ECONOMIES OF SCALE OF SUGARCANE COOPERATIVES IN EAST JAVA PROVINCE AND THEIR INFLUENCING FACTORS

Skala Ekonomi Koperasi Tebu di Jawa Timur dan Faktor-faktor yang Memengaruhinya

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ABSTRAK

Jawa Timur merupakan provinsi sentra tebu terbesar di Indonesia dengan banyak koperasi primer yang terlibat dalam bisnis pertebuan. Penelitian ini bertujuan untuk menguji keberadaan kondisi skala ekonomi dari koperasi-koperasi yang bergerak dalam agribisnis tebu di Provinsi Jawa Timur dan faktor-faktor yang memengaruhi skala ekonomi tersebut. Metode *translog cost-function* dan pendekatan produsen digunakan untuk menganalisis data panel dari koperasi-koperasi responden pada periode 2008-2011. Hasil penelitian menunjukkan bahwa mayoritas koperasi yang bergerak dalam agribisnis tebu di Provinsi Jawa Timur yang dianalisis berada dalam kondisi *diseconomies of scale*. Analisis lebih lanjut menunjukkan bahwa kondisi skala ekonomi dipengaruhi oleh *output* per anggota, klasifikasi koperasi, dan total asset koperasi. Supaya skala ekonomi bisa tercapai dan bisa memberikan pelayanan yang lebih baik kepada anggotanya koperasi-koperasi tersebut harus memperbaiki efisiensi manajemennya.

Kata kunci*: skala ekonomi, translog cost-function, koperasi tebu, Provinsi Jawa Timur*

ABSTRACT

East Java Province is the largest sugarcane producing center in Indonesia and there are many primary cooperatives engaged in sugarcane business. The objective of this study is to determine the existence of economies of scale of sugarcane cooperatives in East Java Province and examine their influencing factors. Trans-log cost-function method and producer approach coupled with a set of panel data over the period 2008 to 2011 was used in this study. The study show significant diseconomies of scale for majority of sugarcane cooperatives in East Java and that the economies of scale were affected by output per member, classification, and total assets of the cooperatives. These results strongly suggest that the sugarcane cooperatives improve their management efficiency in order to achieve economies of scale and better services for their members.

Keywords *: economies of scale, translog cost-function, sugarcane cooperative, East Java Province*

INTRODUCTION

East Java Province is the largest sugarcane producing center in Indonesia. In 2011, it was estimated that East Java Province contributed around 44.2 percent of sugarcane area and 41.4 percent of sugarcane production (Directorate General of Estate Crops, 2012). Around 85.5 percent of total sugarcane area in the province was cultivated by farmers, which in general, according to IAARD (2007), were dominated by small-scale farmers with landholding size less than 1 hectare. For these small-scale farmers, running sugarcane agribusiness individually, both in production and marketing areas, are not efficient. Moreover, they have less bargaining power.

In this matter, a cooperative would be able to increase efficiency due to concentration of activities or joint actions of individual farmers into the cooperative. This concentration of economic activities into cooperative enterprise is a form of economies of scale. Economies of scale are reduced in per unit cost of goods/services when activity (production) scale is larger. Therefore, an effort to achieve economies of scale, individual farmers can join together to form a cooperative enterprise.

Merger of the economic activities of individuals into cooperative enterprise can be done by facilitating inefficient economic activities of individual members in both production and marketing areas. These activities may involve the following (Ariffin, 2002): 1) Procurement of goods/services either in the form of production inputs or goods/services through cooperative activities in purchasing and/or producing outputs, including financial services; 2) Facilitating inefficient economic activities of individual members by providing facilities such as warehouse, transportation, finishing of products, preservation, product development, and others; and 3) Marketing products of members through sale contracts, product promotion, market information, and market research.

Among the primary cooperatives engaged in sugarcane agribusiness in East Java Province, there are 46 primary cooperatives that have become members of KUB Rosan Kencana, a secondary sugarcane cooperative. These cooperatives are spread over 24 regencies/cities in East Java. KUB Rosan Kencana was established in 2003 with its board of directors consists of delegates from its primary cooperative-members and the Office of Cooperative and Small and Medium Enterprises and Office of Estate Crops of East Java Province as the board of supervisors. The main objective of the establishment of KUB Rosan Kencana was to serve as a bound institution for all primary cooperatives engaged in sugarcane agribusiness that received Group Business Capital Strengthening (*Penguatan Modal Usaha Kelompok* = PMUK) funded by the government and revolving fund in the form of *Rawat Ratoon* loan.

According to their categories, these primary cooperatives are divided into two groups. The first group is Village Unit Cooperative (*Koperasi Unit Desa* = KUD), a multipurpose cooperative in which sugarcane business becomes one of the business units it engaged in. Degree of importance of sugarcane business unit to KUD can vary from one KUD to another. However, usually sugarcane becomes their core business. The second group is Sugarcane Farmer Cooperative (*Koperasi Petani Tebu Rakyat* = KPTR) which focuses on sugarcane business as the only/main business they engaged in.

The functions and roles of both the KPTRs and KUDs in sugarcane agribusiness nowadays are to: 1) Empower sugarcane farmers through activities in plantation sector, especially sugarcane farming (on-farm); 2) Play an active role in supporting farmers/members to improve the quality of sugarcane farming; 3) Facilitate farmers/members with training, capital (credits/loans), procurement of inputs, machinery services, and other things needed in supporting sugarcane farming; and 4) Act as a bridge between farmers, sugar factories, and the government.

