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Feasibility study on indigenous confectionery business – the case of gulo puan industries

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Abstract

Agricultural and dairy products can be processed into a more diverse range of products that can attract wider consumers, particularly the burgeoning urban middle-class. However, studies on such an industry, particularly those in the low and lower-middle income countries, are disproportionately sparse in the literature. Therefore, this study examines the financial viability of product diversification of swamp buffalo milk-based artisanal confectionery product named *gulo puan*, which is exclusively produced in Pampangan sub-district, Ogan Komering Ilir regency, South Sumatra, Indonesia. To improve its marketability, the diversification of gulo puan into chocolate bar-like products was proposed. Financial feasibility analyses Cost-Benefit Analysis which includes Net Present Value (NPV), Net Benefit Cost Ratio (Net B/C), Internal Rate of Return (IRR) and Payback Period were conducted to examine the financial feasibility of *gulo puan* chocolate bar. Furthermore, sensitivity analysis was carried out to account for uncertainty of data. The results represent by the value of NPV (IDR 210,519,017 equals to USD 14,493.56 and IDR 185,050,910 equals to USD 12,740.16), Net B/C (1.7 and 1.6), IRR (35%) and payback period (43 months), respectively. Sensitivity analysis shows positive NPV value despite an increase in raw material costs in 6% under more pessimistic assumption. Thus, it is concluded that the proposed implementation is viable, robust,

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and realistic. Hence, the government should play a key role to provide sufficient access to capital, upgrading skill and knowledge in order to improve the competitive edge of artisanal food industries. In addition, the diversification of *gulo puan* into chocolate bar-like products was proposed to improve marketability of the products.

Introduction

Indonesia is a developing country with a low-middle income level (LMIC, low-midlle income country), those low-middle income levels are mainly spread in rural areas (Hussain *et al*., 2007; Liu *et al*., 2019; Mastromarco *et al*., 2014; Mkondiwa *et al*., 2013). The majority of rural communities depend on agricultural products for their livelihood. Some of them process the produce into processed local food, with simple knowledge, skills and tools (Kpossilande *et al*., 2020). Therefore, the artisanal food industry (AFI) has been an important and often indispensable to the local economy. AFIs are able to contribute to local community income by distributing local food at affordable prices to the urban poor (Honfoga *et al*., 2018). In addition, AFI helps food availability by directly processing the raw products of livestock production, thereby reducing the amount of redundant production due to spoilage and extending the shelf life of these products.

Despite its importance, AFI faces constrains such as lack of or nonexistent professional staff, very low capital base, and poor food hygiene (Dossou *et al*., 2017). On the other hand, AFI is often underappreciated and even ignored in policy making in many countries particularly in LMIC. These artisanal industries are rarely recognized due to its informal nature, and hence it is not included in regional policies (Honfoga *et al*., 2018; Lybbert & Elabed, 2013). Due to lack of attention and unsystematic promotion to the growing middle-class masses in these countries, these products are often considered outdated, irrelevant, and out-of-fashion (Cirne *et al*., 2019). Moreover, there are differences in the consumption habits of urban and rural communities in LMIC (Popkin, 2014). Urban communities are closer to processed food compared to traditional foods counterparts. The changes in market preference of urbanians resulted in traditional food being abandoned, they prefer to consume modern-popular foods, which are mostly adapted versions of that from abroad (Honfoga *et al*., 2018).

In this study, industries of *gulo puan*, a dairy-based traditional food, was studied with a focus on its financial potentials. We explore a value added option by diversifying the *gulo puan* product into chocolate *gulo puan*

to increase its attractiveness to potential consumers. Snack food products have the same impact as agricultural products and marketing on business operations in food processing because their existence attracts consumers (Ahmed *et al*., 2020; Lybbert & Elabed, 2013). It is for this reason that we chose chocolate bar as a diversified product from this artisanal confectionery product. *Gulo puan*, with relatively high sugar content, is suitable to be processed into *gulo puan*-chocolate bar (GPCB). A specially-crafted *gulo puan* with some chocolate bar characteristics could potentially increase the attractiveness of *gulo puan*. The financial potentials of this diversification were examined through cost-benefit analysis (CBA), namely net present value (NPV), net benefit and cost ratio (Net B/C), internal rate of return (IRR), payback period, and sensitivity analysis.

The average annual income of *gulo puan* producers in 2013 in the Pampangan District was an average of IDR[1] 10.1 million or USD 711.88 (Aprilyanti & Sobri, 2018). As comparison, the regional minimum wage of workers in South Sumatra Province in the year of 2020 is IDR 36.5 million per year or USD 2,595.18 (Indonesian Central Bureau of Statistics, 2020b). Based on this data, the annual income of *gulo puan* business is apprehensive to provide financial benefits regardless of its promising potential. On the other side, there are several examples of successful practice and promotion of traditional food-derived value-added product in the literature, mostly in more advanced economies (e.g., in Parmigiano Reggiano region of Italy (Roest & Menghi, 2000), Brazil (Medeiros *et al*., 2017), West Australia (Azavedo & Walsh, 2018), United Kingdom (Blundel, 2010), and Japan (Hashimoto & Telfer, 2008)). A few examples in LMIC exist at limited quantity in the literature (Elisabeth, 2015; Kpossilande *et al*., 2020), which is far smaller than the rest of the world. Kpossilande *et al*. (2020) examined the potential of AFIs in West Africa using an economic potentials approach. Further, a study by Elisabeth (2015) uses a value-added approach to AFI products. In addition, the study of Honfoga *et al*. (2018), using a market integration approach and found that traditional food still dominates compared to popular food in rural areas in one of the LMIC countries in Africa. It indicates that traditional food remains engaged to the local community. On the other hand, product diversification could potentially extend the consumer base of the product in question towards urbanites.

With the rationale above, we propose an evaluation of diversification feasibility of *gulo puan* AFI, which was examined during the five years period. To the best of our knowledge, there are no studies examining the feasibility of AFI in LMIC using the CBA approach, we bridge this literature

1. IDR is Indonesian Rupiah; USD 1 equals to IDR 14.525.

gap. Despite the specific scope of the study, this study is aimed to provide a perspective of financial potentials of the industry, particularly on less-represented LMIC context. In addition, that necessary information provides policy makers to formulate policies for increasing financial viability of AFI products.

Considering the above issues, the paper was organized as follows. In section 1, we elaborate upon the background which consist of the explanation of the main product and challenges faced by AFIs. Section 2 describes the materials and methods as well as the theoretical framework of the research hypothesis. The empirical results and discussions are presented in section 3. Finally, conclusions and policy implications of the study are given in section 4.

1. Background

Gulo puan

Presently, *gulo puan* is produced almost exclusively in Pampangan, South Sumatra province, Indonesia (see Figure 1). In its original form, it consists of the basic ingredients of brown sugar and swamp buffalo milk. The local community, using relatively simple and manual processing tools, processes the buffalo milk into *puan gulo* with intention to prolong the milk shelf life. The process of making *gulo puan* is basically similar to that of caramel production. The difference is that caramel uses white sugar while *gulo puan* uses brown sugar. *Gulo puan* texture is soft, gritty, with a brownish color. It tastes sweet and slightly salty, which is akin to combination of caramel and cheese. The way to make it is by mixing five liters of swamp buffalo milk and a kilogram of brown sugar, then cook over low heat. The dough is then stirred for about five hours by gently and continuously to prevent lumping. It is noted that one of the reasons of the localized production of *gulo puan* is attributed to its specific ingredient, that is the swamp buffalo milk. Replacing it with other milk may change its texture and taste, particularly the umami level of the end product, which is its key characteristic.

