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# The Financial Costs-Benefit Analysis of Organic Layers in Organic Households in Chiang Mai Province, Thailand

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**Abstract:** This study aims to investigate the financial-costs-benefit analysis of organic layers in organic households in Chiang Mai, Thailand by separation into three categories; 200 layers, 100 layers and 50 layers in a household. In-depth semi-structured interview to collect data from 12 organic agriculturists were used. The result found that there were 12 female interviewees aged between 50-60 years old; almost all interviewees education level was primary education, with the average income being around 7,000-10,000 baht per month. The results revealed that the net profit per year on three the categories were equal to 79,015.53, 44,050.71 and 13,135.59 baht, respectively. Moreover, the result from the cost and benefit analysis found that the total net cash inflow for six years was 726,639.08, 404,876.77 and 139,429.30 baht, consecutively. The payback periods were 3.93, 3.95 and 3.06 years, respectively. The net present value was to 412,048.93, 234,691.28 and 70,073.23 baht, consecutively and the internal rate of return was 24.96, 24.79 and 15.25 percent, respectively. Thus, this project on three categories is quite interesting for investment, because the payback period covered under the project and the net present value was positive in all layer sizes enabling higher internal rates of return.

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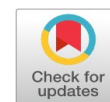
## INTRODUCTION
## Backgound

Nowadays, most people put the importance on the safety of their lives. This is particularly on carefulness in the selection of foods and beverages to be consumed. That is, it must be toxin-free and valuable for body and mind. Chicken eggs naturally produced is one produce widely accepted by consumers and it generates revenue to the producer like vegetables, fruits, rice, and other agricultural rearing (no chemical application) together with good environmental management, not confinement. Besides, non-toxic feed given to organic layers affects higher quality of eggs and its price (Sangyok, 2015; Alfian & Tresna, 2017). Recently, there are groups of farmers producing organic agricultural products in Chiang Mai such as vegetables, fruits, chicken eggs, and processed foods. In fact, organic chicken eggs product of the farmer group can increase revenue to them aside from their main income earned from organic vegetable selling. At present, these farmers rear 50-200 organic layers per household (Madani, 2017)-free ranching and confinement, 4-5 layers per $m^2$ (Komala, 2017). The farmers can collect 80-90 chicken eggs from 100 organic layers per day and it can be sold for 5 baht per eggs. According to the initial data collection of the researcher, it was found that the investment of organic layers rearing is a good alternative for increased incomes to a household. Besides, concerned government agencies can give academic advice to interested persons. The decision-making to invest organic layers rearing is based on the household capital and the production costs include a layer, net fence, and other equipment. This is regardless of the payback period or the computation of production costs. This aims to be a database for systematic pricing. Thus, there is an idea to investigate the costs and benefit of household organic layer rearing of farmers doing organic farming in Chiang Mai province. This will be beneficial to the decision-making to

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invest organic layer rearing of organic layers and interested persons.

**Objective of the study**

Specifically, this study aimed to investigate the costs and benefit of household organic layer rearing of organic farmers in Chiang Mai province.

**RESEARCH METHOD**

**Population**

Population in this study consisted of 12 farmers rearing organic layers covering an area of not more than 1,600 square meters (free ranching) in Sansai, Maetaeng, and Sankampaeng districts, Chiang Mai province. Four farmers reared 200 organic layers; four farmers reared 100 organic layers; and four farmers reared 50 organic layers;

**Research instrument**

A semi-structured interview was used for data collection to obtain in-depth data. It consisted of four parts as follows: Part I socio-economic attributes of the organic layer farmers: age, sex, educational attainment, household income per head and layer breed. Part II data is about the production costs: Variable cost, Fixed-monetary cost and Fixed-non-monetary cost. Part III data is about benefit of organic egg selling. And part IV is data about problems encountered in organic layer rearing.

**Data Analysis**

Percentage and mean were used for analysis of socio-economic attributes. The computation formula below was used for the investigation of costs and benefit. Eurchrapongpan (2014) employed the method of costs analysis and benefits assessment as follows:

I. Cost behavior analysis could be classified into variable cost and fixed cost

II. An assessment of the benefit of the in investment of organic layer rearing

• Payback period

$$PB = \frac{\text{(Initial capital expenditure)}}{\text{(Net cash inflow)}} \tag{1}$$

• The average rate of returns

$$ARR = \frac{\text{Net profit}}{\text{Initial Capital}} \times 100 \tag{2}$$

• Net present value

$$NPV = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} - I \tag{3}$$

• The internal rate of returns

$$IRR = I - \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} \tag{4}$$

**RESEARCH RESULT**

The result of this study revealed that most of the informants were female, 50-60 years old, elementary school graduates and their monthly income range was 7,000-10,000 baht. All of the respondents reared Rhode Island Red breed.