The questions are, do economies of scale really exist in these sugarcane cooperatives? What factors influence economies of scale of these cooperatives? This study aims to determine the existence of economies of scale of sugarcane cooperatives in East Java Province and analyze its influential factors.

METHODOLOGY

Theoretical Framework

The size and structure of businesses change over time as they try to constantly adjust to the size, nature and characteristics of the markets they interact with. In order to compensate for the "natural selection" processes that inevitably lead to the elimination of marginal individuals, that is of those units which are unable to produce a given amount of output at minimal absolute costs, and in order to survive in the long term, a firm needs to organize its operational processes in terms of both technical and economic efficiency, that is, it has to maximize the output of factors in the production cycle. In fact, the growth in size obtained either by its own force or by merging with other firms, is often motivated by the search for scale economies. Such economies are by nature a "dynamic" phenomenon resulting from a process of growth in the firm size that continues in time. Consequently, economies of scale need to be planned over a long-term time horizon (that is a sequence of short periods of time close to each other and characterized by a given level of productivity and fixed overheads (Stigler, 1958 as cited by Celli, 2013)

The theory of the economies of scale is the theory of the relationship between the scale of use of a properly chosen combination of all productive services and the rate of output of the enterprise (Stigler, 1958). The major theoretical background for the economies of scale study is neoclassical theory of firm, which can be categorized into 3 viz; theory of production, theory of cost and the one which attempts to define various objectives of the firm (Usman, 2009).

Economies of scale consist of potential reductions of average costs associated with higher levels of productivity, which is measured by the quantity of output that can be produced in the time unit (Pratten and Dean, 1965 as cited by Celli, 2013). Or, they may also describe the economic advantages that show when higher volumes of output are produced with respect to smaller ones and that result in cost reduction per unit for that particular output, and for the same price of inputs (Celli, 2013). Riley (2012) also stated that economies of scale describe the cost advantages from expanding the scale of production in the long run. That is, they occur when long-run average cost falls as output increases. On the contrary, diseconomies of scale occur when long-run average cost rises as output increases (Thomas and Maurice, 2005).

Economies of scale are expressed by the following formula: $2c(q) > c(2q)$, where $c(q)$ is the cost per unit of output and $c(2q)$ the cost of double the output. The formula shows that economies of scale occur when all other things being equal, increasing outputs lead to a less than proportional increase in overall costs (that is, output costs per unit decrease). Or, when increasing production costs in constant proportion result in a more than proportional output (Zattoni, 2008 as cited by Celli, 2013).

For most industries, economies of scale occur only to a certain level of output, or business size and then diseconomies of scale can set in, resulting in a U-shaped cost curve (the average cost per unit of output is plotted as a function of the volume of output). In Figure 1, economies of scale occur in the range of output on the left-hand side of Q_3, while diseconomies of scale occur in the range of output on the right-hand side of Q_3.

As shown in Figure 1, it is assumed that an individual producer produces Q_1 unit of output with average unit cost of C_1 plotted on the $SRAC_1$ curve. By pooling the resources of individual farmers and agreeing to undertake cooperative activities, it is possible to achieve lower average unit cost at output level Q_2 with the average unit cost of C_2 plotted on the $SRAC_2$ curve. Further expansion of the scale of production to production level Q_3 results in minimum efficient scale (MES), which is the level of the lowest average unit cost (C_3 on the $SRAC_3$ curve). If the cooperative produces beyond output level Q_3, diseconomies of scale will occur.

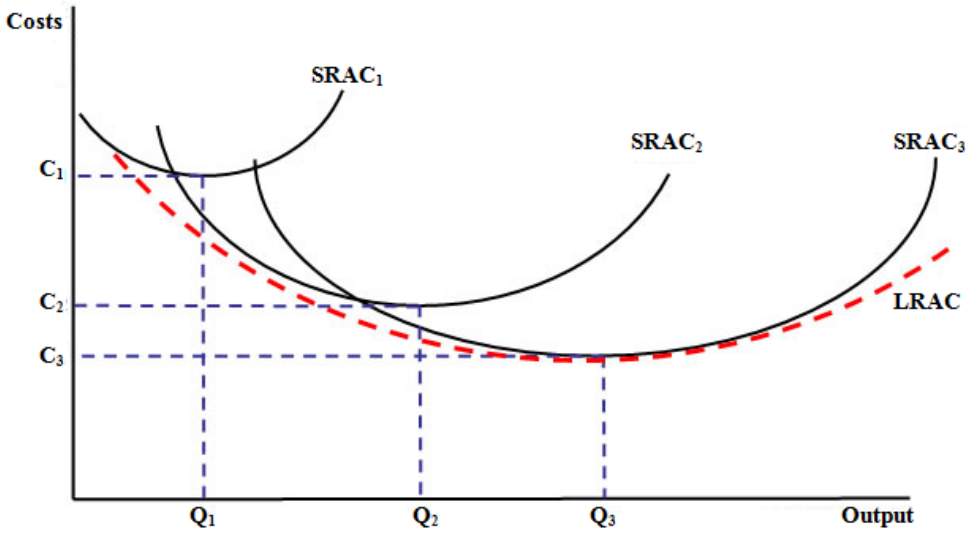

Figure 1. U-shaped long-run average cost curve showing economies of large-scale production

(Source: Riley, 2012)

Location of the Study

East Java Province was purposively chosen as study site because it is the largest sugarcane producing center in Indonesia. Furthermore, there are many primary cooperatives that are engaged in sugarcane agribusiness in this province.

