

Improving the People's Economy through the Utilization of Pandeglang Districts
Local Raw Materials (Sugar Palm and Taro Beneng Flour) for Extrusion Products
(Analog Rice and Analog Noodles)

Arief Arianto, Eko Bhakti Susetyo, Hengky Henanto, Purwa Tri Cahyana, Ade Saepudin,
Eko Pratama Astin, Budiyanto, Ambar Dwi K, Indah Kurniasari, Boni Benyamin*, Puji
Astuti, Ahmad Suhendra, Agus Tri Putranto, Huda El Matsani,
Jonathan Prabowo, Lanjar Sumarno, Mulyana Hadipernata

Pusat Riset Agroindustri
Laboratoria Pengembangan Teknologi Industri Agro dan Biobedika
Jalan Kawasan Puspiptek, Muncul, Setu,
Kota Tangerang Selatan 15314

*Correspondent *e-mail*: bonn01@brin.go.id

Abstract

Beneng taro is a wild plant that is commonly found in Indonesia, and is very easy to cultivate. However, the large potential for export demand of production of analog rice made from beneng taro flour is not accompanied by high productivity, it is constrained by the production process. The Center for Agroindustry Research, under the National Research and Innovation Agency, since 2010 has conducted research on local flour-based food processing using the cold extrusion method with an extruder machine. Various food products can be produced with only one machine. Based on the test results, dietary fiber content of Arben Analog Rice is 8 grams per serving of 100 grams and contains zinc by 50% of the Nutritional Adequacy Ratio (NAR). Soluble dietary fiber helps lower blood cholesterol levels when accompanied by a diet low in saturated fat and low in cholesterol. Zinc is a micronutrient that has an important role in the body's defense system that fight the entry of infection. By consuming Arben analog rice, it can help increase the body's immunity. Through the calculation of the types of investment appraisal techniques, it is obtained that the financial aspects reviewed are declared feasible and the investment proposals are acceptable.

Keywords: Arben rice, nutrient dense, formulation, extrusion, characterization.

PRELIMINARY

Indonesia has a variety of local raw materials that are abundant but have not been used optimally. Imports of flour, which still dominate as raw material for processed food production, make the dependency rate higher and local food ingredients increasingly marginalized. Taro Banten or better known as taro beneng (big and yellow), comes from Pandeglang Districts, Banten Province, Indonesia. Taro has become one of the staple food commodities in Banten Province, in addition to rice and various tubers.

Beneng taro plant is a wild plant that is commonly found at the foot of the coral hills, and is very easy to cultivate. Currently, it has become an icon of Pandeglang Districts through the Center for Plant Variety Protection (PPVT) certification, Ministry of Agriculture. According to the Agricultural Research and Development Agency (BPTP) of Pandeglang Districts, the area for developing beneng taro cultivation in 2019 was 80 ha in Pandeglang, 17 ha in Lebak and 35 ha in Serang, 24 ha in Bogor, 12 ha in Sukabumi and several other areas.

The Pandeglang Districts Agriculture Service stated that the development of planting and harvesting land for beneng taro increased by more than 60% from 2020-2021 (Pandeglang Agriculture Office, 2021). According to available data, the planting area in 2020 is 424 ha with a harvested area of 150 ha of taro beneng (Ministry of Agriculture, 2021). The Ministry of Agriculture has determined taro beneng as a local superior commodity and has been designated as an export commodity. Australia and New Zealand need 250 tonnes of dried bengal leaves per month. Meanwhile, Turkey and Europe are also ready to accommodate 70 tons of processed taro beneng per month.

Currently, taro beneng is widely traded in the form of wet tubers and is sent to various areas such as Bekasi, Sukabumi, and Semarang. Medium in the form of dried tubers / cassava sent to Bogor. In addition, there is also demand for wet tuber exports from the Netherlands and South Korea. The availability of wet tubers ranges from 200-500 tons per month, with a market opportunity of 350 tons/month. Meanwhile, in the form of dried tubers/cassava, the availability is about 5 tons/month, with a market opportunity of 30 tons/month.

On the other hand, under the guidance of the Food Security Service (DKP) of Pandeglang Districts, the MSME of Bumi Pangan Lokal have processed palm flour, taro beneng flour and other local flours, to be used as analog rice, noodles and macaroni beneng, with the current capacity of each, reaching 25 kg, 10 kg and 6 kg/day, with marketing to various regions in Greater Jakarta and export destinations to Turkey and Europe. However, the potential for export demand for analog rice and arben noodles to Turkey and Europe is so large, it is not accompanied by high productivity because it is constrained by the production process.

