The added value of the use of low value fish catches of fishers in Kebumen District, Central Java

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Abstract. Kebumen Regency produces high-quality food products, one of its products is "lanting". Lanting is a snack made from cassava with a mixture of other food ingredients and processed by frying. This product is high in carbohydrates and low in protein. The district also has a significant fishery potential, but some fish species have little commercial value and are frequently discarded during peak season. Enriching lanting with fishmeal can boost the value of both products. The study aimed to describe the availability of low value fish, perform a hedonic test on the lanting product, and quantify the added value of fishmeal and fishmeal-enriched lanting. Surveys, interviews, and questionnaires were used to obtain information from local businesses and customers. The Hayami Method was used for value-added analysis. In addition, hedonic testing and descriptive analysis were carried out. The outcomes showed that there was enough low value fish available for the production of fishmeal. However, consumer acceptance of fishmeal-enriched lanting was lower than that of ordinary lanting. According to the analysis, the added value of fishmeal is 0.11 USD kg^{-1} and the added value of fishmeal enriched lanting is 0.049 USD kg^{-1}. Processing low value fish to fishmeal can boost its economic and nutritional worth, but techniques must be developed to increase customer acceptability of fishmeal-enriched lanting.
Key Words: fishmeal, fishmeal-enriched lanting, Hayami method, hedonic test, lanting.

Introduction. Kebumen Regency has potentially high fish resources. Based on fisheries statistical data, capture fisheries production in Kebumen Regency shows a significant increasing trend from 2020 to 2023. In 2020, the total production of fish catches reached 1,560,547.59 kg, increasing to 6,370,286.09 kg in 2023 or experiencing an average increase of 25.17% per year (DKLHK Kebumen 2023). The high capture fisheries production in Kebumen Regency is in line with the location of Kebumen waters which are in the Indian Ocean. Eight regions in Kebumen Regency directly border the Indian Ocean which has a large marine fish resource potential (Widianti et al 2021; Nurani et al 2023; Nurani et al 2024). One of the sub-districts which is the center of fishing activity in Kebumen Regency is Ayah sub-district, with the infrastructure of the Logending Coastal Fishing Port (PPP) and three Fish Landing Bases (PPI), namely PPI Pasir, Argopeni, and Karangduwur. The types of fishery commodities with high selling prices that are commonly landed include lobster, shrimp, pomfret, sea laurel and snapper.

The fish catches of fishermen in Kebumen Regency do not only include high economic fish commodities, but also low value fish commodities. Referring to the research results of Nurani et al (2023) and Nurani et al (2024), during the peak fishing season, low value fish tend to be simply stockpiled or thrown away without further use. Several types of low value fish with high production quantities in Kebumen waters include tembang fish (*Sardinella fimbriata*), lea fish, and trash fish. The trash fish group

comprises small fish that does not have high commercial value (Jeyasanta et al 2013; Anam et al 2021). Low value fish are generally the result of by-catch. Several opinions regarding the definition of unutilized fish are (1) types of fish with low commercial value; (2) types of fish whose size is below the minimum catch limit; and (3) types of fish that are not included in the fishing quota (Blanco et al 2018; Silva et al 2021). Generally, views on low-cost fish only focus on the commercial value of the product without considering the nutritional content of the fish. Low value fish can provide additional nutritional value benefits equivalent to high economic fish. Several research results show that low-cost fish contain large amounts of bioactive compounds, rich in quality protein, fat or minerals (Blanco et al 2018; Askar et al 2022). Apart from the potential for marine fisheries, Kebumen Regency is also known as a center for the lanting processing agro-industry. The total lanting industry in Kebumen Regency reached 292 small lanting industries. One of the lanting processing industry centers in Kebumen Regency is in Lemahduwur Village, Kuwarasan District, with around 135 lanting industries. The development of the lanting industry in Kebumen shows that the lanting industry makes a significant contribution to the local economy as well as being an important asset for the community development in Kebumen Regency (Furqon 2018; Trifiyanto 2019; Satriawan 2023). Lanting is a superior product of Kebumen Regency with the main raw material being cassava. Cassava is included in a group of tubers that are the richest in carbohydrates, after rice and corn. Tubers are not foods that have high protein content (Paramita 2011). The low protein content in cassava flour requires addition of protein from other sources to the processed lanting products. Protein enrichment to increase the nutritional protein content in lanting products can be done by adding fishmeal. Fish has a relatively high protein content, around 15-25%, rich in nutritional reserves such as n-3 polyunsaturated fatty acids (PUFA), minerals, vitamins and other trace elements (Canti et al 2020; Mathew 2022). Diversification of processed fish products into fishmeal with low-cost fish as raw materials can increase the nutritional value and economic value of lanting products. This diversification of product processing is expected to provide added value to fish products while increasing the economic value of fishermen's catches (Aditi & Varsha 2020; Anam et al 2023).