Sampling Procedure

Since there was no data on the number and distribution of the primary cooperatives engaged in sugarcane agribusiness in East Java Province, this study focused on primary sugarcane cooperatives that are members of KUB Rosan Kencana. Out of 46 primary sugarcane cooperatives, data from 31 cooperatives were collected. However based on the completeness of the data, only data from 19 primary sugarcane cooperatives from 2008 to 2011 were used in this analysis.

Analytical Tools

Translog Cost Function Analysis. A translog cost function (TCF) was used to assess the economies of scale of 19 sugarcane cooperatives in East Java using 2008 to 2011 data. All input prices, total costs, and output values were deflated to 2008 constant Indonesian rupiahs using the Consumer Price Index of East Java.

Estimation of the cost function has some advantages over the production function estimation. First, estimation of the cost function, along with input share equations, adds a first order condition for input usage that places cross-equation restrictions on the parameters and thereby improves the efficiency of the estimates. Second, in general, the cost function imposes fewer a priori assumptions on the substitution possibilities among the factors of production and it allows scale economies to vary with the level of output and allowing for size heterogeneity of scale economies. The TCF can also accommodate homothetic, homogeneous and unit elasticity of substitution forms within its general functional form structure (Haouas and Heshmati, 2013). Furthermore, the TCF can detect a U-shaped average cost curve if one exists in the data, which is the restrictive property of production function like the Cobb-Douglas (Brown and O'Connor, 1995). The TCF has been used in many studies on economies of scale in broad type of industries, such as in credit union (Brown and O'Connor, 1995), cooperative (Kebede and Schreiner, 1996; Liu and Bailey, 2012), banking (Deelchand and Padgett, 2009; Sahoo and Gstach, 2011; Fu and Sio, 2011), payment processing (Beijnen and Bolt, 2009), electricity (Tuthill, 2008), fifteen major sectors of the economy (Haouas and Heshmati, 2013), water utilities (Horn and Saito, 2011), airport (Martin and Voltes-Dorta, 2008), and tourism (Shi and Smyth, 2012)

Following Liu and Bailey (2012), this study used producer approach in which cooperatives were treated as firms that provide services to consumers. With this approach, only labor and physical capital were considered as inputs necessary to conduct transactions (Margono et al., 2010; Deelchand and Padgett, 2009).

The translog cost function specified in this study is:

$$\ln C = b_0 + b_y \ln Y + \sum_{i=1}^{2} b_i \ln P_i + \frac{1}{2} b_{yy} (\ln Y)^2 + \frac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} b_{ij} \ln P_i \ln P_j + \sum_{i=1}^{2} b_{yi} \ln Y \ln P_i + \varepsilon \quad (1)$$

where C represents total costs, Y represents output, P_1 and P_2 represent price of labor and price of physical capital, respectively, the b's are the parameters to be estimated, and ε is the stochastic error term. Total costs were calculated as the sum of production (variable) costs, rental expenses, and depreciation (fixed costs) in IDR million. Output is the total monetary values of output represented by the revenues of the cooperatives which includes gross sales and revenues from services (loan, machinery, transportation, and other services) in IDR million. Following Liu and Bailey (2012), price of labor (P_1) is total labor expense divided by the number of persons employed in the cooperative (in IDR million/person) and price of capital (P_2) is equal to the total depreciation and other capital expenses.

Using Sheppard's Lemma, the associated cost share factor equations S_i can be obtained by differentiating the log of the cost function with respect to the log of the price of input i:

$$S_i = \frac{\partial \ln C}{\partial \ln P_i} = b_i + b_{yi} \ln Y + \sum_{j=1}^{2} b_{ij} \ln P_j + \varepsilon \quad (2)$$

The parameters in the share equations are the subset of those in the translog cost function. The inclusion of cost share factor equations can minimize the problem of degrees of freedom and improve efficiency in the estimation of the model (Deelchand and Padgett, 2009).

Linear restrictions on Equation (1) were imposed to satisfy linear homogeneity in input prices[1]:

$$\sum_{i=1}^{2} b_i = 1; \sum_{i=1}^{2} b_{ij} = 0 \ \forall j; \sum_{i=1}^{2} b_{yi} = 0 \ \forall y \quad (3)$$

In addition to the above restrictions, standard symmetry of the function was also imposed, i.e.

$$b_{ij} = b_{ji} \ \forall i, j \quad (4)$$

The translog cost function (Equation 1) jointly with n-1[2] of the cost share equations (Equation 2) in a Seemingly Unrelated Regression (SUR) framework was used in order to take advantage of cross-equation error term correlation, and to incorporate the cross-parameter restrictions as implied by the duality characteristics (Tuthill, 2008). The SUR model was estimated ~~via~~ by feasible generalized least squares (FGLS) which corrects the error covariance matrix for contemporaneous correlation.

