkulu City (Figure 1).

2.1.2 Data collection

The data of this study were obtained from household respondents who process fresh fish into dried fish. A total of 273 dried fish processors were interviewed using a previously prepared questionnaire. This questionnaire has been tested for its reliability and validity, which shows that the questionnaire is statistically valid and reliable. The determination of respondents was conducted by the census method. Census is a way or process of taking research data by taking all elements of the population under study, or a complete enumeration (Sukiyono, 2018).

2.2 Analysis Data

Two data analysis tools were applied, namely a descriptive and risk management analysis. Sukiyono (2018) defines descriptive analysis as a method of researching with purpose to systematically describe and explain the phenomenon under study. This phenomenon can be in the form of human group status, a set of conditions, a system of thought, or a currently occurring event. Risk management analysis is used to identify and rank the potential impacts of risk. Risk management analysis in this research consists of three steps. The first step is Risk Identification. According to Bowden *et al.* (2001), risk identification involves the comprehensive identification of risks that can impact the organization's sub-processes. This activity is a process in which a business systematically and continuously identifies exposures, responsibilities, and personnel immediately or before the risk itself arises. In this study, a list of potential risks is developed and organized by five risk categories, namely production, price and market, government, human resource, and financial risk as suggested by Padekawati *et al.* (2017). Each risk source category consists of some risk events which will be assessed for risk level using a score from 1 to 5 which indicates the rarity, slightly rare, moderate, frequent, and very frequent risk. Furthermore, the scores obtained from risk-related questions asked to respondents are categorized into 3 categories of risk level, namely low, moderate, and high.

The second step is risk assessment or risk evaluation. This step involves the determination of the frequency of when risk events will occur and measuring the impact of the consequences. Information is needed regarding the two dimensions of each risk exposure, namely (a) probability or frequency of occurrence, and (b) the severity of the loss that will occur or the impact of the risk. The method used to determine risk probability is the Z-score method. It is widely known that Z-score has become a frequent indicator of risk-taking, especially in banking sectors, among academics. This method was developed by Roy (1952) and subsequently furthered by the work of Boyd *et al.* (1993), and Delis *et al.* (2012). A Z-score is a standard score in the form of a distance score from the mean group in Standard Deviation units (Brase & Brase, 2016). Z-score in this study was estimated with the following formula:

$$Z = \frac{x - \bar{x}}{S} \quad \text{where} \quad S = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})}{n-1}}, \quad \text{and}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad \ldots \text{Eq 1}$$

Description:

Z: the risk value of an event

S: the standard deviation of risk in events

x : normal/acceptable risk limit value

$\bar{x}$: the average value of a risk event at the period of i

n: number of observations.

If the Z-score obtained is negative, then the value is to the left of the average value on the normal distribution curve, *vice versa*. After Z-score is estimated, the probability of the risk occurrence of the risk can be found from the distribution Table Z (normal).

Risk Impact is estimated using the VaR (Value at Risk). Jorion (2001) defined Value at Risk as the potential loss in value of a risky asset or portfolio over a defined period for a given confidence interval. Accordingly, VaR measures the biggest loss that may occur in a certain period and is caused by risky events. VaR can be calculated by the following formula:

$$VaR = \bar{x} + Z\left(\frac{S}{\sqrt{n}}\right) \qquad \ldots \text{Eq 2}$$

The final step is formulating a risk management strategy. The risk management strategy is formulated based on the position of each risk source on the risk map. Hence, Risk Mapping is another important component of a risk assessment. The main objective of risk mapping is to identify systematically major risks. As stated by Mouatassim and Ibenrissoul (2015), significant objectives of risk mapping are to set up an internal control system and/or risk management program; to enable management in establishing a strategic plan in dealing with consequent risk exposure, and to guide internal audit plan through emphasizing major risk areas. A risk map is a description of the risk position on a map of two axes, namely the vertical axis that describes the probability and the horizontal axis that describes the impact, *vice versa*. The risk probability and impact are divided into two categories, namely, high and Low. The risk probability and impact threshold are determined by management, but in general, the risk probability is 20 percent, while the limit value is determined by the owners (Kountur, 2008).

