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Green Mustard Farm Business Efficiency in Banjarbaru City Using Analysis Data Envelopment Approach

DyahWahyuningsih[1)], HairinFajri[2)]YudiFerianta 3)
Master of Agricurtural Economy, Agricurtural faculty – LambungMangkurat University
Banjarbaru – Kalimantan Selatan

Abstract: *Technical efficiency of farming is the farmer ability to reduce waste by maximizing the amount of output and minimizing the use of inputs in farming. Improving technical efficiency is one way to increase productivity. Green mustard production in Banjarbaru City fluctuates every year, fluctuations in the production of mustard greens are generally caused by climatic factors and the use of production inputs that are less precise and efficient.The purpose of this study is to analyze the level of technical efficiency and examine the factors that affect the technical efficiency of green mustard farming by estimating factors of age, level of education, experience of farming, number of family members, land ownership status, and income outside the farm.This survey using data survey 50 farmer at Banjarbaru South Kalimantan. The research results showed the average input use of respondent farmers was 0.097 hectares of land, green mustard seedsused 2.48 kg / ha, organic fertilizer 7,420 kg / ha, anorganic fertilizer 747.95 kg / ha, pesticides 2,511 l / ha, labor 436.1 HKSP. Technical efficiency analysis with Data Envelopment Analysis (DEA) shows that farmers are technically inefficient in greenmustard production with an average technical efficiency of 80.6 percent for the CRS-DEA model, 89.9 percent for the VRS-DEA model and 0.897 percent for SE-DEA model. Where 26 farmers (52 percent) IRS scale, 16 farmers (32 percent) on the CRS scale and 8 farmers (16 percent) on the DRS scale. Tobit regression model to find out the factors that influence efficiency revealed that the level of education, farming experience and the number of family members have a positive effect, while age, land ownership status and non-farm income that have negative effect on efficiency.Increased technical efficiency of greenmustard farming in the Banjarbaru city can still be done by reducing the use of production inputs in accordance with the use of production inputsother farmers who are technically efficient and become their respective peers.*

Key Word: *DEA, TechnicalEficciency, Green Mustard, Tobit Regression*

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I. Preliminary

Horticulture sub-sector is one of the agricultural sub-sectors that focus on the fruit crops cultivation,flower, vegetable, medicinal plant and landscape garden. One characteristic of horticultural products is perisabel or easily damaged by fresh. Holticulture plant like vegetable and fruit is very prospective to growht, because the demand for vegetables and fruits is always growing. The increase in population and public awareness of healthy lifestyles and the development of the food industry are the causes of increased demand for vegetables and fruits. (Haryanto et al, 2007).

Banjarbaru city is the one of vegetable city center in south Kalimantan. Data from the Central Statistics Agency of South Kalimantan in South Kalimantan Province in Figures for 2020,Banjarbaru city is the bigest one of greenmustardproduction in south Kalimantan. The data show at table 1.

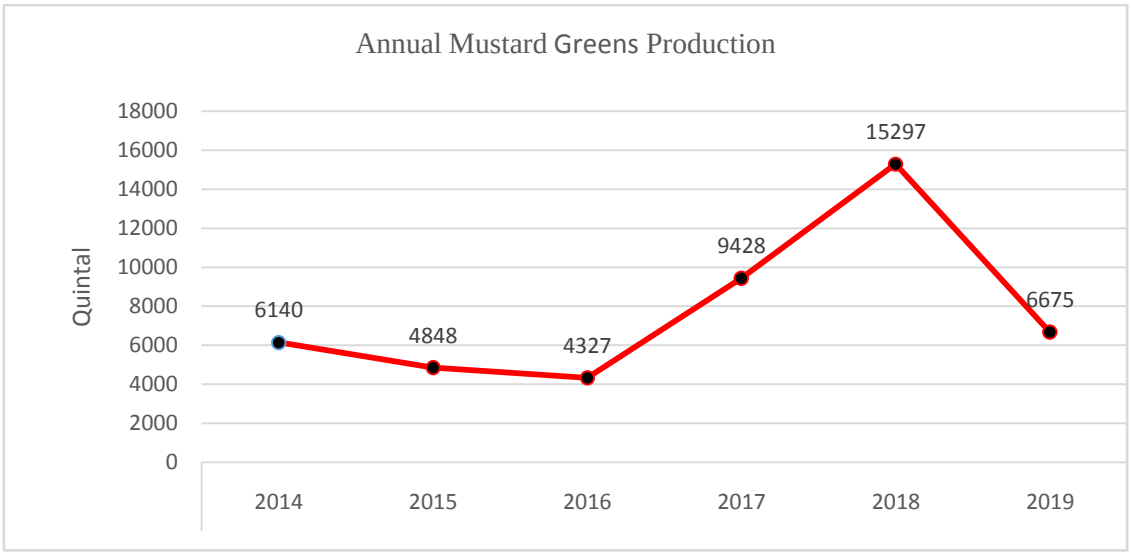
Green mustardis the one comodity that have a great ecom-nomic value and production. The economic value is high because the price of green mustard can reach Rp. 8,000 to 12,000 per bundle weight between 500-750 gram, this plant age is relative short, so that the production results can be felt in the period not too long between 1-1.5 months. This farm business is a source of cash income for farmers and their families.
Green mustardproduction growth in Banjarbaru city for the last six month shown in picture1.

