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# Financial Analysis of Pasteurized Coconut Water with Fruit and Vegetable Blend

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***Abstract*—** *This study evaluates the financial feasibility of pasteurized coconut water with addition of fruit or vegetable blend. It aims to determine the financial feasibility of blended coconut water (BCW) to develop its strategy in production management and marketing. The analysis focuses on key financial indicators, including Net Present Value (NPV), Benefit Cost Ratio (BCR), and Payback Period (PBP) to determine the viability of this venture. With the base scenario of processing 1,187 nuts yielding an output of 1,000 bottles (350ml per bottle) of BCW products per day having a selling price of Php34.50 per bottle, the result showed a positive NPV, BCR of 1.28, and PBP value of 2.09 years. Therefore, based on financial feasibility analysis, the BCW enterprise is feasible to execute. Additionally, the payback period is calculated to be less than ten years, demonstrating a swift recovery of invested capital. These positive financial indicators underscore the potential for profitability and sustainable growth in the coconut water and fruit juice blend market. Furthermore, based on sensitivity analysis using the selling price wherein the potential consumers are willing to pay for a 350 ml bottle of BCW, the enterprise is not feasible to execute while increasing the selling price to the average price of available flavored coconut water in the market will give better financial indicators. In addition, reducing the production per day will also result to negative NPV, a BCR of 1.05 and a PBP of more than six years.*

***Keywords*—** *Blended cocowater, coconut water, financial feassibility, pasteurized coconut water.*

## I. INTRODUCTION

The Philippines ranks second among the coconut producing countries in the world with a total production of 13.825 million metric tons in 2016 (Bersales, et. al, 2017), equivalent to approximately 13.4 billion nuts a year at an average weight of 0.97 kg per nut (Caparino, et. al., 2015). At present, copra remains to be the biggest source of income of coconut farmers. Copra is sold to processing plants, which process it to coconut crude oil & animal feeds and other by-products. The by-products of copra processing are the husks, shells and the coconut water. Coconut husks and shells are usually used as fuel for copra drying while coconut water was left unutilized and considered as waste. Coconut water is a refreshing drink extracted from inside of either young or mature coconut. Coconut water is acclaimed as a natural contender in the sports drink market because of its desirable taste, nutritional and functional properties (FAO, 2007). According to Santoso, et al. (1996), mature coconut water contains more organic ions than young coconut water. The most abundant sugars in mature coconut water is sucrose, which is found in many fruits and vegetables (Oliveira, et al., 2003; Santoso et al., 1996). Remarkably, there is a huge volume of unutilized coconut water from matured coconut intended for copra processing that can be recovered, estimated at 2.4 billion liter per year (Santoso et al. 1996 and Caparino, 2015). The unutilized coconut waters from matured nut are usually disposed directly into the soil without any treatment during copra production. This practice results in soil contamination and emission of bad odors which is detrimental to the environment and to human. To add value to the unutilized coconut water the Philippines Center for Postharvest Development and Mechanization (PHilMech) has developed a coconut water processing system that produce bottled coconut water beverage without any additives or preservatives (100% natural).

Red, J.A. (2016) and Hidalgo, et. al. (2016) reported that the pasteurized coco water derived from the PHilMech processing technology was most preferred than the commercial coco water. She added that the product was liked very much by different groups of panelists e.g. students, athletes, professionals, and other community and household consumers in terms of color, taste and aroma. This report is in agreement with the study of Caparino, et. al. (2016), in which the overall acceptability during sensory evaluation by 100 respondents showed that the PHilMech coconut water was significantly ($p < 0.05$) the most liked sample over other three (3) commercial brands available in the country. To further improve the shelf life and the marketability of coconut water among youngster, blended coconut water with minimal addition of preservatives was developed. Seven (7) coconut water blends were successfully developed such as coconut water blended with blue ternate, pandan, spearmint, calamansi, carrots, cucumber and watermelon, with shelf of life of up to 49-53 days under chilled condition.

