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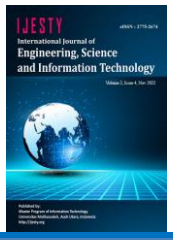

Product Value Analysis of Processed Kimpul Products as an Effort to Develop Local Resources

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Abstract

Kimpul (Xanthosoma sagittifolium) is one of the local products that produce non-rice carbohydrates that have the potential to be developed. The possibility that kimpul tubers can be created by utilizing them in various types of processed products to provide value. The kimpul tubers can be processed into kimpul chips, kimpul sticks, or other preparations. Meanwhile, kimpul flour can be processed into various products, including wet noodles, biscuits, cookies, pastries, or other processed forms. The different diversification of processed products has the potential to be developed into food industry products. For this reason, it is necessary to analyze the various preparations' value in product performance and required production costs. The purpose of this study was to determine the implementation of different simple practices with multiple criteria, analyze the production costs of various simple preparations, conduct a value analysis of various simple trials based on performance and cost analysis, and provide recommendations for the type of product that can provide the best value. Product performance is based on organoleptic properties, product attractiveness, product benefits, and product purchase decisions. The product's value is analyzed based on the help of the product and the costs required to realize these benefits. The results of product value analysis show that products with high honors only need relatively low prices to provide high production values. Alternative products are recommended to be produced kimpul chips, kimpul sticks, and kimpul cookies.

Keywords: *Processed Kimpul Products, Performance Analysis, Cost Analysis, Product Value Analysis.*

1. Introduction

The agroindustry sector, one of the main priorities in leading higher education research, is composed of research on various commodities, methods, products, appropriate technology, and industrial management. Each research branch is equipped with a research roadmap. The items studied in the agroindustry field generally raise the potential of local resources in various types of product diversification to support food security.

The potency of kimpul can be developed by processing it into various kinds of processed products to increase its value. Utilization of local food sources is one of the efforts to improve food security, namely through the process of developing the potential of local resources. Kimpul is one of the local raw materials with tubers as a source of carbohydrates that can be consumed and can potentially be developed into flour and even be used in various types of products [1].

The kimpul tubers can be directly processed into various products, such as kimpul chips and kimpul sticks. In addition, before being processed, kimpul tubers can be floured first and then diversified into various process different ducts. The processing of kimpul tubers into flour has been carried out by [2] with the aim of improving the physical-chemical quality of kimpul flour with various flouring methods. Based on the results of a study's effects of itching sensation on kimpul tubers can be eliminated by certain treaspecificin the process of making kimpul flour, as well as determining the best formulation of cowpea-kimpul composite flour as a raw material for making kimpul biscuits. The use of kimpul flour as a raw material for cookies has been carried out by [4, 5].

The development of diversification of kimpul products is one of the local commodities that has been researched on an ongoing basis. The applicant Value engineering methods must be applied e the type of processed product that will provide the best value. The concept of value can be described as the ratio between the performance displayed by a product to the costs incurred to realize the product.

2. Literature Review

2.1. Kimpul Processed Products

Flour is one form of inte intermediate product recommended for kimpul commodities has a longer self life, is easy to combine (made composites), has increased nutritional value (fortification), is shaped, and is processed more quickly according to the demands of modern life. practical. Practicalr is a semi-finished product that has the potential to be further processed into various processed products, including noodles, pastries, cakes, and others.

One of the specific properties of kimpul that becomes a problem in consuming kimpul is the presence of Ca-oxalate crystals which cause itching and saponin which have a bitter taste and can cause the breakdown of blood grains. Research related to the decrease in Ca-oxalate content has been carried out by [6] and [7], where it is mentioned that one way to get rid of itching in the knots can be done by soaking in 5% salt solution for 30 minutes and blanching treatment at 70^{o}C for 10 minutes.

The research team has conducted research on kimpul starting in 2012, namely the Study of the proportion of kimpul-wheat flour in cake and pastries processing [8]. Followed by Study of kimpul flour concentration in wet noodle processing [9]. In addition, research has been carried out on the characteristics and formulation of cowpea-kimpul composite flour for the Development of non-wheat biscuits [10], Kimpul biscuit shelf life [7], Biscuit formulation based on cowpea-kimpul composite flour with Linear Programming Technique [11], Quality of MP-ASI biscuits from cowpea-kimpul composite flour and sago flour during storage [12], and frozen stick kimpul processing [13].

