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LEVERAGE FACTORS IN ENHANCING FOOD COMMODITIES PERFORMANCE

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ABSTRACT: The research goals are (1) to analyze potential of rice, corn, and soybean commodity; (2) technology replication of rice, corn, and soybean commodity cultivation; (3) post-harvest implementation system of rice, corn, and soybean commodity cultivation; and (4) leverage factors that stimulate sub-sector for rice, corn, and soybean commodity. The research locations were Sumenep, Sampang, Bojonegoro, Lamongan, Tulungagung, Blitar, Situbondo, and Banyuwangi Regency. Data collection technique in this research used Snowball Sampling method and it was also conducted by soil sampling to know content of soil nutrient for organic C, Nitrogen, Phosphate, and Potassium in each commodity land (rice, corn, and soybean). Data used in this research was primary and secondary data. Data analysis method used are (1) descriptive analysis; (2) LQ; (3) Cobb-Douglas production function; (4) Income analysis; and (5) Contribution analysis. The research results show that (1) rice and corn needs in East Java still in surplus level, however it was deficit for soybean; (2) basis sector could be made as mainstay in order to improve an area's economic level through economic growth, especially for three food commodities of rice, corn, and soybean. However, soil fertility was decreasing, particularly for organic C (under 2 percent). Besides, agricultural land in many areas are suffered by degradation due to land conversion. The implementation of cultivation and post-harvest technique have been suitable with local wisdom and varied depending on geographic and topographic condition, rainfall pattern, habit, farmer resource quality, information, and agribusiness capital. Leverage factors for soybean that could stimulate the improvement of food commodity production in East Java is land area and fertilizer use variable. Moreover, the variable that affects production decrease is technology application. Leverage factors for rice are variable of land area, organic fertilizer use, inorganic fertilizer use, seeds, workers, and technology. Then, the leverage factor of corn commodity are land area, organic fertilizer use, inorganic fertilizer use, and seeds.

Keywords: leverage factors, performance, food commodity

INTRODUCTION

In 2013, East Java Province was able to give contribution for national food needs such as rice 53.93 percent, corn 25.79 percent, and soybean 1.47 percent. Rice production gave largest contribution to the food crop in East Java, which was more than 50 percent or about 12.5 million tons per year (Department of Agriculture of East Java Province, 2014).

It is expected that government will be able to play role in planning and implementing the development that lead to the improvement of region independency through planning and development authority. Thus, it needs leverage factors to the activities that stimulate agricultural performance.

This study focuses on: (1) potential of rice, corn, and soybean commodity; (2) technology replication of rice, corn, and soybean commodity cultivation; (3) post-harvest implementation system of rice, corn, and soybean commodity cultivation; and (4) identifying leverage factors that can stimulate performance of food crop subsector, especially for rice, corn, and soybean commodity.

RESEARCH METHODS

The selection of research location was conducted through purposive method, which was Sumenep Regency, Sampang Regency, Bojonegoro Regency, Lamongan Regency, Tulungagung Regency, Blitar Regency, Situbondo Regency, and Banyuwangi Regency, by three months period.

Data collection technique in this research used Snowball Sampling method and it was also conducted by soil sampling to know content of soil nutrient for organic C, Nitrogen, Phosphate, and Potassium in each commodity land (rice, corn, and soybean). Data that used in this research was primary and secondary data. Data analysis method used are: (1) Descriptive analysis; (2) LQ; (3) Cobb-Douglas production function; (4) Income analysis; and (5) Contribution analysis.

Location Quotient Analysis (LQ Analysis) is approach used in this research for assessing the potential commodity in the location. This analysis also used to know basis and non basis sector from various commodities. It has formulation (Soetriono, 2010) as follows

$$LQ = \frac{(vi/vt)}{(Vi/Vt)} \quad \text{..... (1)}$$

Where:
LQ = LQ from s sector in an area
Vi = Basic assessment from s sector in i area
Vt = Basic assessment of total area
vi = Basic assessment from s sector in all areas
Vt = Basic assessment of total area

Criteria for decision taking:
LQ>1= i area has potential to produce certain commodity
LQ<1= i area has no potential to produce certain commodity
LQ = 1 = i area has potential to produce certain commodity, but it is only in sufficient amount to fulfill the needs of area itself

Production analysis

Factors that affected to the rice, corn, and soybean production were found using Cobb-Douglas production function (Soekartawi, 2002), as follows:

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}X_7^{b7}e \quad \text{..... (2)}$$

Formulation above changed to be linear by logarithm equation to be:

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 \quad \text{..... (3)}$$

Where:
Y = Production of Rice/Corn/Soybean (Kg)
a = Constant
b_1- b_7 = Regression Coefficient
X_1 = Land Area (Ha)
X_2 = Seeds (Kg/Ha)
X_3 = Organic Fertilizer (Kg/Ha)
X_4 = Inorganic Fertilizer (Kg/Ha)
X_5 = Pesticide (Bottle/Ha)
X_6 = Workers (HKP)
X_7 = Technology

F-test is used for confirming whether the model is fit enough with the data or not. F-test formulation as follows:

$$F - Stat = \frac{Sum\ of\ Mean\ Squares}{Residual\ Sum\ of\ Squares} \quad \text{..... (4)}$$

