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Feasibility Study On The Development Of Corn Cookies With The Addition Of Spinach And Tilapia Fish Flour

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Abstract– Cookies are a type of snack food that is well known and loved by the public, often served as a supplement to toddlers' diets. Cookies commonly consumed by toddlers are generally made from wheat flour, which is an imported product. Therefore, corn flour is used to reduce dependence on wheat flour. The purpose of this study is to analyze the feasibility of developing corn cookies enriched with spinach flour and tilapia flour. This study uses a quantitative and qualitative approach. The quantitative study uses a survey method with 100 samples determined purposively in districts with high stunting rates in West Sumatra, namely Pasaman and Solok districts. The research samples are parents who have toddlers. The data collected was data on the feasibility of developing cookies, which included aspects of demand, market, and technical aspects (shape, taste, color, aroma, texture). The feasibility study results showed that 96% of respondents were aware of stunting in toddlers and 97% of respondents considered that corn cookies with added spinach and tilapia should be produced as supplementary food for stunted toddlers with the desired characteristics, namely star-shaped (55%), sweet taste (55%), brownish yellow color (57%), savory aroma (65%), and crispy texture (75%). The location where respondents hoped to purchase these cookies was near their place of residence (68%) with a price range of IDR 5,000 - IDR 10,000 per pack (64%). The FGD results stated that corn cookies with added spinach and tilapia flour were very much needed and very feasible to develop.
Keywords: Feasibility study, corn cookies, spinach, tilapia fish flour

I. INTRODUCTION

Food consumption is closely related to the energy intake of children. Low energy intake can cause physical growth deficits in children and increase the risk of stunting [1], [2]. In addition, adequate intake of nutrients such as protein, calcium, vitamin A, and zinc can stimulate children's height growth and reduce the risk of stunting [3]. In general, children prefer snacks to staple foods. Snacks that are consumed daily can help meet energy, nutrient, and protein requirements [4], but snacks are often identified as foods that are high in energy but low in nutrients [5].

In implementing stunting prevention efforts, the Ministry of Health of the Republic of Indonesia (2021) stated that the pandemic had disrupted nutrition services. One of the four alternative solutions designed to address these obstacles is to increase the use of local foods in the form of Supplementary Feeding (PMT) for malnourished toddlers, so that malnutrition does not become prolonged

and cause stunting. PMT for toddlers can be made from nutrient-dense Mixed Food Ingredients (BMC) by utilizing local food ingredients [6]. One form of PMT produced by factories is cookies.

Cookies are a type of snack food that is well known and loved by the public, often served as a supplement to toddlers' diets. Cookies have a crunchy texture and are not easily crushed like most other types of cookies [7]. Wheat flour is generally the main ingredient in cookies. The demand for wheat flour has increased along with the variety of wheat flour-based products [8]. According to data from the Central Statistics Agency (2021), the amount of wheat food imports throughout 2021 reached 31.34 thousand tons [9]. Therefore, in this study, wheat flour was substituted with a local food ingredient, namely corn flour, to reduce dependence on wheat flour as an imported commodity.

Corn (Zea mays) is one of the local food ingredients available throughout Indonesia. Corn contains vitamin B complex, which is excellent for the skin, hair, digestion, heart, and brain. It also contains vitamins C, A, and K, beta-carotene, and selenium, which play an important role in the immune system [10]. The use of corn flour has been previously studied in the production of biscuits and cookies [10]–[12] and cookies [13]. In addition, in this study, cookies were supplemented with other food ingredients, namely spinach and tilapia flour, to increase the nutritional content of the cookies.

Spinach (Amaranthus sp) is a vegetable that is rich in nutrients, low in calories, but very high in vitamins, minerals, and other phytonutrients. Spinach also contains flavonoids that function as antioxidants, thereby counteracting free radicals [14]. The nutritional content of 100 g of spinach leaves is 2.3 g of protein, 3.2 g of carbohydrates, 3 g of iron, and 81 g of calcium. Spinach is also rich in various vitamins and minerals, namely vitamin A, vitamin C, niacin, thiamine, phosphorus, riboflavin, sodium, potassium, and magnesium [15].

The animal protein source added to these cookies is tilapia (Oreochromis niloticus). Tilapia, also known as Nile tilapia, is recognized as one of the freshwater fish with high economic value in Indonesia and several other Asian countries, due to its relatively good adaptability to the environment and ease of cultivation [16]. Suyanto (2010) added that tilapia is widely popular because it has thick and delicious meat, and its price is relatively cheap and affordable for people in Indonesia [17]. Tilapia contains 43.76% protein, 7.01% fat, 6.80% ash, and 4.28% water per 100 g of fish weight [18].