In terms of financial viability of processing coconut water, a feasibility study on pasteurized coconut water integrated in virgin coconut oil processing has been previously undertaken. Processing VCO and coconut water with 2,000 nuts per operation at twice a week and selling at Php18.00 per 350 ml bottle gave good financial indicators such as IRR of 16.12%, NPV of Php632,700.33, BCR of Php1.07 and PBP of 3.21 years.

The previous study conducted by Calica, et. al. (2023) was used as reference in analysis of financial viability of BCW



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processing. Currently the information regarding profitability on venturing with matured coconut water blended with fruits and vegetable processing are not yet available. Thus, this study aimed to analyse the financial feasibility of BCW processing.

## II. METHODOLOGY

The assessment was done using primary and secondary data. Primary data was gathered through survey and interview of key informants, while secondary was obtained from previous studies of PHilMech in partnership with Central Bicol State University of Agriculture (CBSUA) and from other literatures. Data used includes investment cost of equipment required for the blended coconut water processing, capacity, raw materials, labor requirements, labor costs and other operational expenses. Data were analyzed using financial feasibility. Financial viability of a project may be evaluated using undiscounted measures or the discounted measures. In discounted method, the value of an investment or project is estimated based on its expected future cash flows while undiscounted method calculates the total sum of all future cash inflows and outflows without adjusting for the time value of money. For undiscounted measure, payback period and return on investment will be used and for the discounted measure, BCR, NPV and IRR will be computed.

*Payback Period (PBP)*

Payback period is the number of years it takes to recover all the cost of an investment. The payback period measures how long it will take for an investment to pay back its initial cost through its cash inflows. The formula used for computing the payback period is the equation 1.

$$\text{Payback Period} = \frac{\text{Iniital capital investment}}{\text{Average annual cash inflows}} \quad (1)$$

A shorter payback period is generally more desirable since the capital is recovered faster. However, payback period method does not provide any information about overall profitability of the project. It simply tells you how long it will take to recover the initial investment.

*Return on Investment (ROI)*

ROI measures the profitability of an investment by comparing its gains to its costs. ROI is expressed a percentage and it helps investors to evaluate and compare profitability of different investments. A positive and higher ROI means the investment has generated more money than it cost, while negative ROI indicates a loss on the investment.

The rate of return on investment is calculated using the equation 2.

$$\text{ROI (\%)} = \frac{\text{Average annual net income}}{\text{Investment cost}} \times 100 \quad (2)$$

*Benefit-Cost Ratio (BCR)*

BCR is the ratio of the sum of the stream of present value (or discounted value) of gross benefits to the sum of the stream of present value (or discounted value) of gross costs. It is computed using the equation 3.

$$\text{BCR} = \frac{\text{PV of benefits}}{\text{PV of cost}} \quad (3)$$

The decision rule is to accept investment projects with BCR greater than one.

*Net Present Value (NPV)*

NPV represents the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV helps determine the value on an investment by considering the time value of money, which means that a peso today is worth more than a peso in the future due to its potential earning capacity. The formula used for computing the NPV is the equation 4.

$$NPV = \frac{R_t}{(1+i)^t} \quad (4)$$

Where:
$R^t$ = net cash flow at time t
$i$= discout rate
$t$ = time of the cash flow

A project is financially viable if NPV is greater than 0 or if it is positive. Conversely, a negative NPV suggest that the costs outweigh the benefits, and the investment may not be worthwhile.

*Internal Rate of Return (IRR)*

IRR is the discount rate that equates the present values of the project's benefits and costs, so NPV is equal to zero or the BCR is equal to one. IRR is the rate at which an investment breaks even in terms of NPV. The IRR is computed using the equation 5.

$$IRR = i^1 + \frac{NPV_1}{NPV_1 + NPV_2} \text{x } (i_2 - i_1) \quad (5)$$

Any project or investment with an IRR greater than the opportunity cost of capital would be a profitable investment. Otherwise, reject the project.

## III. RESULT AND DISCUSSION

*Blended Cocowater Processing System*

This pre-feasibility study encompasses the blended coconut water (BCW) processing enterprise to be established by small cooperative in major coconut producing areas. Main product of the enterprise is the developed seven pasteurized coconut water blend with minimal addition of preservative including blue ternate, pandan, carrot, watermelon, mint, calamansi and cucumber (Figure 1).


