

THE ECONOMIC FEASIBILITY ANALYSIS OF ARABICA COFFEE PROCESSING PROCESS BY THE COMMUNITY ENTERPRISES IN MAE HONG SON PROVINCE*

Jittikhun Niyomsiri, Kasem Kunasri

Chiang Mai Rajabhat University

E-mail: jittikhun@g.cmru.ac.th

Abstract

The purposes of of this research were 1) to analysis using feasibility study on investing in parchment coffee processing to Arabica coffee product of the community enterprises in Mae Hong Son province and 2) to study on marketing mixes that would affect the coffee consumers buying decision making in Chiang Mai province. The research design applied in this research is a purposive sampling of 200 people in Mae Sariang and Mae La Noi districts to analyze the first objective by using the feasibility analysis. For the second purpose, questionnaires are kept by a purposive sampling of 200 coffee customers in Chiang Mai province by using the Binary Logit Model. The feasibility analysis result on investment of the parchment coffee processing to Arabica coffee product is from the analytical result of estimating profit and loss statement and net cash flow statement. According to simulating the investment model of product processing, it found that the net present value is 57,112,512.08 baht, the internal rate of return is 94.41 percent, the benefit-cost ratio is 2.11 and the payback period is 0.318. These results indicate that investing in coffee processing product of community enterprise in Mae Hong Son province gives the worth of return on investment (gain the profit) and only takes the payback in 4 months. In addition, marketing mixes that would affect the coffee consumers buying decision making in Chiang Mai province from the analytical result of goodness of fit from Binary Logit Model with maximum likelihood found that product strategy affected the coffee consumers buying decision making at statistically significant level 0.1, public strategy affected the coffee consumers buying decision making at statistically significant level 0.05, promotion and product strategy affected the coffee consumers buying decision making at statistically significant level 0.01. Overall, the implementation of such marketing strategies then increases the buying opportunity of community enterprises' Arabica coffee product. Overall, the paper draws new insights of the investment data analysis which benefits for future investment plan and marketing plan of coffee farmers, public, and government agencies of Mae Hong Son province.

Keywords: feasibility analysis, Binary Logit Model, community enterprises

Introduction

Among primary commodities in the international agricultural trade, coffee occupies an important place in the economies of more than 70 developing countries around the world, where it constitutes a key resource of foreign exchange, government revenue and value added (Food and Agriculture Organization of the United Nations, 2015). Owing to the fact that production and harvesting are labor-intensive activities, coffee generates employment and provides a livelihood for millions of smallholders farmers. Despite its importance, the value of coffee exported from Thailand has declined considerably over the years due to the lack of management and poor competitiveness of famers. For example, Thailand's coffee export fell

* ได้รับบทความ: 12 พ.ย. 2563; แก้ไขบทความ: 9 ธ.ค. 2563; ตอรับตีพิมพ์: 31 ธ.ค. 2563

from 137.1 to 21.8 million THB for the crop year 2018 to 2020 respectively. The expansion rate showed a huge reduction from 36.60% down to -33.75% in the same period of time (Information and Communication Technology Center, 2020).

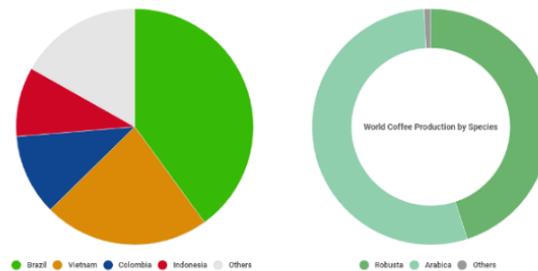


Figure 1 World Coffee Production of 2018 (Sirichai, 2018)