Challenges of gulo puan AFI

Most small-scale dairy processing enterprises in LMICs tend to have challenging technical problems, e.g. sanitation quality, and poor economy-of-scale. The situation is changing gradually, though the capacity of utilization remains low (Dominguez-Salas *et al*., 2019). Further, dairy-based traditional

food, let alone confectionary, is relatively rare in tropical countries. Tropical countries with warm and humid weather present challenges in the process of making traditional dairy-based food. Therefore, the production of *gulo puan* in Pampangan district is merely traditional and not necessarily economical, which keeps the industry confined to the region itself.

Challenges faced by the *gulo puan* artisanal industry are similar to that in other typical LMIC counterparts. Those are the informal status of such business, poor transportation infrastructure, geographical isolation which lead to limited market coverage, inadequate knowledge and technology access, and limited labor skill. The popularity of *gulo puan* has been in steady decline, since a significant portion of its customers base are uninterested or aging. Potential younger customers are not interested to consume *gulo puan* as it is perceived as an old-fashioned food. The price of *gulo puan* is IDR 50,000 to IDR 60,000 (±USD 3.56 to 4.23) per kilograms. Currently, only few communities are still consuming the *gulo puan* on a regular basis, especially those from the Pampangan area. Outside its consumer base, the acceptance tends to be low or even repulsive due to the unusual aroma that comes from swamp buffalo milk. It should be noted that despite its relatively close distance to provincial capital of Palembang, there is only one minor road leading into the vicinity. The transportation access usually become worse during the rainy season where the road becomes slippery and muddy, complicating the marketing distribution process for AFIs. The challenges are not addressed properly since the AFIs are often overlooked by policy makers.

Despite efforts from the government to encourage the added value of local produce, in practice it has not been equally implemented, particularly in rural areas. Most income sources of the rural community derived from farming, such as selling crop products to the city. The revenue from the artisanal food industry is not even ranked within top ten of income contributors to the community in Pampangan district (Ogan Komering Ilir Regency, 2020). In addition to inadequate equipment, infrastructure, and technology, limited capital is also a basic obstacle in developing *gulo puan* AFIs. As local community turns to add other crops as their source of income, livestock can be more resilient to climate change than the existing crops, yet they can suffer adverse impacts such as heat or drought stress, increase of diseases, and ultimately animal losses, particularly in grazing systems in arid and semi-arid areas at low latitudes (HPLE, 2016). Furthermore, mechanization of agricultural activities in the area has proven to render the buffaloes as idle assets, potentially decreasing the scale of production (Aprilyanti & Sobri, 2018; Muhakka *et al*., 2013). Without government intervention, this problem cannot be solved independently by the community therefore, all of these challenges need to be addressed by policy makers to improve the standard of living of *gulo puan* producers.

CBA on Investment of AFI

The essence of CBA follows the assumptions of Pareto's theory (1896-1897) which says a project is said to be efficient only if at least one person gets better and no one is harmed. Furthermore, a project is said to have improvement if the total benefit is greater than the total cost. Hence, the benefits obtained can compensate the costs. If there is improvement, then the project is said to be efficient. CBA is often used in financial and political circles in terms of budget or financial analysis. However, there is no specific guidelines for conducting CBA, only that the analytical framework should be based on sequential steps. Similar to mathematical proofs, its integrity depends on following a consistent line of argument, starting with policy goals, alternative means of achieving goals, and taking into account any legal, physical, or institutional constraints (Dobes, 2019).

The CBA method is considered more practical to be applied to small-scale projects (Dobes, 2019). In addition, this method is one of the investment feasibility analysis that relies on economic rationality, the calculations are relatively minimalist but financially robust and valid. From a domestic viewpoint, the financial aspect of private enterprises is more conclusive than public-owned enterprises, for policy makers (Meyer *et al*., 2021). By this justification, the results obtained can influence interested parties, in particular the policy makers. In regard to this proposed project, AFIs is assumed as a small-scale private business. In despite of small business, if the project is successfully implemented, it will make a significant contribution on society (Friedman, 2005). The main priority in this study is to present financial calculations that can be achieved by the transformation of local products into popular products through product diversification. Thus, investors can access information that it is possible to improve local businesses based on local product. Furthermore, attention from the government in the form of policies becomes very important (Szeto & Kim, 2018). We therefore employed CBA as the method to examine the financial viability of *gulo puan* AFIs and proposed a hypothesis as follows:

H1: The diversification of local product (*gulo puan*) into popular product (GPCB) is financially viable

2. Materials and methods

Profile of the Study Area

Pampangan is a sub-district in Ogan Komering Ilir Regency with a distance of approximately 42 kilometers and 67.3 kilometers from the regency (Kayu Agung) and province (Palembang) capitals, respectively. This

sub-district is located in the northeast of the capital city of Komering Ilir Regency, namely Kayu Agung. It is located at an altitude of ±10 meters above sea level, with an area of 824.40 kilometers square and a population of 28,962 people (Indonesian Central Bureau of Statistics, 2020b).

Figure 1 - Maps of Pampangan sub-district within Ogan Ilir Regency and South Sumatra Province

Source: Ogan Komering Ilir Regency (2020).

Data collection

There are several stages in obtaining the data of this study. Firstly, small-scale laboratory experiments were carried out to determine the exact amount of material to transform *gulo puan* into GPCB. This data is further used to calculate the expected revenue and expenses of the proposed project. From the laboratory experiment it is found that the ingredients of GPCB is presented in Table 1.

Table 1 - The ingredients of making one kilogram of Gulo Puan *Chocolate Bar*

Item	**Quantity**
Gulo Puan	1,000 g
Cocoa Powder	375 g
Milk Powder (Full Cream)	90 g
Additional Flavor	30 g
Cocoa Butter	15 g

Source: Primary data collected in 2020.

Secondly, interviews were conducted at the study area to determine the influence of the existence of the *gulo puan* artisanal industries on social, economic, cultural and environmental conditions. There were 10 respondents who were randomly selected from 15 AFIs which were active workers and owners of AFIs. The interview consisted of semi-structured questions using the discussion group method. The questions consist of demographic questions, e.g., age and gender, and detailed questions related to social, economic, cultural and environmental conditions. The statistical data shows the respondents consist of 70% of female and 30% of male. The average annual income of *gulo* puan AFI is IDR 9.96 million equals to USD 685.71. Furthermore, we found that 100% *of gulo puan* producers attain skill and knowledge in processing *gulo puan* from their ancestors. It implies that they do not use modern skill nor upgraded knowledge (Table 2).

Table 2 - Descriptive statistics of respondents and related questions

Demographics		**Detailed Questions Responses**	**Result**
Female	70%	The average income from *gulo puan* AFI (yearly; Million IDR)	Average: IDR 9.96 million (USD 685.71)
Male	30%	The average of total income (yearly; Million IDR)	Mean: IDR 18.36 million (USD 1,264.02)
Age	Mean: 49.5	The origin of skill and knowledge in processing the *gulo puan* (passing down through generations=1; novel/ modern skill and knowledge=2)	1=100%; 2=0%
		Tools used (simple=1; sophisticated=2)	1=100%; 2=0%
		Infrastructure and transportation (good=1; poor=2)	1=20%; 2=80%

Source: Primary data collected in 2020.

