
Comparison of cost and return between double crop with one crop per year of Maize Community Enterprise in Hin Sorn Subdistrict, Saraburi Province

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Abstract The Hin Son Sub-district Maize Community Enterprise is employed two distinct planting systems of double cropping and single-crop cultivation per year. The findings revealed that under the single-crop approach, the average production cost amounted to 3,630 baht per rai, yielding returns of 7,400 baht per rai annually, resulting in a profit of 3,770 baht per rai per year. In contrast, the double crop method incurred costs of 3,130 baht per rai, with yields reached 19,240 baht per rai. Consequently, this approach is generated profits of 12,980 baht per rai annually, or 6,490 baht per rai per crop for each planting cycle.

Keywords: Double crop, Maize, Cost and return

Introduction

Thailand, known as the "Kitchen of the World" due to its agricultural prominence, sees agriculture and livestock occupying nearly half of its territory (Prathumchai *et al.*, 2018; Thailand Board of Investment, 2021). However, farmers face significant challenges in the livestock sector, with feed expenses, which can make up to 70% of total costs, leading to financial losses (Faculty of Veterinary Medicine Mahidol University, 2021). Research efforts, such as Wariphat's study in 2016, aim to reduce these costs by utilizing agricultural products like maize for animal feed, potentially cutting expenses by 8.10-53.80 baht per animal (Agricultural Research Development Agency, 2021).

Maize holds significant economic importance globally (Chaudhary *et al.*, 2014) and ranks fifth among Thailand's major crops after rice, cassava, sugar cane, and rubber trees (Office of Agricultural Economics, 2021). It plays a crucial role in the country's livestock sector (Supasri *et al.*, 2020), serving as a primary component in animal feed production. Significantly, it is used as the main raw material in the production of animal feed while there has been a continuous

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increase in demand until now it has the expansion of the animal feed production industry. Despite its significance, meeting the demand for feed production, which stands at 8.517 million tons, remains a challenge, with only 4.535 million tons of maize grain currently produced (Thai Feed Mill Association, 2020). Normally, most farmers grow maize for animals in two seasons: The rainy season beginning with planting during March-October and harvesting approximately June - January of the following year and the dry season beginning in November - February of the following year and the harvest beginning from March - April of the following year (Nakhon Ratchasima Provincial Agriculture and Cooperatives Office, 2018).

In this case, according to the growing maize to feed animals from figures from the Office of Agricultural Economics (2023), it showed that Thailand in 2023 planted 6,751,304 rai of maize for animal feed with an output value of 4,952,373 tons. Besides, the largest planting area is the Northern region with 4,621,989 rai with output value of 3,370,312 tons following with the Northeastern region with 1,218,160 rai with output value of 913,817 tons and the Central region with 911,155 rai with output value of 668,244 tons, respectively. In addition, Saraburi Province in Kaeng Khoi District consists of 1,098 households of maize farmers for animal feed. The cultivation area is 24,622 Rai (Kaeng Khoi District Agricultural Office, 2022). The farmers have formed groups, which is a group of large plots of maize to feed animals as the strong good group management. This group has 80 members with gaining with total areas of 4,000 rai or called as a strong group together in areas including of planting in diverse agricultural production, such as growing potatoes, sugarcane, and raising dairy cows and goats for use as the daily products directly for dairy cows in the area. According to the large plot groups, it shows that the animal feed maize farmers have different cropping styles and some of them have planted with double crop and one crop per year. However, double crop cultivation is good for increasing agricultural intensity, especially with double cropping. On the other hand, it has been suggested as a practical strategy to reconcile biofuel production by using priorities and help to reduce costs (Moreira *et al.*, 2020). Thus, this is due to the readiness of farmers; however, the farmers know that double crop cultivation will give a higher return. On the other hand, they have not yet collected clear figures and compared the cost of returns. Then, it depends on the clear numbers from the group leader and the Department of Agricultural Extension for using this number to encourage farmers to grow more double crops.