Coffee grown as an economic crop is divided into two major species: Arabica and Robusta. The overall world’s production is approximately 8 million tons per year; 5 million tons or about 60% is Arabica and the rest is Robusta (Sirichai, 2018). Brazil gets the first rank of Arabica’s production while Vietnam is for Robusta’s. Thailand is at 20th place with 42,000 tons of yield on 2019 (USDA, 2019). Most Arabica coffees are grown in the north, and the Robusta is in the south of Thailand due to the geographical and suitable climate. Arabica coffee production from northern Thailand has been successful and well-accepted by the market in terms of quantity and quality. As seen by the country 2017-2036 research and innovation strategy focusing on the development of potential plants research of northern area to reach the standards in both domestic and export market, Arabica crop is on the list of potential plant. (National Research Council of Thailand, 2017)

Arabica coffee is a type of coffee made from the beans of the Coffea Arabica plant. Arabica originated in the southwestern highlands of Ethiopia and is the most popular kind of coffee worldwide. High-quality Arabica coffee should have a slightly sweet flavor, with hints of chocolate, nuts, and caramel. There will be a pleasant acidity, and a little bitterness. However, the roasting will affect the degree to which the flavors be taste like. Area and soil composition that the beans are grown in can also affect the balance of the flavors. (Haines, 2019) According to National Bureau of Agricultural Commodity and Food Standards (2009), there are two types of commercial Arabica coffee. First, ‘parchment coffee’ is coffee cherry that has been peeled (removing Exocarp and Mesocarp) and dried. Second, ‘green coffee bean’ is parchment coffee that has been peeled (removing Endocarp). Most of the coffee beans we see at the grocery stores or coffee shops are roasted green coffee bean.

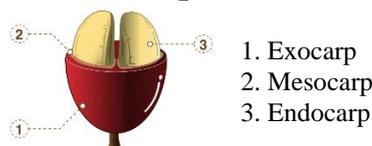


Figure 2 Coffee Cherry (Sirichai, 2016)

Mae Hong Son is the northwesternmost province of Thailand bordering Burma, hemmed in on all sides by high mountain ranges. It has another name as ‘the city of three mists’ because it boasts more than 80% of virgin forests with cold temperature and covered with mist

all 3 seasons (Tourism Authority of Thailand, 2020). From 800 meters above sea level, this perfect geographical made Mae Hong Son a suitable area for growing coffee. Local coffee farmers create a balance between forest care and coffee gardening, as coffee plantations must be made to prevent wildfires. Table 1 represented the statistical of Mae Hong Son Arabica coffee cultivation.

Table 1 Coffee Cultivation Information in Mae Hong Son Province

District	Household	Planted area (rai)	Productive Area (rai)	Yield (kg)	Average Yield (kg/rai)
Muang	80	451.75	418.75	65,590	157
Khun Yuam	125	161.5	10.5	300	29
Pai	108	433.65	433.65	67,356	155
Mae Sariang	418	561.35	546.6	84,248	154
Mae La Noi	725	2557.75	1031.5	92,831	128
Sop Moei	216	450.75	432.75	117,490	271
Pang Mapha	235	682.5	682.5	452,495	663

Source: Mae Hong Son Provincial Agricultural Extension Office (2018)

From Table 1, Mae La Noi, Pang Mapha, and Mae Sariang get high productive areas of 1031.5, 682.5, 546.6 rais respectively. Coffee cultivation in these districts are mainly produced as fresh (coffee cherry) and parchment coffee, and then sold to the outside. The average price of parchment coffee sold last year was 75-80 baht/kg. At this price, economic returns is considered a production loss as farmers are not able to add value to the product and the competition in the domestic coffee market is also high. However, Mae Hong Son Provincial Agricultural Extension Office is encouraged to establish a community enterprises in order to increase bargaining power with buyers. But the major problems are that the farmers do not communicate well with each other, middlemen underpay for the products, the farmers are lack of quality coffee making and parchment coffee and green coffee bean processing standard knowledge. Consequently, farmers are unable to add value to the crop and they are still unsure of how worth it is in order to invest in the processing process. This research is aimed to solve the problems, thus cost-benefit analysis of processing parchment coffee to roasted/green coffee bean is needed, along with the knowledge of marketing mixes.