With criteria as follows:
1. If $F_{statistics} > 0.05$ (α = 5 percent) then jointly independent variable had no significant effect to the production (H1 accepeted)
2. If $F_{statistics} \leq 0.05$ (α = 5 percent) then jointly independent variable affected significantly to the production (H1 rejected)

Evaluating the effect of each independent variable to the dependent variable, it was used by t-test as follows:

$$t - stat = \frac{|bi|}{Sbi} \quad \text{..... (5)}$$

$$Sbi = \frac{\text{Residual Sum of Squares}}{\text{Sum of Squares}} \quad \text{..... (6)}$$

Where: bi = regression coefficient to-i
Sbi = standard deviation to-i
The criteria as follows:
1. If $t_{statistics} > 0.05$ (α = 5 percent), then independent variables had no significant effect to the dependent variable (H1 accepted)
2. If $t_{statistics} \geq 0.05$ (α = 5 percent), then independent variables affected significantly to the dependent variable (H1 rejected)

And to study the extent of Y variable change that caused by variation of X variable, then it was computed by determination coefficient with formulation as follows:

$$R^2 = \frac{\text{Regression Sum of Squares}}{\text{Sum of Mean Squares}} \quad \text{..... (7)}$$

Income Analysis and Cost Efficiency of Agribusiness

The level of farmer income of rice, corn, and soybean is formulated below.

$$Y = TR - TC \quad \text{..... (8)}$$

$$TR = P.Q \quad \text{..... (8)}$$

$$TC = TFC + TVC \quad \text{..... (9)}$$

Where:

Y = Income (IDR/ha)
P = Output price (IDR/kg)
Q = Number of sold output (kg/ha)
TR = Total revenue (IDR/ha)
TC = Total cost (IDR/ha)
TFC = Total fixed cost (IDR)
TVC = Total variable cost (IDR/ha)

Criteria for decision making:
1. TR > TC shows profit in the agribusiness of rice, corn, and soybean
2. TR = TC shows breakeven point in the agribusiness of rice, corn, and soybean
3. TR < TC shows loss in the agribusiness of rice, corn, and soybean

$$\text{R/C ratio} = \frac{\text{Total Revenue (IDR)}}{\text{Total Cost (IDR)}} \quad \text{..... (10)}$$

Criteria:
1. If R/C ratio > 1, then there is efficient cost utilization in the agribusiness of rice, corn, and soybean
2. If R/C ratio ≤ 1, then there is inefficient cost utilization in the agribusiness of rice, corn, and soybean

Contribution Analysis

The contribution of rice, corn, and soybean in East Java, then this research used percentage analysis (Fithriyah, 2006) as follows:

$$Z = \frac{A}{B} x100\% \quad \text{..... (11)}$$

Where :
Z = Percentage of rice, corn, and soybean contribution to the food crop sub-sector in East Java
A = Rice, corn, and soybean production
B = Total production of food crop sub-sector in East Java

Criteria for decision taking:
a. If Z < 50 percent, then rice, corn, and soybean contribution is low
b. If Z ≥ 50 percent, then rice, corn, and soybean contribution is high

RESULTS AND DISCUSSION

Location Quotient Analysis (LQ) di East Java Soybean

Food commodities which had strategic potential and mostly consumed by people were soybean, rice, and corn. Those three food commodities mostly traded in the market, either in primary or secondary type. From 38 Regencies/Cities in East Java which had LQ score more than 1, means basis sector, for soybean commodity was Ponorogo, Blitar, Jember, Banyuwangi, Pasuruan, Nganjuk, Madiun, Ngawi, Bojonegoro, Lamongan, Sampang, and Mojokerto Regency, they had score of 1.12, 1.37, 1.02, 2.81, 1.73, 1.73, 1.26, 1.61, 1.55, 1.88, 2.70, and 1.38 respectively. While, for LQ score less than 1, means non basis sector, for soybean commodity in East Java was Pacitan, Terenggalek, Tulungagung, Kediri, Malang, Lumajang, Bondowoso, Situbondo, Probolinggo, Sidoarjo, Mojokerto, Jombang, Magetan, Tuban, Gresik, Bangkalan, Pamekasan, and Sumenep Regency as well as Kediri, Blitar, Malang, Probolinggo, Pasuruan, Madiun, Surabaya, and Batu City.

