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PRODUCTION EFFICIENCY OF PIPIL CORN FARMING IN THE LIMA PULUH KOTA REGENCY, WEST SUMATRA

EFISIENSI PRODUKSI USAHA TANI JAGUNG PIPIL DI KABUPATEN LIMA PULUH KOTA SUMATERA BARAT

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Abstract

The study aims to determine the technical application of pipil corn cultivation in Lima Puluh Kota Regency, analyze pipil corn farming in Lima Puluh Kota Regency, and analyze the level of production efficiency (technical, allocative, and economic) of pipil corn in Lima Puluh Kota Regency. Lima Puluh Kota Regency, West Sumatra Province with research locations, namely: Nagari Bukik Sikumpa, Nagari Guguak VIII Koto, and Nagari Sungai Talang. The determination of the research location was taken into consideration. The Nagari was chosen with the criteria of the Nagari with the largest production and the largest harvest area. The results of the analysis show that the application of cultivation techniques in Pipil corn farming such as seed preparation, land cultivation, planting, fertilization, maintenance, and harvesting in Lima Puluh Kota Regency is not by the recommended cultivation techniques with a suitability value of 63.5% percent. Farmers who are technically efficient amount to 9 percent, with technical efficiency values ranging from 0.916 - 1.000 with an average value of 0.961, indicating that technical efficiency is not too problematic in pipil maize farming in Lima Puluh Kota Regency because the average value for technical efficiency is close to 1. Who are technically efficient farmers have used inputs efficiently, so that they can produce optimum production. Economically efficient farmers amounted to 9 percent, with economic efficiency values ranging from 0.946 - 1.000 with an average value of 0.982, which means that most Lima Puluh Kota farmers are not economically efficient.

***Keywords*:** *Data Envelopment Analysis, Maize Production Efficiency , Lima Puluh Kota Regency*

Abstrak

Penelitian bertujuan untuk mengetahui penerapan teknis budidaya jagung pipil di Kabupaten Lima Puluh Kota, menganalisis usahatani jagung pipil di Kabupaten Lima Puluh Kota, dan menganalisis tingkat efisiensi produksi (teknis, alokatif, dan ekonomis) jagung pipil di Kabupaten Lima Puluh Kota. Kabupaten Lima Puluh Kota Provinsi Sumatera Barat dengan lokasi penelitian, yaitu: Nagari Bukik Sikumpa, Nagari Guguak VIII Koto, dan Nagari Sungai Talang. Penentuan lokasi penelitian diambil melalui pertimbangan Penentuan nagari dipilih dengan kriteria nagari yang jumlah produksinya terbanyak dan luas panen terbesar. Hasil analisis menunjukkan bahwa penerapan teknis budidaya pada usahatani jagung pipil seperti persiapan benih, pengolahan lahan, penanaman, pemupukan, pemeliharaan, dan panen di Kabupaten Lima Puluh Kota belum sesuai dengan teknis budidaya yang

dianjurkan dengan nilai kesesuaian sebesar 63,5% persen. Petani jagung pipil Kabupaten Lima Puluh Kota yang sudah efisien secara teknis berjumlah 9 persen, dengan nilai efisiensi teknis berkisar antara 0,916 – 1,000 dengan nilai rata-rata 0,961 yang menunjukkan bahwa efisiensi teknis tidak terlalu bermasalah dalam usahatani jagung pipil di Kabupaten Lima Puluh Kota karena nilai rata-rata untuk efisiensi teknisnya mendekati 1. Petani yang sudah efisien secara teknis telah menggunakan input secara efisien, sehingga dapat menghasilkan produksi yang optimum. Petani jagung pipil Kabupaten Lima Puluh Kota yang sudah efisien secara ekonomis berjumlah 9 persen, dengan nilai efisiensi ekonomis berkisar antara 0,946 - 1,000 dengan nilai rata-rata 0,982 yang berarti bahwa sebagian besar petani jagung pipil Kabupaten Lima Puluh Kota tidak efisien secara ekonomis.

Kata Kunci : Data Envelopment Analysis, Efisiensi Produksi Jagung, Kabupaten Lima Puluh Kota.

INTRODUCTION

Corn (*Zea mays* L.) is one of the main crop commodities in Indonesia that has a relatively wide range of uses, especially for human consumption and animal feed needs. Maize is also a demanded commodity in the world market. Corn is the second most important commodity after rice. As the main carbohydrate source in Central and South America, maize is also an alternative food source in the United States. In Mexican communities, corn is a source of carbohydrates that is processed into tortillas. In addition, corn can also be processed into corn porridge, corn parged, and various other forms of food.