1. Capital expenditures included layer, layer building, layer rearing equipment, egg collecting equipment. This study did not include land for the investment.

2. Organic layer rearing costs could be sorted into the following:

    2.1 Variable cost, i.e., direct labor, infrastructure, and feed such as pith of the banana stalk, maize, husk, and soybean residue.

    2.2 Fixed cost it was classified into two types:

        1) Fixed-monetary cost i.e., fuel

        2) Fixed-non-monetary cost i.e., layer building depreciation (5 years) and layer depreciation

(18 months) scrap value was 50 baht and amortization of equipment (3 years)

3. The investigation of costs and benefit of organic layer rearing (3 sizes).

An interview schedule was administered with the 12 farmers rearing organic layers as a supplementary occupation during 1st September 2015 to 31st August 2016. It was found that the informants rearing 200 organic layers could earn an income from it for 258,523 baht (51,705 eggs); those rearing 100 organic layers could earn an income for 141,962 baht (28,392 eggs), and those rearing 50 organic layers could earn an income 65,979 baht (13,196 eggs). Besides, it was found that there net profit per year were 79,015.53, 44,050.71, and 13,135.59 baht respectively.

3.1 Organic layer rearing costs (3 sizes) According to data collection on organic layer rearing costs (3 sizes) for one year, the variable cost was predicted to increase for 1.5 percent, from the first year to the sixth year in accordance with general inflation rate of the year 2017 (Bank of Thailand, 2016b). There were expenses on layer purchase to replace discharged layers, layer rearing equipment, and egg collecting equipment (Table 1).

Table 1: Organic layer rearing costs for six years (3 sizes-200/100/50 layers)

| | Item | Capital expenditure | Variable cost | Fixed-monetary cost | Fixed-non-monetary cost | Total | An average number of eggs | An average egg cost per egg |
|---|---|---|---|---|---|---|---|---|
| First year | 200 layers | 72,092 | 135,696.80 | 12,000 | 31,810.66 | 179,507.46 | 51,705 | 3.47 |
| | 100 layers | 46,095 | 74,000 | 6,000 | 17,911.66 | 97,911.66 | 28,392 | 3.45 |
| | 50 layers | 16,442 | 41,499.04 | 3,600 | 7,744 | 52,843.04 | 13,196 | 4.00 |
| Second year | 200 layers | 35,400 | 139,767.70 | 12,000 | 31,810.66 | 183,578.37 | 51,705 | 3.55 |
| | 100 layers | 17,700 | 76,220 | 6,000 | 17,911.66 | 100,131.66 | 28,392 | 3.53 |
| | 50 layers | 8,850 | 42,744.01 | 3,600 | 7,744 | 54,088.01 | 13,196 | 4.10 |
| Third year | 200 layers | | 143,960.73 | 12,000 | 31,810.66 | 187,771.40 | 51,705 | 3.63 |
| | 100 layers | | 78,506.60 | 6,000 | 17,911.66 | 102,418.26 | 28,392 | 3.61 |
| | 50 layers | | 44,026.33 | 3,600 | 7,744 | 55,370.33 | 13,196 | 4.20 |
| Forth year | 200 layers | 42,092 | 148,279.55 | 12,000 | 31,810.66 | 192,090.22 | 51,705 | 3.72 |
| | 100 layers | 21,095 | 80,861.79 | 6,000 | 17,911.66 | 104,773.46 | 28,392 | 3.69 |
| | 50 layers | 11,442 | 45,347.12 | 3,600 | 7,744 | 56,691.12 | 13,196 | 4.30 |
| Fifth year | 200 layers | 35,400 | 152,727.94 | 12,000 | 31,810.66 | 196,538.61 | 51,705 | 3.80 |
| | 100 layers | 17,700 | 83,287.65 | 6,000 | 17,911.66 | 107,199.31 | 28,392 | 3.78 |
| | 50 layers | 8,850 | 46,707.53 | 3,600 | 7,744 | 58,051.53 | 13,196 | 4.40 |

unit: baht

Table 1: Continue.....

| | Item | Capital expenditure | Variable cost | Fixed-monetary cost | Fixed-non-monetary cost | Total | An average number of eggs | An average egg cost per egg |
|---|---|---|---|---|---|---|---|---|
| Sixth year | 200 layers | | 157,309.78 | 12,000 | 25,810.66 | 195,120.44 | 51,705 | 3.77 |
| | 100 layers | | 85,786.28 | 6,000 | 12,911.66 | 104,697.94 | 28,392 | 3.69 |
| | 50 layers | | 48,108.76 | 3,600 | 6,744 | 58,452.76 | 13,196 | 4.43 |