Methods and Materials

This research was compiled using questionnaires, in which the samples were selected by the purposive sampling method from 200 members of the coffee community enterprises in Mae Sariang and Mae La Noi and 200 coffee consumers in Chiang Mai. To analyze the worthiness of the investment, cost and benefit analysis and financial possibilities analysis are implemented (Brent, 2008; Chen, 1993; Fais and Bonati. 1997; Tianrasiri, 2008). Binary Logit Model (Greene, 2012; Hosmer, Lemeshow, and Sturdivant, 2013) is employed to analyze the marketing mixes affecting the consumer selection of Arabica coffee products.

Research methodology is divided according to the objectives as follows:

Objective 1 – to analysis using feasibility study on investing in parchment coffee processing to Arabica coffee product of the community enterprises in Mae Hong Son province. Consisting of 2 stages as follows.

1) Open-ended questionnaires are gave to members of Mae Hong Son coffee community enterprises to estimate the costs and benefits of processing Arabica coffee product. Costs consist of investment costs (greenhouse building cost, production equipment cost) and

operating costs (raw materials, fuel, electricity, depreciation cost of production equipment, packing materials, labor, analysis of the return on sale of new Arabica coffee product).

2) Raw data kept from the above estimation is used to calculate the 5 financial analysis as follows.

2.1) Net present value (NPV) is the sum of the present values of all of the cash outflows and inflows. The NPV is a metric that is able to determine whether or not an investment opportunity is a smart financial decision. When inflows exceed outflows and they are discounted to the present, the NPV is positive. The investment adds value for the investor. The opposite is true when NPV is negative.

$$NPV = \sum_{t=0}^n \frac{(B_t - C_t)}{(1+i)^t}$$

The business receives regular payments, represented by variable B, for a period of time. This period of time is expressed in variable t and n is the total year of the project. The payments are discounted using a selected interest rate, signified by the i variable.

2.2) Internal rate of return (IRR) is the discount rate that makes the net present value (NPV) of a project zero. IRR is simply the interest rate that makes the market value and total cost equal.

$$IRR = \sum_{t=0}^n \frac{(B_t - C_t)}{(1+i)^t} = 0$$

Where B_t is benefits of the project at t year, C_t is net project investment cost at t year, i or IRR is discounted rate or interest rate, t is project year at 0, 1, 2, 3, ..., n and n is the total year of the project. $n=0$ means the initial year of investment. If the IRR of a new project exceeds the interest rate, that project will most likely be accepted. If IRR falls below the interest rate, the project should be rejected.

2.3) Benefit-cost ratio (B/C Ratio) shows the ratio between the present value of benefit expected and present value of cost of the project B/C ratio helps determine the viability and value that can be derived from investment or project.

$$B/C \text{ ratio} = \frac{\sum_{t=0}^n \frac{B_t}{(1+i)^t}}{\sum_{t=0}^n \frac{C_t}{(1+i)^t}}$$

Projects with a benefit-cost ratio greater than 1 have greater benefits than costs; hence they have positive net benefits. The higher the ratio, the greater the benefits relative to the costs.

2.4) Payback period is the amount of time required for cash inflows generated by a project to offset its initial cash outflow. The payback period is an indicator of risk inherent in a project because it takes initial inflows into account and ignores the cash flows after the point at which the initial investment is recovered.

$$\text{Payback Period} = \frac{\text{Initial Investment}}{\text{Annual Cash Inflows}}$$

The longer the payback period of a project, the higher the risk. Between mutually exclusive projects having similar return, the decision should be to invest in the project having the shortest payback period.

2.5) Sensitivity analysis is a consideration of the changes in investment feasibility analysis. In this research, the main variable used for the analysis of cost and return stability is the cost and benefit variation, changing of price and quantity of raw materials or price and quantity of the Arabica coffee product. This study considered cost and benefit changes by 5%.

Objective 2 - to study on marketing mixes that would affect the coffee consumers buying decision making in Chiang Mai province.