Some regions in Indonesia such as Madura and Nusa Tenggara use corn as a staple food. Apart from being a source of carbohydrates, this commodity is also grown as animal feed (forage and cobs), oil (from seeds), flour (from seeds, known as corn flour or cornstarch), and industrial raw materials (from seed flour and cob flour). Along with the increasing population growth rate, the market demand for corn continues to increase. (Putri, 2023). The increase in maize consumption is related to the level of maize production. Figure 1 shows that the United States is the world's largest producer of maize, followed by China, Brazil, and Indonesia is the sixth largest producer of maize in the world.

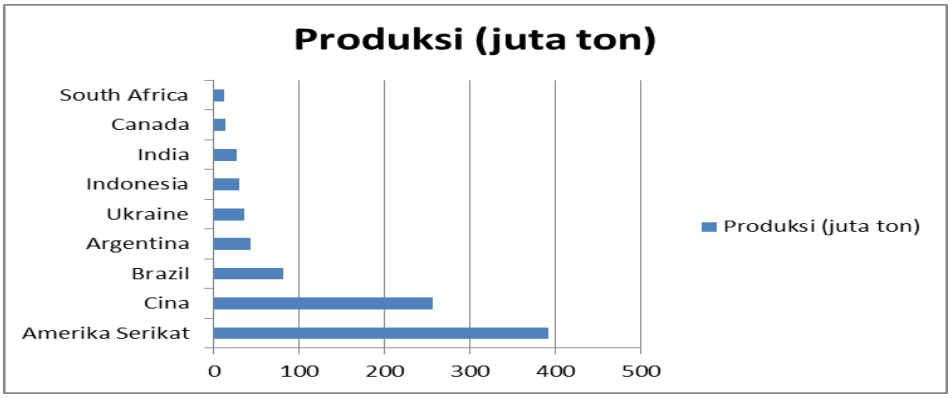

Figure 1. World Corn Production in 2018

The Ministry of Agriculture confirms that the 2018 national corn production is surplus, and has even exported to the Philippines and Malaysia. The surplus production was obtained after calculating the 2018 production minus the projected national corn demand. According to the Directorate General of Food Crops, maize production in the last 5 years increased by an average of 12.49 percent per year, so in 2018 maize production reached 30 million tons of dry-shelled corn (PK). This is also supported by data on the harvest area per year, which increased by an average of 11.06 percent, and the average productivity increased by 1.42 percent (BPS 2018).

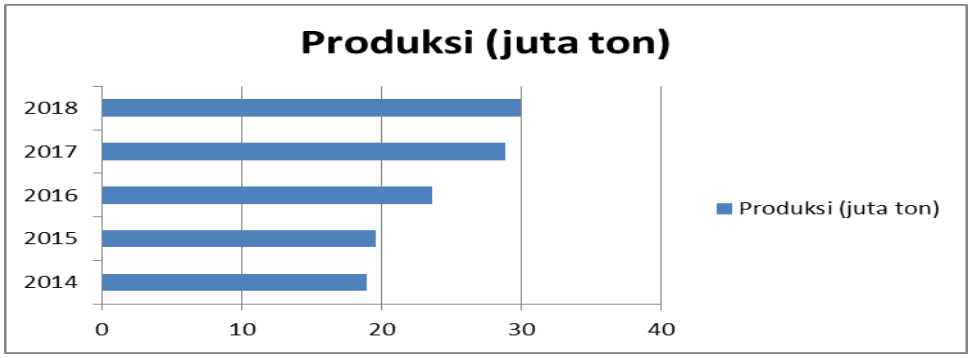

Figure 2. Corn Production in Indonesia from 2014 - 2018

Based on data from the Food Security Agency (FSA) of the Ministry of Agriculture, the need for corn in 2018 is 15.5 million tons PK, consisting of: 7.76 million tons PK for animal feed, 2.52 million tons PK for independent farmers, 120 thousand tons PK for seeds, and 4.76 million tons PK for the food industry. There is still a surplus of 12.98 million tons of PK, and Indonesia has even exported 372,990 tons of maize to the Philippines and Malaysia. In general, national corn production is currently very good. In Western Indonesia, the harvest occurs in January-March, accounting for 37 percent of national production. In Eastern Indonesia, the harvest tends to start in April-May. Corn production centers are spread across 10 provinces, namely East Java, Central Java, South Sulawesi, Lampung, North Sumatra, West Nusa Tenggara, Gorontalo, North Sulawesi, and West Sumatra, with a total production of 24.24 million (83.8%) tons of PK.