Added value is the change in the value of raw materials before and after the production process. The final product is expected to have a higher selling value when commercialized, thereby increasing the amount of revenue. According to Yulihartika & Fariadi (2024), analysis of added value can determine changes in the value of raw materials after processing. The same thing was also quoted in Intyas (2020), added value analysis makes it easy to find out the additional value for each unit of output produced. Apart from that, calculating added value also helps identify the amount of profit received by entrepreneurs and workers. Therefore, this research aims to analyze the added value obtained by lanting industry owners through the addition of fishmeal in the lanting making process. Specifically, the research objectives are: (1) to describe the capacity for economic fish availability and prices; (2) conducting a hedonic test of consumer acceptance of lanting products that have been enriched with fishmeal and those that have not been enriched; and (3) calculating the added value of fishmeal products and lanting products enriched with fishmeal. The approach taken is surveying fish availability, product manufacturing, acceptance testing, and calculating the added value of the product. It is expected that the results of this research support fishermen to utilize low-cost types of fish and business players in the lanting industrial center to diversify their products in order to increase the added value of products and develop Lanting products as local superior products in Kebumen. Increasing the added value of products will be followed by other further benefits such as improving nutrition and the appreciation of the local community.

Material and Method

Study site and period. The research location is the capture fisheries center of Kebumen Regency and the lanting manufacturing industry center of Lemah Duwur Village,

Kuwarasan District, Kebumen Regency. Research to collect field data and product manufacturing trials was carried out during the period from January to April 2024.

Data types and sources. The types of data used in the research are primary data and secondary data. Data for the first objective is secondary data from the Department of Environment, Marine and Fisheries, related to the amount and value of low value fish production in Kebumen. Data for the second objective consisted of hedonic responses for lanting product. Data for the third objective was primary data used to calculate the added value of making fishmeal and lanting products. Data were obtained through interviews and questionnaires, consisting of identifying the needs of lanting fishmeal production; outputs, inputs, and prices of lanting, fish prices; revenues and profits; and fixed and variable costs of production.

Data collecting and processing. Data collection was carried out using a survey method through direct observation, interviews, and filling out questionnaires to lanting product businesses. The total number of respondents interviewed was 10 respondents. Hedonic test respondents totaled 35 people. The results of interviews and questionnaires were then tabulated to be processed at an advanced stage for identifying the added value in lanting products.

Data analysis

Analysis the capacity for economic fish availability and prices. Descriptive analysis is used to explain the capacity for economic fish availability and prices landed in Kebumen Regency. Through this analysis, quantitative data related to the catch volume, trip numbers, and fish prices can be described in more detail. The results of the descriptive analysis can provide a general overview of the condition of low-economic-value fisheries in Kebumen Regency, thereby serving as a basis for stakeholders in enriching food products, particularly lanting products.

Hedonic test analysis. The hedonic test is defined as a subjective test used to measure the standard level of favourability (like or dislike) of a product, especially food products (Tamaya et al 2020). Product assessment is based on the respondent's level of liking. Each respondent will be given an assessment sheet with different scale values for each parameter. The assessment parameters used are colour, aroma, taste, texture, and overall acceptance. The rating scale used is from scale 1 to scale 9. The hedonic test was carried out in two stages, the first hedonic test used 1 kg fishmeal added to lanting, and the second hedonic test used 0.5 kg fishmeal added to lanting.

