Analyzing the Availability of Raw Materials for Sustainable Fisheries Processing in Micro-Small Enterprises in Kendari, Indonesia

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Abstract: This study aims to determine the status of raw material availability to support production activities to become a sustainable business. The analytical methods used were location quotients, standard deviation, and relative scale. Several micro and small-scale fish processing businesses in Kendari City such as smoked fish, dried fish, fish balls, somay, shredded fish, spicy anchovy sauce, seaweed chips, crab shell powder, and crab shell chips. All these products have the potential to be developed locally considering that Kendari City is the centre of the fishing industry in Southeast Sulawesi. The fishery products both capture and cultivation in Kendari can fulfill and support product development except for seaweed and crab shell-based products due to the availability of raw materials. Both raw materials must be imported from other regions such as South Konawe and Bombana districts. This study found that the types of fish most widely used in fish processing businesses are kite, skipjack, and tuna. Three statuses of sustainable availability were identified, namely fulfilled, moderately fulfilled, and less fulfilled. There are three categories of sustainable availability status depending on the fishery product business developed: first, fulfilled mainly for smoked fish, fish balls-somay, and shredded fish; second, less fulfilled for dried fish and spicy anchovy sambal; and finally, less fulfilled mainly for seaweed chips and crab shell powder and chips.

Keywords: developed, fulfilled, fish processing, micro small enterprise, raw material, sustainability

1. Introduction

Fish processing businesses are part of the fisheries sector that plays an important role in the global economy, both as a source of food and a source of foreign exchange. Micro-small-scale fisheries processing businesses play an important role in developing the fisheries sector and expanding the market for fisheries products. In addition, fisheries processing MSEs also have a positive impact on the local economy, such as increasing the income of farmers and fishermen, and creating new jobs. Fish processing plays an important role in developing the fisheries sector, creating new jobs, and increasing the added value of fisheries products. In addition, the fish processing industry also plays a role in maintaining food quality and safety (Purwaningsih et al., 2018) stated that the development of small and medium-scale fish processing units should be a concern because they are able to be the driving force of the economy, especially in times of economic crisis.

The development of fisheries processing businesses in Indonesia is still very minimal and not well developed. Fish processing activities in Indonesia are generally still classified as traditional and carried out at the scale of the household industry. This is because modern processing requires requirements that are difficult to meet by small-scale fisheries, namely the supply of high-quality raw materials in uniform types and sizes, and in large enough quantities in accordance with the capacity of the processing industry. (Heruwati, 2002). The problem that fish processors are still facing is the frequent shortage of raw material supply (Poernomo & Heruwati, 2011; Siang et al., 2017). The major challenge faced today is the imbalance between available supply and expected demand. (Man & Strandhagen, 2017). The development of fish processing businesses in Kendari City, Southeast Sulawesi Province, as a production and marketing centre, is still very low for micro, small and medium scale enterprises.

The ability of a business to fulfill production and consumer needs often depends on the availability and accessibility of the necessary raw materifulfillal resources. Raw material shortages can disrupt the production and distribution of various products, resulting in price increases, reduced product quality, and even significant losses. These conditions can affect product competitiveness and pose serious economic vulnerabilities. Therefore, this study aims to analyze the availability of raw materials for micro and small-scale fish processing businesses against fisheries production in Kendari City. To avoid the risk of shortages and support sustainable economic growth at the level of fish processing businesses and the Kendari City region. The implications of this analysis are crucial in dealing with uncertainties associated with supply and demand in a dynamic business environment. Potential superior businesses that are worth developing based on the availability of local raw materials

2. Materials And Methods

Data were collected through interviews and secondary data searches. Data sources came from micro and small-scale fish processing businesses in Kendari City. The Department of Fisheries and Marine Affairs of Kendari City and Southeast Sulawesi Province, and the Central Bureau of Statistics of Southeast Sulawesi Province. Time series data from 2017-2022 (DKP Kota Kendari, 2017). he data needed for this approach is the amount of fish and its type needed by each fish processing business, the amount and type of fish needed by all fish processing businesses, the amount of fish production based on the type of fish needed by each fish processing business and the amount of fish production in Kendari City. The analysis method used in this research is a comparative approach between the fish needs of fish processing businesses and the amount of fish production in Kendari City. To answer the research objectives to identify and analyse the availability of raw materials for small micro-scale fish processing businesses against fisheries production in Kendari City. This will avoid the risk of stock shortages and support sustainable economic growth at the fish processing business level and in Kendari City.