2.2. Product Value Analysis

The concept of value can be described as the ratio between the performance displayed by a production process to the costs incurred to produce a product. Value engineering procedures that are generally used include five stages, namely: information, creativity, evaluation, development, and presentation stages. The information stage has the goal of obtaining a comprehensive understanding of the system, structure, or elements being studied. At this stage, information must be determined and grouped according to its type and needs. The creativity stage aims to design various alternatives that fulfill the main function (product performance). Creativity is very decisive in getting the alternatives developed. Creative ideas in general can grow other new ideas. Ideas can be: original ideas, improvements to an idea, a combination of ideas, or the use of analogies. The evaluation stage aims to analyze the alternatives that have been successfully developed at the creativity stage. At this stage, the advantages and disadvantages of each alternative will be examined. The techniques that can be used at this stage include: Evaluation Matrix, Zero-One Method, Analytical Hierarchy Process, and Attribute/Adjective Analysis. The development stage aims to develop the proposed design of the value analysis. The proposed design can be in the form of a prototype, model, or drawing. The presentation stage aims to convey the results that have been developed comprehensively. The presentation also aims to convince decision makers that the recommended alternative is the best and profitable alternative.

In carrying out value engineering there are several methods that can be used in the development of facilities, namely morphological analysis, brainstorming, and evaluation matrix. The evaluation matrix has several advantages. The advantages of the evaluation matrix method include: it can be used for multi-criteria alternatives, each criterion has a different level of importance (expressed in weights), and is easy to understand and quite simple.

The evaluation matrix is one of the decision-making tools that can combine qualitative criteria and quantitative criteria. The criteria for this method can be in the form of cost, quality, beauty, maintenance, and so on. The method of implementing the evaluation matrix method is: determining possible development alternatives, determining influential criteria, assigning weights to each criterion, providing an assessment for each alternative against each criterion, calculating the total value for each alternative, and choosing the alternative with the best total score.

Value Engineering is not a cost cutting process, namely the process of reducing costs by reducing unit prices and sacrificing quality and appearance. From the methods mentioned above, it can be calculated the value or value of an existing product with the formula as shown in equation (1).

$$\text{Value} = \frac{\text{Performance}}{\text{Cost}} \quad (1)$$

The Analytical Hierarchy Process (AHP) was first introduced by Thomas L. Saaty in the period 1971-1975. The purpose of this AHP is to determine the priority of choices with many criteria. The Analytical Hierarchy Process has special attention to deviations from consistency, measurement, and dependability within and between groups of structural elements. In principle, AHP makes an assessment of the relative importance of two criteria at a given level and in relation to the level above it [14].

3. Methods

In this study, the value engineering method was applied to analyze the diversification of processed *kimpul* products. The application of the value engineering method using the standard five job plan, consisting of: information, creative, evaluation, development, and presentation/recommendation stages.

3.1. Information Stage

The use of kimpul tubers has varied. Processed products can come from kimpul tubers or kimpul flour. The kimpul processed products include chips, sticks, wet noodles, cakes, and cookies. For this reason, it is necessary to study the value of various processed products, both from tubers and flour, so that processed products can be selected that will provide the best value.

3.2. Creative Stage

The creativity stage is carried out to produce various alternative kimpul processed products. Product diversification that can be done are as follows:

a. Alternative I : Processing kimpul tubers into kimpul chips
b. Alternative II : Processing kimpul tubers into kimpul sticks

c. Alternative III : Processing kimpul flour into kimpul wet noodles
d. Alternative IV : Processing kimpul flour into kimpul cakes
e. Alternative V : Processing kimpul flour into kimpul cookies

Alternative diversification of kimpul processing as shown in Figure 1.

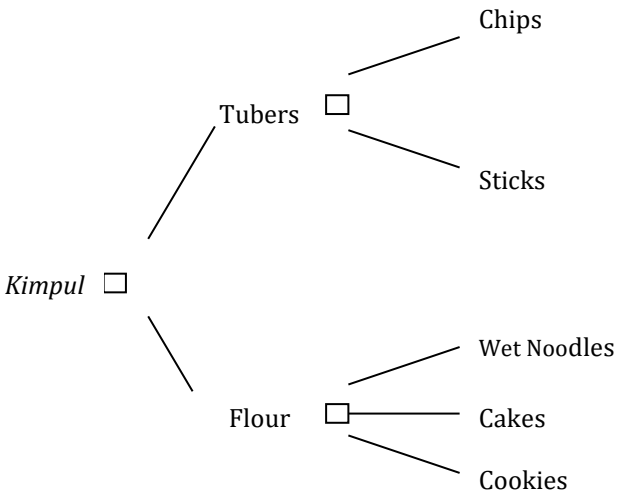

Fig 1: Kimpul Processed Product Diversification Alternatives

The research activity consisted of two creative stages, namely: 1) Phase I: Processing various types of processed products with raw tuber kimpul and kimpul flour, and Phase II: Organoleptic test of diversification of processed kimpul products.

