Total productivity and technical efficiency of coconuts in Malaysia

(Jumlah produktiviti dan kecekapan teknikal tanaman kelapa di Malaysia)

Nor Amna A'liah Mohammad Nor*, Engku Elini Engku Ariff*, Nik Rahimah Nik Omar*, Ahmad Zairy Zainol Abidin*, Rasmuna Mazwan Muhammad*, Hairazi Rahim*, Mohd Syauqi Nazmi* and Nurul Huda Sulaiman*

Keywords: coconut, technical efficiency, total productivity

Abstract
Coconuts are highly nutritious, rich in fibre, antioxidants and packed with essential vitamins and minerals. It is known for their versatility uses ranging from foods to cosmetics. As the coconut industry is experiencing rapid growth due to high demand for coconut-based products, the question of whether Malaysia can increase their coconut productivity and improve efficiency in their operation currently arises. This study gathered information on coconut farmer's profiles, management system and production cost as well as productivity and technical efficiency of coconut farm activities. The results showed that the total cost of production for coconuts was RM9,739.18/ha/yr. Major expenditure was for labour cost which covered 34.4% of the total cost. The Cobb-Douglas production function exhibited that the area had a significant positive correlation with production at a = 1% level while the seed factor had a significant negative correlation with production at a = 5% level using Maximum Likelihood Estimation (MLE). Average productivity index of 1.97 showed that farms were in low efficiency level. The Cobb-Douglas analysis also showed that the technical efficiency analysis was 99% with an elasticity (e) of 1.1699. This indicated that the farm was operating at an increasing return to scale. Current technologies practiced are still in the productive level, but the input combination could be improved to produce better output.

Introduction

Coconut (*Cocos nucifera* L.) is known for its versatility uses ranging from our daily cuisine to our beauty regimens. In contrast to oil palm, coconut palm emphasises on its multi-utility significance. The economic importance of the coconut palm is proven by the fact that it was ingrown in more than 90 countries across the world (Venkat et al. 2017). Nowadays, the coconut industry is grown in Malaysia for both fresh produce and downstream products such as coconut powder, coconut milk, charcoal, activated carbon, coconut oil and coco peat fibre.

Malaysia ranked the 12th largest producer of coconut in the world with a production capacity of 538,685 mt in 2018 [Selected Agriculture Indicator (SUA) 2019]. The production value of this industry is about RM603 million with a total planted area of 85,182 ha. The total consumption of coconut in Malaysia is 745,657.1 mt a year. Due to our over consumption, Malaysia needs to import the coconut mainly from Indonesia and the Philippines to overcome the supply deficit at 250,126.0 mt per year. Coconut is rich in nutrients and is mostly consumed fresh. It is considered as a

*Socio-Economy, Market Intelligence and Agribusiness Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang, Selangor
E-mail: amna@mardi.gov.my
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versatile plant which encourages most of the farming families, especially in rural areas, to grow coconut in their backyard as an extra economic activity and produce a side income for the families. Hence, increasing the value of products through processing activities will offer great opportunities for creating new employment, thus generating income for the locals. As the industry grows, studies on the economic aspects of coconut production in Malaysia should be done to create awareness in farmers on the viability and competitiveness of the industry. Therefore, this study was conducted to evaluate the cost of production, productivity and technical efficiency (TE) of coconut farm activities.

Coconut industry in Malaysia

In 2018, the production of coconut was recorded at 538,685 mt from a planted area of 81,585 ha (*Table 1*). The production was projected to increase in 2018 although the planted area was decreased. The main reasons for the decline in coconut plantations were the change of cultivated areas from coconut to palm oil, rubber or other profitable crops, less youth involvement and also due to land use for other development purposes such as property development. The trends of planted areas and production are shown in *Table 1*. Increase in production might have been due to the use of technology in coconut production such as selected hybrids and inbred varieties as well as effective agronomic practices. MATAG is a well-known high-quality variety and others in line include Pandan, the Malayan Yellow Coconut (MYD) and the Malayan Red Coconut (MRD). Currently, MARDI has successfully developed six new hybrid varieties, namely, MYLAG, MYLECA, MARLECA, MARENA, CARECA and CARENI for commercial development. For the per capita consumption, the production increased from 17.3 kg or nuts in 2015 to 21.5 kg or nuts in 2018. The smallholders owned 94.5% of the total planted areas while 5.5% was owned by the estate.