3. Results and Discussion

3.1 Dried Fish MSMEs Characteristics

The results of research conducted on 273 micro, small and medium entrepreneurs (MSMEs) in Bengkulu Province showed about 78.75% of MSMEs entrepreneurs in this salted fish processing are women. This finding is reasonable due to the fact that the heads of households living in coastal areas normally work as fisherman. Therefore, the work types entered by housewives are mainly close or related to the business run by their husbands, as confirmed by Wawansyah *et al.* (2012). However, men or husbands found to work as dried fish processors were generally quite old to work as fishermen.

The average age of dried fish entrepreneurs was around 42 years old with an age range between 18-80 years old and length of formal education completed for 8 years. This showed that dried fish entrepreneurs had a low level of education, namely the elementary school level, which would certainly impact the performance of MSMEs. This finding is explained by several studies indicating a clear and important link between the level of education of the SME entrepreneurs and the standard of doing business in several countries, such as Pakistan (Merchant *et al.*, 2011) and Czech Republic (Virglerova *et al.*, 2017). However, most of dried fish entrepreneurs have a reasonably long experience of more than 12 years which is important for the sustainability and performance of the business. Several studies conclude that business experience is an important factor in deciding investment (Maxwell *et al.*, 2011) and business performance (Spanjer and Witteloostuijn, 2017).

Concerning the production scale, the average number of dried fish products produced per production process highly depends on the type of fish being processed. Seven types of fish are processed and produced, namely Beledang (*Trichiurus sp.*), Teri (*Stolephorus sp*.), Kerong (*Therapon theraps Cuvier*), Gaguk (*Arius venosus*), Lidah-lidah (*Cynoglossidae*), Kepala Batu (*Mallotus villosus*), and Bleberan (*Thryssa sp*). The average production quantity per production process varies among dried fish types (Table 1). The most processed type of fish is kerong with an average quantity of production per process of 109.03 kg. This finding is reasonable because, as stated by Genisa (1999), the demand for kerong, both fresh and dried fish has increased not only due to local demand, but also for export purposes. Meanwhile, the Lidah-lidah is one type of fish that is relatively poorly processed, averaging 50 kg per production process. One of the arguments is that this type of fish usually has low economic value, because of its unattractive size and shape (Bunlipatanon *et al.*, 2014).

All process of the dried fish production in Bengkulu Province still used the traditional method namely sun drying method. Drying is a popular way of preserving fish, with sun-drying being the most widely used and oldest known method of fish preservation in the world (Reza *et al.*, 2009; Mansur *et al.*, 2013). However, given the value of goods in terms of market volume as well as the socio-economic position of millions of people, this sector needs the necessary attention of stakeholders to ensure the quality and protection of dried fish products produced and marketed (Paul *et al.*, 2018).

3.2 Risk Management Analysis

Zoghi (2017) and Henschel (2009) define risk management as a mechanism in which risk is identified, analyzed, measured, controlled, and tracked. The degree to which the risk process is ultimately implemented depends on the scale and the business field. Merna and Al-Thani (2008) stated that some businesses are only doing what is required to fulfill mandatory criteria, and others are not adequately committed to understanding the outcomes of the risk analysis in all current and future plans. As shown in the research method, there are three key stages involving risk management, namely, Risk Source Identification, Risk Assesment, and Risk Strategy Formulation.