The MSME of Bumi Pangan Lokal only have an extrusion machine with a capacity of 10 kg/hour and do the drying manually which relies on sunlight. Sun drying is highly dependent on weather conditions. This causes the products of rice, noodles and macaroni beneng to take longer to dry and when it rains the product will become moist and moldy, so it must be disposed of with a loss of around 70%. In such conditions, the production target of 1 ton/month for domestic and foreign marketing cannot be achieved.

Based on the data above, it appears that the potential of taro beneng has not been optimally utilized to be processed into products with higher added value. The MSME of Bumi Pangan Lokal need the support of dryers and other large capacity production equipment. Extrusion technology is the process of forcibly flowing food through a barrel with one or more variations in the conditions of the mixing, heating and shearing process and passing it through a die designed to form and/or expand the extrusion product. The use of extrusion technology to make analog rice has many advantages, such as large capacity, the process of flowing, mixing, kneading, heating and forming, so that the analog rice produced has characteristics similar to rice rice (Budi et al, 2013).

The Center for Agroindustry Research (PRA), under the National Research and Innovation Agency (BRIN) since 2010 has conducted research on local flour-based food processing using the cold extrusion method with an extruder machine. The cold extruder machine developed by PRA BRIN has been commercialized by PT Barata for the production of an extruder with a capacity of 10 kg/hour. The cold extruder machine developed by PRA BRIN has spread to various regions through the National Food Agency, including Papua, Riau, Ambon, Central Java, West Java, East Java and Bali.

Cold extrusion technology using an extruder machine developed by PRA BRIN has been used by several small industries in the country for product development such as PT Amman Mineral Sumbawa, Sangehe Food Security Service, Papua Province Food Crops Service, Faculty of Agriculture UMM Malang, Meranti Districts Food Security Service, PT Sri Rejeki Tangerang and the MSME of Bumi Pangan Lokal, Pandeglang Districts.

Extruded products such as analog rice, noodles and macaroni made from local flour have been produced by several small industries in the country and until now the demand for their products continues to increase with online and export markets, including Mie Gunung Kidul products, arben analog rice, Papua dry sago noodles, and Riau sago instant noodles. The MSME of Bumi Pangan Lokal have produced analog rice products and Arben noodles. Food diversification using extrusion technology as a result of PRA BRIN innovation can be the answer to these challenges to help the government empower Indonesia's abundant natural resources and as a substitute for imported raw materials.

Therefore, socialization and diffusion of technology that can support efforts to utilize palm flour and taro beneng flour into products with high economic value, needs to be carried out continuously and sustainably so that the abundant potential of local raw materials can be utilized as a source of income for the business actors involved. PRA BRIN as a government think thank institution that has the duties and functions to carry it out can take part in it.

The aims of this research are: (1) To understand the production process of Arben Analog Rice; (2) To determine the nutritional content of Arben Analog Rice and (3) To determine the feasibility of making Arben Analog Rice.

MATERIALS AND METHODOLOGY

The method of determining the research area was carried out intentionally (purposive method), namely in Pandeglang Districts, Banten Province. This was done by considering that PRA BRIN has signed a cooperation with the Food Security Council (DKP) of Pandeglang Districts to conduct research on the use of flour and starch as raw materials for making analog rice and arben analog noodles. The method used in this research is descriptive method and analytic. The research was carried out for 3 (three) months, from October to December 2020.

The data used in this study are primary data and secondary data. Primary data collected by BRIN PRA researchers was obtained by sending samples of arben flour products to the Food Technology Laboratory, Bogor Agricultural University, which already has ISO 17025 standards, to measure the nutritional content of arben flour. Meanwhile, to calculate the feasibility of making arben analog rice, researchers conducted observations, interviews and questionnaires to obtain data on product selling prices, production costs and investment costs. Meanwhile, secondary data were obtained from the Office of the Food Security Council and the Department of Agriculture, Pandeglang Districts, Banten Province.

The next step, to calculate the feasibility of making arben analog rice is to do:

- (1) Cost Structure Analysis, namely an analysis of the components of fixed costs (FC) and variable costs (VC) and their percentages to total costs (TC); If the percentage value of each business cost can be known, it can be emphasized on each cost according to the proportion level, so that production costs can be more efficient and income will increase.