The coconut industry plays an important economic and socio-cultural role for the wellbeing of rural households, such as food supply, source of income employment, livelihoods and sustainable agriculture. In the 1980s, it was estimated that Malaysia had a total of 150,000 coconut farmers. However, in 2017, the number of coconut farmers dropped significantly to 63,550. The main factor leading to the decline of coconut farmers is unstable coconut price. Farmers then had to convert

Table 1. Planted area and production of coconuts in Malaysia from 2015 to 2018

Year	2015	2016	2017	2018[e]
Planted area (ha)				
Estate	4,493	5,115	5,074	4,973
Small holder	77,508	79,494	78,176	76,612
Malaysia	82,001	84,609	83,250	81,585
Production (mt)				
Estate	80,587	78,544	72,980	75,955
Small holder	425,027	426,229	444,608	462,730
Malaysia	505,614	504,773	517,589	538,685
Consumption per capita	17.3	17.0	19.4	21.5*
Number of coconut farmers		102,253	63,550	N/A

Source: Crop Statistic Booklet 2018 (2019)
e: Estimated
*Consumption per capita for 2018 is from SUA (Supply and Utilisation Accounts), Selected Agricultural Commodities (2019)

their coconut farms to more profitable crops as well as compete the land for other development purposes. Another factor was the lack of involvement of new generations which put pressure on the contraction of not just in coconut cultivation, but in the whole of the agricultural sector. They became more interested in getting involved in the industrial and service sectors as their main source of income.

In order to attract the younger generations, lots of incentives were offered by the government to strengthen and revitalise the industry. Among the incentives are the establishment of the National Young Agropreneur Council (MAM), the Young Agropreneur Programme, the National Agricultural Skills Training Programme (PLKPK) and microlending facilities. Besides that, the Malaysian government also aims to increase the production of coconuts to reduce the dependency on coconuts from foreign countries. Many plans and initiatives were developed under the Malaysian Development Plan and the National Agricultural Policy. The National Agro-food Policy (2011 – 2020) focused on several strategies to reinvigorate the industry. Among the key strategies focused by the government were to intensify the replanting and rehabilitation of the areas, integrate coconut cultivation and downstream processing activities by developing new high value products.

In 2018, a RM50 million fund was allocated for the development of the coconut industry under the incentives known as the new source of wealth (*Sumber Kekayaan Baru*). It was promoted for commercial planting due to their potential in generating income for farmers and the economy. The fund enabled the development of a systematic coconut industry that included the coconut production improvement programme and high-quality varieties of coconut seed production programmes. Such programmes included training to upgrade technological and managerial skills, extension and advisory services on production and coconut-based products. It was crucial to gauge the performance of their farm activities to see whether they had incorporated both tangible and intangible inputs into efficient operation and productive outputs. In addition, MOA also introduced contract farming system which formally started during the 8th Malaysian Plan (2000 – 2005) as one of the programmes that undertook the new restructuring of the coconut industry. The basic concept of contract farms is to ensure that the yield produced by each farm can be marketed and to reduce the dumping of agricultural produce. Contract farming is a high impact project that targets individuals and groups of farmers with the aim of increasing the production of food products and thus contributing to the national economy.

Literature review

Technical efficiency (TE) measurement is one of the most commonly used methods for measuring company performance. Determining the level of efficiency of the company will enable identification of the factors by which improvements can be made as well as providing useful information for policy formulation. Technically, a firm is efficient if it produces a higher level of output as compared to other firms at the same input level (Suhaimi et al. 2011; Rekha 2016; Raziah 2006; Engku Elini and Raziah 2008; Tapsir et al. 2008; Rashilah et al. 20l0). The efficiency measurement has long been a subject of the study for many economists and researchers and at the same time very interesting for policy planners. This is important as a starting point in identifying the process of saving resources and improving productivity. A study on TE in agriculture of 10 new EU member states by Bojnec et al. (2014) showed that an increase in TE in agriculture and the development of the rural economy are seen as a strategy to boost the level of living standards in agriculture and in rural areas.