Table 1. Mean, minimum and maximum production per production process based on types of dried fish produced (kg/production process)

	Beledang	*Teri*	*Kerong*	*Gaguk*	*Lidah-li-dah*	*Kepala Batu*	*Bleberan*	*all types*
Mean	58.02	74.6	109.03	69.67	54.8	87.93	97.25	128.69
Minimum	1.17	5.83	11.33	17.5	8.33	5.67	12.83	10.29
Maximum	200	316.67	975	170	139.17	483.33	358.33	835.71

Table 2. Risks source identification

No	Risk Sources	Score	Classified
A.	Production Risk	3.73	High
B.	Price and Market Risk	3.62	Moderate
C.	Government / institutional risks	3.44	Moderate
D.	Human Resources Risk	3.48	Moderate
E.	Financial Risk	3.64	Moderate
Overall Risk		3.58	Moderate

Table 3. Risk probability and impact based on risk sources

Risk Analysis	Risk Sources	Type of Dried Fish							Total
		Beledang	Teri	Kerong	Gaguk	Lidah-lidah	Kepala Batu	Bleberan	
Z-score	Raw Resources	3.03	0.67	6.24	0.35	6.12	2.35	3.91	0.28
	Input Price	0	-0.01	-0.03	-0.32	0.28	0.62	-0.71	0.12
	Output Price	-1.57	-4.52	-4.79	0.08	-1.75	-0.25	-2.78	10.63
Risk Probability (%)	Raw Resources	49.87	25.16	0	36.32	0	9.26	0.01	38.97
	Input Price	0.8	50.4	11.79	12.55	10.64	22.91	26.11	4.38
	Output Price	44.29	99.99	0	28.81	4.75	0.62	0.27	0
Risk Probability Limit (%)	Raw Resources	20	20	20	20	20	20	20	20
	Input Price	20	20	20	20	20	20	20	20
	Output Price	20	20	20	20	20	20	20	20
Value at Risk	Raw Resources (kg/process)	62.22	75.51	132.36	70.24	61.89	92.43	105.19	132.91
	Input Price (IDR /kg)	6,596.23	20,993.06	4,033.52	4,700.04	3,391.27	4,024.64	4,541.28	7,448.24
	Output Price (IDR/kg)	28,119.52	41,263.14	28,126.23	27,393.77	27,826.90	29,898.78	31,859.33	26,609.52
Risk Impact Limit	Raw Resources (kg/process)	75	80	110	85	55	88	100	125
	Input Price (IDR/kg)	6,000.00	17,500.00	3,500.00	4,500.00	3,000.00	4,000.00	4,000.00	6,500.00
	Output Price (IDR/kg)	25,000.00	40,000.00	25,000.00	25,000.00	25,000.00	30,000.00	27,500.00	25,000.00

3.2.1 Identification of risk sources

As revealed in this research method, risk source classification following the classification of Padekawati *et al.* (2017) includes production, price and market, governance, human resource, and financial risk. Each risk source category has several risky events. The identification results showed that the risk level of all source categories was included in moderate level (Table 2). By analyzing the five risk sources, production risk was found to have the highest risk assessment (score of 3.73) and among its risk events, low availability of raw resources, dried fish preservation, and unpredictable weather obtained the highest score. These findings are acceptable considering the dependence of fish processing industry on the catches of fishermen where the quantity of fish caught, and fishing day also depend on the climate and season. According to Assouto *et al.* (2020), production risk is caused by climate uncertainty, the intensity of disease attacks, and the technical factors of unexpected costs outside the control of each business actor. Moreover, study conducted by Situmeang (2014) revealed that the constraints in the dried fish processing business are the uncertainty of raw material availability, the low quality, and the low-level knowledge about dried fish processing. This phenomenon also causes the possibility of production risk, making it difficult to supply fresh fish raw materials. Supply shortages are also detrimental to the business because consumer demand is not fulfilled when the market price is high which eventually leads to product or company switching by consumers (Lagarense, 2013). Production risk is related to the supply of raw materials used. Abundant raw materials will result in the increasing dried fish production, *vice versa*. Moreover, as dried fish producers still apply the traditional sun-drying technology, bad weather will cause sub-optimal drying or even rot. This sunlight dependence possibly causes the low productivity risk.