To test the factors affecting the purchase of Arabica coffee products, the Binary Logit Model has been used for analysis by determining the model based on the likeness of each alternative event. Dependent variables are $\Pr(Y = l), l = 1, 0$, indicating the probability that consumers will buy Arabica coffee products. Independent variables are $x_i, i = 1, 2, \dots, m$. Raw data are kept from the 200 close-ended questionnaires. The function (1) denotes the logistic distribution functions.

$$\Pr(Y = l) = \frac{e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m}}{1 + e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m}} \quad (1)$$

$\beta_i, i = 1, 2, \dots, m$ is the known regression coefficient.

The function (2) represented the research logistic distribution function. Arabica coffee products that are used as an alternative to modeling are the new products of community enterprises in the target area. In this regard, the variables used in models and variable definitions can be shown in Table 2.

$$\begin{aligned} Y = & \beta_0 + \beta_1 Sex + \beta_2 Age + \beta_3 Edu + \beta_4 Status1 + \beta_5 Status2 + \beta_6 Inc \\ & + \beta_7 Job1 + \beta_8 Job2 + \beta_9 Job3 + \beta_{10} Job4 + \beta_{11} Job5 + \beta_{12} Obj1 \\ & + \beta_{13} Obj2 + \beta_{14} Source + \beta_{15} Product + \beta_{16} Price + \beta_{17} Place \\ & + \beta_{18} Promote + \beta_{19} Pack + \beta_{20} Personal + \beta_{21} Public \end{aligned} \quad (2)$$

Table 2 Variables Definition of the research Binary Logit Model

Variables	Definition
<i>Dependent Variable</i>	
Y	the consumer selection of Arabica coffee products (1= selected to buy Arabica coffee products, 0= selected not to buy Arabica coffee products)
<i>Independent Variables</i>	
Sex	sex (1 = male, 0 = female)
Age	age (year)
Edu	education level (1=non-educated, 2=primary school, 3=secondary school, 4=bachelor's degree, 5=higher than bachelor's degree)
Status1	status 1 (1 = single, 0 = other)
Status2	status 2 (1 = married, 0 = other)
Inc	income (THB/month)
Job1	job 1 (1 = status, 0 = other)
Job2	job 2 (1 = government or public officers, 0 = other)
Job3	job 3 (1 = farmers, 0 = other)
Job4	job 4 (1 = freelancer, 0 = other)
Job5	job 5 (1 = retired, 0 = other)
Obj1	buying objective 1 (1 = own consumption, 0 = other)
Obj2	buying objective 2 (1 = souvenir, 0 = other)
Source	product source (1 = present product source, 0 = not present product source)
Product	marketing strategy: product (score)
Price	marketing strategy: price (score)
Place	marketing strategy: place/distribution (score)
Promote	marketing strategy: promotion (score)
Packaging	marketing strategy: packaging (score)
Personal	marketing strategy: personnel (score)
Public	marketing strategy: public/information (score)

Results

Results of costs analysis. Table 3 presents the overall costs structure of Arabica coffee processing process.

Table 3 Overall costs structure of Arabica coffee processing process of community enterprise in Mae Hong Son province

(Unit: THB)							
Costs	Year 0	Year 1	Year 2	Year 3	Year ...	Year 9	Year 10
Fixed costs							
- Depreciation of tools and equipment		136,792	136,792	136,792	...	136,792	136,792
- Renovation fee of greenhouse and facilities		100,000	100,000	100,000	...	100,000	100,000
- Greenhouse	2,000,000	400,000	400,000	400,000	...	400,000	400,000
- Water supply system	50,000	10,000	10,000	10,000	...	10,000	10,000
- Electricity system	60,000	12,000	12,000	12,000	...	12,000	12,000
- Vehicles	530,000	106,000	106,000	106,000	...	106,000	106,000
- Tools and equipment	791,750						
- opportunity cost of investment funds	24,940						
Total fixed costs	3,456,690	764,792	764,792	764,792	...	764,792	764,792
Variable costs							
- Raw materials		4,455,000	4,860,000	5,265,000	...	7,695,000	8,100,000
- Packaging		519,750	567,000	614,250	...	897,750	945,000
- Labor		1,452,000	1,524,600	1,600,830	...	2,145,265	2,252,529
- Fuel		16,560	17,388	18,257	...	24,467	25,690
- Water		7,200	7,560	7,938	...	10,638	11,170
- Electricity		28,800	30,240	31,752	...	42,551	44,678
- Maintenance		20,000	21,000	22,050	...	29,549	31,027
- Others		15,000	15,750	16,538	...	22,162	23,270
Total variable costs		6,514,310	7,043,538	7,576,615	...	10,867,381	11,433,363
Total costs	3,456,690	7,279,102	7,808,330	8,341,407	...	11,632,173	12,198,155