Figure 1. BCW product variants

The production process of BCW starts from selection and cleaning of nuts and fruit/vegetable for blending, extraction of



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coconut water, blending, pasteurization, filling or bottling and labelling of bottled BCW as shown in Figure 2. The products were pasteurized using the PHilMech-designed low-cost continuous flow pasteurizer.

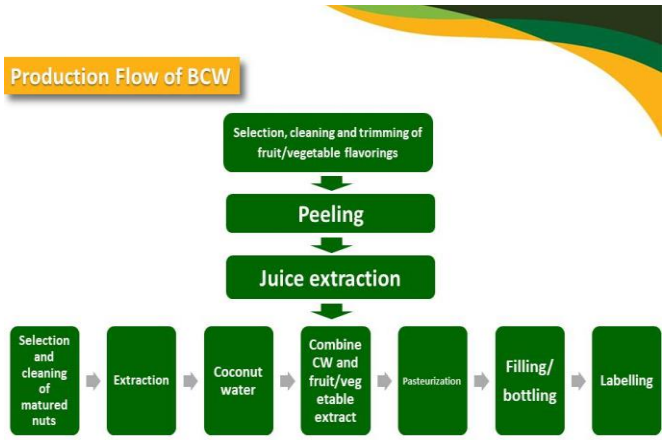


Figure 2. BCW production process flow

The total investment cost for the establishment of BCW enterprise amounted to a total of Php3,234,980.00 (Table I). This enterprise investment cost consists of cost for equipment and machinery as well as investment cost for infrastructure. Table 1 also presented the different equipment for BCW processing.

TABLE I. BCW enterprise initial investment

| Particulars | Cost, Php |
|---|---|
| Land | 200,000 |
| Building | 1,500,000 |
| Delivery van | 350,000 |
| Plant equipment and machinery | |
| Pasteurizer | 490,000 |
| Washing bin | 191,100 |
| Coconut cage | 61,250 |
| Coconut water extractor | 76,200 |
| Chest type freezer | 41,950 |
| Upright chiller | 56,000 |
| Other plant equipment and machinery | 170,480 |
| Office equipment | 98,000 |
| **Total Investment Cost** | **3,234,980** |

The financial projections were based primarily on the preliminary technical study on BCW processing and on the previously conducted pilot testing study of pasteurized coconut water by Calica, et.al (2023). The analysis of the projected financial statement is for the first ten years of its operation.

*Statement of assumptions*

To determine the financial feasibility of the enterprise, the following assumptions were used.

*Production*

Seven blends were considered in the preparation of this pre-feasibility study, namely blue ternate, calamansi, watermelon, cucumber, carrots, mint and pandan. One batch of processing per blend will be done per day with an output of 350 liters BCW or 1000 bottles of 350 ml BCW per bottle. The capacity of the pasteurizer is 50 liters per run. The production schedule of BCW will be done three times in a week and 4 weeks in a month and will be operating 12 months in a year.

*Target market*

The BCW products will be sold to target customers based on the previous studies on the potential market of pasteurized coconut water in the community. Hidalgo (2017) revealed that about 36% of the population is health conscious beverage market. Identified potential market outlet includes schools, convenience store, resorts, hotels and restaurants, government agencies, cooperatives, events and trade fairs.

*Cost of production*

The estimated cost of production annually is estimated at Php3,680,229.47. Table II summarized the component of cost in producing BCW which includes raw materials, packaging, labor, utilities, repair and maintenance and others. In the succeeding years, foreseen inflation is taken into account thus annual increase in cost is considered. Average inflation rate for the past 5 years were used as the basis of the annual increase in production cost (Table III).

The estimated cost of raw materials is Php1,110,256.62 and packaging materials is Php720,000.00. The estimate is based on 1187 nuts processed in a day with an output of 1000 bottled BCW. Basis for coconut water recovery is shown in Table 4.

Raw materials requirement for BCW processing includes coconut water and fruit/vegetables flavorings. The raw materials price is calculated at wholesale price.

