

Full Length Research Paper

Applied production functions cobb-douglas on home industry of palm sugars: A case of Cimenga Village, Cimenga District, Lebak Region, Banten Province, Indonesia

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This research aims to determine eight effects of production factors on the block palm sugar agro-industry. Production factor is labor tap, labor process, labor fuel and tapping experience while productive age of trees, number of tapping trees, mileage, and ratio of crop are yield to total plant. This study was conducted in a village in the District of Cimenga Cijaku Lebak of Banten Province, for its potentiality. The study used survey methods. The location of the research was intentionally set. The sampling technique used was stratified random sampling with stratification of basic amount of raw materials used by producers. Samples were selected from 54 producers. The research was carried out within a year. Cobb-Douglas method of production function chosen to seek efficiency of business analysis. The results: (1) labor input tap, labor input processing, input fuel wood, tree age, number of tapped trees, tapped experience, workshop distance to garden, and ratio of productive crop with non productive plants simultaneously have effect on the production. (2) Partially tapped labor, labor process, labor fuel, and tapped experiences significant effect on the production. While productive age of trees, number of tapping trees, mileage, the ratio of crop yield to total plant does not significantly affect the production of block palm sugar.

Key words: Production factors, agro-industry, block palm sugar, raw material, production functions.

INTRODUCTION

Villagers largely depend on the available resources in their environment. The community did not just take farming as business as usual (commercial) but as a way of life (Cramer et al, 2001). Banten province has potential for development of block palm sugar agro-industry which is not different from agro-industries in other provinces in Indonesia. Basically, block palm sugar agro-industry in small scale are conventionally managed by individual who inherited it from their predecessor. In Banten province these agro-industry has been growing by utilizing local resources naturally available both in terms of raw materials, labor, fuel, and other supporting materials.

The area of the palm in Banten Province in 2005 reached 1,633 ha, compare with the total of palm area on the Java Island, which reached 15,025ha, palm areas in Banten around 11%. Palm sugar production in 2005 in Banten Province reached 1,217 tons with productivity reaching 10,50kw/ha. The districts are quite dominant for block palm area particularly Lebak regency, then followed by Pandeglang. Lebak palm acreage in 2005 reached 1,348 ha, with the level of production reached 1,056 tons and productivity of 10.70kw/ha.

Block palm sugar production in the province is concentrated in Lebak district of Banten. The main of product is fresh juice produced from palm trees. The Largest sugar producer in 2005 is the District Cijaku of 346.20 kg, absorb 1,752 labor, and 876 business units (Dishutbun Lebak, 2006).

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Block palm sugar home industry support the community's economy. At the time of when resources or factors of production of block palm sugar is adequate, these industry has no problem, but when the resources are limited, such as a limited number of productive palm trees, scarce labor, supplies of fire wood, the sustainability of this block palm sugar industry is threatened and also threaten the family economy.

Nowadays block palm sugar in Lebak Districts is still hanging on naturally grown palm tree (the community are not familiar with cultivation techniques), so that development and growth is slow. Besides limitation of cultivation technology, waiting time of blooming palm trees is usually very long, according to Rumokoi (1990), blooming palm trees take 7 to 10 years. It is therefore necessary to develop a strategy in this industry to be able to make a major contribution to the family economy. Up until now crafts men only use palm sugar juice to be processed into block sugar palm only, none of them use palm juice into another product.

Seven factors that influence the production of palm sugar is tapping labor, labor process and procurement of labor fuel, palm trees productive age, business experience, number of productive palm trees, the distance from the farmer to the farmer's home garden or forest, and ratio of tree produces (TP) to total tree (TT).

METHODS

The method used in this study is a survey method. Population to be surveyed are artisans who have palm tree that are being tapped and utilized as block sugar palm in the Cimenga village. The site selection is purposive.

Stratified random sampling is used as sampling method. Sampling frame using a list of names of artisans who have a number of palm trees being tapped and utilized into palm sugar. Use of this stratification is based on the premise that each stratum of the population is relatively homogeneous, whereas the levels of homogeneity among the stratum is relatively small. Basic grouping use the amount of raw material that is processed into juice palm sugar. The number of samples is divided into two groups: (1) a group of crafts men who use equal or less than 45 liters of palm juice with 67 population, (2) a group of crafts men who use more than 45 liters of palm juice with 51 population. Chosen sample of 54 producers with 31 in first group and 23 craftsmen in second group.

This study uses analytical models of Cobb-Douglas production function to determine the effect of simultaneously using the F test and to determine the effect partially using t test.

Cobb-Douglas function in this study is used to determine the influence of factors of production on the block palm sugar. This model was chosen based on considerations: (1) function Model of Cobb-Douglas is commonly used in agricultural economics research because of its convenience and easily transformed into a linear form

(Soekartawi, 2003). (2) Gujarati (2001) state that regression coefficients of production function of Cobb-Douglas indicated the elasticity of production factors and provide information on the effect of scale on the results (returns to scale).

Specification of the model used in this study is a model of Cobb-Douglas production function (Debertin 1987):

$Y=f(X_1, X_2, X_3, \dots, X_n)$, with the following provisions:

Y = yield of production

X_i =factors of production.

General form of the Cobb-Douglas production function in the farming of palm sugar with eight variables associated with real activity in the field, both for the input variables and the fixed input variables are

$$Y = b_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} X_8^{b_8} E^U \dots \dots \quad (1)$$

If the model is transformed into a linear form, the mathematical formulation will take the form:

$$\ln Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + u \dots \dots \quad (2)$$

With provisions; X_1 =labor tapping, X_2 =labor process, X_3 =labor fuel procurement, X_4 =age of productive palm trees, X_5 =number of productive palm trees, X_6 =business experience, X_7 =the distance from house to garden or forest, X_8 =ratio of productive trees (TM) to total tree (TT). Total tree is over all tree with yield and immature trees).