Table 1. Harvested Area (Ha), Production (Quintal) dan Productivity (Quintal/Ha) GreenMustard plant Per District/City in South Kalimantan At year 2018-2019.

District/City	Harvested Area (Ha)		Production (Quintal)		Productivity(Quintal/Ha)	
	2018	2019	2018	2019	2018	2019
(1)	(2)	(3)	(4)	(5)	(6)	(7)
District						
Tanah Laut	66	75	3.115	2.978	47,2	39,7
Kotabaru	68	42	1.048	940	15,9	22,4
Banjar	-	-	-	-	-	-

Barito Kuala	-	-	-	-	-	-
Tapin	3	-	80	-	26,7	-
Hulu Sungai Selatan	12	6	717	390	59,8	65
Hulu Sungai Tengah	4	10	99	251	24,8	25,1
Hulu Sungai Utara	-	-	-	-	-	-
Tabalong	9	6	165	100	18,3	16,7
Tanah Bumbu	89	72	2.374	906	26,4	12,6
Balangan	2	11	45	81	22,5	7,4
City						
Banjarmasin	24	29	806	1.109	33,6	38,2
Banjarbaru	172	153	15.295	6.815	88,9	44,5
Total	449	404	23.744	13.570	52,9	33,6

Source: BPS South Kalimantan



Picture 1. Mustard GreensGrowth InBanjarbaru City At 2015 - 2019.
Sumber: Food Security Service Departement, Fisheries and Agriculture Banjarbaru City

Green mustard production in Banjarbaru at 2017 is 9.428 quintal and at 2018 increase rapid growth 15.297 quintal, In 2019decreased to 6,675 quintals. There is some factor that make the mustardgreens production increasing and decreasing among the year like weather and climate change, pest and disease attacks and changes in factors of production use.

In farm bussines the factor of production usually carried out for generations,so that the use of factors of production is not appropriately measured (Wibisono, 2011). This is what causes low productivity or less optimal and inefficient use of production factors in a farming business.Green mustardfarm bussines have a good oportunity and prospect for growing, for the optimal production we need to use the right combination of production factor, to make more efficient in productio. Based on these fact, technical efficiency is the most important thing. Beside the accuracy of using the factors of production, technical efficiency also influenced by the farmer economics and social side.

Based on these description, the main problem in mustardgreens farm bussines in Banjarbaru city is how to make a Technical efficiency in Banjarbaru city and also what kind of factor that influenced the Technical efficiency in Banjarbaru city.

Goals and usage

Based on the background and the problem that explained above, so this research goals is: (1) Analyzing the technical efficiency of mustard greensfarming in Banjarbaru City and (2) Identifying the factors that influence the technical efficiency of farming in Banjarbaru City..

In addition, the existence of this research is expected to be useful for : (1) For academics, this research expected to be usefull to be a reference and information material about the technical efficiency of green mustard farming with the Data Envelopment Analysis (DEA) approach. (2) For government, this research is expected to be a reference in making policies to develop green mustard farming bussines and improve the welfare of farmers and provide alternatives in increasing productivity so that farming is run more efficiently. (3)

For the public and readers, this research is expected to provide additional information and knowledge or referrals to continue the related research.

II. Method

Research Place and Time

This research was conducted in the City of Banjarbaru, South Kalimantan Province in April to June 2020.

Data Type and Data Source

The primary data is collected through direct interviews with green mustardfarmers using a list of questions or questionnaires that have been prepared previously. And for the secondary data collected from various agencies and agencies related to this study such as the Central Statistics Agency, Food Security Departement, Agriculture and Fisheries Departement and also some literature like books, journal and thesis that related to this study.

Sampling Method

Farmer sample is colected with proportionated random sampling method, the random sampling method is proportional through consideration of the total population in one district. This research is held in three sub district, Liang Anggangsub district, LandasanUlinsub district and north Banjarbarusub district. The sample is collected among 50 farmer from 125 mustard farmer in all three sub district. Calculation of the number of respondents mustard farmers are as follows:

•Liang Anggang Sub district

$n_i = \frac{89}{125}$ x 50 = 35,6 raunding off 36 person

• LandasanUlin Sub district

$n_i = \frac{20}{125}$ x 50 = 8 person

• Banjarbaru Utara Sub district

$n_i = \frac{15}{125}$ x 50 = 6 person

III. Data Analystic

To reach the research goals, using two types of analysis: farm efficiency analysis with DEA and analysis of factors affecting technical efficiency with Tobit Regression.