The economies of scale (ES) can be estimated by summing the partial derivatives of total cost with respect to output values, i.e.

$$ES = \frac{\partial \ln C}{\partial \ln Y} = b_y + b_{yy} \ln Y + \sum_{i=1}^{2} b_{yi} \ln P_i \quad (5)$$

If ES is less than 1, the cooperative exhibits increasing returns to scale or economies of scale is said to exist (per unit costs are declining as output increased). If ES is equal to 1, the cooperative exhibits constant returns to scale. On the other hand, if ES is greater than 1, the cooperatives exhibits decreasing returns to scale or diseconomies of scale exists. Economies of scale exists if a proportional increase in all outputs leads to a less than equal proportional increase in average cost. The economies of scale measure, ES, is considered to be a constant.

Economies of Scale Regression Analysis. Using regression analysis, this study analyzed the factors affecting economies of scale of the sugarcane cooperatives in East Java. Estimated values of economies of scale were obtained from economies of scale determination using translog cost function analysis of 19 sugarcane cooperatives in East Java during the period 2008-2011 (Equation 5). All financial data were deflated to 2008 constant Indonesian rupiah using the Consumer Price Index of East Java.

Among the influential factors of economies of scale, this study postulates that economies of scale is affected by the assets of cooperative, output per member, classification of the cooperative, and the presence of a manager. The regression model was fitted as follows:

$$ES = c_0 + c_1 ASST + c_2 YMEM + c_3 MAN + c_4 CLASS + e_{ES} \quad (6)$$

[1] The homogeneity restrictions ensure linear homogeneity of the cost function with respect to input prices, and do not imply linear homogeneity of the underlying production function with respect to input quantities. The symmetry restriction derives from Shephard's Lemma and Young's Theorem.

[2] Because $\sum_{i=1}^{n} \frac{\partial C}{\partial P_i} = 1$, the inclusion of all *n* share equations results in a singular covariance matrix and one must therefore be dropped. Since in this study n = 2 (for labor and capital), there are 2 cost share equations and only labor cost share equation was used in regression.

where:

ES	= Economies of scale
ASST	= Total assets in million rupiahs
YMEM	= Output per member in million rupiahs
MAN	= The presence of a manager dummy (1 = Manager; 0 =Otherwise)
CLASS	= Performance classification dummy (1 = Classified as A (very good);
0	= Otherwise)
c_0	= Intercept or scale of the regression function
c_j (j =1, 2,…4)	= Slope parameters of the regression function
e_{ES}	= Error term

ASST represents total assets of the cooperatives. The parameter estimate for ASST is expected to be negative, and, if so, would confirm the hypothesis that small firms are more prone to diseconomies of scale than large firm (Liu and Bailey, 2012).

YMEM represents an accounting performance measure of business volume (output) per cooperative member. A cooperative would be considered more efficient in the accounting sense if it handles more output per each member than a cooperative with lower output per member. Therefore, output per member is associated with economies of scale (the parameter estimate is expected to be negative).

MAN is a binary variable representing the presence of a manager in the cooperative. It is equal to 1 if the cooperative has a manager and is equal to 0 for a cooperative without manager. A manager of a cooperative has important role in controlling the production process and management, and therefore associated with efficiency. As a result, the presence of a manager in a cooperative is more likely to be associated with economies of scale. The parameter estimate for MAN is expected to be negative.

CLASS is a binary variable representing the classification of the cooperatives. It is equal to 1 if the cooperative is classified as A (very good) and is equal to 0 if it is classified as others. Classification of a cooperative is determined based on the evaluation set by the Ministry of Cooperative and Small and Medium Enterprises. Classification is associated with efficiency (economies of scale); consequently, it is expected that cooperatives classified as A (very good) have lower estimated value of economies of scale (the parameter estimate for CLASS is expected to be negative).

A fixed effects model could not be estimated for this regression model due to inclusion of time-invariant characteristic of individual, i.e., manager (MAN) and classification (CLASS). Therefore, the Breusch-Pagan Lagrange multiplier (LM) test was used to decide between a random effects regression and a simple OLS regression. The result of the test showed that there was significant difference across units (i.e., there was panel effect). Consequently, the random effects model was used as the best alternative for estimating the parameters of equation. The likelihood-ratio (LR) test procedure (Wiggins and Poi, 2003) was done to test heterogeneity and a test for autocorrelation provided by Drukker (2003) was used. The results of these tests revealed the evidence of heteroskedasticity, but not autocorrelation, in the model. Consequently, White heteroskedastic consistent standard errors (“robust” standard errors) were used to correct the problem of heteroskedasticity.

Because a smaller value for ES indicates a tendency towards economies of scale (economies of scale exists if ES is less than 1), a negative estimated parameter indicates that the variable is associated with economies of scale. Conversely, a positive estimated parameter indicates that the variable is associated with diseconomies of scale.

RESULTS AND DISCUSSION

Characteristics of Sugarcane Cooperative-Respondents

General characteristics. Table 1 presents the general characteristics of the 19 primary sugarcane cooperative-respondents in East Java Province. Majority of the sugarcane cooperatives interviewed were categorized as KPTR (68%), whereas the rest of the sugarcane cooperative-respondents (32%) were categorized as KUD.

