Financial, Economic And Environmental Feasibility Analysis Of Palm Sugar Domestic Industry In Kolaka Indonesia

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Abstract: One of the household agro-industries that have been run for a long time by the people in Southeast Sulawesi is palm sugar agroindustry. Production activities often led to externality or external impact. Benefit externality in palm sugar industry is that the palm trees producing saps used to make palm sugar have ecological value. The existence of these plants can absorb carbon emissions and supports land and water conservation. The palm sugar production can also generate negative externalities because the needs for fuel are met by forest firewood. The environmental feasibility of an industry is now an important and strategic issue that must be addressed properly and the industrial performance should be improved continuously, so does the palm sugar domestic industry. Therefore, this study aims at determining the financial, economic, and environmental feasibility of the palm sugar domestic industry. The analytical method used was the Extended Benefit-Cost Ratio. The results of the study indicate that the palm sugar domestic industry was financially feasible (BCR 1.63) with Net Present Value (NPV) of IDR 79,108,459.75, economically feasible (SBCR 8.69) with NPV of IDR 613,547,754.74 and environmentally feasible (EBCR 9.48) with NPV of IDR 636,521,858.41.

Key-Words: palm sugar, extended benefit-cost ratio, financial feasibility, economic feasibility, environmental feasibility, benefit externality

1 Introduction

One of the household agro-industries that have been run for a long time by the people in Southeast Sulawesi is palm sugar agroindustry. Sugar processing business is an effort to diversify sugar and increase of the utilization of palm sap economically and stimulate the participation of rural communities in increasing the family income, even though the processing is still using simple equipments or done traditionally with limited human resources [1]. Generally, the palm sugar processing businesses in Southeast Sulawesi are characterized by very simple technology and rely solely on family labor or even done by one or two people [2].

In general, a sustainable development has three dimensions: economic, social, and environmental. Specifically, [3] argued that there are at least three requirements of sustainable agriculture in a farming system: the productivity of plants and animals, socio-economic feasibility, and the maintenance of natural resources in the long term. A sustainable development must be able to pursue the achievement of economic goal (efficiency) such as the increase of income; social/distributive goal in such as the ability to narrow a gap between the rich and the poor; and environmental goal such as the increase or, at least, maintenance of environmental carrying capacity. Sustainability is defined as an effort to improve the welfare of the present generation while maintaining or without damaging environment in order to continuously support the next generation's welfare.

Raw materials used to make palm sugar derived from palm tree sap. Palm sap is liquid that tapped from palm trees' male flowers as results of the metabolism in the trees. The palm sap contains 10-15% of sugar. By the sugar content, the palm sap could process into palm sugar. However, the sap used is fresh one.

However, production activities often lead to externalities or external impacts. Externalities can occur between producers, between consumers or between producers and consumers. The externalities are negative if the activities in a group caused the expense of other groups or they are positive if those in a group give benefits to other groups [4].

Benefit externality in palm sugar industry is that the palm trees producing sap to make palm sugar have ecological values. The existence of these plants can absorb carbon emissions and supports land and water conservation. Entirely, the palm trees are ideal for land and water conservation and easily propagated by seeds. The number of seeds produced by each of the palm trees is very much, easy to spread naturally to the difficult terrain, resistant to disease and drought, able to hold soil particles, able to protect top soil from exposure to rainwater, can add organic matter and lived relatively long.

Besides a role in land conservation, the presence of palm population in the mountain region is also very important for water conservation. Soil organic matters that are added by palm population can serve to absorb and hold rainwater in a longer period of time. The deep and widespread roots of palm trees can allow rainwater to seep into deeper soil layers and stuck there for a long time. Palm tree canopy causes slow movement of rain water on the soil surface so that it takes longer to sink into the soil, stored in the pores of the soil, and water does not flow on the surface of ground [5].

Palm sugar production can also generate negative externalities because the needs for fuel are met using forest firewood of large quantity. If the use of firewood is not restricted despite in small quantity, in the long term it can gradually lead to the insufficient availability of firewood for production in the future or even extremely it can be threaten to be extinct.