Value-added analysis. This research is descriptive, explaining the value-added analysis of Kebumen Regency's superior product (lanting) with fish flour. Several types of research that have applied the Hayami method include: (1) research by Sundari et al (2021) on the analysis of the added value of rice in the cracker industry in the Madiun Prefecture; (2) research by Mahbubi et al (2018) related to the analysis of the added value of chicken meat products at PT Sierad Produce Tbk; and (3) research by Padapi et al (2023) on the modification of the calculation in the Hayami value-added analysis of cayenne pepper processing. The Hayami method is carried out by calculating the excess price difference between commodities that receive treatment at a certain stage and the value used during the process (Hayami et al 1987). There are three stages in analyzing calculations with the Hayami method, namely: (1) calculating output-input prices; (2) calculating revenue and profit; and (3) calculating the percentage of added value. The actors that influence the calculation of added value to processing are technical factors and market factors (Ramadhan & Junianto 2021). Technical factors include production capacity, the amount of raw materials used, and labour. Meanwhile, market factors consist of output prices, labour wages, raw material prices, and the value of other inputs. If the calculation of added value has been carried out, the interpretation of added value can be found in the following decision-making criteria (Ramadhan & Junianto 2021):

- a value added >0 indicates that the addition of the product can provide profitable added value;
- a value added is <0, it indicates that the addition of the product can be value-added at a loss.

The process of calculating the added value of products in each study may differ. This is because the calculation concept has been modified following the conditions in the study location. Table 1 shows the procedure for calculating the added value of lanting products using the Hayami method, as shown by Hayami et al (1987).

Table 1

Hayami method average value-added calculation procedure

Variable	*Value*
Output, input, and price	
Output (kg)	(1)
Input raw material (kg)	(2)
Direct labour (HOK)	(3)
Conversion factor	(4) = (1)/(2)
Direct labour coefficient (USD kg^{-1})	(5) = (3)/(2)
Output price (USD HOK^{-1})	(6)
Direct labour wages (USD HOK^{-1})	(7)
Revenue and profit	
Raw material price (USD kg^{-1})	(8)
Other input price (USD kg^{-1})	(9)
Output value (USD kg^{-1})	(10) = (4)x(6)
1. Added value (USD kg^{-1})	(11a) = (10)-(8)-(9)
2. Value-added ratio (%)	(11b) = [(11a)/(10)]x100
3. Direct labour income (USD kg^{-1})	(12a) = (5) x (7)
4. Direct labour share (%)	(12b) = [(12a)/(11a)]x100
5. Profit (USD kg^{-1})	(13a) = (11a) - (12a)
6. Profit level (%)	(13b) = [(13a)/(10)]x100
Returns of services of owners of factors of production	
Margin (USD kg^{-1})	(14) = (10)-(8)
1. Direct labour income (%)	(14a) = (12a)/(14)x100
2. Contribution of other inputs (%)	(14b) = (9)/(14)x100
3. Profit (%)	(14c) =(13a)/(14)x100

This Hayami method calculation is carried out for (1) the process of making 1,000 kg of fishmeal; (2) making lanting enriched with fishmeal with 10,000 kg of cassava raw materials. The limitations used are:

1. Output is the sum of products resulted from 1 tonne of fish and lanting products enriched with fishmeal with 10 tonnes of cassava. Measured in units of kg $tonne^{-1}$ of fish; and 10 kg $tonne^{-1}$ of cassava.
2. Raw materials are used for making fishmeal and enriched lanting. Measured in kg $tonne^{-1}$ of fish; and 10 kg $tonne^{-1}$ of cassava.
3. Direct labor (HOK) is the amount of labor used for making fishmeal per 1,000 kg of fish and making enriched lanting per 10,000 kg of cassava raw material. The units of measurement are person working days per 1,000 kg of fish and per 10,000 kg of cassava.
4. The conversion factor shows the amount of output produced from one unit of raw material or input.
5. Direct labor coefficient is the amount of direct labor required to process one unit of input.
6. The output price is the average selling price in a particular month. The average selling price is the total output sales value divided by the total output sold; the unit of measurement is USD kg^{-1}.
7. Direct labor wages are the daily wages received by each direct worker involved in processing activities and are measured in units of USD HOK^{-1}.