Table 1. General characteristics of sugarcane cooperatives in East Java Province, 2011

Item	No. of Cooperatives	Percent
Category		
KUD	6	32
KPTR	13	68
Classification		
A	8	42
B	10	53
C	1	5
Member (persons)		
<100	5	26
100-500	8	42
>500	6	32

Source: Primary data (2012)

Around half (53%) of sugarcane cooperative-respondents was classified as good (B); 42% was classified as very good (A); and the remaining was classified as fair (C). This classification was set by the Ministry of Cooperatives and Small and Medium Enterprises based on evaluation on cooperatives in performing six aspects of quality cooperatives (active business entity, healthier business performance, member cohesiveness and participation, member-service orientation, community services, and contribution to regional development). Based on the Ministry Cooperatives and Small and Medium Enterprises Regulation No. 22/PER/M.KUKM/IV/2007, the evaluation was done by professional and competent independent institutions.

The size of membership of the sugarcane cooperative-respondents ranged from 65 to 5,602 persons over the period 2008-2011. For these sugarcane cooperative-respondents, woman-members were very small (5% or less) relative to man-members. This was due to the dominance of men in sugarcane farming which was stronger than in food crops farming such as rice and corn.

The size of membership was also highly associated with the category of sugarcane cooperatives. All cooperatives with 500 members were KUDs (32% of sugarcane cooperative-respondents), whereas the rest with less than 500 members were KPTRs. Some cooperatives (26%) even had less than 100 members. However, for

cooperatives with large membership size, it is difficult to involve all members in all cooperatives' activities (including training) due to coordination constraint and some other limitations. This resulted in larger proportion of inactive members for large membership-sized cooperatives. Considering that the membership participation and governance are clear indicators of a cooperative's long-term business success, as well as how it meets social objectives (Mellor, 2009), active membership participation should be priority consideration for all cooperatives.

Financial characteristics. Table 2 presents financial characteristics of the primary sugarcane cooperative-respondents in East Java. These includes assets (current assets, non-current assets, and total assets), liabilities (current liabilities, non-current liabilities, and total liabilities), and equity of the sugarcane cooperative-respondents. Approximately 91% of the total assets of the cooperative-respondents were contributed by current assets indicating high dependency of the cooperatives on current assets. Likewise, the cooperative-respondents' liabilities were mostly contributed by current liabilities, as indicated by approximately 69% contribution of current liabilities to total liabilities. On the other hand, equity was very low at only approximately 9% of total assets (or total liabilities and equity).

Table 2. Financial characteristics of the primary sugarcane cooperative-respondents in East Java Province, 2008-2011

Items	Value (IDR million)	Percent	Growth[a]
a. Assets			
Current assets	9,535	92.77[b]	9.27
Non-current assets	743	7.23[b]	24.49
Total assets	10,278	100.00	7.96
b. Liabilities and equity			
Current liabilities	6,446	68.63[c]	38.22
Non-current liabilities	2,946	31.37[c]	(3.65)
Total liabilities	9,392	91.38[d]	8.80
Members' equity	886	8.62[d]	11.03
Total liabilities and equity (=Total assets)	10,278	100.00	7.96

[a] Average annual growth during 2008-2011 period in %/year
[b] Percentage of total assets
[c] Percentage of total liabilities
[d] Percentage of total liabilities and equity
Source: Primary data (2012)

Except for non-current liabilities, all other financial indicators show positive growth during the period 2008-2011, ensuring the cooperatives' sustainability in general. However, total assets of 9 out of 19 cooperative-respondents tended to decline during the study period. Moreover, five cooperative-respondents showed negative growth in equity, suggesting a worrisome sign, especially for one cooperative with consistent negative growth during the study period, in spite of subsidy given by the government.

Economies of Scale of Sugarcane Cooperative-Respondents

Parameter estimates for the translog cost function and related statistics are presented in Appendix 1 and summarized in Table 3. The capability of independent variables to explain the variation of both natural logarithm of total cost (ln C) and natural logarithm of share cost of labor (ln S_1) was good. This is indicated by the values of R^2 at 0.98 and 0.62, respectively. The result indicates that the model had high degree of goodness of fit. The model was also found significant at 1% probability level. This means that as a whole, the data fitted in the model strongly influenced both natural logarithm of total cost and natural logarithm of share cost of labor.

Table 3 shows that the coefficient of the natural logarithm of output (ln Y) was 11.46 and positive and significant at 1% probability level, which means that a 1% increase in output would cause 11.46% increase in total cost across the study period and between cooperatives. However, the natural logarithm of the wage rate of labor (ln P_1) and the natural logarithm of the rent of capital (ln P_2) were not significant, which means that ln C was not significantly affected by these variables. The sign of coefficient of ln P_1 was negative, which means that the increase in the wage rate of labor would reduce the total cost. *(It is not really need to be exposed)*

Although not significant, the result is consistent with the argument of Mellor (2009) that low payment gives less incentive to management to perform well. Well-paid management will lead to high management performance, resulting in increasing efficiency in operating costs. The sign of coefficient of ln P_2 was positive, showing the tendency of total cost to increase with the increase in the price of capital. The coefficients of the natural logarithm of output-squared ($(\ln Y)^2$) and natural logarithm of the price of capital-squared ($(\ln P_2)^2$) were also significant at 1% probability level. Moreover, lnY ln P_2 was significant at 5% probability level.