1. Data Envelopment Analisis (DEA)

Data Envelopment Analysis (DEA) model is a tool that can be used to evaluate the performance of an activity that uses one or more types of inputs and produces one or more types of output. Cooper, et al (2007), explain in simple terms the DEA, which is a measurement of the ratio of inputs to outputs that are expressed partially. Each unit that will be evaluated in the DEA or Decision Making Unit (DMU) will produce a diversity of results, due to differences in input combinations used to produce different outputs. Efficiency scores can be obtained from a comparison between input and output in the DMU. The result of this technical efficiency in one, if the result is less from one that will be show that technical efficiency farming is relatively technically inefficient.

In DEA, measurement of technical efficiency with assumptions Constant Return to Scale (CRS) it is called with Overall Technical Efficiency (OTE) which illustrates the efficiency of managerial impact and scale. The CRS assumption is only appropriate if all DMUs are operating at an optimal scale.If the DMU does not operate at an optimal scale, then Variable Returns to Scale / VRS applies. The OTE theory can be decompose to be anPure Technical Efficiency (PTE) and Scale Efficiency (SE). PTE measurement show the managerial efficiency type, for example management capabilities in converting inputs into outputs, whereas the SE measures the indication whether the DMU in question is operating at an optimal scale or not.

The mathematic program formula with input and assumption Constant Return to Scale (CRS) can be describe as below :

$$\text{Min } \theta,\lambda\ \theta$$
$$\text{st } - y_i + Y\lambda \geq 0,$$
$$\theta x_i - X\lambda \geq 0,$$
$$\lambda \geq 0$$

Which one:

λ is N x 1 constant vector, xi is the i-DMU (N x 1) nonnegative input vector, yi is the i-DMU (M x 1) nonnegative output vector. The value of θ generated is the efficiency value of the i-DMU which is in the interval $0 \leq \theta \leq 1$, where the value of 1 indicates the frontier and the unit has been technically efficient (Farrell, 1957).

The CRS assumption is only appropriate when a company or farmer operates at an optimal scale.Unperfect competition, financial problem and so forth can cause the farmer can not do the optimal operation (Coelli et al.,

1998). Banker et al. (1984) suggests a Variable Returns to Scale (VRS) model that can be avoided at this scale. VRS model equality is :

Min □ ,λ, □

St – y_i + Yλ ≥ 0,

□ xi– Xλ ≥ 0,

N1'λ = 1

λ≥0

Which one:

N1'λ = 1 is a convexity constraint

If there is a difference in the value of technical efficiency between the CRS and VRS models for one particular unit, then this indicates that this unit is experiencing scale inefficiencies. Efficiency scale can be measure with this equality :

$SE_i = TE_{i\ CRS}$

$TE_{i\ VRS}$

If the result is $SE_i = 1$, This indicate CRS, if the result show $SE_i < 1$ its indicate the Efficiency Scale is happened. Therefore is to determine how was the unit operation in decreasing, increasing or return to scale need to measure the model technique efficiency result from CRS, VRS, and scale efficiency (Coelli et al., 1998).

Input variable that used in this research is land area (X_1), green mustard seeds (X_2), organic fertilizer (X_3), inorganic fertilizer (X_4), pesticides (X_5) and labor (X_6).Meanwhile, the output variables used are mustard greens production.

Primary data processing to analyze the technical efficiency of green mustard farming using the Data Envelopment Analysis (DEA) approach using the help of Microsoft Exel and DEAP version 2.1 computer applications.

2. Tobit Regression

To identify some factor that influenced greenmustard farm bussines technical efficiency, this research use the Torbit Regression. Torbit regression model use the Maximum Likelihood Estimation (MLE). In Torbit regression variable is dependent and limited in value, while the independent is unlimited in value. All of dependent and independent value is correctly measured. There is no autocorrelation, heteroscedasticity, multicolineaticity is perfect in this measurement, and the mathematics model is the right one (Gujarati and Dawn 2009).

Torbit Regression is the regression model that assumed that only the independet variable have an infinty result while the dependent variable that have a limited value. In other words Tobit regression uses the sensor to the dependent variable in its calculations. The reason for using this sensor is so as not to produce an estimated parameter with the dependent variable value that outside the specified limit. The technical efficiency value is the sensor value that used in this study whose value is limited between 0.00 to 1.00.