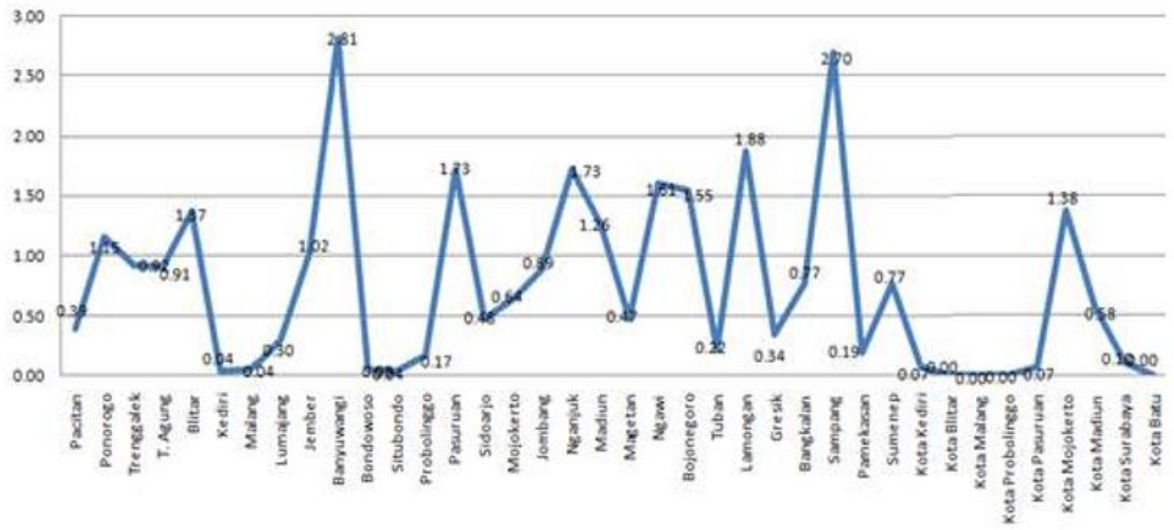

Figure 1. Mean of LQ score for Soybean Commodity each regency in East Java, 2009-2013

Rice

LQ score which more than 1 for rice commodity for five years period showed that rice was basis sector in Lumajang, Jember, Banyuwangi, Bondowoso, Pasuruan, Sidoarjo, Mojokerto, Jombang, Nganjuk, Madiun, Magetan, Ngawi, Bojonegoro, Lamongan, and Gresik Regency as well as Kediri, Blitar, Malang, Pasuruan, Mojokerto, Madiun and Surabaya City with the score of 1.15; 1.26; 1.39; 1.03; 1.20; 1.69; 1.16; 1.22; 1.06; 1.43; 1.09; 1.34; 1.37; 1.24; 1.33; 1.24; 1.08;1.50; 1.89; 1.84; 1.88 dan 1.73. While, LQ score which less than 1, means non basis sector, for rice commodity in East Java was Pacitan, Ponorogo, Terenggalek, Tulungagung, Blitar, Kediri, Malang, Situbondo, Probolinggo, Tuban, Bangkalan, Sampang, Pamekasan, and Sumenep Regency as well as Probolinggo and Batu City.

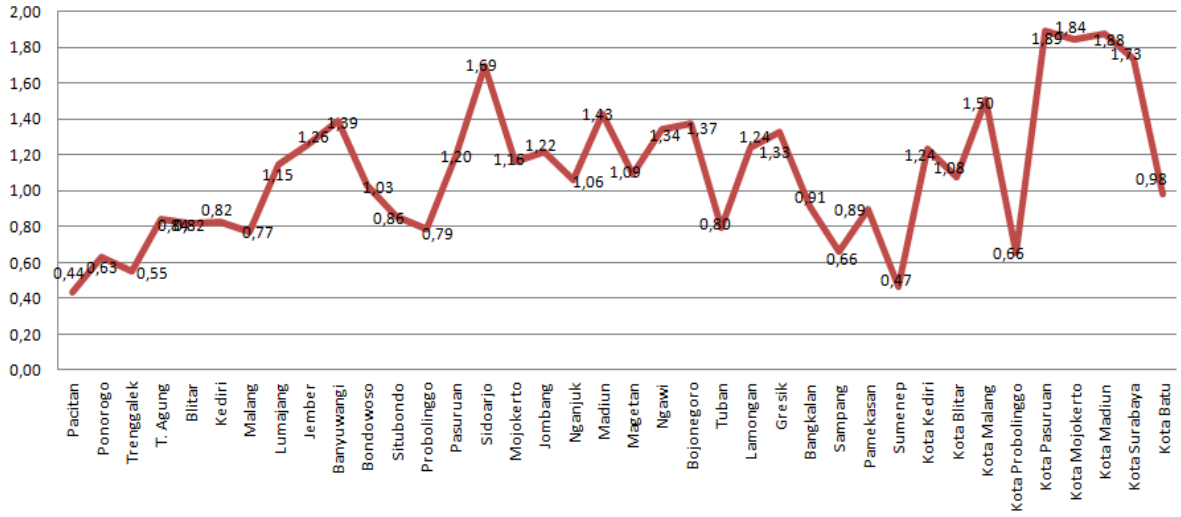

Figure 2. Mean of LQ Score for Rice Commodity in 2009-2013

Corn

LQ analysis result to the corn commodity for five years period – from 38 Regencies/Cities in East Java – which had LQ score more than 1, means basis sector, for corn commodity was Tulungagung, Blitar, Kediri, Malang, Jember, Bondowoso, Situbondo, Probolinggo, Jombang, Nganjuk, Tuban, Lamongan, Bangkalan, Pamekasan, and Sumenep Regency as well as Kediri, Blitar, and Probolinggo City with the score of 1.11; 1.59; 1.06; 1.04; 1.18; 1.92; 1.65; 1.16; 1.05; 1.49; 1.01; 1.04;

1.59; 1.91; 1.19; 1.65 and 2.53 respectively. While, LQ score which less than 1, means non basis sector, for corn commodity in East Java was Pacitan, Ponorogo, Terenggalek, Lumajang, Banyuwangi, Pasuruan, Sidoarjo, Mojokerto, Madiun, Magetan, Ngawi, Bojonegoro, Gresik, and Sampang Regency as well as Malang, Pasuruan, Mojokerto, Madiun, Surabaya and Batu City, such illustration in Figure 3.