The environmental feasibility of an industry is now an important and strategic issue that must be addressed properly and the performance should be improved continuously. Green productivity approach needs to be used in order that the industry is able to increase productivity while lowering environmental impact. If an industrial production is environmentally feasible, it will allow achieving efficiency in the use of natural resources, so does the palm sugar domestic industry. Therefore, it is necessary to study financial, economic, and environmental feasibility of palm sugar domestic industry.

2 Problem Formulation

Natural resources do not only produce goods and services to be consumed directly or indirectly, but also generate environmental services that provide benefits in other forms. The use of a conventional cost-benefit analysis method often does not include ecological benefits in its analysis, so that it is necessary to expand the cost-benefit analysis by the Extended Benefit-Cost Ratio (EBCR) [6].

The analysis is a method to calculate the feasibility of an industry based on a cost-benefit analysis considering financial, economic and environmental dimensions. A financial cost-benefit analysis is the ratio of direct value and direct cost at the palm sugar producers in using actual (market) prices.

Model 1

$$BCR = \frac{\sum[B_t/(1+r)^t]}{\sum[C_t/(1+r)^t]} \dots\dots\dots\dots\dots\dots\dots\dots . (1)$$

where:

Bt = direct use values
Ct = direct costs
r = interest rate of business loans
t = time

Direct use values are the total output values derived from cash receipts, i.e. the results of palm sugar sale and non-cash receipts such as the value of unsold palm sugar and palm sap. Direct costs are the total input values derived from cash outlay (investment costs) and variable costs, equipment that can be used in a period of more than one year (machetes, stoves, pans, mixers, jerry cans, filters, molds, and shell spoon), firewood, and labors.

If the BCR value was > 1 in the period of the next few years, the palm sugar domestic industry is feasible to run from the financial side.

A economic cost-benefit analysis is the ratio of direct value and direct cost in view of local community as a whole by taking into account the tradable goods and non-tradable goods) using a shadow price or so-called Social Benefit-Cost Ratio (SBCR) [7].

Model 2

$$SBCR = \frac{\sum[SB_t/(1+r)^t]}{\sum[SC_t/(1+r)^t]} \dots\dots\dots\dots\dots\dots\dots (2)$$

Where:
SBT = direct value to using output shadow prices
SCT = direct costs using the shadow price input
r = interest rate
t = time

If the SBCR value is >1 in the period of the next few years, the palm sugar domestic industry is feasible and sustainable from an economic standpoint.

Tradable direct use values are palm sugar values based on border price, i.e. Free on Board (FOB) price and Cost Insurance and Freight (CIF) price. FOB price is used for outputs that are exported or potentially exported in the future, while CIF price is used for outputs that are imported or likely imported. Determination of the shadow price of exported commodities is to multiply the FOB price by the Shadow Exchange Rate (SER) minus business costs, while the shadow price of imported commodities is determined by multiplying the CIF price by the SER plus business costs.

Business costs are approximated by calculating the entire business cost from the importer or exporter's port to palm sugar domestic industry. [7] and [8] stated that the business costs are differentiated from freight charges and handling, including loading/unloading, fees.

The direct costs use the shadow price of tradable input over the limit price in business location. The non-tradable inputs are estimated by the social opportunity cost. Macro-economic policy caused the distorted value of foreign exchange rate (US $) and does not describe the real value so that approximation of the real exchange rate or so-called SER is required. Standard Conversion Factor (SCF) used as correction to the prevailing official exchange rate [9]:

$$SCF = \frac{X_t + M_t}{(X_t - T_{xt}) + (M_t - T_{mt})} \dots\dots\dots\dots\dots\dots\dots (3)$$

Where:
SCFt : standard conversion factor at t^{th}
X_t : Indonesia's export value for t^{th} year
M_t : Indonesia's import value for t^{th}
xt : Government revenue from export tax for t^{th} year
Tmt : Government revenue from import tax for t^{th} year

The relationship between SCF and SER was expressed in the following formula:

SER = OER/SCF ………..……………….(4)

Where,
SER : shadow exchange rate (IDR/US$)
OER : official exchange rate (IDR/US$)

Table 1. Determination of the Shadow Prices of Output, Input, and Exchange Rates for Palm sugar

Variety of Outputs-Inputs	Shadow Price and Social Opportunity Cost
Palm Sugar	FOB – Business cost
Palm sap	Market (actual) price
Firewood	Market (actual) price
Stove	Market (actual) price
Coconut Oil	FOB/CIF + business cost
Calsium	FOB/CIF + business cost
Other equipments	Market (actual) price
Labors	Actual wage for labors
Place to make palm sugar	The price of land lease
Exchange Rate	OER : SCF