Corn Commodity Development in Indonesia still experiences several obstacles, among others: (1) little use of hybrid seeds, (2) scarcity of fertilizers, (3) underdeveloped institutions, (4) inadequate post-harvest and harvest technology, (5) narrow arable land, and (5) inadequate water. National maize development policies include; (1) creating a strategic socio-economic environment conducive to business development; (2) providing support facilities and encouraging accelerated adoption of advanced technology; (3) increasing productivity, efficiency, and competitiveness; (4) improving the welfare and equity of various parties involved in maize commodity development; and (5) strengthening the targets and sustainability of agribusiness systems and businesses. The strategy to increase national maize production is through (1) increasing productivity; (2) expanding planting areas; (3) securing production; (4) empowering institutions; and (5) processing and marketing.

Corn production in Lima Puluh Kota Regency shows fluctuating figures both in terms of planted area and production, and its productivity has always increased. Production in 2018 was 39,627 tons. In the same year, the population of broiler and layer chickens was 5,830,746. The feed needed per day is 728.84 tons, for a one-year (365) day feed requirement of 266,026.6 tons of which is sourced from corn (46%), which is 122,372.23 tons so in 2018 the demand for corn that can be met is only 32.38%. The above conditions indicate that the need for corn for broiler feed has not been met. Therefore, research is needed to determine the level of efficiency of pipil corn farming in meeting the need for corn for broiler feed in Lima Puluh Kota Regency.

RESEARCH METHODS

Location and Time of Research

This research was conducted in Lima Puluh Kota Regency, West Sumatra Province. Lima Puluh Kota Regency is one of the corn production centers in West Sumatra. This research was conducted from August to October 2020, which included proposal preparation, data collection, data processing, and thesis writing.

Sampling and Data Methods

The sampling method used in this study is the multiphase method because it uses more than one stage or level. The determination of location was selected in stages starting from the regency, namely Lima Puluh Kota Regency. The determination of the villages was chosen with the criteria of the villages with the highest production and the largest harvest area, namely: Nagari Bukik Sikumpa, Nagari Guguak VIII Koto, and Nagari Sungai Talang. Each of these villages will take 15 samples of flat corn farmers. The total number of samples is 45 farmer households. In the analysis of production efficiency, 1 control respondent is added, namely the use of inputs according to recommendations and results (production) by the literature, so that the total number is 46.

Types and Sources of Data

The data collected consisted of primary data obtained through direct interviews with sample farmers using a questionnaire, including the identity of sample farmers (age, years of education, experience, number of family members), production factors used (harvest area, seeds, fertilizer use, pesticide use, number of workers), and costs incurred during production, as well as the amount of pupil corn production.

Secondary data were obtained from relevant agencies, namely the Sub-Regency Office, the Department of Food Crops Horticulture and Plantations of Lima Puluh Kota Regency, the Lima Puluh Kota Badan Pusat Statistik (BPS), and other literature related to the research. Secondary data required includes the condition of the research area, population, livelihoods, education, facilities and infrastructure, and supporting institutions.

Data Analysis Method

The analytical methods used to answer the objectives of the research are the descriptive analysis method, farming analysis, and the DEA (Data Envelopment Analysis) analysis method.

Technical Application of Pipil Corn Cultivation

Standard cultivation techniques in book theory and recommendations from the Center for Agricultural Plant Assessment tend to be different from those applied by farmers in farming. This study analyzes the cultivation techniques used by smallholder maize farmers in Lima Puluh Kota Regency and compares them with standard cultivation techniques according to textbook recommendations. The method used to answer the objectives of this research is the descriptive analysis method.

Analysis of Pipil Corn Farming

Pipil corn farming in Lima Puluh Kota Regency was analyzed by calculating production costs, revenue, income, and farm RCR. Production costs are analyzed using farming cost analysis which is carried out by calculating the costs incurred in pipil corn farming to finance its farming activities which include the cost of production facilities and infrastructure, labor costs, and other costs.