Land Conversion and Land Utilization Aspect

Soybean

Land area of soybean had decreased for 4.9 percent from 2012. In 2012, land area of soybean was 220,815 Ha, in 2013 decreased to be 210,500 Ha. Productivity of soybean commodity was 15.65 quintals/Ha and it affected soybean commodity production in 2013 which decreased to be 329,461 tons from 361,986 tons in 2012, or it decreased for 9.8 percent.The top three largest area at East Java in 2013 was Banyuwangi, Sampang, and Blitar Regency, with the area of 32,979 Ha, 24,552 Ha and 10,409 Ha respectively.

Rice

Land of rice commodity in 2013 improved for 3.01 percent from 2012. In 2012, land area of rice commodity was 1,975,719 Ha and in 2013 improved to be 2,037,021 Ha. The average of rice productivity was 5.91 quintals/Ha. The improvement of land area was not equal with its productivity, where in 2013 productivity of rice commodity decreased for 1.2 percent, from 12,198,707 tons in 2012 to be 12,049,342 tons. Many regencies had larger rice field area than non rice field area such as Lamongan Regency for 92.441 Ha, Bojonegoro Regency for 78.937 Ha, and Banyuwangi Regency for 66.154 Ha in 2013.

Corn

Land area of corn commodity in 2012 was 1,232,523 Ha which decreased for 2.75 percent to be 1,199,544 Ha. It resulted in the decrease of corn productivity in East Java for 9.27 percent, from 6,295,301 tons in 2012 to be 5,760,959 tons in 2013. In many areas, there was land conversion in the central area of corn commodity such as in Sumenep, Tulungagung, and Situbondo Regency.

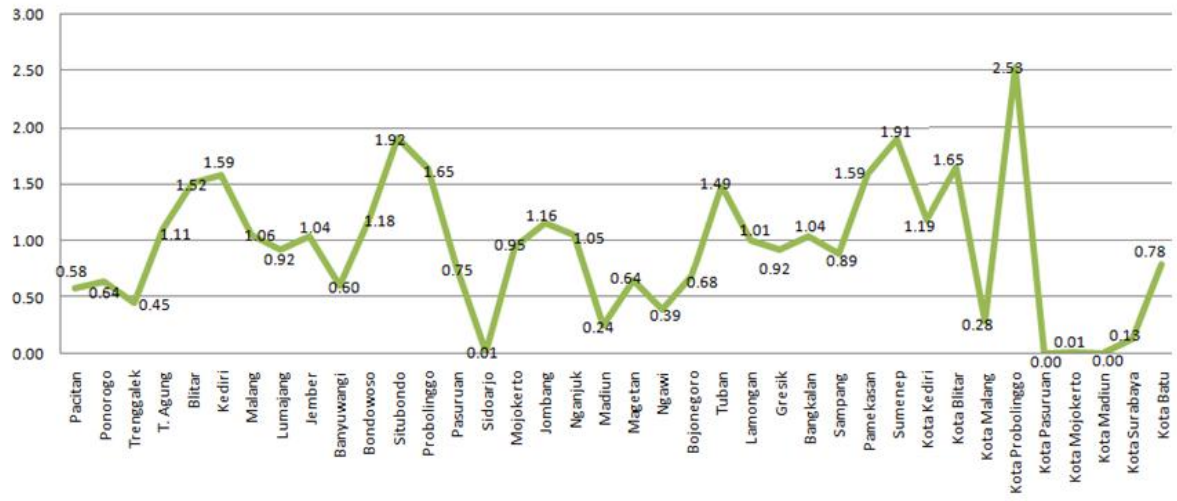

Figure 3. Mean of LQ Score for Corn Commodity in 2009-2013

Distribution Level of Food Crop Area Appropriateness

Production of a food crop was heavily determined by land processing, food crop varieties, climate, and land condition. Continuous land utilization without any good land processing would lead to the land degradation or teh decrease of soil nutrient. Therefore, it was necessary to conduct laboratory analysis to the soil physical and chemical properties as well as soil nutrient status. Despite soil test, soil analysis also needed to determine soil classification and land evaluation. This analysis only saw soil chemical properties, organic-C, Nitrogen (N), Phosphate (P), and Potassium (P) in each area.