Determination of the shadow prices of both tradable and non-tradable inputs-outputs:

1. The shadow price of tradable palm sugar outputs using the border price of FOB minus business cost. This is because palm sugar is potential to export.
2. The shadow price of non-tradable outputs, i.e. palm trees. Palm trees are outputs of the farming system that cannot be imported but can be used for other various purposes.
3. The shadow price of tradable inputs, i.e. coconut oil and calsium. Equipment used a tool widely using domestic inputs but there is also the content of foreign inputs, so that the

allocation of domestic costs and foreign costs is 50%:50% [10].
4. The shadow price of non-tradable inputs included palm sap, firewood, stove, the price of land lease.

Environmental cost-benefit analysis is a comparison between direct and indirect use values as well as direct and indirect costs or so-called as the Extended Benefit Cost Ratio (EnBCR).

Model 3

$$EnBCR = \frac{\sum[EnB_t/(1+r)^t]}{\sum[EnC_t/(1+r)^t]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where,

EnBt = direct and indirect (environmental) use values
EnCt = direct and indirect (environmental) costs
r = interest rate
t = time

If EnBCR value was >1 in the period of the next few years, the palm sugar domestic industry was environmentally feasible and sustainable.

The benefits of carbon storage were calculated based on the values of carbon that can be absorbed by the palm trees. The benefits of carbon storage were obtained from a study by [11], indicating that the average carbon content of total palm trees was 0.478 tons/tree with the largest value in the trunk reaching 0.378 tons /tree. The minimum value of 1 ton carbon was US$10-30 [12].

The benefits of soil and water conservation were such as water contributed by palm plantation to prevent soil erosion and flood and improve soil fertility. The value of soil and water conservation was calculated using the Indonesian forest ecological value approach in Table 2.

The results of study by the Natural Resources Management of USAID (1998) showed that the conservation forest has ecological values as seen in the table below:

Table 2. Indonesian Forest Ecological Values

Various Values	US$ Per Hectare Per Year
Soil and water conservation	37.97
Carbon absorption	5.00
Flood protection	48.64
Water transportation	5.30
Biodiversity	9.45

Source: [13]

Direct costs in palm sugar domestic industry are investment and operational costs. The indirect or external costs refer to the environmental values or benefits of forest environment, which lost or reduced due to the activity to make palm sugar such as: (1) the loss of timber and non-timber potentials (opportunity costs) due to the use of firewood, (2) the cost of losing nutrients in soil due to erosion, and (3) the cost of losing carbon absorption.

To examine the financial, economic, and environmental feasibility of palm sugar domestic industry, the following hypotheses were developed.

Ho : BCR, SBCR, EnBCR = 1
Ha : BCR, SBCR, EnBCR > 1

If BCR, SBCR, and EnBCR values were 1, H_0 was accepted, meaning that the palm sugar domestic industry was financially, economically, and environmentally not feasible and sustainable. If BCR, SBCR and EnBCR values were >1, H_0 was rejected, meaning that the palm sugar domestic industry was financially, economically, and environmentally feasible and sustainable.

The one-sample t-test was carried out using the formula:

$$t_{hit} = \frac{\ddot{x} - \mu}{\bar{S}_x}$$

where

$$\bar{S}_x = \sqrt{\frac{S^2}{n}}, S = \frac{1}{(n-1\_}\sum(x-\bar{x})^2$$

where:

$\bar{x}$ = average BCR, SBCR, EnBCR
μ = comparative value
$\bar{S}_x$ = standard deviation
n = number of sample palm sugar producers
$t\ tabel$ = (n-1: α)

If t_{value} was > t_{table}, H_0 was rejected or BCR, SBCR, and EnBCR were >1, palm sugar domestic industry was financially, economically and environmentally feasible.

3 Problem Solution

3.1 Financial Cost-Benefit Analysis

The financial analysis is an analysis to determine the feasibility of palm sugar domestic industry using the market price. Financial calculation calculates direct use value and direct costs without including the impact on environment.