The other four categories of risk sources, namely financial, government institutions, and markets and prices had a moderate level of risk with a score range of 3.44 to 3.64 (Table 2). The moderate price and market risk indicated that dried fish product had a fairly broad market segment. The dried fish product market has reached markets outside Bengkulu city and Mukomuko Regency, even beyond the Province of Bengkulu. Therefore, marketing was not a major problem for Bengkulu City concerning the dried fish products as indicated by moderate classification of a risk event (score of 3.62). Another reason was that the durability or long-shelf-life characteristics of fish products which also lead to price and market risk was not a major source of risk for dried fish entrepreneurs. The use of salt as an essential ingredient in dried fish processing is one of the reasons for the long shelf life of dried fish (Afrianto and Liviawaty, 1989). Moreover, two risk events obtained the highest score of 3.72 and 3.78, respectively for the price of production input (fresh fish) and the selling price of dried fish, thus they were classified as a source of high risk. As stated by Assouto *et al.* (2020), besides encountering production risks, enterprises are also exposed to price risk. Prices are subject to significant variability primarily caused by the lag between the production decision and the harvest time coupling with the low-price elasticity of demand. Additionally, price risk, often denoted as market risk, is related to input and product price fluctuations. This price risk harms business, as shown by several studies in agriculture, including Rezitis and Stavropoulos (2010), El Benni and Finger (2014), and Wossen *et al.* (2018).

The financial risk source, which is often considered as the source of SMEs risk (Serveas *et al*., 2009; Altman *et al*., 2010; van den Boom, 2019), is not found to be the risk source for processing dried fish in Bengkulu City. The characteristics of fish processing business in Bengkulu Province, which relied heavily on fish caught by fishermen who are husbands to the dried fish producers, the dependency of raw material sources from other fishermen, and relatively small-scale production were the reasons why this processing industry did not face serious financial risks. Similarly, less government intervention caused producers not to depend much on government in developing their businesses. Also, marketing institution was not a major problem for them to market their products.

Based upon the above findings, further analysis in this research will focus more on analyzing production risk with three risk events, namely the availability of raw materials, input, and output prices. These three risk events are interrelated. This way, a considerably low quantity of production input due to weather conditions will further influence the input price and in turn, affecting the selling price of dried fish products.

3.2.2 Risk assessment: probability and impact

Risk probability and impact were analyzed based on the type of dried fish produced and three types of risk events, i.e., the availability of raw materials, input prices, and dried fish prices. In terms of the raw material availability, the risk probability showed that the Beledang has the highest risk raw material supplies of 49.87%, followed by *Gaguk* (36.32%) and *Teri* (25.16%) (Table 3). The assessment of risk probability

involved the calculation of the likelihood of the risk occurrence. The risk probability value of 49.87% obtained by Beledang, reflected the possibility of raw material scarcity (fresh fish) of 49.87%. The value is considered high due to the fact that Beledang is often consumed fresh, dried, or salted fish. Differently, anchovies which were often consumed in dry form rather than fresh had a lower probability of raw material scarcity risk. In general, probability of the occurrence of raw material scarcity risk was 38.87%. Despite the characteristic of commodity to be consumed freshly or dryly, the risk of raw material scarcity was also caused by the weather. It should be noted that the risk limit probability according to the respondents' perceptions was 20%, therefore, risk event would be considered high if the estimated risk occurrence probability had a Z score exceeding 20%.