Table 1. Chemical analysis result of soil at East Java in 2015

No	Regency	Chemical Properties of Soil							
		Organic-C (percent)	Exp	Nitrogen (percent)	Exp	P2O5 (ppm)	Exp	K2O (me/100 g)	Exp
	Soybean								
1.	Banyuwangi	0.59	SR	0.18	R	3.04	SR	0.32	S
2.	Blitar	1.86	R	0.15	R	3.1	SR	0.19	R
3.	Sampang	1.49	R	0.12	R	3.45	SR	0.31	S
	Rice								
1.	Bojonegoro	1.48	R	0.16	R	2.87	SR	0.25	R
2.	Lamongan	2.52	S	0.95	ST	3.67	SR	0.19	R
	Corn								
1.	Sumenep	1.62	R	0.15	R	3.99	SR	0.38	S
2.	Tulungagung	1.47	R	0.13	R	4.17	SR	0.45	S
3.	Situbondo	2.78	S	0.20	R	4.94	SR	0.26	R

Source: Result of Laboratory Test to the Soil Chemical Properties, Faculty of Agriculture, University of Jember

Technology Replication of Food Crops Cultivation in East Java

Soybean

Soybean commodity could grow well in various agro-ecosystem with different soil type, soil fertility, climate, and planting pattern. Thus, agro-ecosystem constraint is different from one to another. It indicated that there was specification in soybean planting. Therefore, the first step that should be concerned in soybean cultivation was seeds selection, land preparation, planting system, pest and disease controlling, maintenance, and harvesting.

Rice

Rice planting is hereditary activity that conducted since the ancestor era. By the advanced technology and science, farmers should be able to implement more efficient and productive planting system, thus the needs of food would be met from domestic production and farmer's welfare also would be improved. Hence, the first step that should be concerned in rice planting was seedling, land preparation and processing, planting system, maintenance, pest and disease controlling, fertilization, and harvesting.

Corn

Corn is one food crop commodity with carbohydrate source for rice substitution. Corn usually planted in dry area or limited irrigation area. Corn mostly planted as companion crop. Therefore, the first step that should be concerned in corn planting was land preparation, seeds selection, pest and disease controlling, irrigation, fertilization, and harvesting.

Post-harvest Implementation System of Soybean, Rice, and Corn Commodity Cultivation in East Java

Soybean

Phenomenon that faced by soybean farmers was low price imported soybean. Despite production aspect, constraints in the harvest and post-harvest aspect were: (1) quite high production loss level; (2) less optimal harvest and post-harvest technology implementation, especially for farmers with small scale agribusiness; (3) capital limitation to buy agricultural tool and machine; and (4) less availability of agricultural tool and machine. The other challenges as follow: (1) no guaranteed price incentive for qualified product; (2) quite high operational cost for agricultural tool and machine; (3) farmer institution that still not well-managed; and (4) limited farm workers.

Harvest that conducted by outdoor drying system without any drying floor or mat caused much grain loss which led into quite high production loss. Drying equipment still considered as quite expensive for soybean farmers. No policy about import price made larger amount of imported soybean, thus it resulted in lower price of domestic soybean and farmers were unwilling to plant soybean. Harvest and post-harvest technology implementation needed to be improved, particularly for farmers that still conducted traditional harvesting process. Besides that, most of farmers not used harvest and drying machine tool. Capital limitation caused soybean farmers were unable to

buy agricultural machine tool. It resulted in quite high production loss and inefficient production process.

Rice

Rice post-harvest activities include harvesting, threshing, drying, packaging, storage, processing, and the last is marketing. Post-harvest process aims to decrease production loss, lowering broken grain level, and improving shelf-life and commodity efficiency in order to achieve added value.

The determination of harvest time by farmers in many areas of East Java showed by yellow color level of rice grain (about 90-95 percent) with indicator of drying leaves in the lower position. Sickle that used in harvest process was common sickle, not serrated sickle, it was conducted with many considerations: (1) from physical aspect: serrated sickle was very thin, thus it was less sturdy to cut rice stems, while common sickle was thicker and larger, thus it was sturdier and longer lasting; (2) from efficiency aspect: common sickle could be used to harvest rice and collect grass for livestock (farmers in the research location mostly raised livestock such as goat, sheep, and cow), while serrated sickle could be only used to harvest rice; and (3) from the easy to get aspect: common sickle mostly available in market which easy to be reached by farmers, while serrated sickle had less availability in the market.

Many farmer groups still conducted threshing process in simple way, which was by pushing rice stems to the log or bamboo. That way needed more workers and time. This traditional way resulted in high level of grain loss and less good product quality. Besides that, there were farmers who used manual rice thresher, which made from nailed cylindrical log. This nailed cylindrical log used counter shaft and chain then hooked by pedal. When it was paddled then nailed cylindrical log would be rotated (like bicycle). This rotation would separate rice grain from its stems. As the result of post-harvest technology development, most of farmers in the research location had used rice thresher with diesel engine. This tool application was really ease thresher activity and made it faster and more efficient.

Traditional rice storage that mostly used by farmers in the research location was by storing rice either in barn or sack. Rice storage in the barn conducted by pouring system, which was dried rice poured to a place (barn) that considered as safe place (from pest or weather). Rice that stored in this way should be in dried condition and the barn should be cool. It has to be concerned that the storage place must free from barn pest, rat, bird, and others. Before storing rice, rice and barn should be cleaned up first. Rice should be cleaned up from dust, waste, or pest.