8. The price of raw materials is calculated from the purchase price at the relevant time. Raw material prices are the total cost of raw materials for purchasing low-cost cassava and fish. Measured in units of USD kg^{-1}.
9. Other input prices are the value of all materials other than raw materials and direct labor used during the production process of lanting enriched with fishmeal. The unit of measurement is USD kg^{-1}.
10. Output value is the output value produced from one unit of input and is measured in units of USD kg^{-1}.
11. Added value is the difference between the output value and the price of raw materials and other input prices. The unit of measurement for added value is USD kg^{-1}.
12. The added value ratio is the percentage of added value from the output value and is expressed in percent.
13. Direct labor income is the wages received by direct labor for processing one unit of raw material and is measured in USD kg^{-1}.
14. The share of direct labor is the percentage of direct labor benefits from added value and is expressed in percent.
15. Profit is the difference between added value and direct labor income and is measured in units of USD kg^{-1}.
16. The profit rate is the percentage of profit to the output value and is expressed in percent.
17. Margin is the amount of contribution of the owner of production factors other than raw materials used in the production process and is measured in units of USD kg^{-1}.

Results and Discussion

Volume and value of low value fish production in Kebumen Regency 2018-2023. The number and value of low value fish production in Kebumen Regency in 2018-2023 is shown in Table 2. Low value fish production in the last five years period (2018-2023) shows quite large amounts, ranging from 115,465 kg to 398,414 kg $year^{-1}$. The highest catch production was in 2023, amounting to 398,414 kg, while the lowest catch production was in 2019, namely 181,718 kg. Production value ranges from USD 24.75 to USD 88.74. The lowest production value occurred in 2022, namely USD 24.75, while the highest production value was in 2023 reaching USD 88.74. Prices range from USD 0.16 to USD 0.25. The lowest price occurred in 2019, namely USD 0.16, and the highest price was in 2023, namely USD 0.22.

Table 2

Number, production value and price of low value fish in Kebumen Regency (2018-2023)

Year	*Production (kg)*	*Production value (USD)*	*Price (USD kg^{-1})*
2018	251,800	45.35	0.18
2019	181,718	29.02	0.16
2020	181,348	44.47	0.25
2021	148,871	28.46	0.19
2022	115,465	24.75	0.21
2023	398,414	88.74	0.22

Source: DKLHK Kebumen 2023

In general, the trend of low value fish production in Kebumen Regency decreased in the 2018-2022 period, but showed a significant increase in 2023, reaching 398,414 kg or an increase of 245% compared to the production in 2022 (Figure 1). The decline in fish production in Kebumen Regency is partly caused by weather factors and oceanographic conditions of the waters. Meanwhile, the decline of production in the 2020-2022 period was also caused by Covid 19.

Overall, the low economic value of fish production in Kebumen Regency shows a fluctuating trend in the production quantities. Production value in the 2018-2022 period experienced a decline, experiencing a drastic increase in 2023 (Figure 2).

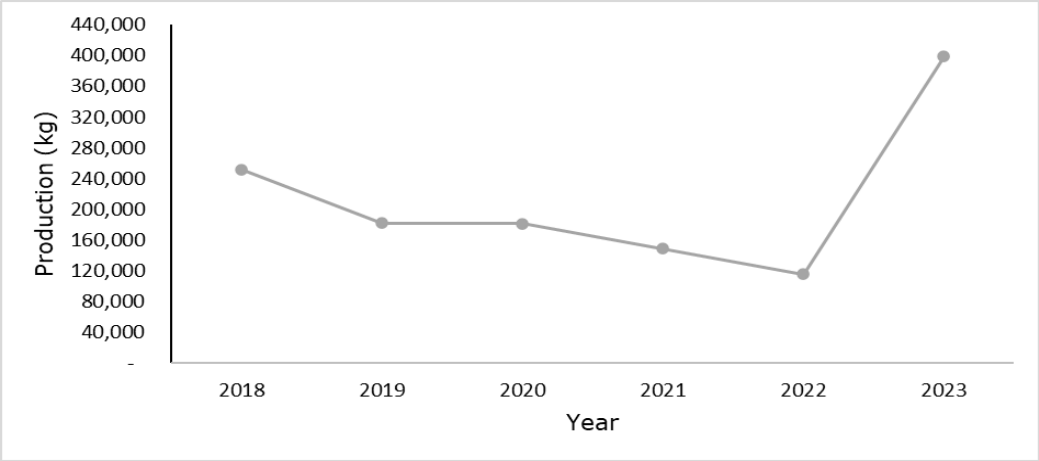

Figure 1. Number of low value fish production in Kebumen Regency 2018-2023.