Table 3. Parameter estimates for translog cost function for sugarcane cooperative-respondents, East Java, 2008-2011

VARIABLE	PARAMETER	ESTIMATE	STD. ERROR
Intercept	b_0	-1.57145***	0.44415
ln Y	b_y	11.46267***	0.12290
ln P_1	b_1	-0.22316ns	0.16768
ln P_2	b_2	0.15508ns	0.07347
0.5 $(\ln Y)^2$	b_{yy}	-0.02584***	0.00967
0.5 $(\ln P_1)^2$	b_{11}	-0.04596ns	0.03237
0.5 $(\ln P_2)^2$	b_{22}	0.04084***	0.00913
ln Y ln P_1	b_{y1}	0.02961ns	0.02611
ln Y ln P_2	b_{y2}	0.01982*	0.01090
ln P_1 ln P_2	b_{12}	-0.03214ns	0.02486
Observation (n)		76	
R-squared: ln C		0.9812	
ln S_1		0.6151	
Chi^2: ln C		2.00e+04***	
ln S_1		121.46***	

Notes: The estimates of the translog cost function model given in Eq. (5) are obtained by the seemingly unrelated regression method using Stata 11 software.
***, **, and *Significant at 1%, 5%, and 10% probability levels, respectively
ns Not significant at 10% probability level

Table 4 reveals evidence of diseconomies of scale for majority of sugarcane cooperative-respondents in East Java, that is, the estimated values of economies of scale (ES) are more than one in every year of study. Note that economies of scale are interpreted as the percentage change in cost associated with a 1% increase in output. Out of 19 sugarcane cooperative-respondents, only 1 cooperative showed the existence of economies of scale over the period 2008-2011. The average estimated values of ES varied from 0.98 to 1.21 among the cooperatives and tended to increase over the period 2008-2011.

Table 4. Economies of scale estimates of sugarcane cooperatives by asset size, sugarcane cooperative-respondents, East Java, 2008-2011

COOPERATIVE	2008	2009	2010	2011	AVERAGE
Small Assets (<IDR10,000 millions)					
1	1.2022	1.2006	1.2058	1.1849	1.1984
2	1.1894	1.1527	1.2219	1.2493	1.2033
3	1.1334	1.1632	1.1628	1.1868	1.1615
4	1.1603	1.1705	1.1638	1.1529	1.1619
5	1.1677	1.0322	1.0438	1.0567	1.0751
6	1.1794	1.1843	1.1323	1.1333	1.1573
7	1.0942	1.1114	1.0746	1.1134	1.0984
8	1.0891	1.0755	1.1450	1.1294	1.1098
9	0.9978	0.9819	1.0237	1.0282	1.0079
10	1.1216	1.1261	1.1439	1.1349	1.1316
AVERAGE	1.1335	1.1198	1.1318	1.1370	1.1305
Large assets (>IDR10,000 millions)					
11	1.0489	1.0979	1.1197	1.1125	1.0947
12	1.0391	1.0551	1.0615	1.0652	1.0552
13	1.1835	1.1798	1.1476	1.1543	1.1663
14	1.1544	1.1286	1.1066	1.0908	1.1201
15	0.9939	0.9855	0.9774	1.0035	0.9901
16	1.1709	1.1781	1.1785	1.1674	1.1737
17	1.0380	1.0459	1.0503	1.0550	1.0473
18	1.1600	1.1478	1.1687	1.1798	1.1641
19	1.0392	1.0135	1.0201	1.0124	1.0213
AVERAGE	1.0920	1.0925	1.0923	1.0934	1.0925
ALL	1.1138	1.1069	1.1131	1.1164	1.1125

Note: The estimated values of economies of scale were obtained by Equation (5)

Similar with the sugarcane cooperatives, the condition of decreasing return to scale (existence of diseconomies of scale) was found in dairy cooperatives in West Java and East Java Provinces due to excessive use of production factors (Yusdja and Sayuti, 2002). The possible explanations for the diseconomies of scale observed for the sugarcane cooperatives are the following: 1) the cooperatives engaged in business with small farmers which entailed significant monitoring cost, thus making it difficult to exploit economies of scale; 2) it may also be attributed to their weak risk management and low profitability level (Deelchand and Padgett, 2009); 3) it is generally attributed to limitation to efficient management (Thomas and Maurice, 2005); and 4) bureaucracy, high wages, and inefficient operation (Carpenter and Sanders, 2007 as cited by Gozali, 2009).

The first explanation was true for sugarcane cooperatives in East Java where majority of the sugarcane cooperatives were engaged in business with farmers who had sugarcane farms less than 1 hectare. According to IAARD (2007), sugarcane farmers in Java in general were dominated by small-scale farmers (70%) with landholding size less than 1 hectare. Some cooperatives required the farmers a certain minimum sugarcane farm size to get their services to overcome this constraint. However, this requirement led to lack of access to cooperative services for sugarcane farmers who had less than the required farm size.

The second and third explanations were also true. Majority of sugarcane cooperative-respondents in East Java had less than IDR100 million and generally did not pay proper attention to risk management. Efficient management was hard to achieve without proper payment to the workers, leading to inefficient operations. In spite of all those explanations, assuming that the goal of these cooperatives is to maximize net returns/surplus to cooperative members, operating at low cost per unit of output is an important competitive strategy for these cooperatives (Liu and Bailey, 2012). Therefore, the cooperatives are expected to keep per-unit costs low by achieving economies of scale if possible.