unit: baht

According to Table 1, it was found that the initial capital expenditure of 200 organic layer rearing was 72,092 baht and the increased capital expenditure in second, fourth, and the fifth year were 35,400, 42,092, and 35,400 baht, respectively. Meanwhile that of 100 organic layer rearing was 46,095 baht and the increased capital expenditure in second, fourth, and the fifth year were 17,700, 21,095, and 17,700 baht, respectively. For that of 50 organic layer rearing was 16,442 baht and the increased capital expenditure in second, fourth, and the fifth year were 8,850, 11,442, and 8,850 baht, respectively. Besides, it was found that the total costs of 200 organic layer rearing from first to sixth year ranged 179,507.46-195,120.44 baht. Meanwhile that of 100 organic layer rearing from first to the sixth year ranged 97,911.66-104,697.94 baht. For that of 50 organic layer rearing from first to the sixth year ranged 52,843.04-58,452.76 baht. It was also found that an average egg cost per egg from the 200 organic layers was 3.47-3.78 baht. Meanwhile, that of 100 organic layers was 3.45-3.69 baht and that of 50 organic layer was 4.00-4.43 baht.

3.2 The benefit of organic layer rearing (3 sizes)

According to data collection on the return of organic layer rearing (3 sizes) for 1 year, benefit (selling price) was predicted to increase for 1 baht per year, of every two years in which an amount of eggs was the same every year (Table 2)

Table 2: Benefit of organic layer rearing (3 sizes)

| Year | Number of layers (size) | Number of eggs | Amount(baht) |
|---|---|---|---|
| First year (5 baht per egg) | 200 layers | 51,705 | 258,523 |
| | 100 layers | 28,392 | 141,962 |
| | 50 layers | 13,196 | 65,979 |
| Second year (5 baht per egg) | 200 layers | 51,705 | 258,523 |
| | 100 layers | 28,392 | 141,962 |
| | 50 layers | 13,196 | 65,979 |
| Third year (6 baht per egg) | 200 layers | 51,705 | 310,228 |
| | 100 layers | 28,392 | 170,355 |
| | 50 layers | 13,196 | 79,174 |
| Forth year (6 baht per egg) | 200 layers | 51,705 | 310,228 |
| | 100 layers | 28,392 | 170,355 |
| | 50 layers | 13,196 | 79,174 |
| Fifth year (7 baht per egg) | 200 layers | 51,705 | 361,932 |
| | 100 layers | 28,392 | 198,747 |
| | 50 layers | 13,196 | 92,370 |
| Sixth year (7 baht per egg) | 200 layers | 51,705 | 361,932 |
| | 100 layers | 28,392 | 198,747 |
| | 50 layers | 13,196 | 92,370 |

According to Table 2, it was found that benefit of 200 organic layers from first to the sixth year ranged 258,523-361,932 baht. Meanwhile, that of 100 organic layers from first to the sixth year ranged 141,962-198,747 baht and that of 50 organic layers ranged 65,979-92,370 baht.

Table 3: Net cash inflow of 200 organic layer rearing (6 years)

| Year | Cash inflow (baht) | Cash outflow (baht) | | | Net cash inflow (baht) |
| --- | --- | --- | --- | --- | --- |
| | | Capital expenditure | Production costs | Total | |
| 0 | | 72,092 | | 72,092 | (72,092) |
| 1 | 258,523 | | 147,696.80 | 147,696.80 | 110,826.20 |
| 2 | 258,523 | 35,400 | 151,767.70 | 187,167.70 | 71,355.30 |
| 3 | 310,228 | | 155,960.74 | 155,960.74 | 154,266.86 |
| 4 | 310,228 | 42,092 | 160,279.56 | 202,371.56 | 107,856.04 |
| 5 | 361,932 | 35,400 | 164,727.94 | 200,127.94 | 161,804.26 |
| 6 | 361,932 | | 169,309.78 | 169,309.78 | 192,622.42 |
| Total | 1,861,366 | 184,984 | 949,742.52 | 1,134,726.52 | 726,639.08 |

Table 3 shows details of net cash inflow throughout six years of 200 organic layer rearing. It was found that cash inflow was 1,861,366 baht; cash out flow for the capital expenditure was 184,984 baht; production cost was 949,742.52 baht, and net cash inflow was 726,639.08 baht.

Table 4: Net cash inflow of 200 organic layer rearing (6 years)

| Year | Cash inflow (baht) | Cash outflow (baht) | | | Net cash inflow (baht) |
| --- | --- | --- | --- | --- | --- |
| | | Capital expenditure | Production costs | Total | |
| 0 | | 46,095 | | 46,095 | (46,095) |
| 1 | 141,962 | | 80,000 | 80,000 | 61,962.38 |
| 2 | 141,962 | 17,700 | 82,220 | 99,920 | 42,042.38 |
| 3 | 170,355 | | 84,506.60 | 84,506.60 | 85,848.25 |
| 4 | 170,355 | 21,095 | 86,861.80 | 107,956.80 | 62,398.05 |
| 5 | 198,747 | 17,700 | 89,287.65 | 106,987.65 | 91,759.67 |
| 6 | 198,747 | 91,786.28 | 91,786.28 | | 106,961.04 |
| | 1,022,129 | 102,590 | 514,662.33 | 617,252.33 | 404,876.77 |

Table 4 shows details of net cash inflow throughout six years of 100 organic layer rearing. It was found that cash inflow was 1,022,129 baht; cash out flow for the capital expenditure was 102,590 baht; production cost was 514,662.33 baht, and net cash inflow was 404,876.77 baht.