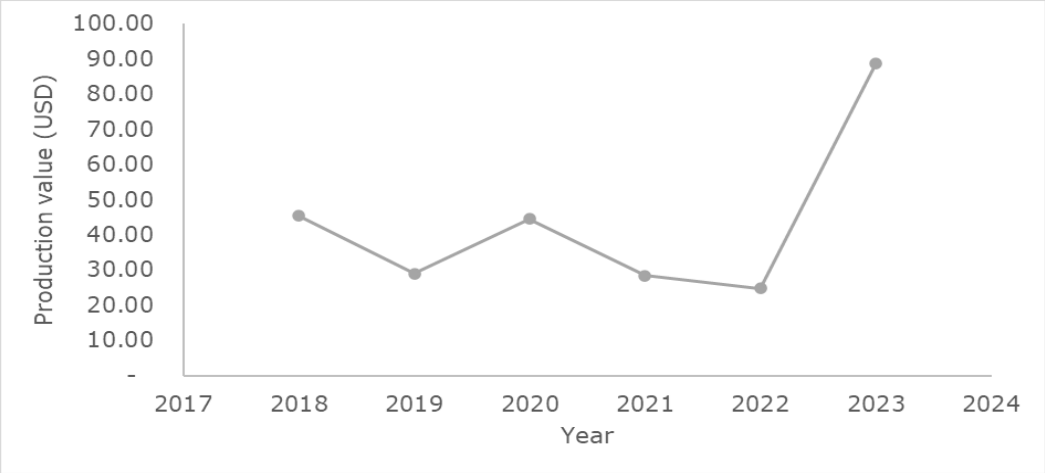

Figure 2. Low value fish production value in Kebumen Regency 2018-2023.

Number of fishing trips in Kebumen Regency. The number of trips to catch low value fish in Kebumen Regency in 2018-2023 is presented in Figure 3. The number of trips decreased in the 2018-2022 period, namely from around 90,559 trips in 2018 to around 48,265 trips in 2022. The number of trips in 2023 increased to 61,721 trips. According to data from the DKLHK (2023), the types of fishing gear used by fishermen in Kebumen Regency are drift gill nets, fixed gill nets, trammel nets and fishing rods.

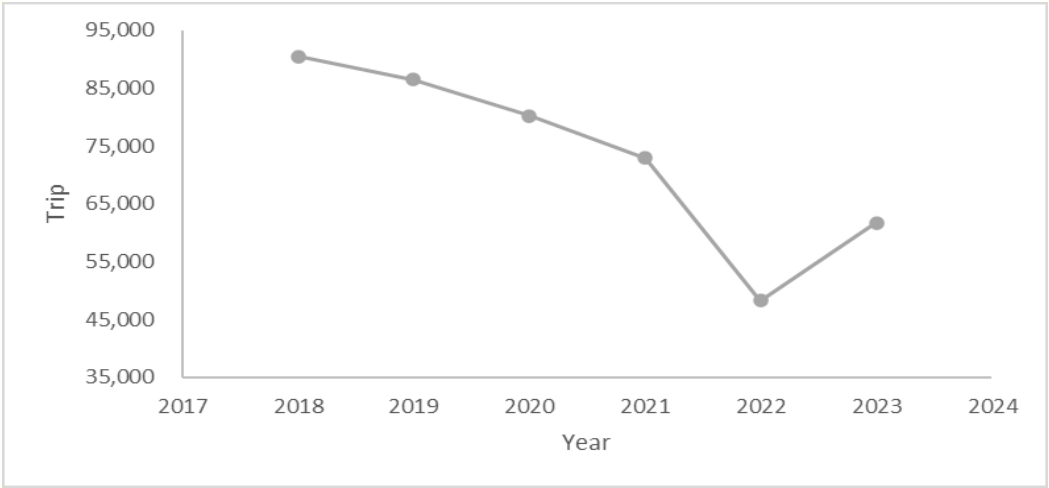

Figure 3. Number of fishing gear trips in Kebumen Regency 2018-2023.