This comparison approach is adopted from the location quotient method introduced by Miller et al., (1991) It is based on a scale of dividing measured location quotients into one of several groups. Location quotients are a way of measuring the relative contribution of a particular area to the whole for a particular outcome (Moineddin et al., 2003). However, it has limitations as it does not include confidence intervals (Beyene & Moineddin, 2005). LQ measures the relative concentration or degree of specialisation of economic activities through a comparative approach (Jumiyanti, 2018). LQ is the ratio between the relative share of production of commodity i at the regional level to the total production of the regional subsector and the relative share of production of commodity i at the national level to the total production of the national subsector (Hendayana, 2003). In this approach, the location index is a useful tool for comparing area characteristics with standard deviation (Moineddin et al., 2003). Traditional LQs and shift shares can be used to estimate the degree of specialisation of different sectors (Martinez Prats, 2018), as well as to assess changes in competitiveness by applying shift-share, location coefficient, and BCG matrix analysis (Mo et al., 2020). LQ is also applied in regional economic analysis (Miller et al., 1991; Alhowaish et al., 2013), determination of potential sectors (Hendayana et al., 2003), determination of base sector or leading sector (2003; Jumiyanti, 2018), and determination of superior commodities or products (Moineddin et al., 2003; Utomo et al., 2022) also used in input and output models (Flegg et al., 1995; Mardiantony & Ciptomulyono, 2012; McCann & Dewhurst, 1998).

In this study, a comparison method was used to assess the ability of business groups to fulfil the raw material needs of fishery product processing in Kendari City. We adopt. This is as a basis for identifying the ability to fulfil raw material needs based on the amount of fish production in Kendari City.

$$LQi = \frac{pi/pt}{Pi/Pt}$$

pi = Total fish demand (the ith fish species) in the ith business sector
pt = Total fish demand in the sector in the ith business sector
Pi = Total fish production (the ith fish species) in the ith business sector at Kendari City level
Pt = Total production in the ith business sector at Kendari City level

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The LQ value obtained will be in the range of 1>LQ>1. The magnitude of the LQ value indicates the degree of specialisation or concentration of the commodity in the region relative to the reference region. This means that the greater the LQ value in a region, the greater the degree of concentration in the region. The data processing and analysis was done simply using Excel spread sheets in Microsoft Windows XP.

The results of the LQ comparison calculation resulted in three (3) criteria, namely (Hendayana et al., 2003; Jumiyanti, 2018):

(a) LQ > 1, meaning that the commodity is a base or a source of growth. The commodity has a comparative advantage, the results can not only fulfil the needs in the region but can also be exported outside the region.

(b) LQ = 1, meaning that the commodity is classified as non-base, has no comparative advantage. Its production is only enough to fulfil the needs of the region itself and is not able to be exported.

(c) LQ < 1, meaning that the commodity is also non-base. The production of the commodity in a region cannot fulfil its own needs so it needs to be supplied or imported from outside the region..

Commodities that produce an LQ value > 1 are normative standards to be designated as superior commodities. However, when there are many commodities in a region that produce LQ>1, while only one is sought, then the commodity that gets the highest LQ value should be chosen. Because the higher LQ value in a region indicates the higher the potential superiority of the commodity. To support the LQ analysis, standard deviation, relative and logical classification are used.