Their findings exhibited that the technical efficiency in agriculture is significantly positively associated with agricultural factor endowments, average farm size, farm specialisation, small-scale farms and technological change.

The measure of efficiency is a concept directly related to the measure of productivity (González and Trujillo 2009). According to the OECD (2016) report, productivity improvements have led to huge agricultural production growth, enabling farmers to produce affordable food, feed, fuel and fibre for a rapidly-growing global population. Higher productivity has raised farm household incomes, increased competitiveness and contributed to national growth. Economically, when resources and opportunities of new technologies are depleted, efficiency studies will be able to show the potential of raising productivity by improving efficiency without increasing the resource base or developing new technology (Suhaimi et al. 2011).

According to Tapsir et al. (2008), efficiency measurement begins with Farrell's (1957) work using a non-parametric approach. Based on Farrell's concept of measurement of output-oriented efficiency, various methods have been developed in estimating TE. These methods are classified into four main approaches comprised of the non-parametric approach also known as data envelopment analysis, parametric approach, deterministic statistical approach and frontier production function model. One of the most popular approach is the frontier production function model which has been widely used in empirical efficiency estimation models.

A number of studies on total productivity (TP) and TE measurements have been done. Raziah (2003) studied 38 fish-based small and medium enterprises (SMEs) in 1996 and 1998 using the Koop and Timmer method and showed that the average efficiency of the firms had decreased to 0.1380 in 1998 from 0.3447 in 1996. Raw materials were found to be the most important factors affecting production, followed by labour and capital. A study on TP and TE of watermelon in 2004/2005 indicated that the TP of the watermelon subsector was found to be 1.78 and the average efficiency level was 46% (Raziah 2006). Another efficiency study conducted by Tapsir (2004) on beef cattle production using translog Cobb-Douglas stochastic frontier production function discovered that the average TE for individual farms was 0.6829 and the total loss in production due to inefficiency was estimated at 32%.

From the aspect of SMEs, Zalina and Marziah (2007) assessed the industrial level of efficiency among the Malaysian SMEs using the stochastic frontier Cobb-Douglas model. The results exhibited that the average TE for all industrial subsectors was 0.7609 which indicated 24% loss or inefficiency in the production process. In 2006, Jejri and Rahmah measured the total factor productivity (TFP) growth in the overall Malaysian manufacturing sector. By using a time series data from the Industrial Manufacturing survey from 1985 to 2000, they found out that the TFP growth was increasing due to TE especially in food, wood, chemical and iron products.

In 2016, Rekha carried out a study on coconut technical efficiency in Karnataka. The study revealed that the TE of coconut production in Karnataka varied from 67% to 99% with a mean of 89%. This indicated that the coconut production in Karnataka was highly technically efficient and revealed the potentiality of attaining productivity of coconut with a given level of factors and technologies. In addition to improving the efficiency of production, the coconut producers were gaining a sustainable profit.

Coconut was chosen for this study due to the threat of increasing competition from countries producing cheaper coconuts such as Indonesia and Thailand. Most studies on coconut production in Malaysia were in the field of technical part and some other research which were related to socio-economic studies. As very few studies have been conducted on the TE of coconut farming especially in Asia, it is instructive to explore it in the coconut industry. In this paper, the TP and TE of the coconut farms are discussed and the factors affecting the productivity and efficiency of the farms are highlighted.

Methodology

Data collection

This study was conducted using primary data obtained from face-to-face interviews and questionnaires. The respondents consisted of coconut farmers from several states of Malaysia who were purposely selected from a list of farmers involved in contract farming programmes. This data selection was collected to look at the productivity and efficiency of coconut farms based on the contract farming programmes that had been implemented in Malaysia. This data comprised of respondents' profiles, crop practices, the processes of input and output, management technologies and the production costs of coconut.

Data analysis

The TE and productivity analysis were performed in order to measure the level of efficiency and productivity of the coconut farms.