Results of benefits analysis.

The estimation of coffee product sale revenue is based on the annual production capacity multiply by selling price. In the first year, production capacity was 17,325 kilograms and then selling price was 510 THB. Therefore, the revenue is equal to 8,835,750 THB. As the production capacity rate increases to 1,575 kilograms/year, the average revenue has risen to 803,250 THB/year. The benefits analysis is represented in Table 4.

Table 4 Benefits per kilogram of processing Arabica coffee product of the community enterprises in Mae Hong Son province

Year	Coffee production capacity (kg)	Average price (THB/Kg)	Average revenue (THB)
1	17,325	510	8,835,750
2	18,900	510	9,639,000
3	20,475	510	10,442,250
...
9	29,925	510	15,261,750
10	31,500	510	16,065,000

Results of the estimation of income statement and net cash flow statement.

The information from the analysis on costs and benefits above are used to estimate the income statement and net cash flow statement as follows.

Estimated income statement presented in Table 5 found that net profit has been positive since the first year of investment. However, net profits in each year increase at a reduction rate.

Table 5 Estimated Income Statement of processing Arabica coffee product of community enterprise in Mae Hong Son province

(Unit: THB)

	Year 0	Year 1	Year 2	Year 3	Year ...	Year 9	Year 10
Revenue							
Sales revenues		8,835,750	9,639,000	10,442,250	...	15,261,750	16,065,000
Total revenue		8,835,750	9,639,000	10,442,250	...	15,261,750	16,065,000
Expenses							
Investment expenses	3,456,690	764,792	764,792	764,792	...	764,792	764,792
Operation expenses		6,514,310	7,043,538	7,576,615	...	10,867,381	11,433,363
Total expenses	3,456,690	7,279,102	7,808,330	8,341,407	...	11,632,173	12,198,155
Income before taxes	-3,456,690	1,556,648	1,830,670	2,100,843	...	3,629,577	3,866,845
Income tax expense (20%)	0	311,330	366,134	420,169	...	725,915	773,369
Net income after taxes	-3,456,690	1,245,319	1,464,536	1,680,675	...	2,903,662	3,093,476
Net income margin (percentage)		136.03	17.60	14.76	...	7.17	6.54

From the estimated net cash flow statement of processing Arabica coffee product of community enterprises in Mae Hong Son province, it is found that the net cash flow has been positive since the first year of investment (year 0) due to the amount of loan being higher than total initial investment and the completion of the loan repayment in year 6. In the first and second years, the loan was repayable only by the loan interest of 420,000 THB. After that, in the third to sixth years, both principal and interest were paid. Although the net cash flow is positive, there is still a tendency to increase at a reduced rate (Table 6).