TABLE II. Operating Cost of BCW processing

| Description | Cost, Php |
|---|---|
| **Variable Cost** | |
| Raw Materials | 1,110,256.62 |
| Packaging Materials | 720,000.00 |
| Other Supplies | 67,941.25 |
| Electricity | 183,328.81 |
| Direct Labor | 360,000.00 |
| **Total Variable Cost** | 2,340,726.67 |
| **Fixed Cost** | |
| Admin Cost | 104,755.00 |
| Repair & Maintenance | 97,349.80 |
| Depreciation | 223,750.00 |
| Market and promotion | 99, 360.00 |
| Administrative Labor | 589,360.00 |
| Fuel | 100,800.00 |
| Water | 23,328.00 |
| **Total Fixed Cost** | 1,226,030.80 |
| **Total Operating Cost** | **3,680,229.47** |

TABLE III. Philippine inflation rate, 2015 - 2020

| Year | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Average |
|---|---|---|---|---|---|---|---|
| **Inflation Rate, %** | 0.67 | 1.25 | 2.85 | 5.21 | 2.48 | 2.64 | 2.52 |

Source: Worldbank (https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=PH)

*Labor*

In a week, laborers are employed for 3 days with 8 hours operation per day. The total number of personnel in the proposed BCW enterprise is 15, which consist of 1 quality assurance specialist, 1 production supervisor, 3 administrative personnel and 10 direct laborers that are task to do processing activities from pre-cleaning of nuts up to bottling and labelling



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of BCW products.

*Utilities*

Included in this cost factor are electricity/power consumption, water and fuel requirements. Power consumption was estimated on the horsepower rating of machinery and equipment for BCW processing. Fuel and oil were simply assigned as daily budgeted expense for the transport and delivery of BCW products.

*Repair and maintenance*

Basis for the estimated repair and maintenance expenses per annum are shown in Table IV.

TABLE IV. Repair and maintenance assumptions

| Particulars | Repair and Maintenance |
|---|---|
| Building | 5% of acquisition cost |
| Truck | 3% of acquisition cost |
| Processing Equipment | 1% of acquisition cost |
| Office equipment | 1% of acquisition cost |

*Selling Price*

The selling price assigned per 350ml bottled of BCW is Php34.50. The pricing is done by adding a mark-up of 35% to the total production cost per unit. The selling price set is comparable and competitive against the price of the flavored coconut water available in the market with price ranging from Php35.00 to Php47.00 per bottle.

*Financial Projection and Analysis*

The annual production of 350 ml bottled BCW is 144,000 bottles with an estimated gross sales of Php4.9 million. The computation is based on the assumed selling price of Php34.50 per bottle. The number of products which is produced every month or every year is all sold and did not experience rejection.

Table V shows the relative profitability of the proposed BCW enterprise. The estimated gross income in year one is Php 4.9 million and with a net profit of Php 1.3 million.

TABLE V. BCW Processing Financial Analysis

| Particulars | Amount, PhP |
|---|---|
| Income | |
| BCW sales | 4,968,000.00 |
| **Gross sales** | 4,968,000.00 |
| *Less Direct Cost* | |
| Raw materials | 1,110,256.62 |
| Packaging materials | 720,000.00 |
| **Total Direct Cost** | 1,830,256.62 |
| Gross Profit | 3,137,743.38 |
| Less operating expenses | |
| Labor Cost | 949,360.00 |
| Other Supplies | 67,941.25 |
| Fuel | 100,800.00 |
| Electricity | 183,328.81 |
| Water | 23,328.00 |
| Other Admin | 104,755.00 |
| Repair and maintenance | 97,349.80 |
| *Sub total* | 1,526,862.86 |
| Depreciation | 223,750.00 |
| **Total Operating Cost** | 1,750,612.86 |
| Net operating income | 1,387,130.53 |
| **Net profit** | 1,387,130.53 |
| Average net income | 1,617,727.46 |
| Investment cost | 3,234,980.00 |
| **ROI** | **50.01%** |

The financial indicators showed that the project has a positive net present value of Php6,833,568.63 and could operate up to an interest rate of 42%. Per one peso investment, the project will earn around Php1.28 and all the investment could be recovered within 2.09 years (Table VI).