Corn

Harvest process and post-harvest management of corn in East Java was conducted as local people habit, which was by chopping corn stem. And then the farmers carried their harvest and sold their corn without shelling or drying process, in which it depended on weather condition and tool availability.

Drying process was conducted naturally in the sun. This harvest product just scattered over the edge of street along corn field area. It took three days, depended on weather condition. Way of harvesting for corn commodity that ripe physiologically was conducted by shaking corn cob and its husk or it could be conducted by breaking corn stem. Actually, according to farmers who planted hybrid corn, it was very suitable to use harvest machine in the large and flat land. It could make faster harvest process because it was difficult to find workers. Inappropriate time and less ripe of corn harvesting resulted in low quality and wrinkled corn grain. The experience of many farmers showed that drying process in this way would cause broken shelled corn, especially if it is shelled using sheller machine.

Corn peeled directly when it still attached to its stem or after harvest process. Peeling process aims to decrease water content in the corn cob and humidity around corn grain could not emerge any fungus. Peeling could ease corn transportation during the drying process. Peeling activity could be conducted manually. In Madura, usually corn peeling conducted in togetherness without any returns, while in other area of East Java, it has been implemented by profit-sharing, daily wage, or contract system.

The dried corn then separated from its cob and shelled. In general, shelling process conducted manually by using man's hand. Only few farmers, with high production, who used corn sheller machine. To gain higher profit, there were farmers who conducted corn sorting. The shelled corn separated from any unwanted waste which could decrease corn quality. Sorting process conducted to the cob residual, small corn grain, broken corn grain, and other wastes that might be brought during the harvest process. It was conducted to avoid or decrease fungus and pests onset in the storage also it could improve air circulation.

Leverage Factors that Stimulate Food Crop Sub-sector In East Java

Efficiency of Production Cost and Farmer Income to the Rice, Corn, and Soybean Commodity in East Java

Quite high food crops potential in East Java are still not accompanied by the change of paradigm, from product orientation to the improvement of farmers' income orientation. To realize that situation, it was necessary to conduct appropriate farming, knowledge and skill improvement. It is also recognizing potential crops, arranging precise farming plan, solving any problems, taking decision, and implementing synergic and environmental oriented technology. Then, those create efficient farming.

R/C ratio analysis showed the score of 5.1, 2.12, and 2.53 for soybean, rice, and corn; while income analysis showed IDR 16,353,732/Ha; IDR 9,801,042.69/Ha; and IDR 13,723, 523.27/Ha for soybean, rice, and corn. R/C ratio score which more than 1 means that soybean agribusiness in East Java could be stated as efficient in the use of production cost as well as to the other food crops – rice and corn – and economically it was still profitable for farmers.

Leverage factors of food crop in East Java

Food crops that mostly planted by farmers are soybean, rice, and corn. The attempts to improve food crop production had been conducted in many ways both by government, research institutions, farmers, and university. However, the fact is that the results of potential food crops production are still significantly different from its real production, which is obtained by farmers. This yield gap, in general, is caused by two factors, technical factor (biologic) and non technical factor (social-economic).

The result of Cobb-Douglas analysis to the soybean production factor

The analysis is conducted using five independent variables. The results of Cobb-Douglass production function showed that R^2 is 0.75. It means that 75 percent soybean production in East Java could be explained by five independent variables that included in the model. Those variables were land area (X_1), inorganic fertilizer (X_2), seeds (X_3), workers (X_4), and technology (X_5). While, the remaining of 25 percent of soybean production is explained by other independent variables which are not included in the model. The detail of those five independent variables to the soybean production could be seen in Table 2.

Table 2. Anova of Soybean Production in East Java

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.317	5	0.863	87.435	0.000a
Residual	1.422	144	0.010		
Total	5.738	149			

Source: Processed Primary Data, 2015

Based on Table 2 above, the result of ANOVA test shows that Fstatistics score is 87.435 with significance level of 0.000. Because of its probability is smaller than 0.05 then it means that land area (X1), inorganic fertilizer (X2), seeds (X3), workers (X4), and technology (X5) variable jointly affected to the soybean production in East Java with significance level of 95 percent. The result of Cobb-Douglas partial test showed such in the Table 3.

Table 3. Coefficient for Soybean Commodity Production in East Java

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.051	0.234		13.020	0.000
LL	0.503	0.120	0.732	4.195	0.000
PA	0.240	0.084	0.307	2.842	0.005
BNH	-0.030	0.072	-0.049	-0.421	0.674
TK	-0.037	0.099	-0.047	-0.373	0.710
TEKNO	-0.065	0.025	-0.138	-2.622	0.010

Source: Processed Primary Data, 2015

From those five independent variables – land area (X_1), inorganic fertilizer (X_2), seeds (X_3), workers (X_4), and technology (X_5) – which have significant effect to the soybean production are land, inorganic fertilizer, and technology variable. Each of those variables have probability score of rejecting alternative hypothesis 0.000, 0.005, and 0.010, respectively. Those are smaller than 0.05 significant level employed. Therefore, those variables are statistically significant affecting soybean production in East Java. Whereas, the other variables – seeds and workers variable – are no effect to the soybean production due to its score of 0.674 and 0.710, respectively.