Shepherd (1979) as cited by Stimpert and Laux (2011) provides a comprehensive list of the factors that lead to diseconomies of scale, including fixed factors, administrative and bureaucratic costs, and transportation costs, which also true for sugarcane cooperatives in East Java. Fixed factors include limits on managers and managerial ability. Managers are most efficient with small firms where they are able to manage more intensively and to catch and solve problems quickly, but this ability diminishes with increasing firm size. As for bureaucracy, information flows moving from the bottom to the top of an organization (and vice versa) are inefficient, and data and knowledge will become distorted as they move through the bureaucratic chain of command. Thus, bureaucracy adds direct costs to the firm, reduces the quality of decision-making, and therefore tends to make average costs higher as firm size increases. Finally, transportation costs can also contribute to scale diseconomies. As firm size increases, firms will also often expand their markets geographically, and as this happens, higher transportation costs to reach distant customers can result in higher average costs.

Table 4 shows that both cooperatives with small assets and cooperatives with large assets have diseconomies of scale. However, cooperatives with smaller assets had slightly greater ES estimates than cooperative with larger assets, 1.13 and 1.09, respectively. In other words, smaller cooperatives have bigger diseconomies of scale.

The tendency is similar with the results of an earlier study of farmer cooperatives in China's Shanxi Province (Liu and Bailey, 2012). However, the magnitude of ES estimates for sugarcane cooperatives in East Java Province was much greater than those for farmer cooperatives in China's Shanxi Province. Liu and Bailey (2012) found the average ES estimates for small-sized cooperatives at 1.0039 while for large-sized cooperatives, it was 0.5334 over the period 2008-2010. Table 4 indicates that only one sugarcane cooperative within the large asset group was in economies of scale condition (ES estimate was less than 1) while all sugarcane cooperatives within small asset group experienced diseconomies of scale (ES estimates were more than 1).

Factors Affecting Economies of Scale

The estimated regression coefficients and related statistics for factors affecting economies of scale of the sugarcane cooperative-respondents are presented in Appendix 2 and summarized in Table 5.

The value of the overall coefficient of determination (overall R^2) was 0.6553 which indicates that the independent variables in the model consisting of total assets, output per member, the presence of manager, and classification were good enough to explain variations of the ES estimates of the sugarcane cooperative-respondents in East Java. Approximately 65.53% of the variations in the ES estimates were explained by independent variables, while the rest of variations (36.47%) were explained by variables that were excluded from the model. The model was also found significant at 1% probability level. This means that as a whole, the data fitted in the model strongly influenced the ES estimates of the sugarcane cooperatives.

Table 5. Parameter estimates for factors affecting economies of scale, sugarcane cooperative-respondents, East Java, 2008-2011

ITEM	COEFFICIENT	STD. ERROR
Dependent variable		
Economies of scale (ES)		
Independent variables		
Intercept	1.17522***	0.0118
Total assets (ASST)	-7.60e-07**	3.43e-07
Output per member (YMEM)	-0.00208***	0.0004
The presence of Manager (MAN)	-0.03570ns	0.0237
Performance classification (CLASS)	-0.03821**	0.0166
Observation (n)	76	
Overall R^2	0.6553	
Wald chi2(4)	58.50***	

***, **, and * Significant at 1%, 5%, and 10% probability levels, respectively
ns Not significant at 10% probability level

Total assets of the cooperatives (ASST) is significantly (at 5% significance level) associated with economies of scale as expected. This means that smaller cooperatives had bigger diseconomies of scale than larger cooperatives as indicated by the average estimated values of ES for the smaller-sized cooperative which were greater than those for larger-sized cooperatives (Table 4). This result is similar with the finding of Hailu et al. (2005) that larger-sized fruit and vegetable marketing cooperatives were more cost efficient than smaller-sized fruit and vegetable marketing cooperatives.

As being argued by Liu and Bailey (2012), the difference in incentives for large and small cooperatives maybe an indication of the differences in the type and quality of assets that the different cooperatives have. Larger cooperatives may have made investment in larger trucks or more sophisticated and expensive equipment than smaller cooperatives. As a result, large cooperatives had lower and flatter average cost curve compared to small cooperatives in the sample. However, since the larger-sized sugarcane cooperatives were also in diseconomies of scale, further business expansion was not suggested for them. For these sugarcane cooperatives it is more important to make their business more economically efficient.

For smaller-sized sugarcane cooperatives, their effort to have larger assets in order to reap the benefit of economies of scale through bank services may be not easy. The study of Zhao and Jian (2013) on Chinese banking sector found that almost all Chinese commercial banks are trying to grow larger, and no large bank is really willing to serve Small and Medium-sized Enterprises (SMEs) and farmers. The reasons are that

only large banks could finance large projects and only serving large consumers could finance large projects and only serving large customers could reap the benefit of economies of scale. Similar condition in Indonesian banking would make it difficult for small-sized sugarcane cooperatives to get bank services.

Output per member (YMEM) was also significantly associated with economies of scale (at 1% significant level). This result supports the hypothesis that cooperative would be considered more efficient if it handles more output per each member than a cooperative with lower output per member. In this case, the management of cooperatives should do some efforts to make their members actively participate in their business so that the output per member would be increased. Some evidence in the field showed that some farmer-members, especially in larger-sized cooperatives (in terms of farmer-members) were less actively participate in cooperative business due to lack of sense of belonging or ignorance.