Technical Efficiency (TE)

Based on the study done by Engku Elini et al. (2010), the production efficiency of coconut farmers can be measured by using TE, which is a measurement of the stochastic frontier production function by Battese and Coelli (1995). It is measured by looking at the most attainable level of output for a given level of input within a given range of technology (Engku Elini et al. 2010; Rashilah et al. 2010). This method used the Cobb Douglas production function with the following specifications:

$$LnY_1 = \beta_0 + \beta_1 \ln X_{ij} + \square_i$$

Where,

Y = output quantity
X = production factor
β = estimated coefficients
i = 1, 2, 3, ……… n numbers of sample
j = 1, 2, 3, ……… m numbers of production factor
□ = V_i - U_i (error)

The parameter □ is an error whereby V is a random error and U error is caused by the inefficiency component (Aigner et al. 1977 and Meeusen and Broeck 1977). The V and U parameters are assumed to be independent of each other. V is assumed to be normally distributed while U is partially normalised. Negative error U is defined as inefficiency due to factors in control (Battesse and Corra 1977). V error is defined as the variation of measurements related to factors outside of control in the production process such as weather, industrial policies and factors beyond the study observation.

The estimation of stochastic frontier production function is by using the "Maximum Likelihood" (MLE) method. The random errors (V and U) can be estimated by maximising the following "log likelihood" function:

$$Ln\ \ell = \text{K In}\left[\tfrac{2}{\sigma}\right]\tfrac{1}{2} + K\ \text{In}\ \sigma^1 + \sigma^{k}_{k=1}\sigma\text{In}[1 - F(\square_k\ \lambda\sigma^1)] - \tfrac{1}{2}\sigma^2\sigma\epsilon^{k}_{k=1}k^2$$

where € is the sum of V and U, σ is equal to √ (σv2 + σu2) and λ is the ratio of σu to σv. F is the standard normal distribution and k is the number of farms in the study sample. The TE for each farm can be estimated as follows:

$$TE_k = \exp\left[-E\left(\frac{U_k}{\square_k}\right)\right] \text{ makes } 0 \leqslant TE_k \leqslant 1$$

The method of stochastic frontier production function by using MLE is customising data with the maximum estimation. Therefore, it is actually measuring the best farming practices. The TE index is classified as follows:

Table 2. Technical efficiency (TE) scale

Scale	Description
TE <25%	Very low
TE = 25% – 50%	Low
TE = 50% – 75%	Modest
TE >75%	High

The stochastic frontier production function can provide information on the level of returns according to the scale. Therefore, it enables the determination of the resources in the production process whether it has been used efficiently and the technology used has maximised profitability. The production process has many alternative input combinations to produce a good level of output, whereby substitution between one input and another is possible. In the long run, the addition of one input will increase output with increasing rates, "ceteris paribus". Subsequently, output increases with decreasing rates and eventually become negative if inputs continue to increase. In the Cobb Douglas production function, this condition can be measured by the amount of elasticity. The total elasticity (ε) in this function is the sum of the coefficients and is broken down into three conditions (Gujarati and Porter 2009) which are summarised below in *Table 3*.

Table 3. Elasticity indicators

Scale	Description
$\varepsilon > 1$	Increasing returns to scale
$\varepsilon = 1$	Constant returns to scale
$\varepsilon < 1$	Decreasing returns to scale

An elasticity value of >1 indicated that the farms were operating at increasing returns to scale while a value of <1 indicated that the farm is in a phase of diminishing returns to scale. Increasing returns to scale meant that there is a great opportunity to increase productivity as well as space for increased production with the improvement of better input combinations. Therefore, decreasing returns to scale meant that the technologies used by these farms were matured enough and required an introduction to the new technologies. This efficiency can be enhanced by innovations in agricultural practices and technologies used.

Partial Productivity (PP)

Productivity is defined as the relationship between the output (i.e. produced goods) and input (i.e. used resources) which are used in the production (Tangen 2003). Productivity is related to efficiency as it is the total output produced per unit of input sources such as land, labour, capital and management that are used in production (Engku Elini and Raziah 2008; Engku Elini et al. 2010). Productivity is directly proportional to the efficiency in which high-productivity is followed by high-efficiency performance and vice versa. In theory, productivity is used to measure the sustainability of a farm and organisation as a whole rather than a specific reference. Partial Productivity (PP) also known as a single factor of productivity is stated as a ratio of output to a single input such as labour, capital or resources (Raziah 2006). Changes in the quality and quantity of other inputs affect the productivity measure in a single output.