Production costs are calculated from all costs used in the production process, both fixed and variable costs. Fixed costs are costs that do not change with changes in output, such as land rent, family labor, and equipment depreciation. Variable costs are costs that change with changes in output, such as the cost of seeds, fertilizers, pesticides, wages of outside family labor, threshing, and milling. The following formula was used to calculate the amount of production costs in flat corn farming in Lima Puluh Kota Regency:

$$TC = TFC + TVC$$

Where:

TC = Total production costs of pipil corn farming (Rp/planting season/acreage) and (IDR/planting season/ha)

TFC = Total fixed costs of pipil corn farming (Rp/planting season/arable area) and (IDR/planting season/ha)

TVC = Total variable costs of pipil maize farming (Rp/planting season/arable area) and (IDR/planting season/ha)

Fixed costs of pipil maize farming consist of equipment depreciation, intra-family labor (IFL), and land rental value. The equipment used are hoe, sickle, and reap. Depreciation costs are calculated using the straight-line method. The formula for the straight-line method is as follows:

$$D = \frac{NB - NS}{UL}$$

Where:

D = Depreciation value (IDR/ Planting Season / Arable area) and (IDR / Planting Season / Ha)
NB = Purchase value of equipment (IDR/Unit)
NS = Residual value (IDR/Unit)
UE = Economic life (Year)

Variable costs used are the cost of seeds, organic and inorganic fertilizers, pesticides, wage labor in the family (LiF), threshing, and milling. The formula for calculating total variable costs is as follows:

$$TVC = (Px_1*X_1) + (Px_2*X_2) + (Px_3*X_3) + (Px_4*X_4) + (Px_5*X_5) + (Px_6*X_6)$$

Where:

TVC = Total variable costs of Pipil corn farming (Rp/planting season/acre) and (IDR/planting season/ha)
Px_1 = Seed price (IDR/Kg)
X_1 = Quantity of seeds (Kg)
Px_2 = Fertilizer price (IDR/Kg)
X_2 = Quantity of Organic and Inorganic fertilizer (Kg)
Px_3 = Price of pesticides (IDR/Liter)
X_3 = Amount of pesticide (Liter)
Px_4 = Labor worker wage (IDR/Working Day)
X_4 = Number of labor workers (Working Day)
Px_5 = Rent for threshing (IDR)
X_5 = Quantity of threshed grain (Kg)
Px_6 = Rent for milling (IDR/Kg)
X_6 = Number of grain milled (Kg)

The amount of revenue obtained can be known by the formula:

$$TR = (P_1*Y_1) + (P_2*Y_2)$$

Where:

TR = Total acceptance of peeled corn farming (IDR / Planting Season / Arable area) and (Rp / Planting Season /Ha)
P1 = Price of Corn Grain (IDR/Kg)
Y1 = Quantity of Corn (Kg)

Income is calculated by subtracting total revenue from total costs, with the following formula:

$$\Pi = TR - TC$$

Where:

Π = Pipil corn farming income (IDR/planting season/acreage) and (IDR/planting season/ha)

TR = Total revenue of pipil corn farming (IDR/planting season/acreage) and (IDR/planting season/ha)

TC = Total cost of farming pipil corn (IDR / Planting Season / Arable area) and (IDR/Planting Season / Ha)

The feasibility of farming can be measured by comparing the amount of revenue with the total costs incurred in the pipil corn farm.

$$RCR = TR / TC$$

Where:

RCR = Revenue Cost Ratio of pipil corn farming

TR = Total revenue of pipil corn farming (Rp/planting season/arable area) and (Rp/planting season/ha)

TC = Total cost of farming pipil corn (Rp/Planting Season/Arable area) and (Rp/Planting Season/Ha)

The criteria are:

RCR > 1 => Pipil corn farming is said to be profitable.

RCR < 1 => Pipil corn farming is said to be unprofitable

RCR = 1 => A pipil corn farm is said to break even (no profit or loss).

Production Efficiency Analysis

Analysis of production efficiency of flat corn farms in Lima Puluh Kota Regency using the DEA method. The working principle of the DEA model is to compare the input and output data of a Decision Making Unit (DMU) organization with other input and output data in similar DMUs. This comparison is done to get an efficiency value.

The production function of peeled corn farming is:

$$Y = f(X_1, X_2, X_3, X_4, X_5)$$

Where:

Y = Maize production (Kg/planting season/arable area)

X_1 = Land area (Ha/planting season)

X_2 = Seeds (Kg/planting season/acreage)

X_3 = Organic and Inorganic Fertilizer (Kg/planting season/acreage)

X_4 = Herbicide (Liters/planting season/acreage)

X_5 = Labor (Day/planting season / cultivated area)

Efficiency measurement uses Data Envelopment Analysis (DEA). In the DEA concept, the resulting efficiency value is relative or only applies within the scope of the Pipil corn farmers who become the DMU (Decision-Unit) being compared.