The last stage was the collection of the secondary data. The secondary data was obtained from a literature study from Indonesian Central Bureau of Statistics. We used the Indonesian Central Bureau of Statistics website to examine the price and cost of each item (Indonesian Central Bureau of Statistics, 2020a).

Data analysis

The data was examined using qualitative and quantitative analysis. The result of laboratory experiment for ingredient of GBPC and interviews were classified as primary data which is used for qualitative analysis. Whilst quantitative analysis was carried out using secondary data which is collected from Indonesian Central Bureau of Statistics (2020a). After the data was collected, the initial balance sheet was designed. The financial statement consists of a classification of accounts in the accounting formula, namely assets, liabilities and equity. Furthermore, cash flow estimates for five years and an interest rate was employed to calculate the NPV, IRR, Net B/C, and payback period as well as sensitivity analysis. This study uses two scenarios. The first scenario uses a loan interest rate of 9%. For the second scenario, we use an interest rate of 11%, assuming the loan interest rate is the maximum MSME interest rate based on historical data in Indonesia.

By displaying comprehensive calculation results, interested parties can see the value of NPV, IRR, net B/C, PP[2], respectively. Technically, one calculation of viable result will be followed by the other calculation. However, in this study, we decided to display all the calculation results with the consideration that the more complete the information provided will explain better. Likewise for sensitivity analysis, we can predict how far the results of this calculation are sensitive to changes in significant factors, such as raw materials.

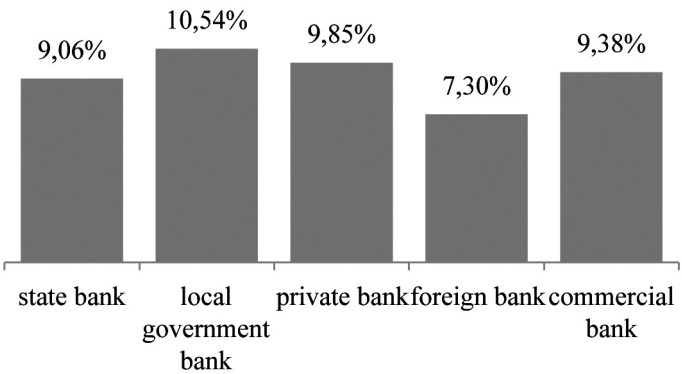
3. Results

At the time of the study, there were fifteen *gulo puan* AFIs in Pampangan. In this study, *gulo puan* AFIs are aggregated into one legal entity for a five-year period (2020 to 2024). Cost increase was calculated based on the inflation rate of Indonesia. The inflation rates of Indonesia is at 4% per year. Furthermore, the cost of establishing and installing electricity comes from personal capital, whilst additional capital is obtained from loan (bank debt) in the amount of IDR 150,000,000 or around USD 1,500. The average Micro Small Medium Enterprise (MSME) annual loan interest rate is 9.23%, while the lowest and highest interest is at the point of 7.3% and 10.54%, respectively (see Figure 2).

2. We use four measurements in term of CBA, comprises of NPV, IRR. Net B/C and Pavback Period. The formulation of each measurement is as follows: NPV=$\sum_{t=1}^{n}\frac{Bt}{(1+i)^t}-\sum_{t=1}^{n}\frac{Ct}{(1+i)^t}=\sum_{t=1}^{n}\frac{Bt-Ct}{(1+i)^t}$; IRR=$\frac{NPV}{NPV\ -NPV'}\ (i'-i)$; Net B/C=$\sum_{t=0/1}^{n}\frac{\frac{B_t-C_t}{(1+i)^t}}{\frac{B_t-C_t}{(1+i)^t}}$; Payback Period=$\frac{I}{A_b}$.

The areas of interest in this study are cost and revenue. The costs are classified into several categories, namely investment costs, production costs and operating costs. Meanwhile, revenue is estimated from sales of chocolate bars price multiply by estimated number of bars of aggregated entity.

Figure 2 - Average Loan Interest Rates



Source: Bank of Indonesia (2020).

Cost breakdown

Total costs include investment, production and operating costs. Investment costs are obtained from personal capital consisting of establishment costs and electrical installation costs which occur once at the time of establishment. The cost of acquisition of fixed assets is obtained by loan capital. The rest of capital loan is saved in the form of cash or cash equivalents. Establishment cost is required to establish the legal aspect of new company, which consists of notary fees, business license and registration fees of IDR 5,000,000 or USD 344.23. In addition, the company has to register a corporate taxpayer identification number which is free of charge. Electricity for MSME business scale is at the cost of IDR 454 (USD 0.032) per Volt Ampere (VA)[3]. Thus, the cost of installing electricity power by the State electricity company in Indonesia is IDR 13,274,960[4] equals to USD 913.93. Electricity installation

3. Electricity for MSME business scale is classified between 14.1 VA to 200 kVA, where VA is the abbreviation of volt ampere. Volt ampere is the unit of apparent power in electrical circuit and kVA is the kilo volt ampere. 1 kVA equals to 1,000 VA.

4. The calculation of installing cost defines as the multiplication of 29.24kVA x IDR 454 x 1,000 VA. 29.24 kVA is denoted for the electrical power needed of the project.

service costs consist of electric transformer (IDR 6,000,000 or USD 413.08) and installation fees (IDR 5,000,000 or USD 344.23). Furniture, fixture, machine, vehicle and other assets that are used more than a year are classified as fixed assets.

The cost of fixed assets are the acquisition costs which have been capitalized by shipping, installation, testing fees up to ready-to-use assets. The vehicle used is assumed to be a modified motorcycle to meet the transportation challenge due to poor transportation infrastructure from the *gulo puan* AFIs location to the production center of GBPC. Production center is in Palembang, the capital of the province. The rationale of choosing modified motorcycle is that the road access is rough, bumpy and mostly consists of only non-all weather one lane, thus presenting difficulties for traversing heavy vehicles.

Furthermore, during the rainy season the road terrain is much worse due to mud and soil. Lastly, the cost of packaging, stickers, and leaflets design for promotion purposes was specified at IDR 1,500,000 (USD 103.27). The total investment costs for the GPCB at the time of business establishment are shown at Table 3.

Table 3 - Estimated total investment costs

Item	**Investment Cost (IDR)**
Business establishment	5,000,000
Electrical installation	24,274,960
Fixed assets	85,800,000
Equipment[5]	18,350,000
Miscellaneous	1,500,000
Total	**134,924,960**

Source: Indonesian Central Bureau of Statistics (2020a).

Gulo puan is the main raw material in producing GPCB bars. Based on a small-scale laboratory test, each kilogram of *gulo puan* is estimated to bring out 1.5 kilograms of chocolate bar. Other food ingredients (Table 4) are added to improve and to vary the flavor of chocolate bar. In this case, we added nuts, dried fruits and honey.

5. Equipment is classified into current assets. The list is shown at Table A1 in appendix.

Table 4 - Total cost for 1.5 kilogram of GPCB

Item	Quantity	Price/g (IDR)	Total cost (IDR)
Gulo Puan	1,000 g	60	60,000
Cocoa Powder	375 g	225	84,375
Milk Powder (Full Cream)	90 g	75	6,750
Additional Flavor	30 g	200	6,000
Cocoa Butter	15 g	250	3,750
Total			**160,875**

Source: Indonesian Central Bureau of Statistics (2020a); Primary data collected (2020).