Formula:

$$P = \frac{NTFC \times NTVC}{NTC} \times 100\%$$

which is:

$$\begin{aligned} P &= \text{Value of production costs structure (\%)} \\ NTFC &= \text{Fixed costs component value (Rp)} \\ NTVC &= \text{Value of variable costs components (Rp)} \\ NTC &= \text{Total production costs (Rp)} \end{aligned}$$

- (2) Break Even Point Analysis (BEP) is an analysis that aims to find a point in the cost-income curve, which shows REVENUE equals COST.

BEP analysis includes:

$$\begin{aligned} \text{BEP Revenue (Rp); formula} &= \frac{FC}{1-VC/S} \\ \text{BEP Production (Kg); formula} &= \frac{FC}{P-AVC} \\ \text{BEP Price (Rp/Kg); formula} &= \frac{TC}{Q} \end{aligned}$$

which is:

FC	=	Fixed costs (Rp)
VC	=	Variable costs (Rp)
S	=	Sales (Rp)
AVC	=	Variable costs Per Unit (Rp)
P	=	Netto selling price Per Unit (Rp)
TC	=	Total costs (Rp)
Q	=	Total Production (Kg)

(3) Calculation of Return on Investment

Formula:

$$ROI = \frac{\text{Total Revenue} - \text{Total Investment}}{\text{Total Investment}} \times 100\%$$

Conclusions can be drawn after the results of the analysis of the nutritional content carried out by ITP IPB and the economic calculations by the researchers have been completed.

RESULTS AND DISCUSSION

Analysis of Nutritional Content of Rice Analog Arben

The application of extrusion technology encourages the growth of MSMEs that produce fortified extruded food products based on local resources supported by technological innovation, in an effort to encourage the growth of the middle to lower scale business sector. Furthermore, it can contribute to recovering the Indonesian economy affected by the pandemic.

The advantage of the cold extrusion process, an innovation developed by PRA BRIN, is that the process is relatively simple and easy to apply. In addition, the energy consumption is small, suitable for application in MSMEs, all flour raw materials can be processed into extruded products. The resulting product can be formulated according to needs. Various food products can be produced with only one machine (the mold/die can be changed as needed). It can be seen from the results of the Arben Rice test, that the dietary fiber content of Arben Rice is 8 grams per serving of 100 grams and contains zinc by 50% of the Nutritional Adequacy Ratio (RDA).

Based on the results of the analysis by Food Technology Science, Bogor Agricultural University, that the nutritional content of arben flour as the main raw material for making Beneng analog rice can be seen in Table 1 below:

Table 1 Arben Flour Nutritional Content

NUTRITIONAL VALUE INFORMATION		
Serving size 100 g; 10 servings per pack		
QUANTITY PER SERVING		
Total Energy 379 kkal Energy from fat 10 kkal		
% NUTRITIONAL ADEQUACY*		
Total fat	1 g	2 %
Saturated fat	1 g	5%
Protein	3 g	4%
Total carbohydrate	87 g	27%
Food fiber	8 g	26%
Glucose	0 g	
Salt (Natrium)	47 g	3%
Mineral:		
Zinc		50%
Iron		13%
* Percentage of RDA based on energy needs = 2150 kkal. Your energy requirements may be higher or lower		

Soluble dietary fiber helps lower blood cholesterol levels when accompanied by a diet low in saturated fat and low in cholesterol. Zinc is a micronutrient that has an important role in the body's defense system. Zinc controls the activation of immune cells that fight the entry of infection. It is hoped that by consuming Arben rice, it can help increase the body's immunity during this pandemic.

Business Feasibility Analysis of Arben Analog Rice Production

Based on the results of primary data collection through the distribution of questionnaires and interviews with related parties, the following is the calculation of the business analysis of arben rice production with the following assumption:

Production Capacity		
1	Rice production per Batch	= 41,322 kg
2	Production (Kg per year)	= 8.264,43 kg
3	Production (Tons per year)	= 8,26 ton
4	Batch number per year	= 200
5	Batch number per Shift	= 1

Production costs		
Variabel costs		
Raw materails costs per Batch	Rp	476.171,15
Total Variabel Costs	Rp	476.171,15
Fixed costs		
Energy costs per Batch	Rp	28.800,00
Manpower costs per Batch	Rp	92.485,55
Total fixed costs	Rp	121.285,00
Total production costs per Batch		
	Rp	597.456,70
Investastment costs		
1 Mixer steamer	Rp	15.000.000
2 Ekstruder	Rp	90.000.000
3 Polisher	Rp	25.000.000
4 Vacuum packing	Rp	15.000.000
5 Dies & tools	Rp	10.000.000
6 Packaging & exhebition mats.	Rp	30.000.000
7 Genset	Rp	15.000.000
Total Investment Costs		
	Rp	200.000.000