Cookies with added corn flour as a substitute for corn flour and added spinach and tilapia flour to increase the nutritional content of cookies have not yet been found. Therefore, this study on the development of corn cookies with added spinach and tilapia flour as a potential food for stunted toddlers is the main focus of this research, which is expected to answer the question of how promising the development is in terms of demand, market conditions, and technical aspects.

II. MÉTHODOLOGIE

This study used quantitative research with a survey method. The research area was determined purposively from a list of 1,000 villages prioritized for stunting in 2018 [19], selecting Pasaman and Solok districts as the areas with the highest stunting rates in West Sumatra and included in the stunting intervention priority.

The research sample consisted of families with toddlers as the main target of the product to be produced. The family sampling technique was carried out purposively with 100 samples, with 50 samples in each selected village. The feasibility study data collection technique was carried out directly with the assistance of the local Health Office team, which had previously entered into a cooperation agreement with the proposing university. The data collection tool used an instrument designed by the research team together with partners in the initial preparatory FGD, followed by a validity and reliability test of the instrument. Data processing used basic statistical analysis using SPSS.

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III. RÉSULTS AND ANALYSES

1. Respondent Characteristics

This study used 100 respondents who had toddlers. Most of the respondents were mothers aged 27-32 years (38%) and fathers aged 33-38 years (40%). Thirty-two percent of mothers had a D3 education level, while 34% of fathers had a D3 education level. Based on the study results, 55 percent of mothers were housewives and 48 percent of fathers worked as farmers. Thirty-six percent of mothers had an average income of less than IDR 1,000,000, and 35 percent of fathers had an average income of IDR 1,000,000–IDR 2,000,000.

Table 1. Frequency distribution of respondent characteristics

Variable	Percentage	
	Mother	Father
Age		
18 – 26	11,0	3
27 – 32	38,0	27
33 – 38	36,0	40
39 – 46	15,0	20
47 – 54	0	10
Education		
Elementary School	7,0	11
Junior High School	6,0	19
Senior High School	30,0	34
Diploma 3	32,0	5
Bachelor's Degree	17,0	27
Master's Degree	8,0	4
Job		
Housewife	55	0
Seller	2	13
Farmer	2	48
Livestock farmer	0	2
Driver/Motorcycle taxi driver	0	8
Civil servant	25	8
employee	16	19
Unemployed	0	2
Average Income		
< Rp 1.000.000	36	13
Rp. 1.000.000 – Rp. 2.000.000	24	35
Rp. 2.000.000 – Rp. 3.000.000	27	32
Rp. 3.000.000 – Rp. 4.000.000	10	11
>Rp. 4.000.000	3	9

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A high level of maternal education can play a more significant role in achieving good nutritional status in children [20]. In a study by Nurmaliza and Herlina [21], mothers with a low level of education were three times more likely to have toddlers with poor nutritional status compared to mothers with a high level of education.

Table 2. Number of family members supported by respondents

Number of Dependents	Percentage
1 person	6
2 people	9
3 people	22
4 people	30
5 people	22
6 people	7
7 people	3
8 people	1

Based on the results of data processing from respondents, it was found that 30% of respondents had 4 family members to support (Table 2).

2. Needs Aspect

Customer needs are an important part of the concept development phase, which is one of the phases in the product development process. Based on the results of a study on stunted toddlers, which is a condition of chronic malnutrition in toddlers, 96% of respondents were aware of this condition. Respondents were aware of cookies as a supplementary food for toddlers (80%), and the cookies commonly consumed by toddlers were those made from wheat flour, such as Good Time, Promina, Bisquat, and Roma. The production of corn cookies with the addition of spinach and tilapia flour is considered necessary by 97% of respondents for supplementary food for stunted toddlers (Table 3).

Table 3. Frequency distribution of respondents' knowledge

Knowledge	Percentage
About cookies specifically for toddlers	80
About stunted toddlers	96
The need for cookies for stunted toddlers	97

The level of toddler preference for cookies shows that 44% of toddlers like to eat cookies (Table 4).

Table 4. Toddlers' preference for cookies

Level	Percentage
Really like it	10%
Like it a lot	26%
Like it	44%
Somewhat like it	16%
Don't like it	4%

Based on the results of data processing from respondents, it was found that 46% of toddlers consume cookies 1-2 times/week (Table 5).

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Table 5. Frequency of toddlers consuming cookies

Frequency of consumption	Percentage
1 – 2 times/week	46%
3 – 4 times/week	35%
5 – 6 times/week	8%
Every week	11%

Based on the results of data processing from the number of cookies commonly consumed by toddlers, it was found that 78% of toddlers usually consume 1-3 cookies (Table 6).