Double cropping is a distinctive agricultural practice in which two crops are cultivated and harvested in the same field within a single year. This system allows for increased productivity and resource utilization (Lofton *et al.*, 2022). There is research studying the cost of maize for animal feed production as a

single crop (Paudel and Matsuoka, 2009; Murthy *et al.*, 2016). However, there is limited research comparing the costs between single-cropping and double-cropping systems. There is currently no research in Thailand comparing these aspects.

Then, according to providing information to farmers by comparing information on the development of animal feed formulas include of increasing income for farmers, there should be a study of the costs and benefits of raising animals with maize. Therefore, the research finding aimed to study the cost of returns for farmers who have grown the animal feed maize inside the community enterprise for large plots of animal feed maize in Hin Son Subdistrict. In this case, it compared the costs and returns before and after processing maize by-product scraps into animal feed for maize farmers inside the community enterprise of large plots for animal feed maize.

Materials and methods

The farmer members have grown a large plots of maize for feed animals in Saraburi Province with 80 cases and the data were collected by using an In-Depth Interview. Moreover, it used a random purposive sampling method or 10 cases in the main positions from the large plots including of the questionnaire and interviewed forms that were checked for accuracy and suitability by three experts. In addition, it is used the index of Item Objective Congruence: IOC) from the formula (Rovinelli and Hambleton, 1997) with every question gaining an IOC value exceeding 0.5 (Araya and Phongtara, 2018).

Moreover, it used descriptive statistics including frequency, percentage, Mean and standard deviation for the cost and the return analysis. Besides, it analyzed the information about planting and the costs of animal feed maize obtained from interviews with farmers. In this case, the returns from growing animal feed maize depended on the amount of produce that was harvested and the price at which it was sold by collecting data for analysis and calculation on Microsoft Excel program to calculate cost returns.

Results

General information of the respondents

According to the collecting samples from a group of farmers growing large plots of maize to feed animals in Saraburi Province with 10 cases.

Table 1. The general information of the respondents

General Characteristic		Frequency	%
Gender	Male	3	30%
	Female	7	70%
Age (Year)	31 – 40 year old	3	30%
	41 – 50 year old	5	50%
	51 – 60 year old	1	10%
	More than 60 year old	1	10%
Education Level	Junior high school	4	40%
	high school	5	50%
	Bachelor's degree	1	10%
Main occupation	Government	2	20%
	farmer	7	70%
	general employee	1	10%
Secondary career	farmer	1	10%
	general employee	2	20%
	No Secondary career	7	70%
Status	Single	2	20%
	Married	7	70%
	Divorced	1	10%
The Numbers of family	3 people	2	20%
	4 people	4	40%
	More than 5 people	4	40%
Experience	More than 7 year	10	100%
Source of funds	personal money	8	80%
	Loan	2	20%

Table 2. The cost of growing maize for animal feed

Item	Cost/Rai		Cost/Rai	
	planting 1 round per year	%	planting 2 rounds per year	%
Land Rent Costs	1,200	33	600	19
Adjust the land area	300	8	300	10
Tractor costs	300	8	300	10
Harvest wages	300	8	300	10
Fertilizer	600	17	600	19
insecticide	80	2	80	3
Imamectin benzoate	25	1	25	1
seed	650	18	650	21
herbicide	75	2	75	2
Gasoline cost	100	3	100	3
Water system	0	0	100	3
electricity cost				
Sum	3,630	100	3,130	100

It was found that most of them have more than 20 years of experience in planting classified into 70 percent that were women, 30 percent that were men; the most were 40 years of age or older with 4 - 5 family members (Table 1). In this group, agricultural machinery were used together, and whoever wanted to use the machinery which contacted the large plot group until enabling to reduce of the cost of hiring labor. Additionally, the machinery in the group consisted of tractors, injection drones and others and common production factors to be used, such as fertilizer or pesticides with producing for their own formula to reduce costs for planting.