3. Results

The following is one way to measure and predict the availability of raw materials in fish processing businesses in Kendari City. The measurement is done by comparing the need for fish raw materials in micro and small-scale fish processing businesses and the availability of raw materials based on the amount of fish production from PPI and PPS in Kendari City. We adopt the method introduced by (Miller et al., 1991). This is based on a scale of dividing the measured location quotients into one of several groups, useful for measuring the absolute magnitude of the location quotients. This approach is most relevant as a basis for identifying the ability to fulfill the raw material needs of fish processing businesses based on the amount of fish production in Kendari City.
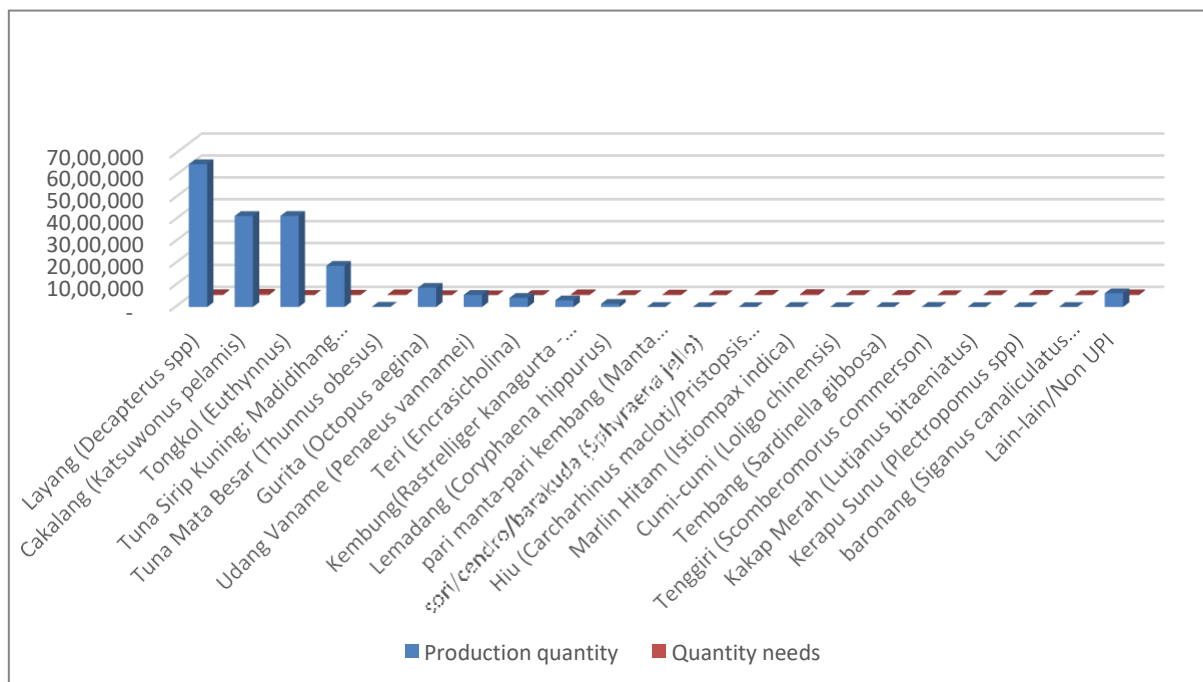
Fig 1: Diversity of fish species used in fish processing businesses in Kendari City

Identifying the diversity of fish species required in fish processing activities is important to fulfil market demand, ensure sustainability, improve product quality, and support local livelihoods. The following are the results of the identification of fish species needed in fish processing in Kendari City.

Figure 1, that the types of fish most widely used in fish processing businesses are kite, skipjack, and tuna. The diversity of fish species used in fisheries processing businesses based on the type of business (sorted from the largest to the smallest population), the highest is salted fish and smoked fish business actors. For the smoked fish business, the types of fish raw materials used are skipjack, lamadang, ray, barracuda, kite, shark, marlin, squid, sardine, tembang, kwe, and tuna. The fish meatball business uses the types of fish raw materials, namely marlin, lemadang, tuna, and mackerel. For the somay business using the types of fish raw materials, namely marlin, tuna, kite, and skipjack. The shredded fish business uses fish raw materials, namely tuna, marlin, shrimp, squid, skipjack, mackerel, and milkfish. The fish sauce business uses the type of fish raw material, namely anchovies. For the chips business using the type of raw material, namely kite, anchovies, cork fish, seaweed and crab shells. And for the salted fish business using the types of fish raw materials, namely yellow tail, anchovy, grouper, baronang, snapper, kwe, katamba, and grouper.

The results of the analysis of measuring the availability of fish raw materials using a comparative approach can be seen in Table 1 below:

Table 1: Analysis of fish raw material availability in micro and small-scale fish processing businesses (2017-2022)

Business Type	Number of bases formed				Description
	Average	StDev	Min	Max	
Smoked Fish	1.93	0.80	1.13	2.73	fulfilled
Meatballs-Somay	2.29	0.76	1.53	3.04	fulfilled
Shredded fish	2.50	1.20	1.30	3.70	fulfilled
Dried Fish	2.00	0.58	1.42	2.58	moderately fulfilled
Fish crackers	1.60	1.52	0.08	3.12	less fulfilled

Tabel 1, The fisheries processing business that fulfills the availability of raw materials is the shredded fish business, with the highest base sector forming a value of 2.50. This indicates that the shredded fish business has better access to the required raw materials compared to other fisheries processing businesses, such as meatballs, dried fish, smoked fish, and fish crackers. Research results (Utomo et al., 2022), that there are three priority local superior products in Tarakan City, namely dried fish/pepija crackers, shredded milkfish, and milkfish amplang crackers. These results can be used as a basis for policy making regarding the development of superior products according to local characteristics.