Table 6 Estimated Net Cash Flow Statement of processing Arabica coffee product of community enterprises in Mae Hong Son province

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year ...	Year 9	Year 10
Cash inflows										
- brought forward		43,310	1,633,420	3,442,748	4,148,215	5,774,586	7,894,469	...	17,270,636	20,939,089
- cash from loan	3,500,000									
- cash from sales		8,835,750	9,639,000	10,442,250	11,245,500	12,048,750	12,852,000	...	15,261,750	16,065,000
Total cash inflows	3,500,000	8,879,060	11,272,420	13,884,998	15,393,715	17,823,336	20,746,469	...	32,532,386	37,004,089
Cash outflows										
- initial investment	2,664,940									
- tools and equipment	791,750									
- loan interest		420,000	420,000	240,000	132,000	48,000	48,000	...		
- principal and loan interest				1,500,000	900,000	700,000	400,000	...		
- operations		6,514,310	7,043,538	7,576,615	8,113,733	8,655,095	9,200,912	...	10,867,381	11,433,363
- taxes		311,330	366,134	420,169	473,395	525,773	577,259	...	725,915	773,369
Total cash outflows	3,456,690	7,245,640	7,829,672	9,736,784	9,619,128	9,928,868	10,226,171	...	11,593,297	12,206,732
Net cash flow	43,310	1,633,420	3,442,748	4,148,215	5,774,586	7,894,469	10,520,298	...	20,939,089	24,797,357
Net cash flow margin (percentage)		3671.47	110.77	20.49	39.21	36.71	33.26	...	21.24	18.43

Results of the economic feasibility analysis (cost-benefit analysis).

The economic feasibility is analyzed based on the financial assumptions of 10 years investment duration, depreciation rate calculated by straight-line method, operation costs increasing 5% annually, initial investment at 3,500,000 THB, and loan interest rate at 9.63%. (average loan interest rate of commercial banks registered in Thailand, Bank of Thailand, 2018) Overall information are gathering as a guideline to make an investment decision of Arabica coffee product processing process of Mae Hong Son province (Table 7).

Table 7 Financial Analysis of Mae Hong Son Arabica Coffee Processing Process

Year (t)	Cash inflow (B_t)	Cash outflow (C_t)	Net cash flow ($B_t - C_t$)	Reduction rate ($1 + i$) ^t	Net present value $\frac{(B_t - C_t)}{(1 + i)^t}$
1	8,879,060	7,245,640	1,633,420	1.10	1,489,939.08
2	11,272,420	7,829,672	3,442,748	1.20	2,864,484.16
3	13,884,998	9,736,784	4,148,214	1.32	3,148,277.23
...
9	32,532,386	11,593,297	20,939,089	2.29	9,153,623.71
10	37,004,089	12,206,732	24,797,357	2.51	9,888,063.66
Total	209,966,850.04	99,749,702.85	110,217,147.19		57,112,512.08

1. Net Present Value (NPV): Based on the analysis of Table 8, the net present value (NPV) is 57,112,512.08 THB, indicating that the coffee processing investment of community enterprises provides a positive return on the investment due to the positive value of NPV, which means that when investing in coffee processing process, the present value of the total return is greater than the present value of the total cost, overall investment is profitable.

2. Internal Rate of Return (IRR): Based on the analysis of net present value (NPV) of 57,112,512.08 THB, the internal rate of return (IRR) is 94.41% per year, which is approximately 9.76 times higher than the loan interest rate of 9.63% per year, indicating that the coffee processing process is worthwhile return on investment.

3. Benefit-Cost Ratio (B/C Ratio): benefit-cost ratio is 2.11, which is greater than 1, shows the profitable of investment as the ratio of benefit is higher than the cost ratio.

4. Payback Period (PB): payback period of the investment project is 0.318 years or about 4 months.

Results of the Sensitivity analysis

By assuming that the cost and benefit are increasing/decreasing at 5%, 10%, and 15%, the sensitivity analysis result is showed in Table 8.