3.3. Evaluation stage

At the evaluation stage, an assessment of various alternatives for diversification of processed kimpul products is carried out using various assessment criteria to determine the value of each product. Activities at this stage include: market demand analysis, determination of performance criteria weights, cost analysis, and value analysis.

1. Market analysis
   Market acceptance is analyzed through market research. This analysis was conducted to determine consumer perceptions of product attractiveness, product benefits, and consumer buying decisions.
2. Determine the weight/importance of the criteria used in the performance assessment of kimpul processed products using the AHP method [14]. Meanwhile, while the Expected Value Method is used to calculate the overall product performance [15]. The assessment criteria (K) used are Product Organoleptic Properties (K1), Product Attractiveness (K2), Product Benefits (K3), and Consumer Buying Decisions (K4).
3. Cost analysis
   Cost analysis was carried out to determine the production costs of each processing of kimpul processed products. This analysis is based on capital, both fixed and working capital, as well as annual costs in the form of fixed costs and variable costs [16].
5. Value analysis
   Based on the weight/level of importance of each criterion and the performance of each type of product based on predetermined criteria and production costs, a value analysis of various processed kimpul products is carried out. The value or value of an existing product with a formula as shown in Equation (1).

3.4. Develop And Recommendation Stage

At this stage, the alternative kimpul processed products selected from the evaluation stage are presented in full with packaging and production labels.

4. Results and Discussion

Product value analysis in this study consisted of five stages, namely the information, creative, evaluation, development, and presentation/recommendation stages.

4.1. Information Stage

Processed products can come from kimpul tubers or kimpul flour. The kimpul processed products include chips, sticks, wet noodles, cakes, and pastries. The processing of kimpul processed products in this study is based on previous studies.
The processing of cakes and cookies is based on research results of [8] on the study of the proportion of kimpul-wheat flour in the processing of cakes and Cookies. The processing of wet noodles is based on research of [9] on the study of kimpul flour concentration in processing of wet noodles. While the process of kimpul sticks processing is based on research by [13] on the study Frozen Stick Kimpul.

4.2. Creative stage

The creative stage is carried out to produce various alternative kimpul processed products. The product diversification that can be done is as follows: processing kimpul tubers into kimpul chips, processing kimpul tubers into kimpul sticks, processing kimpul flour into wet noodles, processing kimpul flour into kimpul cakes, and processing kimpul flour into kimpul cookies.

Organoleptic test or sensory test or sensory test is a test method using the human senses as the main tool for measuring product acceptance. Organoleptic test has a high relevance to product quality because it is directly related to consumer tastes. In addition, this method is quite easy and fast to do, the results of measurements and observations are also quickly obtained. Thus, organoleptic tests can help business analysis to increase production or marketing [17]. In this study, the organoleptic parameters studied included: taste, color, texture, and appearance.

4.3. Evaluation stage

At the evaluation stage will be discussed related to consumer acceptance, the weight of performance assessment criteria, cost analysis, and value analysis.

4.3.1. Consumer acceptance

The results of the descriptive analysis of the product attractiveness parameter can be seen in Figure 1. Based on consumer preferences, kimpul chips and kimpul cookies have the highest attractiveness, while kimpul wet noodles products have the lowest attractiveness.

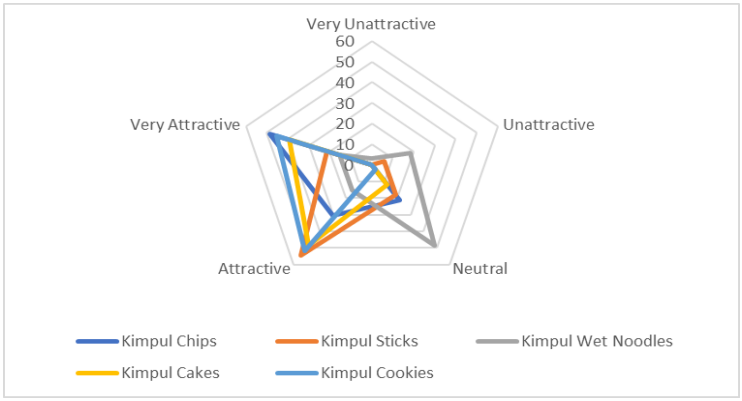

Fig 2: The Attraction of Kimpul Processed Products

The results of the descriptive analysis of the product benefits parameters can be seen in Figure 2. According to consumer preferences, the five alternative kimpul processed products offered provide equal benefits, except that the kimpul wet noodles product does not provide benefits.