Factors that emphasize the technical efficiency of mustard farming are farmers age (Z_1), Farmer education level (Z_2), farmer experience (Z_3), number of family members (Z_4), land ownership status (Z_5), non- farm bussines income (Z_6). Torbit regression equality for some factor that influenced technical efficiency of farm bussines is describe below:

$TE = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \beta_6 Z_6 + \varepsilon$

Which one:

TE = Technical efficiency value (0=1)

Z_1 = Farmer age (Year)

Z_2 = Education Level

Z_3 = Farming Experience (year)

Z_4 = Family number (person)

Z_5 = Dummy Land ownership status (1=owned, 0= not owned)

Z_6 = Dummy incom non- farming bussines (1=able, 0= unable)

ε = Galat

β_0 = Constanta

β_1- β_6 = The estimated coefficient of the independent variable

The factors that chosen affect the technical efficiency adjusted by respondents at the study site, and based from Maryanto, et al (2008), Kurniawan (2012) and Hidayati (2018) research result.

Farmer age characteristic, education level, mustard farming bussines experience, number of family members, land ownership and non- farm bussines income is thought to have a big influence on the technical efficiency of

mustard farming. So these factors need to be tested for their effect on the technical efficiency of mustard farming.

IV. Result And Discussion

Respondent Farmers Characteristics

The different in farmers characteristics will influenced farmer in farm bussines and technical efficiency level of production input.Differences in the characteristics of farmers in this study include Farmer age , education level, mustard farming bussines experience, number of family members, land ownership and non-farm bussines income.

Age of farmers based on respondent data from this study, the largest percentage is in the productive age group, namely the age of 20 to 60 years as many as 46 people with a percentage of 92 percent and the less productive group, namely the age range of farmers between> 60 years by 4 people with a percentage of 8 percent. The average age of respondent farmers is 47 years with the youngest age is 35 years and the oldest age is 68 years. This grouping of productive age is based on the age classification according to the World Health Organization (WHO), where the ages of 20 - 60 years are included in the group of adult / productive age, while those aged> 60 years are included in the age group / non-productive age.

Table 2. Age distribution of respondent farmers in Banjarbaru City

Farmer age (Year)	Amount (Person)	Percentage (%)
20 – 60	46	92
>60	4	8
Total	50	100

Source: Primary data processing, 2020

Work productivity level and technology understanding level in agriculture is related with farmer age. Generally young farmer will be easier in understanding technology and able to decide on technology application in their farming.

Education level that mean here is the length of time a farmer attends formal education.

Table 3. Farmer education level ditribution in Banjarbaru city

Education Type	Amount (person)	Percentage (%)
SD (6 year)	19	38
SMP (9 year)	14	28
SMA (12 year)	17	34
Total	50	100

Source: Primary data processing, 2020

Some respondents who only took elementary education or about 6 years is about 38 percent that show lack of awareness of the importance about formal education. Lack of awareness to pursue formal education is partly due to the interests of family labor to carry out farming activities, some factor like economically disadvantaged and the availability of places for pursue formal education. Some farmer that had a great education will be easier to understanding and acceptance every information, especially with additional informal education such as counseling and training that can be provide the succes farming direct lesson.

Farming experience is one indicator which indirectly shows the experience in farming. Respondents' farming experience distribution Banjarbaru City is presented in the table below.

Table 4.Farmer farming experience respondent distribution in Banjarbaru city

Experience of farming (year)	Amount (person)	Percentage (%)
1-10	16	32
11-20	15	30
21-30	19	38
Total	50	100

Source: Primary data processing, 2020

The most respondent have been farming for 21-30 years as many as 19 people (38%). Experienced farmers are better able to solve the farming problems than new farmers. This also effected in faming activity

decision. In addition, farmers also have more support, especially production facilities, labor, and product marketing.

The number of family members is the number of respondent farm family members who occupy one house and live in the house. Most respondent farmers have family dependents of 3 to 5 people as many as 39 respondents 78 percent. The number of family members shows the size of the dependents of family living costs and can also be a source of family labor if they are at productive age. However, if there are family members who are not in their productive age, then it will add to the cost of living of the family. The average number of respondent farm family members in the three sub-districts was 3.64 or 4 people, at most 6 people and at least no family members.

Table 5. Family Members of Respondent Farmers in the City of Banjarbaru

Family amount (person)	Amount (person)	Persentage (%)
0-2	9	18
3-5	39	78
6-8	2	4
Total	50	100

Source: Primary data processing, 2020

Land ownership status farmer respondent in Banjarbaru city divided into self-owned land, borrowed and rented land.

Farmer land ownership status determind the farmer income. The status of land ownership that cultivated most is self-owned land by 30 people or 60 percent. Furthermore some farmer has a borrowed land without paying the rent is 15 farmer wich is 30 percent. This is very beneficial for respondents because the profits obtained is greater than a farmers who have to set aside their income to pay for land rent.