Referring to Figures 1, 2, and 3, it can be seen that the increase in fishing operation trips will not be so sharp in 2022-2023. However, if we look at it from the production volume and value perspective, there has been a quite significant increase in 2022-2023. This shows that the potential availability of low economic value fish in Kebumen Regency is quite large.

Hedonic testing of lanting products. The average results of the hedonic test for the 1st product making trial and the 2nd product making trial for Lanting products that have been enriched with fishmeal and those that have not been enriched are presented in Table 3. The test results show different assessments for trial 1 and trial 2. In general, the results of the hedonic test show that the overall acceptance results of respondents prefer lanting products without additional fishmeal. The addition of fishmeal to lanting products makes the product have a brownish color, a strong fish aroma, a fish taste, and a harder texture. This is also influenced by the perception of respondents with the habit of eating original lanting products.

Table 3

Average results of the hedonic test for the 1st and 2nd trials

Hedonic test group	*Assessment parameters*				
	Color	*Aroma*	*Flavor*	*Texture*	*Texture overall*
First hedonic test (1 kg fishmeal added to lanting)					
Lanting with the addition of fishmeal	5.7	5.5	6.4	6.4	6.5
Lanting without adding fishmeal	6.9	6.5	6.9	7.0	7.0
Second hedonic test (0.5 kg fishmeal added to lanting)					
Lanting with the addition of fishmeal	6.7	6.3	6.8	7.3	6.8
Lanting without adding fishmeal	7.1	7.1	7.3	7.3	7.4

Analysis of the added value of fishmeal and fishmeal enriched lanting. Calculation of the added value of fishmeal using the Hayami method is shown in Table 4. The amount of raw material used in calculating the added value of fishmeal is 1,000 kg of low value fish. The price of fish is 0.32 USD kg^{-1}. The final result or output is 400 kg of fishmeal, so the conversion value obtained is 0.4. The labor input used in the fishmeal processing process starting from the cleaning/weeding stage to sieving is 10 HOK. Details of the work carried out by the workforce, namely cleaning/weeding, boiling/steaming, pressing, drying, grinding, and sieving. Labour wages for 1 production are 6.42 USD kg^{-1}. The processed fishmeal does not only use fish as raw material input, but there is a contribution of other inputs amounting to 0.06 USD kg^{-1}. Other inputs consist of water and flavorings. The added value of processed fishmeal is 0.11 USD kg^{-1} of low value fish raw materials. The margin obtained by the company is 0.12 USD kg^{-1}. The percentage of profits obtained by fishmeal entrepreneurs is 38.89%.

Calculation of the added value of lanting products with the addition of fishmeal using the Hayami method is shown in Table 4. The amount of raw material used in calculating the added value of lanting with the addition of fishmeal is 1,000 kg. The final product obtained and ready for sale is around 2,500 kg, so the conversion value obtained is 0.25. The labor input used in the processing of lanting with the addition of fishmeal from the peeling to packaging stages is 30 HOK. Details of the work carried out by the workers, namely peeling, washing, soaking, steaming, mixing and forming the dough, drying, frying, draining, and packaging. Labour wages for 1 production are 6.42 USD kg^{-1}. The processing of lanting products with an enriched fishmeal does not only use cassava and fishmeal as raw materials, but there is also a contribution of other inputs amounting to 0.06 USD kg^{-1}. Other inputs consist of cooking oil and flavorings. The added value of processed lanting products enriched with fishmeal is 0.048 USD kg^{-1} of raw material. The

margin obtained by the company is 0.11 USD kg^{-1}. The percentage of profit obtained from producing lanting enriched with fishmeal is 25.71%.