The presence of a manager (MAN) is not a significant factor affecting economies of scale. In East Java, only a few sugarcane cooperatives hire a manager to run their business. Many smaller cooperatives choose not to have a manager to save their budget and because they think that they (the board of officers) could handle their business alone. Only some larger-sized sugarcane cooperatives have a manager. However, the regression result suggests the importance of having a quality manager, not just a manager. According to Miniter (1998), the quality of managerial ability and skill is a key factor in determining whether or not a firm realizes economies of scale, and managerial talent will also influence how soon a firm begins to encounter diseconomies of scale.

Meanwhile, the sign of the coefficient of classification (CLASS) was negative and significant at 5% probability level which means that classification of cooperatives was associated with economies of scale. This means that when the cooperative was classified as very good, the probability of the existence of economies of scale would increase.

CONCLUSIONS AND POLICY RECOMMENDATIONS

The results of translog cost function model estimated using seemingly unrelated regression revealed the evidence of diseconomies of scale for the majority of sugarcane cooperative-respondents in East Java, both for small-sized and large-sized cooperatives. Further analysis using regression method leads to a conclusion that total assets, output per member, and classification of the cooperatives were significantly associated with economies of scale.

Based on the results of the study, it is strongly recommended that improvement in cooperative management could be done to increase cooperative efficiency which would lead to economies of scale and better performance as a whole. Therefore, a periodic and continuous training and guidance should be carried out for the cooperatives, with regard to both administrative management and financial management. The training and guidance can be facilitated by the Office of Cooperative and Small and Medium Enterprises at the regency, provincial, or national level. It can also be facilitated by KUB Rosan Kencana as secondary cooperative. The cooperatives should also be encouraged to have an external auditor to assure that the cooperatives have good financial management.

It should be noted that the presence of a manager is not enough, but what is more important is good quality manager. Therefore, the recruitment of a manager of a cooperative should be based on professionalism principles to assure the delivery of

quality service to the members. A manager should really understand his roles and functions to support the success of cooperative. Appropriate education and trainings for cooperative managers should be conducted intensively and continuously to increase their understanding on cooperative enterprise managerial tasks.

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Appendix 1. Regression analysis of economies of scale for sugarcane cooperatives in East Java, 2008-2011

```
Seemingly unrelated regression
------------------------------------------------------------------------------
Equation          Obs  Parms        RMSE    "R-sq"       chi2        P
------------------------------------------------------------------------------
lnc                76      9    .0866328    0.9812   20043.77   0.0000
s1                 76      3     .154763    0.6151     121.46   0.0000
------------------------------------------------------------------------------


------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lnc          |
         lny |   1.462695   .1229031    11.90   0.000     1.221809     1.70358
        lnp1 |  -.2231559    .167682    -1.33   0.183    -.5518065    .1054948
        lnp2 |   .1550769   .0734722     2.11   0.035      .011074    .2990797
      lnylny |   -.025839   .0096727    -2.67   0.008    -.0447972   -.0068809
    lnp1lnp1 |  -.0459637   .0323732    -1.42   0.156     -.109414    .0174865
    lnp2lnp2 |   .0408386   .0091279     4.47   0.000     .0229482    .0587289
     lnylnp1 |   .0296061   .0261085     1.13   0.257    -.0215657    .0807779
     lnylnp2 |   .0198162   .0109025     1.82   0.069    -.0015523    .0411847
    lnp1lnp2 |  -.0321446   .0248593    -1.29   0.196    -.0808679    .0165786
       _cons |  -1.571453   .4441498    -3.54   0.000     -2.44197    -.700935
-------------+----------------------------------------------------------------
s1           |
         lny |  -.0688712   .0153829    -4.48   0.000    -.0990212   -.0387213
        lnp1 |   .2548623   .0389018     6.55   0.000     .1786162    .3311083
        lnp2 |   .1323503   .0194729     6.80   0.000     .0941841    .1705165
       _cons |   .7229878    .105822     6.83   0.000     .5155804    .9303951
------------------------------------------------------------------------------
```

Appendix 2. Regression analysis of factors affecting economies of scale of sugarcane cooperatives in East Java, 2008-2011

```
Random-effects GLS regression                   Number of obs      =        76
Group variable: coop                            Number of groups   =        19


R-sq:  within  = 0.2663                         Obs per group: min =         4
       between = 0.7047                                        avg =       4.0
       overall = 0.6553                                        max =         4

                                                Wald chi2(4)       =     58.50
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

                                  (Std. Err. adjusted for 19 clusters in coop)
------------------------------------------------------------------------------
             |               Robust
          es |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        asst |  -7.60e-07   3.43e-07    -2.22   0.027    -1.43e-06   -8.80e-08
        ymem |  -.0020772   .0004428    -4.69   0.000     -.002945   -.0012094
         man |  -.0357047   .0237192    -1.51   0.132    -.0821935    .0107841
       class |  -.0382109   .0165726    -2.31   0.021    -.0706926   -.0057292
       _cons |   1.175217   .0117866    99.71   0.000     1.152116    1.198318
-------------+----------------------------------------------------------------
     sigma_u |  .03801204
     sigma_e |  .02176393
         rho |  .75311549   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```