As seen at Table 4, the total cost of raw materials to produce 1.5 kilograms of chocolate bars is IDR 160,875 (USD 11.07) or IDR 103.2 (USD 0.0072) per gram of *gulo puan*. The GPCB is assumed to be marketed in several sizes, at the size of 30 grams, 60 grams, and 100 grams. Several package sizes are available to give costumers more flexible options. A study conducted by Thaichon *et al*. (2018) revealed that most consumers chose to buy a smaller size product because it is more handy and easier to carry. Moreover, smaller size will be more affordable for those with lower income. The targeted sales of this project are thus on the smaller size (i.e., 30 grams). The annual sales targets for this project are represented in Table A7. The total cost of raw materials in the first year is IDR 366,566,400 or USD 25,236.92 (3,552,000 grams multiply by IDR 103.2/gram or USD 0.0072/ gram).

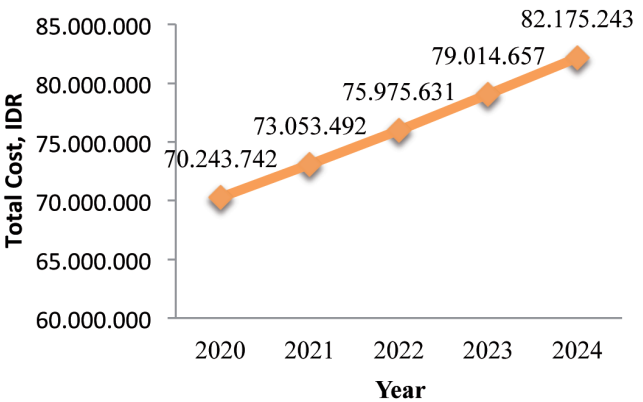
The cost of production equipment yearly was assumed to be 20% of the equipment costs provided for investment in business establishment. Therefore, the amount is 20% multiply by IDR 18,350,000 (USD 1,263.33) which equals to IDR 3,670,000 (USD 252.66). Furthermore, the estimated total production cost during period of project (2020 to 2024) is given in Table 5. It includes the cost of raw material, quality control and packaging, equipment and labor cost.

The operational cost is consist of administration, maintenance, electricity, water subscription, internet subscription, transport cost, miscellaneous cost, depreciation, rental cost of place of business as well as rental cost of several equipments such as brookfield texture analyzer, muffle furnace, spectrophotometer to ensure the quality of each production.

Table 5 - Estimated production cost for five-year project. Total production cost consists of production material, quality control & packaging, production equipment, labor cost. It is assumed to increase by 4% a year

Production Cost	**2020**	**2021**	**2022**	**2023**	**2024**
Raw material	366,566,400	381,229,056	396,478,218	412,337,347	428,830,841
Quality control and packaging	33,000,000	34,320,000	35,692,800	37,120,512	38,605,332
Equipment	3,670,000	3,816,800	3,969,472	4,128,251	4,293,381
Labor cost	72,000,000	74,880,000	77,875,200	80,990,208	84,229,816
Total	**475,236,400**	**494,245,856**	**514,015,690**	**534,576,318**	**555,959,371**

Figure 3 - Estimated operational cost for five-year project. Total operational cost consists of all operational related activities, including depreciation. It is assumed to increase by 4% a year

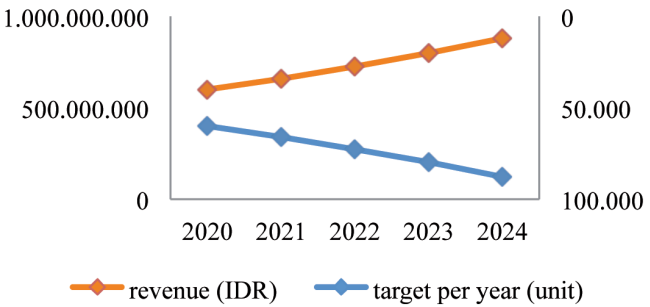


Revenues

Revenue of this project is calculated by multiplying sales targets and the price of each size of GBPC. The price is determined by aggregated the costs and comparing the price of similar products. The sales target per year for each size are shown in Table A9. The GPCB products are assumed to be sold in three different sizes, listed as small (30 grams), medium (60 grams), and large (100 grams). Sales target per day is 250 packs consisting of 70 pieces of big size, 80 pieces of medium size and 100 pieces of small size. The operational working days of business were assumed to be 240 days (5 working days a week). Sales target increases by 10% per

year, assuming *ceteris paribus* from the data published by the International Cocoa Organization (ICCO) Consultative Board (2010) which revealed that consumption of chocolate confectionery products increased by 11% between 2000 to 2008 corresponding to an average of annual growth rate of Indonesia is at 5.1%. Meanwhile, the average of annual growth rate of Indonesia for the past 10 years is 5.4% (Indonesian Central Bureau of Statistics, 2020b).

Figure 4 - Estimated chocolate bar selling revenue for five-year project



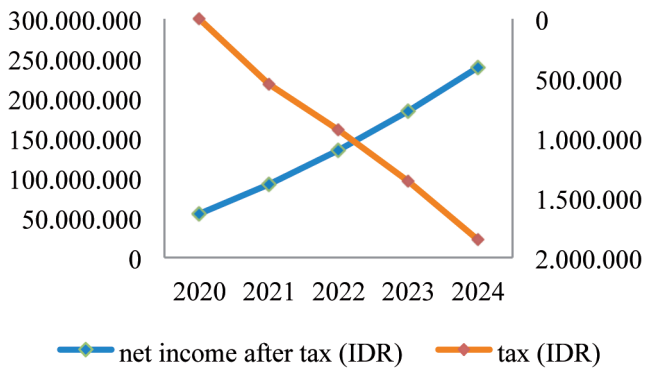
Source: Indonesian Central Bureau of Statistics (2020a); Primary data collected (2020).

The GPCB production per year is estimated at 60,000 packages, which equals to 3,552 kg of *gulo puan* per year in total. It implies that *gulo puan* AFIs at Pampangan should be produced at least 9.7 to 10 kg per day (3,552 divided by 365 days) to meet the minimum production quantity to transform into GBPC. The solution is by increasing the female buffalo population, and/or boosting the milk productivity per buffalo. The former can be achieved by providing incentives to farmers, while the latter can be achieved by improving nutrition feed intake (Naveed-ul-Haque *et al.*, 2018) and educating the farmers to adhere to good milk-producing buffalo rearing practice (Deb *et al.*, 2016; Sweers *et al.*, 2014). Moreover, based on the above data, it is necessary to calculate net income and cash flow in determining the result of investment criteria analysis.

The profit generated from the project shows the amount of IDR 54,519,858 (USD 3,753.51), IDR 92,155,454 (USD 6,344.60), IDR 135,081,672 (USD 9,299.94), IDR 183,648,939 (USD 12,643.64), and IDR 238,475,296 (USD 16,418.26) in the first, second, third, fourth, and fifth year, respectively (Figure 5). Based on Indonesian Government Regulation Number 46 in the year of 2013, corporate taxpayers with a gross turnover not more than IDR 4.8 billion (± USD 334.809) in a year will be charged a tariff of 1%. Gross turnover is the net income for the following year thus, the implementation of

the tariff is for the following tax period. Therefore, in the first year of project the income tax is zero, meanwhile in the further period the amount of tax is IDR 545,199 (USD 37.53), IDR 927,007 (USD 63.82), IDR 1,360,087 (USD 93,63), and IDR 1,850,000 (USD 127.36).