Table 4

Analysis of the added value of fishmeal and fishmeal enriched lanting

Variable	*Unit*	*Value*	
		Fishmeal added value	*Fishmeal enriched lanting added value*
Output, input, and price			
Output	kg	400	2,500
Input raw material	kg	1000	10,000
Direct labour	HOK	10	30
Conversion factor	-	0.4	0.25
Direct labour coefficient	-	0.01	0.003
Output price	USD kg^{-1}	1.09	1.41
Direct labour wages	USD HOK^{-1}	6.42	6.42
Revenue and profit			
Raw material price	USD kg^{-1}	0.32	0.24
Other input price (raw material)	USD kg^{-1}	0.06	0.06
Output value	USD kg^{-1}	0.44	0.35
1. Added value	USD kg^{-1}	0.11	0.048
2. Value-added ratio	%	25.00	13.64
3. Direct labour income	USD kg^{-1}	0.064	0.019
4. Direct labour share	%	58.82	40
5. Profit	USD kg^{-1}	0.045	0.029
6. Profit level (%)	%	10.29	8.18
Returns of services of owners of factors of production			
Margin (USD kg^{-1})	USD kg^{-1}	0.12	0.11
1. Direct labour income (%)	%	55.56	17.14
2. Contribution of other inputs (%)	%	5.56	57.14
3. Profit (%)	%	38.89	25.71

Conclusions. The trend of low value fish production in Kebumen Regency shows significant fluctuations with an increasing trend, especially in the 2022-2023 period. This increase in production indicates sufficient availability of low value fish, with a relatively cheap selling price of around 0.32 USD kg^{-1}. The high production indicates that low value fish has the potential for further utilization, such as processing into fishmeal. The lanting product enriched with fishmeal did not have a positive perception from respondents, with a lower average acceptance value than lanting products without fishmeal. Respondents' acceptance of lanting with added fishmeal only amounted to 6.5 and 6.8 for the hedonic tests I and II, respectively; while respondents' acceptance of lanting without fishmeal reached 7.0 and 7.4. Processing low value fish to fishmeal and enriching lanting with fishmeal has a positive value for marketing. The added value of fishmeal is 0.11 USD kg^{-1} with a value-added ratio of 25%. The added value of lanting enriches fishmeal by 0.049 USD kg^{-1} with a value-added ratio of 13.64%.

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Conflict of interest. The authors declare no conflict of interest.

References

Aditi M., Varsha L., 2020 Fish processing : Product and by-product, processing and marketing. International Journal of Fisheries and Aquatic Studies 8(1):74–77.

Anam C., Bagus Z. M., Kholifah A. N., Hermawan M., Santoso K., Istiorini N., Rohmanto M. D., Ary D., Sa'diyah C., Fakhorbillah M. D., 2023 [Empowering Weru Paciran Lamongan village residents through diversification of processed Rucah fish products]. Bernas: Jurnal Pengabdian kepada Masyarakat 4(4):2722–2730. [In Indonesian].
Anam C., Harini N., Damat D., Wahyudi A., Witono Y., Kuswardhani N., Azar M. A. S., Anne O., Rachmawati D., 2021 Potential analysis of low economic value fish in lamongan regency, east java, Indonesia. E3S Web of Conferences 226(000111):1–12.
Askar H., Muslimin I., Irawati A., Rasdi R., Mustari M. A., 2022 [Training on making fish noodles from trash fish in Mangindara Village, South Galesong District, Takalar Regency]. Nobel Community Services Journal 2(2):54–58. [In Indonesian].
Blanco M., Domínguez T. F., Pérez M. R. I., Fraguas J., Ramos A. P., Vázquez J. A., Borderías A. J., Moreno H. M., 2018 Valorization of recurrently discarded fish species in trawler fisheries in North-West Spain. Journal of Food Science and Technology 55(11):4477–4484.
Canti M., Fransiska I., Lestari D., 2020 [Characteristics of dry noodles substituting wheat flour with pumpkin flour and tuna fish flour]. Jurnal Aplikasi Teknologi Pangan 9(4):181–187. [In Indonesian].
Fauziah Y. D., Rasmikayati E., Saefudin B. R., 2021 [Analysis of added value of processed mango products (case study of mango fruit strips frutivez products)]. Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Illmiah Berwawasan Agribisnis 7(2):1045. [In Indonesian].
Furqon D. F., 2018 [The influence of business capital, length of business, and entrepreneurial attitude on the income of lanting entrepreneurs in Lemah Duwur, Kuwarasan District, Kebumen Regency]. Jurnal Ekonomi dan Pendidikan 7(4):51–59. [In Indonesian].
Hayami Y., Kawagoe T., Morooka Y., Siregar M., 1987 Agricultural marketing and processing in upland Java a perspective from a Sunda Village. The CGPRT Centre, Bogor, pp. 1-73.
Intyas C. A., 2020 [Analysis of the added value of the squid fish crackers business in Weru Village, Paciran District, Lamongan Regency]. Journal of Fisheries and Marine Research 4(2):214–221. [In Indonesian].
Jeyasanta K. I., Aiyamperumal V., Patterson J., 2013 Utilization of trash fishes as edible fish powder and its quality characteristics and consumer acceptance. Journal of Dairy & Food Sciences 8(1):1–10.
Mahbubi A., Muhib A., Putri D., 2018 An added value analysis of chicken meat products at PT. Sierad Produce TBK 149:77–79.
Mathew S., 2022 Recent advances in the utilization of bycatch as quality protein. KRISHI Publication and Data Inventory Repository 1986:121–126.
Nurani T. W., Wahyuningrum P. I., Hapsari R. D., Khoerunnisa N., Widianti E A., Wiyono E. S., Solihin I., Iskanda M. D., Wisudo S. H., 2023 Implementation of good practices in sustainable capture fisheries in Ayah District, Kebumen Regency. Agrokreatif: Jurnal Ilmiah Pengabdian kepada Masyarakat 9(1):98–111. [In Indonesian].
Nurani T. W., Wisudo S. H., Astarini J. E., Sondita M. F. A., Purwangka F., Wahyuningrum P. I., Hakim A. R., Widiastuti B. A., Widianti E. A., Khierunnisa N., Wahju R. I., 2024 Resilience of Kebumen Regency fisheres in facing the uncertainty of the fishing season. AACL Bioflux 17(1):251-263.
Padapi A., Fitriani R., Wulandary A., Haryono I., 2023 Modification of Hayami value-added analysis calculations in the processing of cayenne pepper. Anjoro : International Journal of Agriculture and Business 4(2):82-91.
Paramita, 2011 [Identification of nutritional content in local Indonesian tuber flour]. Seminar Nasional Wonderful Indonesia 51(1):51. [In Indonesian].
Ramadhan M. F., Junianto, 2021 Analysis of added value of fish drumstick at home industry "Adisyafidz Barokah" Nagreg, Bandung Regency, West Java. Asian Journal of Fisheries and Aquatic Research 11(6):9–13.