The decision variable is the weight to be given to each input and output unit by the farmer Vik is the weight given to unit i by activity k and Urk is a decision variable, which is a variable whose value will be determined through a fractional linear program, a linear program formulation for each DMU in the sample. The objective function of each fractional linear program is the ratio of the total weighted output of the farmer divided by its total weighted inputs (Labetubun et al., 2021).

The linear transaction program is then transformed into an ordinary linear program using the simplex method to solve it. The VRS model assumes that farmers are not operating at optimal scale. This model is that the ratio between additional inputs and outputs is not equal. This means that the addition of X times of input will not necessarily cause output to increase by X times, it could be smaller or larger than X times. Mathematically, the relationship between technical efficiency, allocative efficiency, and economic efficiency is as follows:

$$EE = ET * EH$$

Where:

EE = economic efficiency
ET = technical efficiency
EH = price efficiency

RESULTS AND DISCUSSION

Technical Cultivation of Pipil Corn

The technique for cultivating shelled corn in Lima Puluh Kota Regency has an average percentage of application of cultivation techniques that is less than recommended by experts and based on literature at 63.5%. This can be seen in Table 1 below:

Table 1. Technical Approval of Pipil Corn Cultivation in Lima Puluh Kota Regency in 2020

Indikator	In accordance	Not appropriate	Information
Seed Preparation	50%	50%	Not suitable
Land Management	70%	30%	In accordance
Planting	70%	30%	In accordance
Fertilization	50%	50%	Not suitable
Cultivation Maintenance	72%	28%	In accordance
Harvest	69%	31%	In accordance
Average	**63,5%**	**36,5%**	**Not suitable**

Information : 1 % – 33 % = Not appropriate 34 % - 67 % = Not suitable 68 % - 100 % = In accordance

The table above describes several activities in the technical cultivation of shelled corn in Lima Puluh Kota Regency, and the technical techniques for cultivating shelled corn between those carried out by farmers and the literature (experts) are not appropriate.

a. Seed preparation
   The seed preparation recommended by literature or experts is not suitable for the seeds used by farmers, where farmers mostly use the Pioneer 32 variety.
b. Land processing
   The land processing recommended by the literature or experts and that carried out by farmers is close to being compatible, namely cleaning up the remains of corn cobs, eradicating growing weeds, and turning over the soil.
c. Planting
   Recommendations from experts for planting corn are done manually by inserting the seeds into the holes or planting grooves. Corn farmers use an average of around 15 kg of seeds per hectare, this gives an idea that the planting carried out in the field is close to the advice given by the literature and experts.
d. Fertilization
   Fertilization carried out in the field is different from the advice given by literature and experts because farmers are used to fertilizing methods that have been used for generations.
e. Maintenance
   The maintenance carried out by farmers, starting from eradicating weeds, and handling pests and diseases, is close to the advice given by literature and experts.
f. Harvest
   The harvest recommended by the literature or experts and that carried out by farmers are close to compatibility, namely, starting from the age of harvest, method of harvest, and post-harvest drying.

Analysis of Corn Farming Business

The average production of shelled corn in Lima Puluh Kota Regency is 8,703 kg per planting season per cultivated area or 12,005 kg per hectare. The results of the production of shelled corn include quite high productivity, according to the Badan Tanaman Pangan dan Penyuluh Pertanian Lima Puluh Kota (2020), the production results of a good shelled corn farming business reach 11-13 tonnes/Ha. Part of the corn produced is used for animal feed and part is sold to cover production costs. Corn flakes produced by farmers are usually sold to chicken breeders for IDR 3,400/kg. There is no difference in the selling price of shelled corn because it is still in the same area, namely Lima Puluh Kota Regency.

Corn farming in Lima Puluh Kota Regency needs to be calculated to find out whether the activity is profitable or not. Profits can be obtained by calculating the total revenue minus the total production costs incurred by farmers during one corn-growing season. The average total production cost required by shelled corn farmers is IDR. 16,406,792 per planting season per cultivated area or Rp. 22,634,521, per hectare. Meanwhile, the average receipt is Rp. 29,589,444 per planting season

per cultivated area or IDR 40,817,000 per hectare. so that the average profit obtained is Rp. 13,182,652,- per planting season per cultivated area or IDR 18,182,479,- per hectare.