TABLE VI. Financial profitability indicators of BCW processing

| Parameter | Values | Interpretation | Description |
|---|---|---|---|
| **NPV** | Php6,833,568.63 | Positive NPV | The enterprise is feasible to execute |
| **IRR** | 42% | Greater than hurdle rate set at 8% | |
| **BCR** | 1.28 | For every Php 1.00 investment there is a return of Php1.28 | |
| **ROI** | 50% | Positive ROI | |
| **Payback period** | 2.09 years | Years of peration when the investment will be recovered | |

*Sensitivity Analysis*

Sensitivity analyses were done in terms of an increase or decrease in the volume of the available coconut for processing and the market price variation as shown in Table VII. Three scenarios were considered in the available coconut for processing based on the number of batches of processing per day per BCW blend. Based on the result, processing seven (7) blends per day that will require 1187 nuts per day will give a positive NPV, a BCR of 1.28 and a payback period of 2.09 years. Increasing the number of processing per day or processing 1721 nuts per day will result to more positive financial indicator.

TABLE VII. Sensitivity analysis based on number of batches of processing per day at Php26.00 per bottle

| No. of batches processing per blend | 7 blends per day (Base scenario) | 5 blends per day | 10 blends per day |
|---|---|---|---|
| No. of nuts per day | 1187 | 842 | 1721 |
| Price per 350 ml BCW, Php | 34.50 | 34.50 | 34.50 |
| NPV, Php | 6,833,568.63 | -11,911.65 | 14,680,652.27 |
| BCR | 1.28 | 1.05 | 1.43 |
| Payback Period, years | 2.09 | 6.06 | 1.15 |

TABLE VIII.Sensitivity analysis based on reducing/increasing the price per bottle

| No. of batches processing per blend | 7 blends per day | | |
|---|---|---|---|
| No. of nuts per day | 1187 | 1187 | 1187 |
| Price per 350 ml BCW, Php | 34.50 | 21.00 | 39.50 |
| NPV, Php | 6,833,568.63 | -7,305163.91 | 12,070,136.23 |
| BCR | 1.28 | 0.79 | 1.46 |
| Payback Period, years | 2.09 | - | 1.26 |

Sensitivity analysis was also done in terms of changing the price per bottle of BCW as shown in Table VIII. The price of BCW was reduced to Php21.00 per bottle. The price was based on the price wherein the potential consumers are willing to pay. Moreover, another scenario is when the price was increased to Php39.50 which is the average price of available flavored coconut water in the market. Based on the result, having a price



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of Php21.00 per bottle will give a negative NPV, a BCR of 0.79 and the payback period will be beyond 10 years. However, selling the BCW products at Php39.50 per bottle will result to positive NPV, a BCR of 1.46 and payback period of 1.26 years.

## IV. Conclusion and Recommendation

The pre-feasibility study indicates that the total initial investment for BCW processing enterprise is Php3,234,980.00. The production schedule of BCW is done three times in a week in a month and will be operating 12 months is a year. The capacity of the pasteurizer is 50 liters per run. Seven BCW blends were considered in the preparation of FS. Processing per day will produce an output of 350 liters BCW or 1000 bottles of 350 ml BCW per bottle.

The BCW enterprise that processes 1187 nuts per day have shown good financial indicators such as positive NPV, a BCR of 1.28 and a payback period of 2.09 years. Increasing the number of processing nuts per day will result to more positive financial indicator.

Reducing the price of BCW to Php21.00 per bottle, which is the price potential consumers are willing to pay, will give a negative NPV, a BCR of 0.79 and a payback period of more than 10 years.

However, increasing the price of BCW per bottle to Php39.50, which is the average price of flavored coconut water juice in the market, will give better financial indicators.

Establishing and operating the processing system in actual situation will validate the estimated financial performance of the BCW enterprise. Results from the proposed pilot study may corroborate or oppose the findings of this research.

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