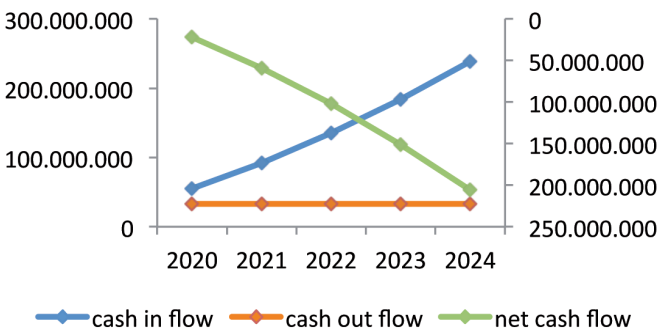
Figure 5 - Estimated Net Income for Five-year Project



Source: Indonesian Central Bureau of Statistics (2020a); Primary data collected (2020).

Figure 6 shows net cash flow data of GPCB based artisanal confectionery product project for five years period. Cash inflow is obtained from net income plus depreciation expense, while cash outflow represents payments from bank loans. The amount of net cash flow is obtain from the deduction between cash in flow and cash out flow. We calculated the amount of net cash flow in every period are IDR 21,819,858, IDR 59,455,454, IDR 102,381,672, IDR 150,948,939, IDR 205,775,296, respectively.

Figure 6 - Estimated Cash Flow for Five-year Project



Source: Indonesian Central Bureau of Statistics (2020a); Primary data collected (2020).

Feasibility analysis

The decision to invest in a project is difficult (Dué, 1991). Therefore, financial analysis is needed prior to deciding on an investment. Financial analysis is what needs to be done first to ensure that the project is economically feasible. If the financial feasibility is met, it means that there is added economic value that provides benefits from the proposed project (Dué, 1991). Financial feasibility uses a market price approach. Whilst, the calculation of economic feasibility uses social price (shadow price), which in the scope of this study, it is complicated to determine the accurate social price. Market prices are generally available and accessible, besides that the results of financial feasibility using CBA calculations are relatively accurate, especially if used on small and private projects. Which in turn the objective of this study is to increase the added value of local products to deliver economic and social impact. In the end, it can be taken into account by policy makers to develop competitiveness of AFI, one of which is through diversification of local food products.

NPV is employed to measure the opportunities and financial viability of the project assuming that there are changes in cost or productivity which impart effect to the cash flow of a company. The interest rate used in NPV calculation is 9% which is the prevailing bank loan interest rate (Indonesian Central Bureau of Statistics, 2020a).

NPV shows positive value of IDR 185,050,910 (USD 12,740.16) and IDR 210,519,017 (USD 14,493.56). It indicates that the proposed investment in the next five years will receive positive net benefits. In addition, net B/C ratio of 1.6 or 1.7 is a comparison of the total present value of net cash flows. An

Table 6 - Investment criteria result of CBA analysis

Criteria	Result	Explanation
NPV	Debt ratio 9%: IDR 210,519,017 (USD 14,493.56) Debt ratio 11%: IDR 185,050,910 (USD 12,740.16)	NPV > 0 = feasible
Net B/C	9%: 1.7 11%: 1.6	Net B/C > 1 = feasible
IRR	35%	IRR > debt ratio (i.e., 9%, max 11%) = feasible
Payback Period	Personal capital: 16 months Total capital: 43 months	PP < project period (5 years) = feasible

IRR of 35% indicates that this business projection can return the investment capital up to a loan interest rate of 35% per year. It is noted that the IRR is considerably larger than the loan interest rate (i.e., 9%). Furthermore, the repayment periods for the business are shorter than the proposed project, which are 16 months and 43 months. It is concluded that the proposed project is feasible.

Sensitivity Analysis

Lastly, sensitivity analysis was conducted to examine the effect of changes in production parameters on performance of the production system in generating profits. Sensitivity analysis looks at what might happen if a certain change occurs in a variable. For example, how will the results change if the expected price changes. The results obtained will provide an indication of the resilience of a project to unexpected exogenous shocks. Since the economic assumptions on which the analysis is based are not expected to remain the same, the analysis indicates the extent to which the analysis results will be valid.

By conducting a sensitivity analysis, the possible consequences of these changes can be anticipated in advance. Any changes in production costs or a declining in productivity affect the feasibility level (measured by NPV). We performed sensitivity analysis by using two scenarios in the CBA method, namely the optimistic scenario using a 9% loan interest rate and a pessimistic scenario with a 11% loan interest rate. With a pessimistic scenario, this project is still feasible to perform.

However, we retested the sensitivity of this project using the cost of GPCB raw materials. The main raw materials in producing GPCB are *gulo puan* and cocoa powder. Based on the interviews to workers and owners of *gulo puan* AFIs, the tendency of *gulo puan* price is relatively stable, means no significant changing in price. However, according to the data published by the ICCO Consultative Board (2010), the international price of cocoa (in the form of cocoa beans) circa 1980-2010 has experienced considerable fluctuation. Hence, the price of cocoa bean induces the price changing of cocoa in the form of semi-processed products, such as cocoa powder. Based on this history, we predicted the price of cocoa powder for five years further using extrapolation. By employing the linear regression analysis, the result indicates that the cocoa powder price could possibly shifts 0.92% higher annually. Because of the fluctuation of cocoa powder price, we therefore conducted sensitivity analysis using two scenarios, namely optimistic and pessimistic. In optimistic scenario, it is assumed that the raw material cost reduces at 3 and 6%. We performed pessimistic scenario to assume the worst risk of raw

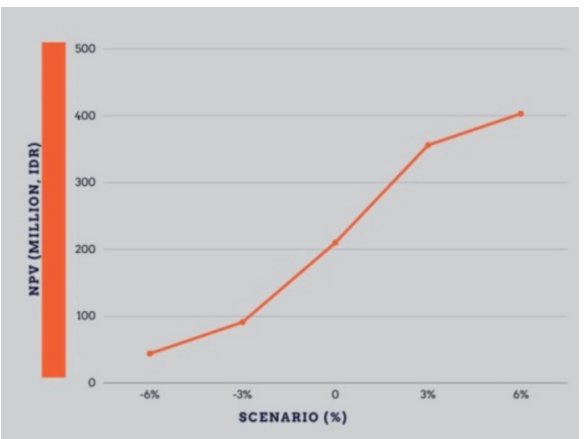
material increases and decline in sales. In this analysis, we employed much higher percentage increase in price per year than that of fluctuating annual rate of raw material, considering the cacao powder price changes contribute 2.4% of total material costs.

Table 7 - Calculated NPV from sensitivity analysis of raw material and sales

Scenario	Indicator	NPV (IDR)
Pessimistic	Sales declined at 3% Raw material cost increased at 3%	91,411,179
	Sales declined at 3% Raw material cost increased at 6%	44,490,017
Optimistic	Sales increased at 3% Raw material cost declined at 3%	356,939,098
	Sales increased at 3% Raw material cost declined at 6%	403,860,260

The results of sensitivity analysis show that positive NPV value (NPV > 0), despite the scenario is assumed to be pessimistic with an increase in raw material costs of 6% and a decrease in sales of 3% (see Table 7) which is depicted in Figure 7. It is concluded that chocolate bar-based artisanal confectionery product project presented herein is feasible and not sensitive to changes in raw material costs up to 6%.