The way to find out if a corn farming business is making a profit, loss, or breaking even is to use the Return Cost Ratio (RCR) analysis, namely by comparing revenues during one planting period with production costs during one planting period. For more details regarding production, income, and RCR of shelled corn farmers in Lima Puluh Kota Regency, see Table 2 below:

Table 2. Average Revenue, Total Production Costs, and RCR of Pipil Corn Farming in Lima Puluh Kota Regency per Planting Season

No	Description	Rp/Kg	Rp/Ha
1	Total Revenue (TR)	29,589,444	40,817,000
2	Total Cost	16,406,792	22,634,521
3	Profit	13,182,652	18,182,479
4	RCR	1.8	1.8

Sumber: Processed Data, 2020.

Based on the calculation results in the table above, the RCR value is 1.8 per planting season per cultivated area and hectare. The RCR value obtained by shelled corn farmers in one hectare means every Rp. 1,000 cost incurred will receive a receipt of Rp. 1,800 and a profit of Rp. 800. So it can be said that shelled corn farming in Lima Puluh Kota Regency is profitable. The profits obtained by farmers greatly influence the selling price of shelled corn. Farmers stated that if the price of shelled corn was still above IDR 3,000/kg, they would make quite a large profit. According to the Fifty Cities Food Crops and Agricultural Extension Agency (2020), the RCR in one hectare of shelled corn farming can reach 2.35. The details are shown in Table 3 below.

Table 3. Revenue, Total Production Costs, and RCR of Pipil Corn Farming According to the Fifty Cities Food Crops and Agricultural Extension Agency (2020) per Planting Season.

No	Description	Rp/Ha
1	Total Revenue (TR)	44,200,000
2	Total Cost	18,815,000
3	Profit	25,385,000
4	RCR	2.35

Based on Table 3 above, the RCR results for farmers' shelled corn in the field are smaller, namely only 1.8 compared to the Badan Tanaman Pangan dan Penyuluh Pertanian Lima Puluh Kota Regency (2020) which reached 2.35. This is because the total production costs incurred by farmers are greater and the results of farmers' shelled corn production in the field are smaller, namely 12,005 kg/ha, while the Badan Tanaman Pangan dan Penyuluh Pertanian Lima Puluh Kota Regency (2020) produces 13,000 kg/ha.

Technical Efficiency

Technical efficiency is a combination of the farmer's ability and capacity to produce optimal output levels from several inputs which is calculated by looking at the input and output ratio. The results of the technical efficiency analysis in this research used the DEAP (Data Envelopment Analysis Program) version 2.1 analysis tool with the VRS (Variable Return to Scale) assumption. The VRS assumption was chosen considering that each additional input does not necessarily produce an output.

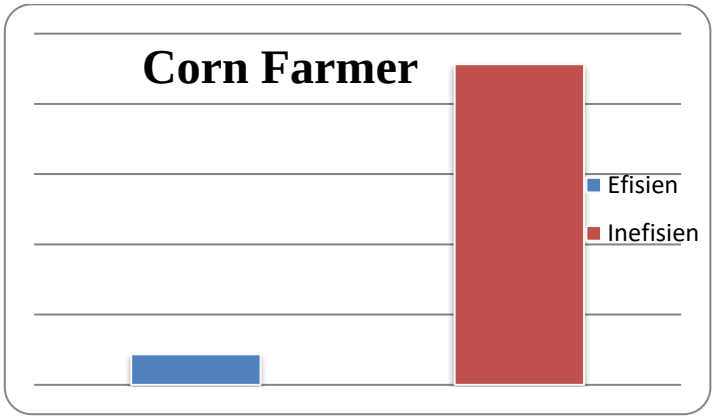

Figure 3. Proportion of Technical Efficiency of Corn Farming Farmers in Lima Puluh Kota Regency

From the analysis carried out using the DEA application, there was the 46th respondent who was a control respondent with an efficiency value of 1. This shows that the efficient shelled corn farmers were 4 people and the inefficient ones were 42 people. This is because shelled corn farmers in fifty cities have not applied guidance from experts, so the results have not been satisfactory.

Table 4. Suggestions for Adding or Reducing Input Allocations to Technically Inefficient Corn Farmers

Produktion Input	Average Input in the Field	Average Efficient Input	Average Addition / Subtraction of Input
Land Area (Ha)	0.73	0.71	-0.02
Seeds (Kg)	10.96	10.7	-0.26
Organic Fertilizer (Kg)	7517.39	7336.38	-181.01
Inorganic Fertilizer (Kg)	580	566.21	-13.79
Pesticides (Ltr)	1.53	1.49	-0.04
Labor (D)	57	49.96	-7.04

Source: Processed Data, 2020

Table 4 above shows that farmers' use of inefficient production factors in Pipil Corn farming must be reduced by an efficient combination of inputs to achieve technical efficiency. The results of calculations using DEA show that technically inefficient shelled corn farmers are farmers 1, 2,

3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 37, 38, 39, 40, 41, 42, 43, 44, and 45.