Concerning the price risk of raw materials, the probability of this risk event was relatively small, which was only 4.38% overall, which indicated 4.38% of input price risk production. The probability of this risk event was relatively small compared to the risk event of raw material scarcity (fresh fish). This finding is reasonable because most of the fish processed into dried fish are those with low economic value (known as trash fish). This is different from snapper or tuna, for example, which have a high economic value. Hence, most of the catch of these types of fish is consumed fresh rather than being processed into dried fish. Among the types of dried fish, Teri (anchovies) had the highest input price risk which reached 50.40%. Since this fish is mostly consumed in the form of dried fish and cannot be substituted by other fish types, it is not surprising that anchovies are at the highest risk of input prices. Meanwhile, Beledang had the lowest probability of input price risk occurrence of 0.80% (Table 3). The possibility for consuming this fish freshly indicated that this type of fish does not have a significant price fluctuation. However, Beledang faces a high risk of raw material availability due to extreme weather factors as previously discussed.

Based on the perception of dried fish processors on the source of risk, selling price is considered a high-risk event, as explained above. However, not all fish species experience a high-risk event probability. There are only three types of fish that are likely to have a high risk of output prices, namely Teri, Beledang, and Gaguk with the percentage of 99.99%, 44.29%, and 28.28%, respectively. As explained above, these three types of fish also had a high probability of raw material scarcity compared to other types of dried fish. Therefore, it is predictable that the situation also has an impact on the high probability of risk occurrence. Another argument that could explain this finding is that the selling price or the price received by dried fish processors is often determined by the collecting traders. Dried fish processors do not have strong bargaining power in determining the selling price for their products, therefore they only act as price takers for their products. The dependence of fish processors on collecting traders is resulted from the fact that collectors provide initial capital for the production process, causing dried fish producers remain powerless concerning the selling price of their products. As a result, the price highly depends on collecting traders around their village. This further leads to a tendency of price fluctuations to be borne more by the dried fish producers. Moreover, the reason that middlemen are the ones who buy the products reflects their dependence on middlemen, as confirmed by Hardinawati (2017). In the case of catfish cultivation, Fuad *et al.* (2015) found that the salient patron-client relationship between catfish farmers and middlemen was triggered by the absence of capital to meet catfish production needs. In return, they have to follow the middlemen's demands, including lowering the selling price or even carrying out early harvests for catfish farming.

The impact of production and market risks are estimated by comparing value at risk with risk impact limit based on producers' perception instead of measuring income loss resulting from risk events. There are two important reasons underlined the use of this method. First, by comparing the value at risk with the risk limit, it is possible to directly examine the magnitude of the impact of the observed risk event. If the value at risk is higher than the risk impact limit, then it would impact a specific type of fish greater, the further these two indicators are apart. Second, the income received by dried fish producers also depends on the price received by them. Thus, implicitly, if the value at risk is greater than the risk impact limit, it can be concluded that producers experience a high loss impact as a result of the risk event and *vice versa.* Looking at raw material availability, three dried fish types, namely, Beledang, Teri, and Gaguk, had a lower value at risk compared to risk impact limit. These results showed that although the availability of these fish had a high probability of risk occurrence, their risk impacts on availability was not high. This is indicated by the relatively small value of risk compared to the impact limit perceived by salted fish producers. Higher risk probability value exists due to the different number of fish processed in each production process. One reason is the existence of competition among producers to obtain raw materials for certain types of fish, such as anchovies. Besides, different production scale among producers also leads to higher value of risk probability.

Competition among dried fish producers to obtain fresh fish as raw material for dried fish does have a significant impact on the risk probability of the input price. This is based on the risk value that is higher than the input price accepted by dried fish producers. It means that input price is a serious problem for dried fish producers as shown by the relatively high probability of risk occurrence compared to the probability limit with exception of Beledang, Kerong, Gaguk, and Lidah-lidah (Table 3). The instability of input prices has made it difficult for dried fish producers since they have to sacrifice production costs. Many studies, including Srivastava *et al.* (2017) and Lee (2002), showed that input price is often an important factor in increasing production costs and it has been concluded that the utilization of physical inputs and the rising production cost was caused by the increasing input prices.