Production basic price per Batch	Rp 14.458,51/kg
Product selling price per kg	Rp 35.335,79
Production capacity	100%
Revenue	Rp 289.255.050,00/thn
Return on Ivenstment	44.63 %
Investment	200.000.000,00
Pay Back Period	2,42 tahun
NVP DF 10%	282,466,998.99
IRR	39.97%
Net B/C	2,41
BEP selling per batch	Rp 8.914,850

(1) Cost Structure Analysis

Based on the table of Production Costs above, that the Total Variable Cost (TVC) is Rp. 476,171.15 and Total Fixed Cost (TFC) is Rp. 121,285.00. Shows that the loading of Variable Costs per unit of variable input is larger, on the other hand, the imposition of Fixed Costs per unit of fixed inputs is Smaller to produce arben analog rice;

The variable cost component has a large percentage of the total production cost (80%); while the fixed that have a large percentage of the total production costs are: labor costs (15%) and energy costs (5%)

Conclusion: the production cost for the business of making arben analog rice is quite large, so that if the rice production costs are allowed to be high, it will affect rural inflation.

(2) BEP Analysis

$$\begin{aligned}\text{BEP Revenue} &= \frac{\text{FC}}{1-\text{VC/S}} \\ &= \frac{121.285}{1-(476.171/597.455)} \\ &= \text{Rp } 606.425\end{aligned}$$

$$\begin{aligned}\text{BEP Price} &= \frac{\text{TC}}{\text{Q}} \\ &= \frac{597.456,70}{41,322} \\ &= \text{Rp } 14.313, 36\end{aligned}$$

$$\text{Revenue values} = \text{Rp } 289.255.050/200 = \text{Rp } 1.446.275, 25$$

Conclusion: Both BEP values are smaller than the Revenue and Price Value obtained by producers, thus the business is feasible to continue.

(3) Calculation of Return on Investment

$$\text{ROI} = \frac{\text{Total Revenue} - \text{Total Investment}}{\text{Total Investment}} \times 100\%$$

$$\text{ROI} = \frac{289.255.050 - 200.000.000}{200.000.000} \times 100\%$$

$$\text{ROI} = 44,63\%$$

Based on the results of the business analysis above, it is known that the selling price of Arben rice is Rp. 35,335 or can be rounded up to Rp. 35,000 per pack of 100 gr, it will get BEP sales per batch of Rp. 8,914,850 with an income of Rp. 289,255,050/year. The payback period for the sale of arben rice is 2.42 years, where if the investment criteria are still within that time frame, then the investment proposal can be accepted. Based on the calculation of the

Based on the calculation of the NPV value of more than 0, so that according to the assessment criteria if the NPV is more than 0 (zero), then the investment proposal can be accepted.

The next calculation is the result of a positive discount factor of 39.97%. From the above calculation results, the IRR result is greater than 10% interest, then the investment proposal can be accepted. Thus, the calculation of the four types of investment appraisal techniques, it is obtained that the financial aspects reviewed are declared feasible and the investment proposal is acceptable, so that business development in the context of increasing production will run smoothly.

CONCLUSION

Based on the description above, the following conclusions can be drawn:

- (1) Extrusion technology is the process of forcibly flowing food through a barrel with one or more variations in the conditions of the mixing, heating and shearing process and passing it through a die designed to form and/or expand the extrusion product. The use of extrusion technology to make analog rice has many advantages, such as large capacity, the process of flowing, mixing, kneading, heating and forming, so that the analog rice produced has similar characteristics to rice.
- (2) The dietary fiber content of Arben Rice is 8 grams per serving of 100 grams and contains zinc by 50% of the Nutritional Adequacy Ratio (RDA). Soluble dietary fiber helps lower blood cholesterol levels when accompanied by a diet low in saturated fat and low in cholesterol. Zinc is a micronutrient that has an important role in the body's defense system. Zinc controls the activation of immune cells that fight the entry of infection. It is hoped that by consuming Arben rice, it can help increase the body's immunity during this pandemic.
- (3) Through the calculation of the types of investment appraisal techniques, it is obtained that the financial aspects reviewed are declared feasible and the investment proposals are acceptable, so that business development in the context of increasing production will run smoothly.

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