4. Discussion

A deep understanding of raw material availability is an important step in supporting sustainable business development and ensuring stable production. To ensure the right supply at the right time, it is necessary to measure the availability of raw materials to fulfill production needs. Businesses need to conduct continuous monitoring of the supply of raw materials available in the market. This includes identifying potential suppliers, monitoring the price, quality and quantity of raw materials. Raw material availability analysis is different from raw material requirement analysis, but the two things are interrelated. Analyse raw material availability to determine the type and quantity of raw materials used in the fish processing process (Gunadi & Rahmani, 2017). Raw material inventory is based on the estimated needs stated by the company (Rohmanudin, 2020).

By carefully identifying and measuring the availability of fish raw materials, the business can run more efficiently, avoid the risk of stock shortages, and maintain the sustainability of the fish processing business. Efforts can be made to identify and measure the availability of fish raw materials by: identifying the types of fish raw materials required for the fish processing business; identifying key supply sources, including local fishermen, fish collectors, or larger fish raw material suppliers to ascertain the extent to which these sources can be relied upon to fulfil the needs of the business; evaluating the seasonality and availability patterns of fish

species. Some fish species have specific seasons where they are easier to find and more affordable and when their availability tends to be high or low; measuring the availability of fish raw materials covers both quantity and quality aspects, including size, freshness, and general condition; forecasting the demand for processed products to help better plan fish raw material production and supplies; making agreements or contracts with fish raw material suppliers can help ensure a steady supply. This may include talks on order volumes, delivery schedules, and agreed prices; implementing efficient inventory management practices to maintain optimal inventory levels without significant overstocks or shortages; and diversifying supply, to avoid the risk of supply shortages if one source faces problems.

It is difficult to obtain raw materials for the fish crackers and chilli sauce business because they are obtained from outside Kendari City, namely from Bombana, South Konawe, and Bau Bau. Things that can affect the availability of fish are season, weather, fisheries regulations, market demand, and export-import. The lack of availability of raw materials for seaweed and crab shell-based products in Kendari City can have an impact on limited production and can increase production costs. In general, the availability of raw materials can impact the sustainability of livelihoods, income, and welfare. To address these challenges, interventions such as developing alternative livelihoods, and improving access to markets and financing are required. As per the research results (Marwan et al., 2013), the development strategy of the fish processing industry can be done by developing the market reach of processed fish products, strengthening fish processing groups, and utilising available catch handling facilities.

5. Conclusion

This study found that the types of fish most widely used in fish processing businesses are kite, skipjack, and tuna. There are three statuses of sustainable availability were identified, namely fulfilled, moderately fulfilled, and less fulfilled. There are three categories of sustainable availability status depending on the fishery product business developed: first, fulfilled mainly for smoked fish, fish balls-somay, and shredded fish; second, less fulfilled for dried fish and spicy anchovy sambal; and finally, less fulfilled mainly for seaweed chips and crab shell powder and chips.

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Conflict Of Interest

The authors declare no conflict of interest.

Reference

[1] Alhowaish, A., Alhowaish, A. K., Alsharikh, M. A., Alasmail, M. A., & Alghamdi, Z. A. (2013). Location Quotient Technique and Economy Analysis of Regions: Tabuk Province of Saudi Arabia as a Case Study. *International Journal of Science and Research (IJSR) ISSN*, *4*. https://doi.org/10.13140/RG.2.1.1406.2167

[2] Beyene, J., & Moineddin, R. (2005). Methods for confidence interval estimation of a ratio parameter with application to location quotients. *BMC Medical Research Methodology*, *5*. https://doi.org/10.1186/1471-2288-5-32

[3] DKP Kota Kendari. (2017). *Laporan Tahunan SKPD-Tahun Anggaran 2017*.