Not all types of dried fish had a significant impact on the output price aspect (Table 3). It is found that only Kepala Batu, Lidah-lidah, and Beleberan fish which had a lower value at risks than the risk impact limit. Nonetheless, the stubble had a higher probability than the acceptable limit for the risk occurrence by approximately 20%. Similar situation was found in dried fish species of Beledang, Teri, and Gaguk, but with a higher value at risk than the acceptable risk limit for each type of fish. This finding also revealed that the last three types of fish had a probability of price volatility even though they had a higher selling price of output than the selling price limit received by producers. In other words, this finding also indicated that even though their selling price was unstable, they still received a higher price than the limit price, resulting in business loss.

3.2.3 Risk maps and strategies

Risk Maps can be defined as a matrix obtained from the relationship between the probability of risk events and the impact of risk events. Based on the results of the VaR and the risk impacts, it is possible to map the position of each dried fish types in the risk map (Table 3). The results of the risk maps demonstrated that the extent of risk was expected to occur, and the risk impact would be accepted and borne by the producer due to the risk event. In this study, the mapping of each risk event was interpreted carefully that not everything in quadrant 4 will harm SMEs, as argued by Kountur (2008). The output price, for instance, is always expected to be higher than the limit of risk impact, yet opposite situation is hoped for the price of production input (raw materials).

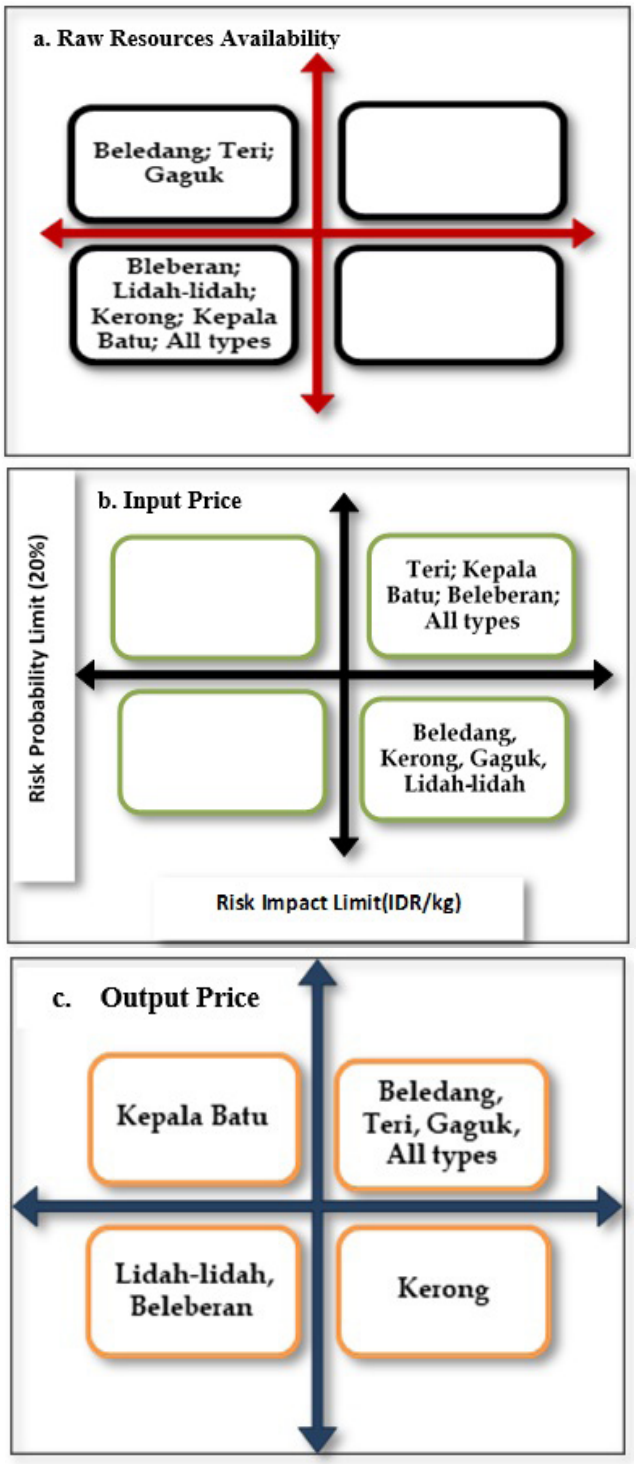

Figure 2. Risk event mapping of the availability of fresh fish input, input prices, and output prices