Figure 7 - Plot of sensitivity analysis of raw material and sales



4. Conclusions and Policy Implications

The results of CBA indicate that product diversification of swamp buffalo milk-based artisanal confectionery product named *gulo puan* is financially viable and has high economic potential for implementation. Furthermore, the sensitivity analysis confirms that our results are robust and realistic to be implemented. Hence, the proposed hypothesis is not rejected at NPV IDR 210,519,017 (USD 14,493.56), Net B/C 1.7%, IRR 35.0054% and payback period 43 months, respectively.

With this innovation, it is expected that swamp buffalo milk production can be increased to foster the local economy. The milk itself is potential to be upgraded, thus it become products that represent artisanal confectionery products with value added in it. The extent of the viability of *gulo puan* AFI demonstrated in this study indicates the considerable potential benefits and implications in terms of financial aspect. Apart from financial benefits, this proposed project has a positive impact to conserve the swamp ecosystem, which is the habitat of swamp buffalo. The taste, quality, texture, size, price and diversity of mixed ingredients are important traits in selection of chocolate bar and chocolate bar-like products from the perspective of consumers (Thaichon *et al.*, 2018). Therefore, it is important for this project to maintain the aforementioned factors, taking into consideration that chocolate bar consumers are price sensitive (Romaniuk & Nenycz-Thiel, 2014). Thus, with competitive prices, local products still have wide market opportunities.

On wider scale, product diversification needs to be considered as a means of increasing income and harness the natural resources potentials in LMICs, particularly in rural areas. Limited skills and knowledge, technological constraints, and poor transportation are persistent problems that requires attentions and region-specific policies. With addressed policies, AFIs could access and attract bigger capital, improve the production method (e.g. towards standardized Good Manufacturing Practice, GMP) with the assistance of professionals in their fields in assessing every business operational activity. Hence, the government should play a key role to provide sufficient access to capital, expertise and knowledge in order to improve the competitive edge of AFIs. In addition, further study should examine the impact of project feasibility of AFI on woman entrepreneurs, given that majority of the owners and active workers of *gulo puan* AFIs is female.

References

Ahmed, J., Tefera, T., & Kassie, G.T. (2020). Consumers' preference and willingness to pay for enriched snack product traits in Shashamane and Hawassa cities, Ethiopia. *Agricultural and Food Economics*, *8*(1), 14. doi: 10.1186/s40100-020-00157-1.

Aprilyanti, N., & Sobri, K. (2018). Contribution of Gulo Puan Business Income to Family Income of Rice Farmers in Pampangan District, Ogan Komering Ilir Regency. *Societa: Jurnal Ilmu-Ilmu Agribisnis*, *2*(2), 67-71. doi: 10.32502/JSCT.V2I2.1192.

Azavedo, M., & Walsh, J. (2018). Artisanal Food Production And Marketing In The Perth Area Of Western Australia: Some Preliminary Indications Of Difficulties With Classical Economics And Supply Chain Theory. *Agricultural and Food Economics*, *16*(1), 47-57. doi: 10.1186/S40100-014-0023-0.

Bank of Indonesia (2020). *Bank Indonesia*. -- www.bi.go.id/seki/tabel/TABEL1_26.pdf.

Blundel, R. (2002). Network evolution and the growth of artisanal firms: a tale of two regional cheese makers. *Entrepreneurship & Regional Development*, *14*(1), 1-30. doi: 10.1080/08985620110094647.

Cirne, C.T., Tunick, M.H., & Trout, R.E. (2019). The chemical and attitudinal differences between commercial and artisanal products. *Npj Science of Food*, *3*(1), 1-4. doi: 10.1038/s41538-019-0053-9.

Deb, G.K., Nahar, T.N., Duran, P.G., & Presicce, G.A. (2016). Safe and Sustainable Traditional Production: The Water Buffalo in Asia. *Frontiers in Environmental Science*, *4*. doi: 10.3389/fenvs.2016.00038.

Dobes, L. (2019). Special Issue: Regional Economic Development in Australia. *ECONOMIC PAPERS*, *38*(2), 156-166.

Dominguez-Salas, P., Omore, A., Omosa, E., & Ouma, E. (2019). Agrifood systems in low- and middle-income countries: Status and opportunities for smallholder dairy in LMIC. *Encyclopedia of Food Security and Sustainability*. doi: 10.1016/B978-0-08-100596-5.21543-6.

Dossou, S.A.R., Aoudji, A.K.N., & Adegbidi, A. (2017). Processing of local agricultural products to meet urban demand: lessons from soybean cheese consumption analysis in Southern Benin. *Afr J Market Manag*, *9*(8), 133-143. doi: 10.5897/AJMM2017.054.

Dué, R.T. (1991). The Real Costs and Benefits of Case. *Journal of Information Systems Management*, *8*(3), 63-66. doi: 10.1080/07399019108965001.

Elisabeth, D.A.A. (2015). Added Value Improvement of Taro and Sweet Potato Commodities by Doing Snack Processing Activity. *Procedia Food Science*, *3*, 262-273. doi: 10.1016/J.PROFOO.2015.01.029.

Friedman, D. (2005). Economics and evolutionary psychology. In: R. Koppl (Ed.), *Evolutionary psychology and economic theory, Advances in Austrian economics, Vol. 7.* Emerald Group Publishing. eBook download. Electronic copy -- available from www.daviddfriedman.com/Academic/econ_and_evol_psych/economics_and_evol_psych.html.

Hashimoto, A., & Telfer, D.J. (2008). From saké to sea urchin: Food and drink festivals and regional identity in Japan. *Food and Wine Festivals and Events Around the World: Development, Management and Markets* (1st ed.). doi: 10.4324/9780080887951-28.

Honfoga, B.G., N'tandou-Bonzitou, G., Vodouhè, R.S., Bellon, M.R., & Hounhouigan, J.D. (2018). Assessing the role of market integration in the consumption of traditional foods in Benin: a joint price instability coefficient and diet composition approach. *Agricultural and Food Economics*, *6*(1), 1-18. doi: 10.1186/S40100-018-0097-1.

HPLE (2016). *Sustainable Agricultural Development for Food Security and Nutrition: What Roles for Livestock? A Report by the High Level Panel of Experts on Food Security and Nutrition. HLPE Report 10 |Policy Support and Governance| Food and Agriculture Organization of.* FAO. -- www.fao.org/policy-support/tools-and-publications/resources-details/en/c/854204.

Hussain, I., Gichuki, F., Louw, A., Andah, W., & Moustafa, M. (2007). Agricultural water management pathways to breaking the poverty trap: Case studies of the Limpopo, Nile and Volta river basins. *Irrigation and Drainage*, *56*, 277-288. -- https://cgspace.cgiar.org/handle/10568/40841.

Indonesian Central Bureau of Statistics (2020a). *Badan Pusat Statistik*. -- https://bps.go.id.

Indonesian Central Bureau of Statistics (2020b). *Badan Pusat Statistik*. -- www.bps.go.id/pressrelease/2020/11/05/1738/ekonomi-indonesia-triwulan-iii-2020-tumbuh-5-05-persen--q-to-q-.html.

International Cocoa Organization (ICCO Consultative Board) (2010). *International Cocoa Organization (ICCO Consultative Board)*. -- www.icco.org/statistics.

Kpossilande, C.E., Honfoga, B.G., & Ferre, T. (2020). Economic potentials of artisanal food processing microenterprises in West Africa: case of "atta" production in Cotonou (Benin). *Agricultural and Food Economics*, *8*(1), 1-18. doi: 10.1186/S40100-020-00168-Y.