Table 8 Sensitivity Analysis of Mae Hong Son Arabica coffee processing process
Cost Changes

		0%	5%	10%	15%	
Benefit Changes	0 %	49,385,873.40	46,695,286.73	44,004,700.06	41,314,113.00	NPV
		94.41%	86.99%	79.92%	73.20%	IRR
	5 %	54,545,753.74	51,855,167.07	49,164,580.40	46,473,994.00	NPV
		105.25%	97.50%	90.06%	82.95%	IRR
	10 %	59,705,634.08	57,015,047.41	54,324,460.74	51,633,874.00	NPV
		116.35%	108.32%	100.55%	93.09%	IRR
15 %	64,865,514.41	62,174,927.75	59,484,341.08	56,793,754.00	NPV	
	127.70%	119.41%	111.36%	103.58%	IRR	

From the changes in costs and returns that affect the net present value (NPV) and internal rate of return (IRR) of the investment in coffee products of Mae Hong Son community enterprises, according to the analysis shown in Table 8, it is found that

1) If the cost is fixed but the benefit is increasing in the range of 5% - 15%. NPV values are between 49,385,873.40 - 64,865,514.41 and IRR values are between 94.41 - 127.70.

2) If the cost rises at 5%, benefit will increase in the range of 5% - 15%. NPV values are between 51,855,167.07 - 62,174,927.75 and IRR values are between 97.50 - 119.41.

3) If the cost rises at 10%, benefit will increase in the range of 5% - 15%. NPV values are between 49,164,580.40 - 59,484,341.08 and IRR values are between 90.06 - 111.36.

4) If the cost rises at 15%, benefit will increase in the range of 5% - 15%. NPV values are between 46,473,994.00 - 56,793,754.00 and IRR values are between 82.95 – 103.58.

The results represent that if the cost of investment in the processing process of Arabica coffee of Mae Hong Son community enterprises has changed, the net present value (NPV) and internal rate of return (IRR) are reduced and vice versa.

Results of the factors affecting the consumer selection of Arabica coffee products

From the Binary Logit Model, goodness of fit considered from Hosmer, Lemeshow and Sturdivant (2013) shows Chi-square (χ^2) value at 28.028 and P-value at 0.000, meaning that the model is appropriate or fit. Value of McFadden's Pseudo R-square is at 0.5357, meaning that the factors in the model are able to explain the consumer selection of Arabica coffee products at 53.57%.

When the research's logistic distribution function (2) was tested with maximum likelihood (represented in Table 9), it is found that basic characteristics of coffee customers are being single, being a student or government/public officer, purchasing for personal consumption, and willing to know the origin of Arabica coffee. In addition, marketing mixes that would affect the coffee consumers buying decision making in Chiang Mai province from the analytical result of goodness of fit from Binary Logit Model with maximum likelihood found that product strategy affected the coffee consumers buying decision making at statistically significant level 0.1, public strategy affected the coffee consumers buying decision making at statistically significant level 0.05, promotion and product strategy affected the coffee consumers buying decision making at statistically significant level 0.01.

Table 9 Result of the Binary Logit Model

Variables	Coefficient	Standard Deviation	t-value	P-value	Marginal effects
Constant	-18.130	4.566	-3.970	0.000***	-4.484
<i>Sex</i>	0.615	0.495	1.243	0.214	0.152
<i>Age</i>	0.014	0.027	0.513	0.608	0.003
<i>Edu</i>	0.253	0.237	1.070	0.285	0.063
<i>Status1</i>	1.475	0.560	2.634	0.008***	0.351
<i>Status2</i>	-0.704	0.523	-1.345	0.179	-0.172
<i>Inc</i>	0.352	0.401	0.876	0.381	0.000
<i>Job1</i>	1.071	0.491	2.181	0.029**	0.259
<i>Job2</i>	3.069	0.550	5.575	0.000***	0.639
<i>Job3</i>	0.594	0.502	1.182	0.237	0.146
<i>Job4</i>	0.293	0.519	0.564	0.573	0.072
<i>Job5</i>	-0.756	0.505	-1.497	0.134	-0.183
<i>Obj1</i>	1.712	0.622	2.754	0.006***	0.402
<i>Obj2</i>	-0.506	0.616	-0.822	0.411	-0.123
<i>Source</i>	1.616	0.528	3.063	0.002***	0.382
<i>7P Marketing Strategy</i>					
<i>Product</i>	1.314	0.737	1.783	0.075*	0.325
<i>Price</i>	-0.400	0.527	-0.759	0.448	-0.099
<i>Place</i>	-0.491	0.636	-0.772	0.440	-0.121
<i>Promote</i>	2.719	0.708	3.841	0.000***	0.673
<i>Packaging</i>	-2.063	0.672	-3.068	0.002***	-4.484
<i>Personal</i>	0.528	0.592	0.891	0.373	0.152
<i>Public</i>	1.194	0.582	2.052	0.040**	0.003
Number of observations		200			
McFadden Pseudo R-square		0.5357			
Restricted log likelihood		-138.2692			
Hosmer, Lemeshow, and Sturdivant χ^2 (P-value)		28.02819 (0.00009)			