The availability of raw materials, namely fresh fish, was found to be below the limit of the amount of risk that could be tolerated by dried fish producers per production process. It showed that the availability of dried fish input could lead to a serious problem for producers since the quantity produced is still below the production capacity. Fortunately, not all fish species

experienced a risk occurrence above the limit of 20%, except for the types of Beledang, Teri, and Gaguk as discussed above. The results differed when viewed from the input price mapping where input prices of all types of salted fish were above the input price limit that could be tolerated by producers despite the different probability level of risk occurrence (Figure 2b). These findings indicated that different strategy was needed to overcome the problem of high input prices compared to the problem of production input availability. Furthermore, in terms of risk events on output price, some types of fish were observed to experience output prices below and some above the limit. Similar result was also found when risk occurrence probability was taken into consideration (Figure 2c), showing that all types of dried fish investigated spread over the four existing quadrants when viewed from the risk event of the selling price. The dominance of wholesaler traders in determining prices is perhaps the reason that causes the spread of this risk, both from the probability of risk occurrence and value at risk, as previously discussed.

3.2.4 Designing alternative risk strategies

Alternative strategies are designed based on the presence of each risk presented in the risk map (Figure 2). In general, strategies designed to deal with business risks are classified into risk mitigation and risk avoidance. By definition, risk mitigation is a strategy deliberately taken by the firms to counteract the possibility and impact of risk incidents (Peltier, 2005; Rainer *et al*., 2015). Risk mitigation is the second step in the risk management process consisting of prioritizing, reviewing, enforcing, and maintaining effective risk-reduction controls as recommended in the risk evaluation process (Jaffee *et al*., 2010; Vlajic *et al*., 2012). Meanwhile, risk avoidance is defined as risk avoided when the company refuses to accept it. Exposure is not permitted to occur in the absence of action that creates a risk. Risk avoidance is the removal of risk, exercises, and exposures that may negatively affect a business (Rezakhani, 2012). An example of risk avoidance strategy is found in research conducted by Näther and Theuvsen (2012) on a horse farm, and Schaper *et al*. (2010) in dairy farming.

The characteristics of SMEs engaged in dried fish processing in Bengkulu Province are also characterized by less developed risk management. Therefore, and also based upon the results of the risk map for each risk event, three strategies that can be designed and implemented are establishment of joint business groups, introduction of business risk insurance, and downstream processing of dried fish products.

3.2.4.1 Establishment of joint business groups

This business group is expected to increase the collaboration amongst dried fish producers. Many advantages can be obtained including (a) increasing the bargaining power of producers when dealing with collectors, (b) reducing competition amongst producers in procuring fresh fish production inputs, (c) collectively procuring production inputs, and (d) carrying out joint marketing including the product market's expansion . Several studies by Gilmore *et al*. (2004), Kim and Vonorta (2014), and Li *et al*. (2015) also concluded the importance for micro, small, and medium enterprises to collaborate in order to mitigate, avoid, and reduce the possible risks that the business may face. They reveal that SMEs can adapt to technological, financial, and market risks through collaboration. Also, by collaborating with their competitors, as mentioned by Simatupang *et al*. (2002), SMEs are enabled to share market information and promotion to increase market network as well as to reduce their dependence on intermediate traders. Furthermore, as an economic or business institution especially with a legal entity, there is a great opportunity to become a guarantor to borrow a farming capital from economic institutions such as people's credit banks or other financial institutions as well as government capital loan assistance which allow current production scale to improve. These economic institutions can also seek business loans from banks or government assistance in a more convincing manner. This is important for strengthening business capital by expanding and increasing the scope of business units. Capital strengthening can also be done in the form of business cooperation with local governments.