Liu, M., Feng, X., Wang, S., & Qiu, H. (2019). China's poverty alleviation over the last 40 years: successes and challenges. *Australian Journal of Agricultural and Resource Economics*, *64*(1), 209-228. doi: 10.1111/1467-8489.12353.

Lybbert, T.J., & Elabed, G. (2013). An Elixir for Development? Olive Oil Policies and Poverty Alleviation in the Middle East and North Africa. *Development Policy Review*, *31*(4), 485-506. doi: 10.1111/DPR.12016.

Mastromarco, C., Peragine, V., Russo, F., & Serlenga, L. (2014). Poverty, inequality and growth in Albania. *Economics of Transition*, *22*(4), 635-682. doi: 10.1111/ECOT.12048.

Medeiros, J.M.S. de, Câmpelo, M.C.S., & Silva, J.B.A. da (2017). Good manufacturing practices of artisanal products in Northeastern Brazil. *Journal Homepage*, *1*(4), 103-108. doi: 10.26656/fr.2017.4.050.

Mkondiwa, M., Jumbe, C.B.L., & Wiyo, K.A. (2013). Poverty – Lack of Access to Adequate Safe Water Nexus: Evidence from Rural Malawi. *African Development Review*, *25*(4), 537-550. -- https://ideas.repec.org/a/adb/adbadr/2092.html.

Muhakka, M., Riswandi, R., & M. Ali, A.I. (2013). Morphological Characteristics and Reproduction of Pampangan Buffalo in South Sumatra Province. *Jurnal Sain Peternakan Indonesia*, *8*(2), 111-120. doi: 10.31186/JSPI.ID.8.2.111-120.

Naveed-ul-Haque, M., Akhtar, M.U., Munnawar, R., Anwar, S., Khalique, A., Tipu, M.A., Ahmad, F., & Shahid, M.Q. (2018). Effects of increasing dietary protein supplies on milk yield, milk composition, and nitrogen use efficiency in lactating

buffalo. *Tropical Animal Health and Production*, *50*(5), 1125-1130. doi: 10.1007/S11250-018-1539-1.

Ogan Komering Ilir Regency (2020). *Ogan Komering Ilir Regency*. https://okikab.bps.go.id.

Pareto, V. (1896-1897). Premier Cours d'Économie Politique Appliquée Professé à l'Université de Lausanne. Paris: Rouge/Pichon.

Popkin, B.M. (2014). Nutrition, agriculture and the global food system in low and middle income countries. *Food Policy*, *47*, 91-96. doi: 10.1016/J.FOODPOL.2014.05.001.

Roest, K. De, & Menghi, A. (2000). Reconsidering 'Traditional' Food: The Case of Parmigiano Reggiano Cheese. *Sociologia Ruralis*, *40*(4), 439-451. doi: 10.1111/1467-9523.00159.

Romaniuk, J., & Nenycz-Thiel, M. (2014). Measuring the Strength Of Color Brand-Name Links. *Journal of Advertising Research*, *54*(3), 313-319. doi: 10.2501/JAR-54-3-313-319.

Sweers, W., Möhring, T., & Müller1, J. (2014). The economics of water buffalo (Bubalus bubalis) breeding, rearing and direct marketing. *Archives Animal Breeding*, *57*(1), 1-11. doi: 10.7482/0003-9438-57-022.

Szeto, M., & Kim, Y.C. (2018). Costs and benefits of business-government relations: Empirical analysis of former-communist transition economies. *Int. J. Bus. Soc.*, *19*(1), 219-232.

Thaichon, P., Jebarajakirthy, C., Tatuu, P., & Gajbhiyeb, R.G. (2018). Are You a Chocolate Lover? An Investigation of the Repurchase Behavior of Chocolate Consumers. *Journal of Food Products Marketing*, *24*(2), 163-176. doi: 10.1080/10454446.2017.1266551.

The ICCO Consultative Board (2010). *EXECUTIVE COMMITTEE One hundred and forty-second meeting Bloomsbury House, 2-3 Bloomsbury Square, London WC1A 2RL THE WORLD COCOA ECONOMY: PAST AND PRESENT.*

Appendices

Table A1 - Estimated fixed assets and current assets

Asset	Quantity	Price/unit (IDR)	Total cost (IDR)
Fixed Assets			
Oven Vacuum (50 Liters)	1	22,500,000	22,500,000
Display Refrigerator (4 Decks)	3	3,000,000	9,000,000
Chest Freezer (double door 1,200 Liters)	2	10,500,000	21,000,000
Mixer (20 Liters)	1	7,000,000	7,000,000
Cashier Table	1	600,000	600,000
Display Table	3	300,000	900,000
Chair	4	50,000	200,000
Cashier Machine (Casio SE-S10)	1	2,300,000	2,300,000
Air Conditioner (1 PK)	1	3,000,000	3,000,000
Desicator	1	1,600,000	1,600,000
Modified Motorbike	1	13,500,000	13,500,000
Total Fixed Assets			
Current Assets			
Stainless Measuring Container 10 Liters	10	700,000	7,000,000
Stainless Measuring Cup 5 Liters	5	900,000	4,500,000
Stainless Measuring Cup 1 Liters	10	200,000	2,000,000
Silicone Mold 30gr	50	20,000	1,000,000
Silicone Mold 60gr	50	26,000	1,300,000
Silicone Mold 100gr	50	30,000	1,500,000
Spoon 50ml	20	40,000	800,000
Heat Resistant Spatula	5	50,000	250,000
Total Current Assets			

Table A2 - Estimated quality control and packaging costs

Material	Quantity	Price/unit (IDR)	Total cost (IDR)
Protein Analysis:			
– Potassium hydroxide	500 grams	6,000	30,000
– Concentrated sulfuric acid	500 ml	140	70,000
– Aquadest	4 Liters	25,000	100,000
– Boric acid	500 grams	10,000	50,000
Color Analysis:			
– Color checker	1	2,000,000	2,000,000
Lipid content analysis:			
– Shock let	15	50,000	750,000
Food Packaging	60,000	500	30,000,000
Total			**33,000,000**

Table A3 - Estimated transportation cost

Item	Total cost (IDR)
Fuel	2,041,804
Parking	300,000
Total	**2,341,804**

Table A4 - Estimated electricity cost for first-year GPCB small business establishment

Item	Quantity	Electrical Power (kWh)	Electrical Power/year (kWh)	Total Electrical Power/year (IDR)
Oven Vacuum	1	0,4	737,28	1.081.796,20
Display Refrigerator*	3	0,18	2.954,88 (WLBP)	4.335.636,33
			1.088,64 (WBP)**	1.597.339,70
Chest Freezer*	2	0,468	5.121,80 (WLBP)	7.515.102,97
			3.773,95 (WBP)**	5.537.444,29
Mixer	1	1,1	2.027,52	2.974.939,54
Air Conditioner	1	0,35	589,82	865.436,95
Muffle furnance 1.3 L (mineral analysis)***	1	1,06	488,45	716.689,98
Spectrophotometer 1200L/mm grating***	1	0,22	101,37	148.746.98
Lamp (lighting)	6	0,001	11,06	16.226,94
Cashier Machine	1	0,0035	6,45	9.456,71
Electricity Cost for Medium Enterprise ****	–	2,5025 (3,128 kVA)	30,03	2.203.120,92
Total				**27.001.937,51**

* All electricity usage for equipment other than refrigerators and freezers is calculated during peak load time (PLT), except refrigerators and chest freezers which are used every day (30 days) for 24 hours with peak load outside time (PLOT) for 5 hours each day (17.00-22.00).
** The ratio of PLT (K) is between 1.4 to 2. In this case, it is considered that business electricity is charged under PLT of 1.4.
***It is assumed only used two hours in a day of 24 working days.
**** Electricity cost applied minimum account (day hour), the calculation is 40 (hours on) x connected power (kVA) x usage cost.