Note: *, **, and *** represent the statistical significance levels at 0.1, 0.05, and 0.01 respectively.

Discussion

From the financial calculation finding that investing in processing process of Arabica coffee yield a profitability is related to the result of Tiansiri (2008) who found a positive payback on 4.48 years project of Arabica processing process investment at Thepsadet sub-district, Doisaket district, Chiang Mai province at 3% minimum rate of return. Moreover, Jaima, Futhananchai, Chaportam, Promchai, Thongin, and Janin (2018) also found the worthiness of Arabica processing process at Lampang province on 3.8 years project at 7% NPV and 23.75% rate of return.

The analysis of 7Ps marketing strategy shows that concentrating on product, promotion, packaging, and public strategies are likely to increase the possibility of consumer selection of the Arabica coffee. This outcome is related to the research result of Krajang (2008) indicated that marketing mixes: product and promotion are influenced customer buying decision of ready-to-drink instant coffee in Chiang Mai province at a high level. Treewetvinij (2009) also supported that product factor had a high level affecting on fresh coffee purchasing decision in Nakornsawan province.

Conclusion and Suggestions

The results of the research shows that the target consumer characteristics of Arabica coffee product of Chiang Mai are single people and being students or public/government officers. They are willing to know the source of the coffee and they buy for their personal consumption. Product, promotion, packaging, and public marketing strategies are able to increase the possibility of purchasing the product.

For the financial projections, income statement and net cash flow statement, the processing of Arabica coffee products yielded a worthwhile return on investment based on the positive value of net present value (NPV) of 57,112,512.08 THB indicating that the present value of the total return is greater than the present value of the total cost, so overall investment is profitable. The annually internal rate of return (IRR) at 94.41% per year which is higher than the loan interest rate, signifies that the coffee processing is a worthwhile return on investment. Benefit-cost ratio (B/C Ratio) is 2.11, which is greater than 1, suggests the profitability of investment as the ratio of benefit is higher than the cost ratio. The investment project takes 4 months to recover all paid costs. Furthermore, as the payback period is an indicator of risk inherent in a project, the longer is the payback period, the higher is the risk. Therefore, this project shows low level of risk as it takes only 4 months.

The research team recommends that the members of Mae Hong Son coffee community enterprises should invest in the processing process of their own Arabica coffee as the financial calculation reveals profitability of the project. For other options, community enterprises themselves should offer some loan to their members with a lower interest rate than the commercial bank in order to increase the possibility of success, decrease risks, facilitate members, and reduce time consumed for the banking documents.

However, this research result is only a simulation of the project investment data. Analysis on the economic feasibility of processing Arabica coffee products of Mae Hong Son community enterprises and also the factors affecting consumers purchasing decision are studied in order to plan the right marketing strategies in the future. In addition, as the community has limited technology and innovation in product development, this study has policy recommendations as follows.

- 1) Creating readiness for the community enterprises by developing knowledge, educating, and training members. Certifications should be offered by local authorities to people who have passed the training program.
- 2) The government should encourage and support the technologies and innovations related to a new product development for the continuity of the development.
- 3) The online trading system should be established to increase marketing distribution channels while helping promote processed coffee to become more widely recognized.
- 4) Promoting a participatory opinion meeting between middlemen, processors, coffee growers, and government agencies to create cooperation and also sharing of knowledge and information.

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