Allocative Efficiency

Allocative efficiency is a state of efficiency when the marginal product value is the same as the price of the production factor concerned, or a way in which farmers can maximize their profits. Allocative efficiency analysis in this research uses Data Envelopment Analysis (DEA) Cost, using VRS assumptions. The results of the allocative efficiency analysis were obtained from the production input side using input prices applicable at the farm level.

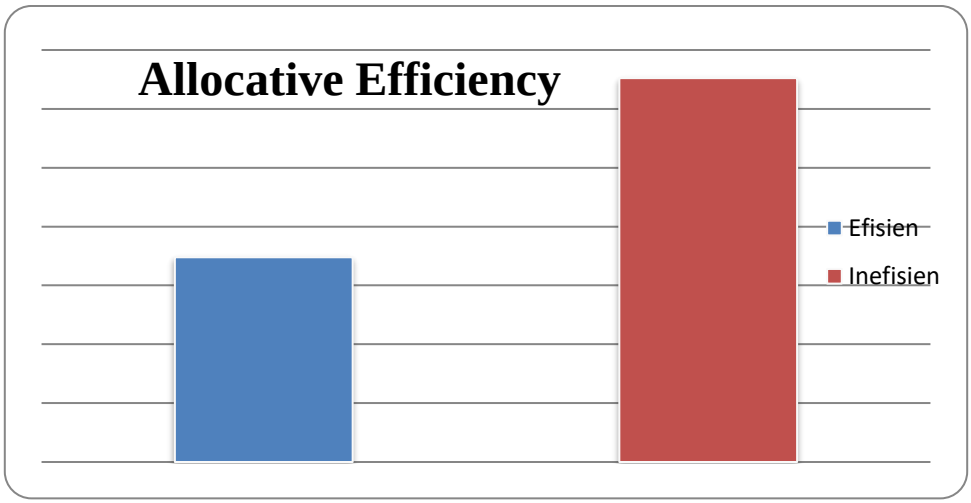

Figure 4. Proportion of Allocative Efficiency of Corn Farmers Farming in Lima Puluh Kota Regency

In Figure 4 it can be seen that 65 percent of farmers are allocative inefficient, but there are around 35 percent of farmers who can achieve the level of allocative efficiency, this means that these farmers have a better level of management when compared to other farmers who are not yet efficient. Allocatively efficient were 16 farmers namely farmers 5, 6, 10, 16, 17, 18, 19, 24, 27, 30, 35, 36, 37, 38, 41, and 46 (control respondents). Allocatively efficient can optimize the combination of input use relative to the input price or equate marginal product value with marginal costs.

The sixteen allocative efficient have used inputs efficiently so that they can produce optimum production and obtain maximum profits. Efficiency can be achieved not because minimal input is used, but because the additional production value (marginal production) obtained by farmers is equal to additional production costs (Panjaitan et al., 2020). Farmers who are not yet allocative efficient still have the opportunity to minimize production costs so that they can be allocative efficient. The average input that can achieve allocative efficiency can be seen in Table 5 below:

Table 5. Suggestions for Adding or Reducing Input Allocations to Allocatively Inefficient Corn Farmers

Produktion Input	Average Input in the Field	Average Efficient Input	Average Addition / Subtraction of Input
Land Area (Ha)	0.73	0.69	-0.04
Seeds (Kg)	10.96	10.35	-0.61
Organic Fertilizer (Kg)	7517.39	3833.1	-3684.29
Inorganic Fertilizer (Kg)	580	454.54	-125.46
Pesticides (Ltr)	1.53	2.84	1.31
Labor (D)	57	53.59	-3.41

Source: Processed Data, 2020

Based on Table 5, farmers' use of inefficient production factors in shelled corn farming must be increased or reduced according to the efficient input combination to achieve allocative efficiency.

Economic Efficiency

Economic efficiency is the result of a combination of technical efficiency and allocative efficiency, meaning that farmers who are technically and allocative efficient are economically efficient. Economic efficiency can be achieved if the use of production factors can produce a predetermined amount of output using predetermined costs to obtain maximum profits. Economic efficiency is the ability possessed by farmers in production to produce a predetermined amount of output by considering the costs they have.