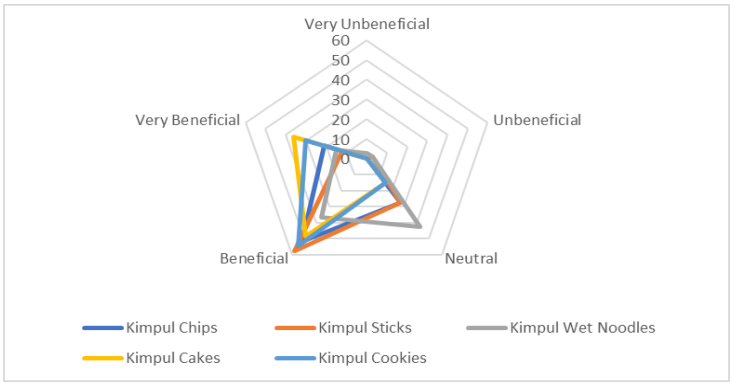

Fig 3: Benefits of Kimpul Processed Products

The results of the descriptive analysis of the parameter of consumer buying decisions can be seen in Figure 3. Based on the purchase decision parameters, the kimpul cakes product has the greatest opportunity to be purchased by consumers compared to the kimpul chip and kimpul cakes product. Meanwhile, the products that consumers are least interested in are kimpul sticks and kimpul wet noodles.

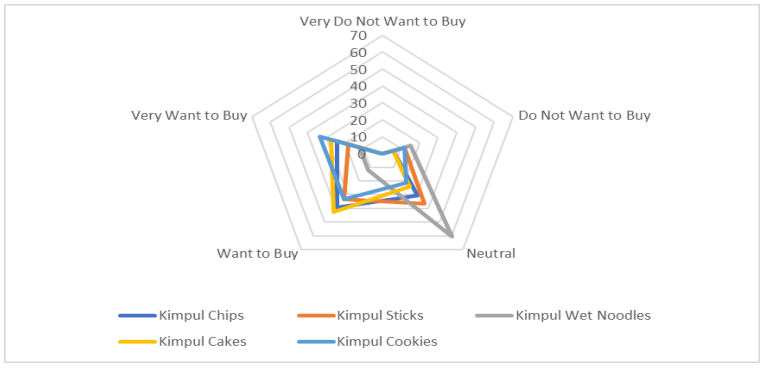

Fig 4: Consumer Buying Decisions of Kimpul Processed Products

4.3.2. Weight Of Importance Criteria

The criteria used to determine the performance of kimpul processed products include: product organoleptic properties (K1), product attractiveness (K2), product benefits (K3), and consumer purchasing decisions K4). Determination of the weight of the importance of the assessment criteria using the Analytical Hierarchy Process (AHP) method. Based on the results of the AHP, the weights of each criterion are as follows: K1 0.10; K2 0.28; K3 0.16, and K4 0.47, as shown in Figure 5.

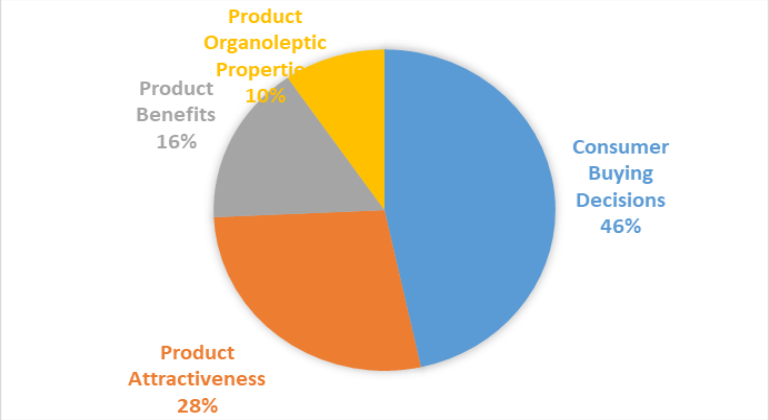

Fig 5: Weight of Importance of Each Performance Criteria

4.3.3. Performance Analysis

Product performance is the ability of a product to provide benefits in accordance with the claims set by the brand owner. This is closely related to consumer satisfaction, because they are the main target of the products sold. Performance or performance has dimensions to indicate the level of product operation or the basic usability of a product. In its implementation, performance is defined as the customer's perception of the basic benefits of the product consumed [18].