Table 6. Land ownership status at Banjarbaru city.

Land Status	Amount (person)	Percentage (%)
Self-owned	30	60
Brrowed	15	30
Rent	5	10
Total	50	100

Source : Primary data (2020)

Non- farming income is income that farmers get beside their farming activity can be offered from several sources including other trades, builders, masseurs and others.

Some respondent farmer in Banjarbaru city has a non- farming income about 12 persons or 24 percent, furthermore 38 persons or 76 percent does not have a non- farming income. Data on farmers number who have other non-farm income is presented in Table 7.

Tabel7. Data on Number of Farmers Who Have Non-Farm Income.

Status	Amount (Persons)	Percentage (%)
Have non- farm income		
Do not have non- farm income	12	24
	38	76
Total	50	100

Source : Primary data (2020)

Farmer respondents who does not have other income outside of farming are better at managing their farms, because it is only their income source. Otherwise for farmers who have other income outside farming bussines will reducing time in farming bussines and cause unoptimal in managing the farm.

Level of Input Use of Mustard Farmers in Banjarbaru City

Production factor that used in mustard farming in Banjarbaru city are land area, mustard seed, organic fertilizer, inorganic fertilizer, pesticides and labor.

Land area is an area that mustard plant, even the land is owned, rent or profit sharing. Based on respondent farmer data, , the largest area of arable land by respondent farmers is about 0.03 - 0.09 hectares wich stand of 78 percent of the total number respondents farmer.Whereas farmers with land area of 0.20 - 0.26 hectares are the smallest wich stand for 4 percent of the total number of respondents farmers.

Table 8. Mustard farm land area in Banjarbaru City

Land Area (hektar)	Amount (orang)	Percentage (%)
0,03 - 0,10	36	72
0,11 - 0,18	7	14
0,19 - 0,26	2	4
0,27 - 0,35	5	10
Total	50	100`

Source : Primary data (2020)

The average land area used by farmers of Banjarbaru City for mustard farming is 3.36 lots (0.097 hectares) where the smallest land area is 1 stock (0.029 hectares) while the largest land area is 12 stocks (0.35 hectares).

Table 9. Land area for mustard farming in Banjarbaru city

Description	**Score**
Average	0,097
Maximum Result	0,347
Minimum Result	0,029

Source : Primary Data procces, 2020

Mustard seed that prefer used in Banjarbaru city is about 1,44 kg/ha to 2,45 kg/ha wich used by 24 respondent farmer that stand for 48 percent. Mustard seed that used in the range of 0.35 kg / ha to 1.40 kg / ha are about 3 farmers or 6 percent same as respondent farmer that used 3,54 kg/ha to 4,55 kg/ha. Farmer distribution data in mustard seed using is presented in Table 10.

Table 10. Mustard seed using distribution data

Seed Using (kg/ha)	**Amount (orang)**	**Percentage (%)**
0,35 – 1,40	3	6
1,41 – 2,46	24	48
2,47 – 3,52	20	40
3,53 – 4,58	3	6
Total	50	100

Source : Primary data , 2020

The average use of mustard seeds is 2.45 kg / ha where the minimum use of seeds is 0.47 kg / ha and the most is 4.20 kg / ha.

Table 11. Mustard seed used per – hectare

Description	**Score**
Average	2,48
Maximum Result	4,20
Minimum Result	0,47

Source : Primary Data Process, 2020

Fertilizer use by respondent farmer in Banjarbaru city devided into two kind, organic feltizer and inorganic fertilizer (Chemical).
Farmers use organic fertilizer from chicken manure mixed with husk, in one hectare farmers use organic fertilizer with average of 7,420 kg / ha. With a range of 2,345 kg / ha - 9,625 kg / ha.
Farmer use inorganic fertilizer with average 748 kg / ha with a range of use between 88 kg / ha to 1,750 kg / ha. Inorganic fertilizers used include urea and phonska.

Table 12. The use of manure (kg) per stock in Banjarabaru city.

Fertilizer	Uraian	Nilai
Organic	Average	7.420
	Maximum Result	9.625
	Minimum Reslut	2.345
Inorganic	Average	748
(Kimia)	Maximum Result	1.750
	Minimum Reslut	88

Source : Primary Data Process, 2020

Pesticide use really important in maintaining the plant, because plant is really vulnerable to pest and dissease. The use of pesticides varies depending on the needs of the plant and what pests that attack the plant.
The use of pesticides among respondents mustard farmers was an average of 2.51 l / ha where the lowest use was 1.09 l / ha and the highest was 4.38 l / ha.