3.2.4.2 Introduction of business risk insurance

Insurance for SMEs, especially in the field of dried fish processing in Indonesia does not exist. Insurance that has just been introduced is agricultural insurance known as the Rice Farmers Business Insurance (AUTP) program. The basis for implementing agricultural insurance appeared with the Regulation of the Minister of Agriculture of the Republic of Indonesia number 40/ PERMENTAN/SR.230/7/2015 concerning the Facilitation of Agricultural Insurance. In general, farmers agreed with the AUTP program and benefited from this program (Primandita *et al*., 2018; Kaban and Kusno, 2019). Based on these findings, it is important to introduce insurance in order to face the risks that may befall this business. The benefits that may be obtained from this insurance program are as follows; (a) providing an economic incentive, especially concerning

the high cost of production resulted from an uncertainty of input and output prices, (b) providing a guarantee (credit) for producers to repay their loan debts especially when they face production failure, and (c) creating stability and certainty in the fishery sector to secure and create jobs.

3.2.4.3 Downstream processing of dried fish products

Dried fish is not the only product from fresh fish processing. Apart from being cooked for consumption, dried fish can be processed further into fish meal which contains protein, minerals, and vitamins produced from fish meat with nutritional content which depends on the type of fish used as the raw material (Martinez *et al*., 1998). Also, fish meal is one of the more advanced fish processing products that has not been fully utilized, especially for food and fish feed. The production of fish meal made from anchovy, for example, can be used as alternative food. The use of fish meal as a substitute for wheat flour in biscuits is a promising alternative, especially in terms of the quality of nutrients produced (Mervina *et al*., 2012). Local fish meal production has not been able to meet the needs of the fish feed industry, both in terms of quality and quantity. According to Kusumo (2012), the national fishery industry needs a minimum of 150,000 tons of fish meal every year to reduce the dependence on feed raw materials which is still dominated by import mechanisms. Further processing of dried fish is also aimed to increase the value of the dried fish product itself. This action is also intended to diversify the dried fish products; thus, they do not only depend on the demand for dried/salted fish. However, increasing the value of dried fish, particularly the less preferred ones, into processed products such as fish meal requires a sophisticated technology. Expertise is therefore required to use an advanced technology to produce high-value products.

4. Conclusion

It is found that SME fish processing in Bengkulu Province does not face serious business risks, yet all risk sources are still considered moderate, except for the production risk with its high-risk level. The high risk in production is reasonably certain to occur since fish processing business, both in the production process and in the procurement of fresh fish input, is very dependent on the weather, which is often unpredictable. In turn, this condition also contributes to the risk of input and product prices. Therefore, the risks of input availability, input prices, and output prices cannot be avoided in the SME of dried fish processing industry.

Risk is unavoidable and must be faced by the enterprises. The problem is how dried fish SMEs can prevent and control this risk, especially the production risk, hence serious impact on the sustainability of these SMEs will not occur. Three important strategies possibly implemented to prevent production risk are found to have a broad impact on the business, namely the formation of joint business groups, the introduction of business risk insurance, and the downstream processing of processed dried fish products. Besides, the intervention of the local government for the sustainability of dried fish processing business through guidance to improve the quality and quantity of dried fish products should also be considered.

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Authors' Contributions

All authors have contributed to from collecting data, discussion to the final manuscript. The contribution of each author as follow, KS: Idea, Concept, and drafted article; MMR and MN: Discussion and drafted article, NW for collecting, and generating data, and designed the figures. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

We declared that no competing interests exist in conjunction with the publication of this article.

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