Table A5 - Estimated fixed assets depreciation

Item	Quantity	Estimated period	Book value	Residual period	Depreciation/ year (IDR)
Oven Vacuum	1	15	22,500,000	0	1,500,000
Display Refrigerator	3	10	3,000,000	0	300,000
Chest Freezer	2	10	10,500,000	0	1,050,000
Mixer	1	10	7,000,000	0	700,000
Cashier Table	1	10	600,000	0	60,000
Display Table	3	5	300,000	0	60,000
Chair	1	5	200,000	0	40,000
Cashier Machine	1	10	2,300,000	0	230,000
Air Conditioner	1	5	3,000,000	500,000	500,000
Desicator	1	10	1,600,000	0	160,000
Modified Motorbike	1	5	13,500,000	2,000,000	2,300,000
Total					**6,900,000**

Table A6 - Forecasting of cocoa powder price circa 2020-2024

Year	Price (ratio)
2020	0.99
2021	1.01
2022	1.03
2023	1.05
2024	1.07

Table A7 - Estimated annual sales target of GPCB

Size	Target (pc)	Total (kg)
100 grams	16,800	1,680
60 grams	19,200	1,152
30 grams	24,000	720
Total	**60,000**	**3,552**

Table A8 - Estimated labor costs

Position	Quantity	Salary/person (IDR)	Months	Total cost (IDR)
Workman/woman	2	1,500,000	12	36,000,000
Marketing	1	3,000,000	12	36,000,000
Total				**72,000,000**

Table A9 - Estimated GPCB sales and revenues

Size	Target sales (piece)	Price/Piece (IDR)	Revenue (IDR)
100 grams	16,800	15,000	252,000,000
60 grams	19,200	10,000	192,000,000
30 grams	24,000	6,500	156,000,000
Total			**600,000,000**

Table A10 - NPV of 9% and 11% interest rate

Year	Net cash flow	Discount factor of 9%	Present value of 9%	Discount factor of 11%	Present value of 11%
2020	21,819,858	0.91743	20,018,218	0.90090	19,657,530
2021	59,455,454	0.84168	50,042,466	0.81162	48,255,380
2022	102,381,672	0.77218	79,057,436	0.73119	74,860,596
2023	150,948,939	0.70843	106,936,034	0.65873	99,434,741
2024	205,775,296	0.64993	133,739,824	0.59345	122,117,623
Total Present Value			389,793,977		364,325,870
Equity			179,274,960		179,274,960
Net Present Value			210,519,017		185,050,910

Table A11 - Net benefit cost ratio of 9% and 11%

Year	Cash In flow	Discount factor 9%	Present worth	Discount factor 11%	Present worth
2020	54,519,858	0.925925926	50,481,350	0.900900901	49,116,989
2021	92,155,454	0.85733882	79,008,448	0.811622433	74,795,434
2022	135,081,672	0.793832241	107,232,186	0.731191381	98,770,554
2023	183,648,939	0.735029853	134,987,452	0.658730974	120,975,244
2024	238,475,296	0.680583197	162,302,280	0.593451328	141,523,481
Benefit			**534,011,716**		**485,181,703**
Year	**Cash out flow**	**Discount factor 9%**	**Present worth**	**Discount factor 11%**	**Present worth**
2020	32,700,000	0.925925926	30,277,778	0.900900901	29,459,459
2021	32,700,000	0.85733882	28,034,979	0.811622433	26,540,054
2022	32,700,000	0.793832241	25,958,314	0.731191381	23,909,958
2023	32,700,000	0.735029853	24,035,476	0.658730974	21,540,503
2024	32,700,000	0.680583197	22,255,071	0.593451328	19,405,858
Cost			130,561,618		120,855,832
Investment			179,274,960		179,274,960
Total			309,836,578		300,130,792
Net B/C			1.7235		1.6165

Table A12 - Internal rate of return

Year	Net cash flow	Discount factor 35%	Present value
2020	21,819,858.00	0.74	16,162,857.78
2021	59,455,453.74	0.55	32,623,019.88
2022	102,381,671.89	0.41	41,612,222.48
2023	150,948,938.77	0.30	45,445,929.47
2024	205,775,296.32	0.22	45,890,669.46
Total Present Value			181,734,699.07
Equity			179,274,960.00
Net Present Value			**2,459,739.07**
Year	**Net cash flow**	**Discount factor 36%**	**Present value**
2020	21,819,858.00	0.74	16,044,013.24
2021	59,455,453.74	0.54	32,145,033.38
2022	102,381,671.89	0.40	40,701,038.65
2023	150,948,938.77	0.29	44,123,954.76
2024	205,775,296.32	0.21	44,228,141.86
Total Present Value			177,242,181.89
Equity			179,274,960.00
Net Present Value			–2,032,778.11

Table A13 - Sensitivity analysis

Scenario	Indicator	NPV
Pessimistic	Sales declined at 3% Raw material cost increased at 3%	91,411,179
	Sales declined at 3% Raw material cost increased at 6%	44,490,017
Optimistic	Sales increased at 3% Raw material cost declined at 3%	356,939,098
	Sales increased at 3% Raw material cost declined at 6%	403,860,260

Table A14 - Operational cost breakdown

Item	Description	Total cost (IDR)
Administration fee	A cost incurred by the company in the form of administrative costs, we assume to set it at IDR 1,000,000 per year with no increasing cost each year.	1,000,000
Maintenance fee		2,000,000
Electricity cost	The electricity is supplied by state-owned utility company. Further, the Basic Electricity Tariff is based on Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia number 41 in 2017 concerning electricity tariff provided by the state. Based on the regulation, calculation of electricity costs uses the formula 80% x 8 hours (operational hours) x 24 days x 12 months x kWh. This business is classified as a medium enterprise (B-2/TR) with a basic tariff of IDR 1,467.28/kWh. Further breakdown of the electricity cost can be seen in Table A4.	27.001.937,51
Water subscription fee		3,000,000
Rental cost	Assuming there is no increasing rent cost for five years.	15,000,000
Rental cost for Brookfield Texture Analyzer	Assuming there is no increasing rent cost for five years.	5,000,000

Table A14 - continued

Item	Description	Total cost (IDR)
Rental cost for Muffle Furnace	No increasing of rent cost for five years.	3,000,000
Rental cost for Spectrophotometer	No increasing of rent cost for five years.	1,000,000
Internet subscription fee		1,800,000
Transportation cost	The distance from Pampangan sub-regency to main consumer base in Palembang is 67.3 kilometers, hence by assuming current petrol price is IDR 6,450/liter and fuel consumption for motor vehicles per mileage is 1 liter/40 kilometers, fuel cost is estimated at IDR 1,041,804. It should be noted the GPCB is transported weekly by employees. For other fuel purposes, it is assumed to be at IDR 1,000,000 per year whilst the parking fee is IDR 300,000 per year (Table A3).	1,041,804
Miscellaneous fee		2,000,000
Depreciation	Straight line method is employed to foresee the depreciation of fixed assets. Depreciation is specified as margin of book and residual values per estimated period. The detailed breakdown of asset depreciation can be seen in Table A5.	6,900,000

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