Model of production function as follows:

$$Y = 1{,}124.6\ X_1^{0.503}\ X_2^{0.240}\ X_3^{-0.030}\ X_4^{-0.037}\ X_5^{-0.065}$$

From the equation above, it could be stated that when land, inorganic fertilizer, seeds, workers, and technology variable were in constant, then soybean production in East Java placed in the position of 1,124.6 unit. From the result of Cobb-Douglas production function, it is found that land variable have positive effect to the soybean production with significance level of 95 precent. It means that the increase of 1 percent land would increase soybean production for 0.503 percent. Furthermore, Land variable has significant effect on soybean production. It was affirmed by t-test where $t_{statistics}$ showed the score of 4.195, larger than t_{table} (1.990). It means that the increase of land would give significant and positive effect to the soybean production.

Inorganic fertilizer has positive effect to the production with significance level of 95 percent. It means that the increase of 1 percent of the fertilizer would increase soybean production for 0.240 percent. Based on t-test, $t_{statistics}$ is 2.842, which is higher than t_{table} (1.990). It means that inorganic fertilizer use would give significant and positive effect to the soybean production.

The other variables – seeds and workers – are negative (-0.030 and -0.037), the effect was not significant which showed by probability score that higher than 0.05. While, technology measure shows having negative effect on soybean production. This is happening since there is no significant technological improvement in soybean and the effect of weather and others destruct the potential production of soybean.

The Result of Cobb-Douglas Analysis to the Rice Production Factors

R^2 of the model is 0.91. It means that variety of rice production in East Java could be explained by land area (X1), organic fertilizer (X2), inorganic fertilizer (X3), seeds (X4), pesticides (X5), workers (X6), and technology (X7) variable for 91 precent and the remaining 9 percent affected by other factors that are not included in the model.

Table 4. Anova of Rice Production in East Java

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.118	7	0.588	144.488	0.000[a]
Residual	0.375	92	0.004		
Total	4.493	99			

Source: Processed Primary Data, 2015

In Table 4, it is found that $F_{statistics}$ 144.488 higher than F_{table} (2.215) with alpha level of 5% or significance level of 95%. It means that land area, organic fertilizer, inorganic fertilizer, seeds, pesticides, workers, and technology jointly affected significantly to the rice production.

Cobb-Douglas partial t-test affirmed this result could be seen in Table 5.

Table 5. Coefficient for Rice Commodity Production in East Java

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.107	0.163		12.936	0.000
LL	0.106	0.042	0.136	2.500	0.014
PO	0.057	0.019	0.097	2.919	0.004
PA	0.257	0.084	0.281	3.052	0.003
BNH	0.383	0.069	0.426	5.553	0.000
OBT	0.030	0.019	0.131	1.589	0.116
TK	0.288	0.087	0.260	3.306	0.001
TEKNO	0.032	0.014	0.076	2.378	0.019

Source: Processed Primary Data, 2015

From Table 5, it can be showed model of production function as follows:

$$Y = 127.93\ X_1^{0.106} X_2^{0.057} X_3^{0.257} X_4^{0.383} X_5^{0.030} X_6^{0.288} X_7^{0.032}$$

Land, organic fertilizer, inorganic fertilizer, seeds, workers, and technology variables are significant factors influenced rice production. However, pesticides are not. Pesticides variable has no significant effect to the rice production.

The result of Cobb-Douglas analysis to the Corn production

In this corn cultivation, farmers did not use pesticides. Thus, the analysis uses six independent variables. The R^2 of Cobb-Douglas production function is 0.96. It means that 96 percent variation of corn production in East Java is affected by land area (X1), organic fertilizer (X2), inorganic fertilizer (X3), seeds (X4), workers (X5), and technology (X6) variable and the remaining 4 percent affected by other variables that are not included in this model.

Analysis of variance for this model is described below.

Table 6. Anova of corn production in East Java

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.507	6	1.418	638.286	0.000[a]
Residual	0.318	143	0.002		
Total	8.824	149			

Source: Processed Primary Data, 2015

From Table 6, it is found that $F_{statistics}$ is 638.286, higher than F_{table} (2.215). It means that land, area, organic fertilizer, inorganic fertilizer, seeds, workers, and technology variable significantly affected to the variation of corn production in East Java.

Table 7. Coefficient of corn commodity production in East Java

Model	Unstandardized Coefficient		Standardized Coefficient		
	B	Std. Error	Beta	T	Sig.
(Constant)	2.456	0.096		25.587	0.000
LL	0.395	0.076	0.424	5.211	0.000
PA	0.156	0.022	0.210	7.102	0.000
PO	0.105	0.014	0.526	7.780	0.000
BNH	0.914	0.048	0.892	18.965	0.000
TK	-0.248	0.049	0.412	-5.026	0.000
TEKNO	-0.171	0.031	0.277	-5.519	0.000

Source: Processed Primary Data, 2015

The equation about factors that affected corn production in East Java can be described as follows:

$$Y = 285.75\ X_1^{0.395}\ X_2^{0.156}\ X_3^{0.105}\ X_4^{0.914}\ X_5^{-0.248}\ X_6^{-0.171}$$

From the equation above, it can be stated that dependent variable is 285.75 unit. It means that 285.75 unit variation of corn production in East Java was affected by land area (X_1), organic fertilizer (X_2), inorganic fertilizer (X_3), seeds (X_4), workers (X_5), and technology (X_6) variable, in which it was occurred when the variables were constant.