Table 5: Net cash inflow of 50 organic layer rearing (6 years)

| Year | Cash inflow (baht) | Cash outflow (baht) | | | Net cash inflow (baht) |
| --- | --- | --- | --- | --- | --- |
| | | Capital expenditure | Production costs | Total | |
| 0 | | 16,442 | | 16,442 | (16,442) |
| 1 | 65,979 | | 45,099.04 | 45,099.04 | 20,879.59 |
| 2 | 65,979 | 8,850 | 46,344.01 | 55,194.01 | 10,784.61 |
| 3 | 79,174 | | 47,626.33 | 47,626.33 | 31,548.02 |
| 4 | 79,174 | 11,442 | 48,947.12 | 60,389.12 | 18,785.23 |
| 5 | 92,370 | 8,850 | 50,307.54 | 59,157.54 | 33,212.54 |
| 6 | 92,370 | | 51,708.76 | 51,708.76 | 40,661.31 |
| Total | 475,046 | 45,584 | 290,032.80 | 335,616.80 | 139,429.30 |

Table 5 shows details of net cash inflow throughout six years of 50 organic layer rearing. It was found that cash inflow was 475,046 baht; cash out flow for the capital expenditure was 45,584 baht; production cost was 290,032.80 baht, and net cash inflow was 139,429.30 baht.

Table 6: Results of an analysis of the benefit of organic layer rearing investment (3 sizes)

| An analysis of benefit | 200 layers | 100 layers | 50 layers |
|---|---|---|---|
| Payback period | 3.93 years | 3.95 years | 3.06 years |
| Average rate of return | 109.60% | 95.57% | 79.89% |
| Net present value | 412,048.72 | 234,691.28 | 70,073.23 |
| Internal rate of return | 24.96% | 24.79% | 15.25% |

According to Table 6, it was found that the payback period of organic layer rearing investment for 3.93 years (200 layers), 3.95 years (100 layers), and 3.06 years (50 layers). The payback period was less than the investment period which fixed for six years. The average rates of return of the investment of the three sizes were 109.60, 95.57, and 79.89 percent, respectively. Besides, it was found that the assessment of the benefit of investment (3 sizes) for six years at 8.00 percent discount rate was equal to the interest rate of Thanachart Bank loans (Bank of Thailand, 2016a). The net present value of 200 layer rearing investment was 412,048.72 baht while that of 100 layers was 234,691.28 baht and that of 50 layers was 70,073.23 baht. Rearing layers of all sizes had a positive value. Besides, it was found that the internal rate of the benefit of organic layer rearing investment (3 sizes) were 24.96, 24.79, and 15.25 percent, respectively.

**DISCUSSION**
According to the study on costs and benefit of household organic layer rearing of farmers doing organic farming in Chiang Mai, it was found that most of the organic layer rearing costs were variable cost comprising feed, workforce wage, and utility expense and an average egg cost per egg ranged from 4.00-4.43 baht. This conforms to a study of Agricultural Economics Office (2012) on free ranching layer rearing costs and price insurance. It was found that the farmer comprised feed which had a high proportion (66.10 percent) and the egg cost per egg was 2.32 baht. Results of the study also showed that the investment of 200, 100, and 50 organic layer rearing had similar payback period at 3.06-3.95 years and the positive in net present value were 412,048.72, 234,691.28, and 70,073.23 baht, respectively. This conforms to a study of (Lerdchanawong, 2009; Musa, 2016) on an analysis of costs and returns of the investment of layer farming in Baan Na sub-district, Nakhon Nayok province, Thailand. It was found that the layer farming project was appropriate and worthwhile for the investment. The net present value had positive value (477,263,742 baht), and the internal rate of returns was 74 percent, the payback period was two years.

**CONCLUSION**
Results of the study revealed that analysis of costs and benefit of 3 categories of household organic layer rearing of the farmers doing organic farming could give benefit which should be invested. That is, the payback period ranges 3.06-3.95 years. However, the investment of 100 layer rearing and above will give the most appropriate returns. This is because the net present value ranges 234,691.28-412,048.72 baht. The internal rate of returns ranges 24.96-24.79 percent even though the payback period is later than the investment of 50 layer rearing.

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