Based on Table 3, calculation of the feasibility of industry estimated for 25 years showed that NPV obtained was IDR 79,108,459.75 with a discount factor of 22 per cent. Calculation of the Net Benefit/Cost Ratio of palm sugar domestic industry produced a value of 1.63, indicating that each cost unit spent for the palm sugar domestic industry will benefit a value of 1.63 units. The results of one-sample t-test showed that the t_{value} (18,317) was greater than t_{table} (2.646). Thus, H_0 was rejected, meaning that the palm sugar domestic industry was financially feasible to run. The Net B/C ratio greater than one showed the palm sugar domestic industry in Kolaka Regency was feasible to run.

Table 3. The Financial Feasibility of Palm sugar domestic industry in Kolaka Regency

No.	Parameter	Results
1	Net Present Value	79,108,459.75
2	Net B/C Ratio	1.63

Source: Primary Data Analysis, 2014

3.2 Economic Cost-Benefit Analysis

The economic analysis was intended to look at the cost-benefit of palm sugar domestic industry in view of the standpoint of communities as a whole by using the shadow price.

The economic feasibility analysis of palm sugar domestic industry in Kolaka Regency was estimated by using a social interest rate of 23.36 per cent in 2014. The calculation of feasibility was from the difference between costs and benefits annually, so that a net benefit was obtained from the results of palm sugar sale. The calculation for an economic feasibility analysis of palm sugar domestic industry in Kolaka Regency can be seen in Appendix. Results of the calculation of economic feasibility analysis of palm sugar domestic industry in Kolaka Regency can be seen in Table 4 below.

Table 4. The Economic Feasibility of Palm sugar domestic industry in Kolaka Regency

No.	Parameter	Result
1	Net Present Value	613,547,754.74
2	Net SB/SC Ratio	8.69

Source: Primary Data Analysis, 2014

Based on the table, a calculation of industry feasibility estimated for 25 years showed that NPV obtained was IDR 613,547,754.74 with a discount factor of 23.36 per cent. The calculation of Net Social Benefit-Cost Ratio of palm sugar domestic industry resulted in a value of 8.69, indicating that each unit of cost for palm sugar domestic industry will benefit a value of 8.69 units. The Net Social B/C ratio values greater than one show that the palm sugar domestic industry in Kolaka Regency had economic feasibility. The results of the one-sample t-test showed the t_{value} (11,258) was greater than t_{table} (2,646). The results of statistical test showed that H_0 was rejected, so that the palm sugar domestic industry was feasibly to run.

3.3 Environmental Cost-Benefit Analysis of Palm sugar domestic industry

This analysis was an Extended Benefit Cost Ratio by using the calculation of economic opportunity costs and shadow price, and included the environmental cost-benefits analysis derived from the palm sugar domestic industry.

Based on Table 8, a calculation of the feasibility of industry estimated during 25 years showed that NPV obtained was IDR 636,521,858.41 with a discount factor of 23.36 per cent. Calculation of the Net Environment Benefit-Cost Ratio of palm sugar domestic industry produced a value of 9.95, indicating that each unit of cost spent for palm sugar domestic industry will benefit a value of 9.95 units. The Net Value Extended Benefit-Cost Ratio value higher than one showed that the palm sugar domestic industry in Kolaka Regency has an environmental feasibility. The result of one-sample t-test showed that the t_{value} (12,022) was greater than t_{table} (2,646). The results statistical tests showed that H_0 was rejected, so that the palm sugar domestic industry was environmentally feasible to run.

Table 5. Environmental Feasibility of Palm sugar domestic industry in Kolaka Regency

No.	Parameter	Result
1	Net Present Value	636,521,858.41
2	Net EBCR	9.48

Source: Primary Data Analysis, 2014

4 Conclusion

Based on the results of the study, it can be concluded that the palm sugar domestic industry was financially feasible (BCR 1.63; NPV IDR 79,108,459.75), economically feasible (SBCR 8.69; NPV IDR 613,547,754.74), and environmentally feasible (EBCR 9:48; NPV IDR 636,521,858.41). Thus, palm sugar is a product feasible to develop in Southeast Sulawesi. The existence of palm plants gives great economic and environmental benefits, so that the cultivation of palm tree needs to be done to ensure the availability of palm sugar raw materials and provide environmental benefits in favor of soil and water conservation, carbon absorption, flood protection, and water transportation.

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