RESULTS AND DISCUSSION

Influence of Production Factors

Based on the results of the regression analysis that the coefficient regression f each is independent variable presented in Table 1. Coefficient Regression values of Block Palm Sugar Production at Cimenga Village.

Effect of simultaneous use of production factors in block palm sugar in the village can be seen from value of $F_{\text{calculated}}$ obtained with 8087.9 is greater than F_{table} which is 2.02. Analysis implies that labor input tap, labor input processing, input labor procurement fuel, age of tree, number of trees tapped, tapped experience, mileage and the ratio of crop yield with non productive palm tree simultaneously effect on the production of block palm sugar.

Partially tapped labor (X_1), labor process (X_2), fuel labor (X_3), and the experience of tapping (X_6) has significant effect on the production of block palm sugar because the value of $t_{\text{calculated}}$ is greater than t_{table} (0.681). While productive age of palm trees (X_4), the number of palm trees in tapping (X_5), mile age (X_7), and the ratio of productive crop yield to total plant (X_8) did not significantly affect the production of block palm sugar. Production function of palm sugar production in the Cimenga village mathematically can be written as follows:

$$Y = -1,324 X_1^{0,248} X_2^{0,4469} X_3^{0,307} X_4^{-0,001} X_5^{-0,002} X_6^{0,001} X_7^{-0,002} X_8^{0,001} e \dots \dots \quad (3)$$

Table 1. Coefficient Regression values of Block Palm Sugar Production at Cimenga Village.

Production Factors	Regression Coefficient	T _{calculated}
Labor tapping(X ₁)	0,248	3,558
Labor process(X ₂)	0,432	5,107
laborfuel procurement(X ₃)	0,307	3,489
Age of productive palm trees(X ₄)	-0,001	-1,114
Number of productive palm trees(X ₅)	-0,002	-0,418
business experience(X ₆)	0,001	0,789
the distance from house to garden or forest(X ₇)	-0,002	-1,297
ratio of productive trees (PT) to total tree(NPT)(X ₈)	0,001	0,408
R ² = 0,966	F _{calculated} = 8087,9	Intercept (b ₀) = -0,12200

Explained: Productive trees = PT, Non Productive trees = NPT

T_{hitung} → (3,558) (5,107) (3,489) (-1,114) (-0,418) (0,789) (-1,297) (0,408)

T_{tabel} → (0,681)

The above equation can be written in Cobb-Douglass production function as follows (3) with any number of inputs was readily transformed to logs. A function of the general form of equation transformed to logs :

$$\ln Y = - \ln 0,122 + 0,248 \ln X_1 + 0,432 \ln X_2 + 0,307 \ln X_3 - 0,001 \ln X_4 - 0,002 \ln X_5 + 0,001 \ln X_6 - 0,002 \ln X_7 + 0,001 \ln X_8 + e \dots \dots (3)$$

Production functions obtained describe technical efficiency and elasticity of production. Regression coefficients in the function production show the elasticity of production. The coefficient of determination of block palm sugar is 0.998. This amount shows that the production factor labor tapping, processing labor, labor fuel procurement, tree age, number of trees tapped, tapped experience, mileage and the ratio of productive and non productive trees affect the production of block palm sugar with 99.80%, while 0.20% is influenced by other factors. Other factors that are thought to affect the production of palm sugar is a factor of management.

Partially labor process(X₂), tree age(X₄), and the ratio of productive and non productive trees(X₈) significantly affected the production of block palm sugar because the value of t_{calculated} is greater than t_{table} which is 0.685. While tapping labor (X₁), labor fuel procurement (X₃), the number of palm trees in tapping(X₅), business experience (X₆), and mile age(X₇) had no significant effect on the production of sugar palm print.

According debertin (1986), the partial regression coefficients in a Cobb-Douglas production function has a positive value at the stage of increasing rate (irrational stage 1) at the time of the crafters can add additional input as the input will provide additional output proportionally.

Cobb-Douglas production function is applied to the craft after the results of this study showed different results for

some of the inputs used to have a negative value, it indicates that it is not always the Cobb-Douglas production function and is always positive, if developed more than two input variables, can also have negative values. Overall findings further craft palm sugar is at a stage when the totalized increasing rate because the value of elasticity is positive.

The result of this study indicated that: Quantity of palm sugars production were influenced of labour for raw material, labour for fuel, labor for production process, age of tries, amount of tree production, experience of producers, location of workshop, and ratio between tree production with total number of trees.

A partial quantity of palm sugars production were influenced by labour for raw material, labour for fuel, labour for production process and experience of producers and then the amount of tree production, location of workshop, and ratio between tree production with total number of tree were not influenced by the quantity of palm sugars production.

It was recommended that this home industry of palm sugar should be conducted trough vertical integration on farm business.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Simultaneously block palm sugar production is influenced by labor input tap, labor input processing, input of wood fuel, tree age, number of trees tapped, tapping inexperience, the distance from the workshop to the garden area and the ratio of productive and non productive plant. Partially tapped labor, labor process, labor fuel and significant experiences tapped to block palm sugar production, while the productive age of palm trees, the number of palm trees in tapping, mile age, and the ratio of total plant does not have significant effect on the production of block palm sugar.

RECOMMENDATIONS

To make efficient production factors used require business strategy as a group, because the group may transfer the use of factors of production, then this strategy will result in increased added value and benefit scrafters. In order to increase the level of family income required for the distribution of production factors which experienced group burn out to the production of block palm sugar. The production factors are labor and fuel, the capital cost for the two of production factors can be distributed into other business activities both vertically and horizontally outside palm sugar production.

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