[4] Flegg, A. T., Webber, C. D., & Elliott, M. V. (1995). On the Appropriate Use of Location Quotients in Generating Regional Input—Output Tables. *Regional Studies*, *29*(6), 547–561. https://doi.org/10.1080/00343409512331349173

[5] Gunadi, A., & Rahmani, U. (2017). Analisis ketersediaan bahan baku terhadap industri pengolahan ikan tuna di PT. Permata Marindo Jaya Jakarta. *Jurnal Satya Minabahari*, *1*, 38–46.

[6]   Hendayana, R. (2003). Aplikasi metode Location Quotient (LQ) dalam penentuan komoditas unggulan nasional. *Informatika Pertanian*, *12*, 1–20.

[7]   Heruwati, E. S. (2002). Pengolahan ikan secara tradisional-prospek dan peluang pengembangan. *Jurnal Litbang Pertanian*, *21*(3), 92–99. https://www.academia.edu/download/76519572/p3213023.pdf

[8]   Jumiyanti, K. R. (2018). Analisis location quotient dalam penentuan sektor basis dan non basis di Kabupaten Gorontalo. *Gorontalo Development Review*, *1*(1).

[9]   Man, J. C. De, & Strandhagen, J. O. (2017). An Industry 4.0 Research Agenda for Sustainable Business Models. *Procedia CIRP*, *63*, 721–726. https://doi.org/10.1016/j.procir.2017.03.315

[10]   Mardiantony, T., & Ciptomulyono, U. (2012). Penerapan Analisis Input Output dan ANP dalam Penentuan Prioritas Pengembangan Sub Sektor Industri. *Jurnal Teknik ITS* , *1*, A455–A495.

[11]   Martinez Prats, G. (2018). Analysis of the behavior of a regional economy through the shift-share and location quotient techniques. *Management Dynamics in the Knowledge Economy*, *6*(4), 553–568. https://doi.org/10.25019/MDKE/6.4.03

[12]   Marwan, U. M., Wiryawan, B., & Lubis, E. (2013). Kajian strategi pengembangan industri pengolahan ikan di Kota Palopo Provinsi Sulawesi Selatan. *Jurnal Teknologi Perikanan Dan Kelautan*, *4*(2), 197–209.

[13]   McCann, P., & Dewhurst, J. H. L. (1998). Regional size, industrial location and input-output expenditure coefficients. *Regional Studies*, *32*(5), 435–444. https://doi.org/10.1080/00343409850116835

[14]   Miller, M. M., Gibson, L. J., & Wright, N. G. (1991). Location quotient: a basic tool for economic development. In *Economic Development Review* (p. 65).

[15]   Mo, S. W., Lee, K. B., Lee, Y. J., & Park, H. G. (2020). Analysis of import changes through shift-share, location quotient and BCG techniques: Gwangyang Port in Asia. *Asian Journal of Shipping and Logistics*, *36*(3), 145–156. https://doi.org/10.1016/j.ajsl.2020.01.001

[16]   Moineddin, R., Beyene, J., & Boyle, E. (2003). On the location quotient confidence interval. *Geographical Analysis*, *35*(3), 249–256. https://doi.org/10.1111/j.1538-4632.2003.tb01112.x

[17]   Poernomo, A., & Heruwati, E. S. (2011). Industrialisasi perikanan: suatu tantangan untuk perubahan. *Squalen*, *6*(3), 87–94. achpoer@yahoo.com

[18]   Purwaningsih, R., Cahyantari, A. E., Ariyani, Z., Susanty, A., Arvianto, A., & Santoso, H. (2018). Product-service system method to measure sustainability level of traditional smoked fish processing industries. *MATEC Web of Conferences*, *154*. https://doi.org/10.1051/matecconf/201815401062

[19]   Rohmanudin, R. (2020). Analisis kebutuhan bahan baku konveksi dalam rangka permintaan dengan menggunakan metode Economic Order Quantity (EQQ). *Jurnal Mahasiswa Industri Galuh*, *1*(1), 23–30.

[20]   Siang, R. D., Sriwulan, D., & Risfandi. (2017). Shredded Fish Marketing In Kendari City South Sulawesi Province. *Jurnal Bisnis Perikanan FPIK UHO*, *4*(2).

[21]   Utomo, M. N., Kaujan, K., & Cahyaningrum, W. (2022). Improving competitiveness of small and medium enterprises based on local leading products in Tarakan City, Indonesia. *Acta Logistica*, *9*(1), 63–74. https://doi.org/10.22306/al.v9i1.271

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