It showed the average cost of farmers growing animal feed maize which among farmers grows maize to feed animals in Saraburi Province with 2 types of planting as planting 1 round per year and planting 2 rounds per year. It was found that planting 1 round per year had an average cost of 3,630 baht and planting 2 rounds per year had an average cost of 3,630 baht. 3,130 baht. However, when comparing planting 2 rounds per year, it was found that the cost was lower than planting 1 round per year. On the contrast, when considering the cost of each item, it was found that the top 3 most expensive ones to grow 1 round was from a rental fee of 1,200 baht, calculated as 33% of the total cost, followed by seeds price with 650 baht, accounting for 17% and the total cost and fertilizer with 600 baht, accounting for 17%, respectively, and for planting 2 rounds per year, the highest cost is namely, seed 650 baht (21%), rent 600 baht (19%) and fertilizer 600 (19%), respectively. It can be found that the average cost of farmers growing animal feed maize had the highest cost when planting 1 round on average with total of 3,630 baht due to the rental cost for 1 round of planting was higher than for 2 rounds of planting (Table 3).

Table 3. The cost of returns for growing animal feed maize

Item	1 round /year	2 round /year
Price (baht/kg.)	7.40	7.40
Productivity (per rai/year)	1,000	2,600
Return (per rai/year)	7,400	19,240
Cost (per rai/year)	3,630	6,260
Profit (baht/year)	3,770	12,980
Profit (baht/round)	3,770	6,490

It was found that farmers received returns from growing maize to feed animals which among farmers grows maize to feed animals Saraburi Province

has 2 types of cultivation as 1 round of cultivation per year with a selling price of animal feed maize with 7.40 baht / kg, productivity per rai/year with 1,000 baht, return per rai per year with 7,400 baht, cost with 3,630 baht, profit per year with 3,770 baht and profit per cycle with 3,770 baht. For planting 2 cycles per year, the selling price of animal feed maize was 7.40 baht per kilogram including of productivity per rai/year with 2,600 baht, returned per rai per year was shown to be 19,240 baht which the production cost of 6,260 baht, profit per year was shown to be 12,980 baht and profit per cycle was shown to be 6,490 baht.

According to the study, it was found that farmers received the highest return from planting maize for animal feed that is the planting 2 rounds per year, with an annual profit of 12,980 baht, or a profit per round was 6,490 baht, more than planting 1 round per year which had a profit per year around only 3,770 baht.

Discussion

Result showed the costs and returns of growing maize for animal feed in Hin Son Subdistrict, Kaeng Khoi District, Saraburi Province, it was found that investing in growing maize for 1 round has a high cost of 1,200 baht because the rental cost is 1 equal to that of growing 2 rounds with 600 baht of cost. Then, it is a high expense in production costs to be found that in 1 round of planting, the average cost was 3,630.00 baht per rai and in planting 2 rounds were the same cost of 3,130.00 baht per rai. Besides, the Ministry of Agriculture and Cooperatives (2019) has shown the total cost of maize production in 2019 / 2020 at the total cost per rai with 4,385 baht per rai. In this case, it showed that when combining in growing maize for animal feed, there was a higher cost in growing maize for animals in Hin Son Subdistrict, Kaeng Khoi District, Saraburi Province. Because in this group, there was shared in using agricultural equipment and machinery, the shared cost was low (Murthy *et al.*, 2015). In terms of returns, it was found that the selling prices for 1 round and 2 rounds of planting were not different. As for the yield, it received from planting 2 rounds with more than from planting 1 round per year and according to the results of the study it was found that profits in growing maize for animal feed will increase when planting 2 rounds per year due to costs. Furthermore, the production in 2 rounds of planting per year was lower than in 1 round of planting per year in accordance with Methaporn (2002), Atcharaporn (2014) and Wilailak (2017).

The cost section for large plot farmers who grew maize with feeding animals in Hin Son Subdistrict, Saraburi Province showed lower costs than other places because it saved on labor costs and used machinery including of making fertilizer for applying, resulting in low costs and had high returns. The case study indicated that double cropping per year had lower average costs

per rai and higher returns as are compared to single cropping per year. However, the challenge for farmers depended on their ability to invest in irrigation systems, as double cropping is shown to be suitable for areas with appropriate irrigation systems. Therefore, the research suggested that farmers invested in irrigation systems to cultivate maize for animal feed twice a year. Additionally, agricultural promotion agencies should further promote irrigation systems to farmers. In addition, government agencies should support the integration of equipment and machinery that can be widely shared.

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