Table 13. Pesticide use in liter per hectare, in Banjarbaru city

Description	Result
Average	2,51
Maximum Result	4,38
Minimum Reslut	1,09

Source : Primary Data process, 2020

The labor use is needed in mustard farming activities ranging from tillage, to harvesting. The labor amount even from own family and from outside the family used per mustard farming activity in one cultivation season is based on work days equivalent to men labor. Labor used among respondent farmer is different, because it based by the land area that farmer use. Generaly, respondent farmers only use labor in the family in their mustard farming, as many as 30 farmers (60 percent), meanwhile there are only 20 farmers (40 percent) of respondents who use non-family labor. Labor used will be present in table 14.

Table 14. Labor used per hectare in Banjarbaru city

Description	Result
Average	436,1
Maximum Result	756
Minimum Reslut	163,45

Source : Primary Data process, 2020.

Technical Efficiency AnalisysWith DEA

The results mustard farming data processing in Banjarbaru city with DEA orientation input obtained an average technical efficiency of 80.6 percent for the DEA CRS model, 89,9 percent for DEA VRS model and 89,7 Percent for SE model. Mustard farmers in Banjarbaru are still able to increase their technical efficiency by 19.4 percent for the DEA CRS model, and 10,1 for DEA and VRS model and 10,3 percent for SE without additional cost.

Techical efficiency result variety is between 46,6 percent until 100 percents. The large variation in technical efficiency value among mustard farmers shows that there are still various uses of production inputs per unit of land area. Farmer criteria which is classified as efficient if it has a value of technical efficiency above 90 percent (Murthy et al., 2009). It just about 21 respondent farmer wich stand for 42 percent in DEA and CRS model,while in the DEA VRS model there are 31 farmers (62 percent) farmers who are technical efficiency and 34 (68 percent) farmers in the DEA SE model.

Technical efficiency is the ability to avoid waste by producing as much output as possible with existing inputs and technologies or by using fewer inputs with the same technology and output, so technical efficiency is using minimal input to producing as much output as possible. Farmers will be technically efficient if an increase in output is obtained by reducing at one other output or increasing at one input and if a decrease in one input is obtained by increasing one other input or decreasing at least one output. Therefore, producers who are

technically efficient will be able to produce the same output with decreasing at least one input or by using the same input and increasing the output level. Technical efficiency measure is very important because technical efficiency can decrease production cost and make produsen will more competitive (Alvarez and Arias, 2004).

Technical efficiencyis associated with some behavior to make a maximum output. Farmers are called technically efficient if they have produced at the frontier level of production where this cannot always be achieved due to various factors such as bad weather, the presence of pests and diseases that damage or other factors that cause production is below the frontier wich are expected (Battese and Coelli, 1995). Respondents farmers technical efficiency distribution in detail is presented in Table 15.

Based on table 15. Liang Anggang district is the highest district that have an average technical efficiency wich is 82,8 percent (CRS), 91,6 percent (VRS). Farmer in Liang Anggang district that have technical efficiency result above 90 percent are 62 percent. Farmers with an efficiency above 90 percent, are included in technically efficient farmers group. The district with the lowest average efficiency is LandasanUlin District where the average technical efficiency result is 71 percent (CRS), 79,8 percent (VRS). Farmer in LandsanUlin district that have an average result above 90 percent is only 37,5percent.

Tabel 15. Respondent Farmer Technical Efficiency Distribution InBanjarbaru City

Description	**Technical Efficiency DEA**		
Banjarbaru Utara Sub district	**CRS**	**VRS**	**SE**
Average	0,805	0,927	0,872
Maximum efficiency result	1,000	1,000	1,000
Minimum efficiency result	0,546	0,825	0,546
Total farmers with efficiency values = 1	2	3	2
Total farmers with efficiency values between 0.91 – 1	2	4	4
Total farmers with efficiency values <0.9	4	2	2
Total respondent farmer	6	6	6
LandasanUlinSub district	**CRS**	**VRS**	**SE**
Average	0,710	0,798	0,876
Maximum efficiency result	1,000	1,000	1,000
Minimum efficiency result	0,466	0,651	0,668
Total farmers with efficiency values = 1	2	2	2
Total farmers with efficiency values between 0.91 – 1	2	2	5
Total farmers with efficiency values <0.9	6	6	3
Total respondent farmer	8	8	8
Liang AnggangSub district	**CRS**	**VRS**	**SE**
Average	0,828	0,916	0,906
Maximum efficiency result	1,000	1,000	1,000
Minimum efficiency result	0,486	0,599	0,486
Total farmers with efficiency values = 1	10	19	12
Total farmers with efficiency values between 0.91 – 1	17	25	25
Total farmers with efficiency values <0.9	19	11	11
Total respondent farmer	36	36	36
Banjarbaru City	**CRS**	**VRS**	**SE**
Average	0,806	0,899	0,897
Maximum efficiency result	1,000	1,000	1,000
Minimum efficiency result	0,466	0,599	0,486
Total farmers with efficiency values = 1	14	24	16
Total farmers with efficiency values between 0.91 – 1	21	31	34