Figure 5 shows that farmers who are economically inefficient in shelled corn farming number 42 farmers or 91 percent, this is much more than efficient farmers, namely 4 farmers or 9 percent with efficient values ranging from 0.946 to 1.000 with an average of 0.982. It can be concluded that farmers who are not yet economically efficient cannot minimize the use of inputs so with certain input prices these farmers cannot minimize the input costs incurred. If efficiency can be achieved, then farmers have the opportunity to earn higher net income. Based on the results of the analysis, it was found that the handling of allocative inefficiency problems is more important to improve because it has a much smaller value than technical inefficiency to achieve a higher economic efficiency value.

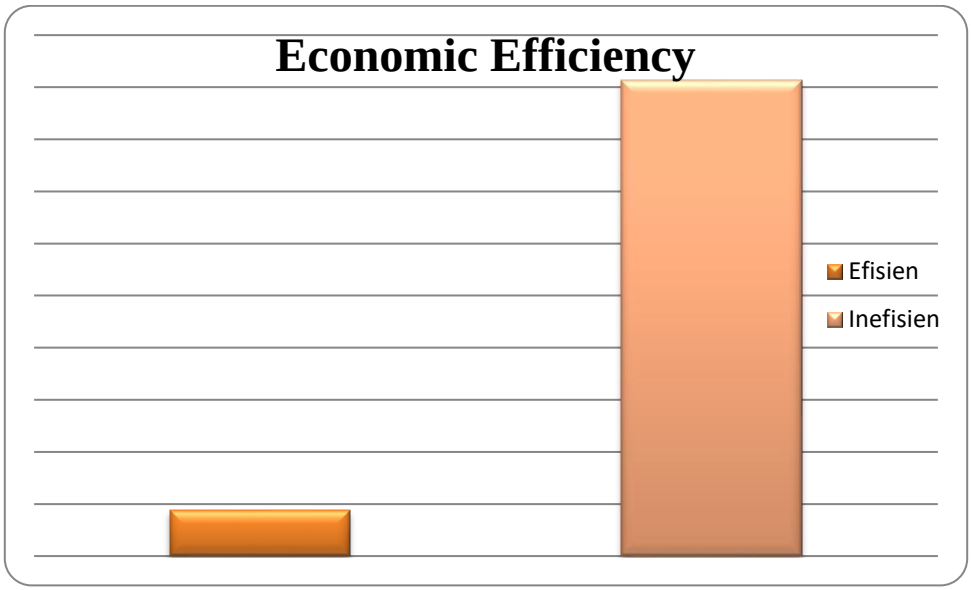

Figure 5. The proportion of Economic Efficiency of Corn Farming Farmers in Lima Puluh Kota Regency

CONCLUSION

The application of cultivation techniques in shelled corn farming such as seed preparation, land processing, planting, fertilizing, maintenance, and harvesting in Lima Puluh Kota Regency is not by the recommended cultivation techniques with a suitability value of 63.5% percent. Production costs for shelled corn farming in Lima Puluh Kota Regency are IDR. 22,634,521 per planting season per Ha, with a total revenue of Rp. 40,817,000 per planting season per Ha, then a net income of Rp. 18,182,479 per planting season per Ha with an RCR of 1.80, which means every Rp. 1,000 cost incurred will receive a receipt of Rp. 1,800 and a profit of Rp. 800. Efficiency assessment is divided into three, namely technical efficiency, allocative efficiency, and technical efficiency: Lima Puluh Kota Regency shelled corn farmers who are technically efficient amount to 9 percent, with a technical efficiency value ranging from 0.916 – 1.000 with an average value of 0.961 which shows that technical efficiency is not too problematic in shelled corn farming in Lima Puluh Kota Regency because of its value. The average for technical efficiency is close to 1. Farmers who are technically efficient have used inputs efficiently, so they can produce optimum production. Lima Puluh Kota Regency shelled corn farmers who are allocative efficient are 35 percent, with an allocative efficiency value ranging from 0.922 - 1.000 with an average value of 0.978, which means that farmers who are allocative efficient are able to optimize the combination of input use relative to the input price or equates the value of marginal product with marginal cost. Lima Puluh Kota Regency shelled corn farmers who are economically efficient amount to 9 percent, with an economic efficiency value ranging from 0.946 - 1.000 with an average value of 0.982, which means that the majority of Lima Puluh Kota Regency shelled corn farmers are not economically efficient. Farmers who are not yet economically efficient cannot minimize the use of inputs so with certain input prices these farmers cannot minimize the input costs incurred.

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