Satriawan D., 2023 [Formalization of the processing industry in Kebumen Regency: a challenge]. JIP Jurnal Ilmiah Perikanan 19(1):77-85. [In Indonesian].
Silva F., Duarte A. M., Mendes S., Borges P., Magalhães E., Pinto F. R., Barroso S., Neves A., Sequeira V., Vieira A. R., Magalhaes M. F., Rebelo R., Assis C., Gordo L. S., Gil M. M., 2021 Adding value to bycatch fish species captured in the portuguese coast—development of new food products. Foods 10(68):1-21.
Sundari M. T., Setyowati, Adi R. K., 2021 Hayami method application: A value-added analysis of rice crackers industry in ex-residency of Madiun. IOP Conference Series: Earth and Environmental Science 905(1):1-6.
Tamaya A. C., Darmanto Y. S., Anggo A. D., 2020 [Characteristics of flavor enhancers madefrom different types of fish broth with addition of cornstarch]. Jurnal Ilmu dan Teknologi Perikanan 2(2):13-21. [In Indonesian].
Trifiyanto K., 2019 [The future of local products: an analysis of the influence of consumer ethnocentrism, packaging design, and perception of halal labeling on purchase intent of local products]. Jurnal Fokus Bisnis 17(2):15–24. [In Indonesian].
Widianti E. A., Nurani T. W., Sondita M. F. A., Wahyuningrum P. I., 2021 [Composition of lobster (*Panulirus* spp) catches landed at the Karangduwur Fish landing base, Kebumen Regency, Central Java]. Albacore 5(2):121–132. [In Indonesian].
Yulihartika R. D., Fariadi H., 2024 [Analysis of the added value of fish bone waste into crackers in the krupuk tuiri industry in Bengkulu City]. Jurnal Ilmiah Agrisains 25:28–33. [In Indonesian].
***DKLHK Kebumen, 2023 [Logbook of fish landing data for the period 2018-2023, Kebumen Regency]. Department of Marine Affairs, Environment, and Fisheries of Kebumen, 1-10. [In Indonesian].

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