Total farmers with efficiency values <0.9	29	19	16
Total respondent farmer	50	50	50

Source: Primary Data Prosess, 2020

The DEA CRS and VRS models are used to determine whether trends in respondent mustard farmers in the study site are Increasing Return to Scale (IRS) or Decreasing Return to Scale (DRS). If the value of VRS technical efficiency is greater than CRS, then the respondents must produce these mustard farmers by increasing their scale of return. From all three district data, all technical efficiency VRS is higher than CRS, so the mustard farmer respondents in the study location belong to the IRS.

SkalaEfisiensi (SE) measurement is intended to determine the relative output loss caused by constant returns to scale which is indicated by one or close to one The majority of mustard farmers who are still inefficient are in a position to increase the scale of returns (increasing returns to scale) by 26 farmers (52 percent) where the increase in output is greater than the increase in input. Only 1 person in LandasanUlin district and 7 person in Liang Anggangdistictwich produce with deminishing return to scale, wichincrasing output is smaller than input increasing in production (Table 16).

Table 16. Mustard Farmer Production scale in Banjarbaru city

Sub District	Scale Of Production			Total People
	IRS	CRS	DRS	
Banjarbaru Utara	4	2	0	6
LandasanUlin	5	2	1	8
Liang Anggang	17	12	7	36
Total Petani	26	16	8	50

Source : Primary Data Process, 2020

Input Slack

*Input slack*indicate inputs that can be reduced by respondent farmers due to excess use of inputs to produce the same level of output. Input slack occurs in farmers who are inefficient about their peers, namely farmers who are efficient. Reduction of Excess input is needed to improve farmer efficiency relative to peer farmers. While the output slack is output that can be increased without increasing the number of inputs. Output Slack is happened in study case that use the DEA model wich output orientation. In this study output slack does not occur, because this study uses an input oriented DEA model.

Input slack in inefficient farmer is varied and spread value in all input factor. The arable land used area inputs has an average slack of 0.005 hectares. There are 16 people (32 percent) farmers who can reduce used land with an average of 0.005 hectares and this reduction does not reduce mustard production.In this case it indicates that there are farmers who efficient (level of efficiency = 1,000) who become peers for 32 percent of farmers for the use of land area input. Used arable land input reduce is never effected the mutard production.as in peers farmers. In the use of seeds, there are 9 (18 percent) farmers who inefficient with an average seed saving of 0.175 kg. In organic fertilizer use, there are 17 (34 percent) farmers who inefficient with an average of organic fertilizer that can be saved by 1,478.89 kg. In inorganic fertilizers use, there are 10 farmers (20 percent), farmers who inefficient with an average of inorganic fertilizer that can be saved by 339.78 kg. The same thing applies to the use of pesticides where the average use of pesticides that can be saved is 204.6 ml without reducing the mustard production ouput by 9 farmers (18 percent) of respondent farmers,so that the production targets are the same as those of peer farmers. The workforce has an average slack value of 15,225.This shows that at 4 (8 percent) farmers can still reduce the use of work by an average of 15,225 HKSPs to get the same output as their peer farmers.In detail the average value of slack inputs from all farmers in the input variables can be seen in Table 17.

Tabel 17. Average Slack Input Value of Sawi Farmers Respondents in Banjarbaru City

Variabel	Nilai Slack Rata-rata	Satuan	FrekuensiPetani (%)
Land area	0,005	hektar	32,00
Seed	0,175	Kg	18,00
Organik fertilizer	1.478,89	Kg	34,00
Inorganic fertilizer	339,78	Kg	20,00
Pesticide	204,6	Ml	18,00
Labor	15,225	HKSP	8,00

Source: Primary Data Prosess, 2020

Factors Affecting the Technical Efficiency of Mustard Farms Analisys

To analize some factor that affecting maustard farming technical efficiency is carried out by regressing the results of the Data Envelopment Analysis (DEA) calculation of several socioeconomic factors using Tobit regression.