Coefficient score of land area variable that used for corn cultivation in East Java had positive effect to the variation of corn production, thus the increase of land area variable would increase corn production in East Java. Hence, the increase of one unit land area, significantly would increase corn production for 0.395 unit. It was also the same for organic fertilizer, inorganic fertilizer, and seeds variable. Whereas, it was in contrast with workers and technology variable. The increase of this variable unit would decrease corn production.

Each commodity of these food crops – rice, corn, and soybean – had different problem. Those commodities had large contribution for people in East Java. Those commodities mostly needed by people. Therefore, production of those commodities should reach maximum level. There are many things affected each of those commodities such as regional ability in cultivating those commodities, either from human resource, natural resource, and technology aspect. It was not all regions which able to produce all commodities maximally, because each region had different resource.

Contribution of Rice, Corn, and Soybean Production in East Java

These three food commodities (rice, corn, and soybean) have quite large contribution to the food crops development in East Java. Rice has large contribution to the food crop in East Java for more than 50 percent or 12.05 million tons per year.

East Java Province is national rice barn along with West Java Province. The next largest contribution was corn commodity for 25.71 percent. Corn is one of tolerant crops in dry land. Most of the corn utilization is for cattle feed.

East Java Province is the largest corn producer in Indonesia. Forty-five percent corn area in total nationally is in East Java. East Java also has animal feed industry with quite large contribution to the corn development.

Soybean has strategic role in Indonesia food commodities. East Java Province has largest soybean producer in Indonesia; however, the production does not meet the domestic demand of soybean. Moreover, this commodity contribution was small, only 1.47 percent and it still far from average needs per year. The analysis of rice, corn, and soybean commodity contribution to the food crop production in East Java can be seen in Table 8.

Table 8. Contribution of rice, corn, and soybean commodity production to the food crops production in East Java, 2013

Commodity	Percentage (%)
Contribution of rice commodity	53.78
Contribution of corncommodity	25.71
Contribution of soybean commodity	1.47

Source: Processed Primary Data, 2015

Based on Table 8, it is found that contribution of rice commodity is 53.78 percent, contribution of corn commodity is 25.71 percent, and contribution of soybean commodity is 1.47 percent from total production of food crop sector in East Java. The average score of this contribution is obtained by dividing the average production per commodity with the average of total food crops production in East Java.

CONCLUSION

1. Agricultural land in many areas of East Java Province suffered by land degradation due to land conversion and soil degradation (less fertility). Land conversion is caused by many factors such as: housing needs due to the increase of people number; infrastructure development; industrial development; and non agricultural facility building. Soil degradation (less fertility) is caused by farmers' behavior in farming activities. Those conditions would be a threat in the future of agricultural sector, especially for the availability of food crop production.
2. The results of soil chemical analysis show that the average of organic C in the soil was less than 2%, low Nitrogen, very low P2O5 content, and low KO2 (me/100 g). For rice production, the results show that there are low organic C, very low P2O5 (ppm), and low K2O (me/100 g). For corn commodity, the soil test shows that there are low organic C, low Nitrogen, very low P2O5 (ppm), and medium K2O (me/100 g).
3. The implementation of cultivation technique for soybean, rice, and corn commodity vary among them. That are caused by many factors such as: (a) geographic and topographic conditions, (b) rainfall pattern that related with calendar and planting pattern, (c) local habit pattern in cultivation practice (for example, land treatment, land processing, the use of local or certified seeds, planting space, and plant treatment), (d) variety of farmer resource quality, especially for skill and experience in the farming, (e) the availability of information and cultivation technical service, and (f) farming capital.
4. The problem faced by farmers in order to decrease production loss and to improve product quality are: (a) less farmers' skill in operating post-harvest agricultural machine tools; (b) limited post-harvest agricultural machine tools, especially rice thresher, corn sheller, and drying machine; and (c) limited drying facility and barn to store harvested result.
5. Based on the discussion of leverage factors that stimulate food crop sub-sector in East Java, it could be stated as follows:
   a. The income of corn commodity with average land area of one Ha is IDR 13,723,523.27; rice commodity is IDR 9,801,042.69; and soybean commodity is IDR 16,353,732.66 per Ha.
   b. There were many leverage factors that could be stimulant in improving potential food crops in East Java as follow: a) variables that significantly affected the improvement of soybean production are land area and inorganic fertilizer use. Variable that significantly affects the decrease of soybean production is technology application. b) Variables that significantly affected to the improvement of rice production in East Java are land, organic fertilizer use, inorganic fertilizer use, seeds, workers, and technology; c) variables that significantly affected to the improvement of corn production in East Java are land, organic fertilizer use, inorganic fertilizer use, and seeds.
   c. Based on contribution analysis, it is found that contribution of rice commodity production is 53.78%; corn commodity production is 25.71%, and soybean commodity production is 1.47% from total production of food crop sector in East Java.

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