Based on research of [19], Product performance can be viewed from the benefits provided by the product to consumers. Product performance can be measured based on the attributes attached to the product. Attributes attached to food products include taste, texture, packaging materials, shape, health benefits, and appearance.

Performance analysis in this study uses the expected value method, where this expected value embodies the product performance value. Product performance criteria considered include product organoleptic properties, product attractiveness, product benefits, and consumer buying decisions. The results of the calculation of the Expected Value are shown in Table 1.

Table 1. Performance Value of Each Alternative Product

Products alternatives	Organoleptic Properties	Attractiveness	Benefits	Consumer Buying Decision	Performance Value
Kimpul Chips	4.18	3.38	2.98	3.17	3.70
Kimpul Sticks	3.87	2.67	2.64	2.77	3.27
Kimpul Wet Noodles	3.24	1.85	2.36	2.21	2.64
Kimpul Cakes	4.20	3.39	3.56	3.44	3.84
Kimpul Cookies	4.17	3.71	3.45	3.41	3.89
Importance Weight	0.47	0.28	0.16	0.10	

4.3.4. Product value analysis

Product value is the ratio between the benefits of a product at the expense of a number of costs [18]. According to [19] value is the proportion of a product's performance or benefit to the cost incurred to attain that performance or benefit. In this study, what is meant by benefits is the value of product performance, while sacrifice is the cost of making products for each alternative to processed kimpul products. The value of product performance is based on the criteria of organoleptic properties, product attractiveness, product benefits, and consumer buying decisions. Product costs are limited to the cost of the manufacturing process, not involving design costs, storage costs, or distribution costs. Calculation of product value as shown in Table 2.

Table 2. Product Value Analysis

Product Alternatives	**Performance**		**Cost per Unit**		**Product Value**
	Value	**Scale**	**IDR**	**Scale**	
Kimpul Chip	3.70	9.51	10,000	1.00	9.51
Kimpul Stick	3.27	6.00	10,000	1.00	6.00
Kimpul Wet Noodle	2.64	1.00	15,000	3.50	0.29
Kimpul Cake	3.84	10.56	30,000	11.00	0.96

Kimpul Cookies	3.89	11.00	30,000	11.00	1.00

Based on the results of the product analysis, it is known that the kimpul chip product has the highest value, which is 9.51, while the product that has the lowest value is the kimpul wet noodle product with a value of 0.29. Although the kimpul cake product has the highest performance, the product value obtained is lower than the kimpul chip product. This is due to the high cost required to realize the high performance, so that the overall value of the product is relatively low.

4.4. Develop And Recommendation Stage

The need for different materials and processes for each alternative product has an impact on the product cost per unit of the alternative product. The value of the product is analyzed based on the performance of the product and the costs required to realize that performance. The results of product value analysis show that products that have high performance, but only require relatively low costs provide high product values. Products with high performance do not necessarily have a high product value. According to [20] the increase in product value is mediated by an entrepreneurial orientation. Furthermore, the increase in product value will improve the company's performance.
Product performance rankings for each alternative product, ordered from the highest, namely kimpul pastries, kimpul cakes, kimpul chips, kimpul sticks, and kimpul wet noodles. However, considering the cost of the product, the order of product values starting from the highest is kimpul chips, kimpul sticks, kimpul pastries, kimpul cakes, and kimpul wet noodles. Overall, the recommended kimpul processed product alternatives include kimpul chips, kimpul sticks, and kimpul cookies.

5. Conclusion

The kimpul processed product can come directly from the kimpul tuber and can also be processed from the kimpul flour. Based on the results of the frequency test for each product, the kimpul chip product was the most preferred compared to other kimpul processed products, reaching 84.8% of respondents liking the taste of the kimpul chip product. Meanwhile, in terms of appearance, respondents liked cake kimpul products, reaching 84.9%. Based on the attractiveness of the product, the product that has the highest attractiveness score is the cookies product, while the lowest is the wet noodle product. Based on product benefits, the product that has the highest benefit is cake product, while the lowest is wet noodle product. Based on the purchase decision parameters, the product that is most in demand by consumers is cake products, while the least desirable is wet noodle products.
The product that has the highest performance is the kimpul cake product, while the product that has the lowest performance is the kimpul wet noodle product. The product that has the highest value is the kimpul chip product, while the product that has the lowest value is the kimpul wet noodle product. Overall, alternative products that are recommended to be produced are kimpul chips, kimpul sticks, and kimpul cookies.

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