Based on the analysis with Tobit Regression, the results obtained are age, level of formal education, farming experience, number of farmers burden, land ownership status and non-farming income significantly influence the level of technical efficiency of mustard farming in Banjarbaru city. Farmer age will affected the farmer performance that will decreasing the farmers technical efficiency as the farmer getolder. Amoh*et al.* (2014) and Akamin*et al.*(2017) also found that age will have a negative effect to techical efficiency.This is in line with Khan and Saeed (2011) research which states that younger age is more efficient if compared to farmers who have an older age. Most of respondent farmer in this research were in productiv age. The Tobit regression result is describe in table 18. That describe as below

Tabel 18. Tobit Regression calculation results

Variable	Coefficient	T_{Count}	P> |t|
Constanta	0,7620032	16,90	0,000**
Age	-0,0017962	-2,40	0,020**
Education Level	0,0135216	3,47	0,001**
Farming Experience	0,0043781	3,62	0,001**
Farmer Burden Amount	0,0139613	2,01	0,051*
Dummy Land Ownership Status	-0,0389353	-2,63	0,012**
Dummy Non-farming Income	-0,0521047	-2,20	0,033**

*) real test level 0,10 (α = 10%)
**) real test level 0,05 (α = 5%)

Sumber :Primary Data Process, 2020

Based on the data presented in Table 17, educational factors have a positive effect and significant influence on technical efficiency.Farmers who have higher education level have a broad networks so that access to information that obtained can be easier and faster than farmers who have lower levels education.Wider and faster access to information can help farmers obtain technology information, appropriate inputs use information, as well as knowledge about cultivation techniques that can help farmers in managing their farming. Farming experience also have an positive and significant effect for farming technical efficiency. Farmers who have low level farming experience rather make mistakes more often in cultivation activities so that the production that produced is not optimal.Farmers with a low level experience rather use their farming activities as a trial and error by asking advice from other farmers that more experienced in farming activity. Maganga (2012) and Hussain*et al.* (2014) also stated that farming experience has a positive influence on the farming technical efficiency. This is because the farming experience can help farmers in making decisions. Farmers who have longer farming experience can make better decisions because they have learned from the experience of failures that have occurred.

Amount of farmer family also have positive effect to farming technical efficiency even though not significant. Famer burden average in study site is 3,64 persons.Nwaru*et al.* (2011) and Mapemba*et al.* (2013) also revealed that a large number of family members can overcome the labor constraints faced by farmers, especially in rural areas who rely more on family members as labor rather than employing others.

Land ownership has an negative effect in farming technical effeciency. Farmers that have self-owned land have an effect on reducing the farming technical efficiency value in their farming activities.There are 30 respondent farmers with own land ownership status or around 60% of the total respondents farmers. Fauziyah (2010) and Suharyanto et al. (2013) also suggested that land ownership status had a negative effect on the farming technical efficiency.beside that Tinaprilla (2012) also stated that farmers who own land with their own status tend to be more negligent in managing their farming.

Non-farming inome also have negative effect in farming technical efficiency. Farmer that have non-farming income can get additional funding, but if the money does not managed well that will not influenced the farming technical efficiency.Beside that, farmers who have non-farm income will not focus on managing their farming so that can reduce farming technical efficiency. This also in line with Fauziah (2010) research that also stated the higher income will increase the inefficiency value or the higher income outside the farm can reduce the value of farming technical efficiency. However, Khotimah and Nurmalina (2012) state that other sources of income can positively influence technical efficiency.

V. Result And Advice

Result

Based on the results of the research conducted, the following conclusions can be drawn:

1. Input use in Banjarbaru city is varieted. The average input use of respondent farmers is 0.097 hectares land area, 2.48 kg of mustard seed / ha, 7,420 kg / ha of organic fertilizer, 747.95 kg / ha of inorganic fertilizer as much as 2.11 liters / ha of pesticides and the usage of an average workforce is 436.1 HKSP per hectare.
2. Mustard Farmer tchnicl efficiency analysis in Banjarbarucity with DEA method. The technical efficiency value of mustard farmers varies between 46.6-100 percent with an average of 80.6 percent (CRS) and 89.9 percent (VRS). This shows that mustard farmers in Banjarbaru City are still technically inefficient and still have the potential to be able to improve their technical efficiency with the same input and technology.
3. Mustard farming condition in Banjarbaru city with DEA analysis is 26 farmer 52 percent with IRS,CRS 16 farmers 32 percent, DRS 8 farmers 16 percent. generaly, mustard farmers in the study site belong to the IRS, the increase in output is greater than the increase in production inputs so farmers can still optimize the use of production inputs.
4. Some significant factors that have a positive effect on the technical efficiency of mustard farming in Banjarbaru City are the education level, farming experience and number of family burden while the age of farmers, land ownership status and non-farming income have a negative influence on the technical efficiency of mustard farming.

Advice

Farmer in Banjarbaru city can improve their farming technical efficiency value with decreasing their production input with reduce the amount of excess input usage, especially in the use of organic fertilizers, anorgainic fertilizers and pesticides, which have a large slack input value compared to other slack inputs. Socialization regarding the importance of using appropriate inputs also needs to be done through the role of extension workers. Non-formal training can be used as an effort to improve farmers understanding of good cultivation techniques and training that is expected to be able to continuously improve farmers' cultivation skills.

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