Table 6. Number of cookies typically consumed by toddlers

Number of cookies consumed	Percentage
1 – 3	78%
4 – 6	20%
7 – 9	2%
10	0%
>10	0%

3. Market Aspects

Market feasibility studies serve as a link between business management and the target market through information obtained through research. Based on the data processing results, 91 percent of respondents chose wheat flour as the basic ingredient for cookies (Table 7).

Table 7. Respondents' knowledge about the basic ingredients of cookies

Respondents' knowledge about the basic ingredients of cookies	Percentage
Wheat flour	91
Rice flour	27
Sago flour	17
Corn flour	17
Sweet potato flour	13

The price of cookies usually purchased by respondents generally ranges from IDR 5,000 to IDR 10,000 (80%), and only 1% of respondents usually buy cookies priced at IDR 30,000 to IDR 35,000 (Table 8).

Table 8. Prices of cookies commonly purchased by respondents

The price of cookies that are usually purchased	Percentage
Rp 5000 - Rp 10000	80
Rp 10000 - Rp 15000	12
Rp 20000 - Rp 25000	7
Rp 30000 - Rp 35000	1

Based on the results of the study, it was found that 80 percent of respondents chose taste as a parameter for buying cookies that respondents usually buy, and 13 percent of respondents chose color as a parameter for buying cookies that they usually buy (Table 9).

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Table 9. Considerations for choosing cookies that respondents usually buy

Considerations for choosing commonly purchased cookies	Percentage
Taste	80
Need	33
Price	28
Texture	25
Shape	20
Colour	13

Based on the results of the study, it was found that 83 percent of respondents chose taste as a parameter for repurchasing cookies that respondents usually buy, and 10 percent of respondents chose color as a parameter for buying cookies that they usually buy (Table 10).

Table 10. Considerations for repurchasing cookies that respondents usually buy

Considerations for repurchasing regularly purchased cookies	Percentage
Taste	83
Price	30
Need	29
Shape	22
Texture	20
Colour	10

The results of the study show that as many as 79 percent of respondents are not yet aware of corn cookies with added tilapia and spinach (Table 11).

Table 11. Knowledge about corn cookies with added spinach and tilapia flour

Knowledge about corn cookies with added spinach and tilapia flour	Persentase
Know	21
Don't know	79

Although many respondents were unaware of corn cookies with added spinach and tilapia flour, if such a product were produced, 64% of respondents would be willing to purchase it at a price of Rp 5,000–Rp 10,000 per pack, while another 36% would be willing to pay more than Rp 10,000 (Table 12).

Table 12. Determination of corn cookie prices with the addition of spinach and tilapia flour

A reasonable price for corn cookies with added spinach and tilapia flour	Percentage
Rp 5000 - Rp 10000	64
Rp 10000 - Rp 15000	26
Rp 20000 - Rp 25000	9
Rp 30000 - Rp 35000	1

Corn cookies with added spinach and tilapia are expected to be sold at locations close to respondents' residences (68%) (Table 13).

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Table 13. Sales locations for corn cookies with added spinach and tilapia flour

Sales location for corn cookies with added spinach and tilapia flour	Percentage
Integrated Health Service Post (Posyandu)	19
Shop/stall near home	68
Supermarket	13

4. Technical Aspects

The technical assessment aims to provide broad limitations on the technical parameters related to the physical manifestation of the product [22]. A product offered to consumers will survive in the market if its attributes are acceptable. Based on the results of a study on the development of corn cookies with added spinach and fish meal, the shapes of corn cookies that respondents preferred were star shapes (51%), cartoon shapes (33%), and other shapes (Table 14).

Table 14. Respondents' Ratings of the Texture of Corn Cookies with Added Spinach and Fish Meal

Character Shapes	Percentage
Star	51
Cartoon	33
Animal	31
Heart	16
Rectangle	2
Various	1
Circle	1

The taste that respondents expected from corn cookies with added spinach and tilapia flour was sweet (55%), brownish yellow in color (57%) with a savory aroma (65%) and a crunchy texture (75%) (Table 15).

Table 15. Respondents' ratings of the taste, color, aroma, and texture of corn cookies with added spinach and fish meal

Parameters	Percentage
Taste	
Sweet	55
Salty/Savory	44
Slightly sweet and savory	1
Color	
Brownish yellow	57
Brown	42
Colorful	1
Aroma	
Savory aroma	65
Sweet aroma	35
Texture	
Crispy/Crumbly	75
Soft	19
Easily crushed	6
Hard	0

IV. CONCLUSION

From the feasibility study of corn cookies with added spinach and fish meal, in terms of demand, market, and technical aspects, it is feasible to develop this product based on the respondents' choices, most of whom chose this product for production.

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