The partial productivity (PP) model is represented as:

$$PP = \frac{\text{Output}}{\text{Input}} = \frac{Q1}{q^1}$$

Where,
PP = partial productivity (yield/ ha)
Q = output quantity
q = input quantity

The classification of partial productivity levels in this study is based on the MOA 2004/2005 Productivity Survey (MARDI 2010). The productivity classification is according to scale as shown below in *Table 4*.

Table 4. Productivity indicator scale

Scale	Indicator
TP < 1	Not productive
TP = 1.00 to < 2.00	Low
TP = 2.00 to < 3.00	Modest
TP ≥ 3.00	High

Findings
The findings were based on 46 contract farming respondents who were chosen purposely in several states in Malaysia. Based on the survey, profile information is shown in *Table 5*. The majority of coconut farmers were from 51 to 80 years old. Most of them were high school graduates with SPM (Certificate of Education Malaysia) qualifications. Only 15.2% had farm accreditation while 84.8% had none. Most of the farmers were using conventional practices, which included manual cultivation, fertilization and harvesting activities.
The labour force was mainly from family members as the farms were mostly inherited from their parents. Few of the farms were not productive as farmers still managed 70 to 80-year-old coconut trees that were not producing at optimum capacity. A total of 15 respondents owned coconut farms which were less than 2 hectares, while around 25 respondents owned coconut farms with an area of 2 to 6 hectares.

A coconut TE is a measure of its ability to produce in relation to the maximum output possible from a given set of inputs and production technology. From the data collection, the analysis was done to estimate the cost of production, productivity and TE.

Table 5. Coconut respondent's profiles

State	Number of respondents
Johor	9
Melaka	1
Pulau Pinang	2
Pahang	2
Perak	11
Sabah	11
Terengganu	10
Age (yrs)	
30 – 40	6
41 – 50	12
51 – 60	14
61 – 70	10
71 – 80	4
Race	
Malay	33
Chinese	2
Bajau	1
Rungus	10
Educational level	
No schooling	2
Primary School	9
Secondary School	16
University	5
Accreditations	
myGAP	7
No accreditations	39
Area (ha)	
< 2	15
2 – 4	13
4 – 6	12
6 – 9	4
> 10	2

Table 6 shows the cost structure of coconut cultivation per hectare. In average, the cost of production was at RM9,739.18 per hectare. Labour cost was the highest component at 34.4% (RM3,351.67) followed by depreciation costs at 17.5% (RM1,703.96). High labour cost indicates that coconut cultivation is still labour-intensive especially in harvesting. For

Table 6. Cost structure of coconut planting per hectare

Parameter	Average cost (RM/ha)	Percent (%)
Seeds	1,680.1	17.3
Fertilizers	1,183.33	12.2
Herbicides and pesticides	409.27	4,2
Labour	3,351.67	34.4
Utility	202.61	2.1
Maintenance	122.17	1.3
Depreciation	1,703.96	17.5
Other costs	1,086.07	11.1
Total cost/ha	9,739.18	100%
Cost/nut	1.21	

respondents who own small coconut farms, the cost of labour is much lower because they normally use family labour with daily payroll. For large coconut farms, farmers hired permanent workers who consisted of local workers or foreign labourers. The value of depreciation cost consisted of cost of fixed assets owned by farmers such as motorcycles for the use in farms, four-wheel drives or lorries, stores, lawn mowers and knapsack sprayers. In terms of input costs, the seeds were the highest at 17.3% (RM1,680.10) followed by fertilisers, 12.2% (RM1,183.33) and pesticides, 4.2% (RM409.27). Most of the farmers obtained seeds subsidised from the Malaysian governemnt and some of them buy their own seeds. Based on the findings, the average price of coconut seeds is around RM15 – RM25 per plant for the Matag variety and RM12 per plant for the Pandan variety. Other costs involved are taxes, rental and insurance, which accounted for 11.1% (RM1,086.07).

Overall, the total cost of a coconut is RM1.21 with an average yield of 8,000 nuts per year. According to Christopher (2018), the overall productivity level of coconuts in Malaysia is generally low, around 5,000 – 6,000 nuts/ha/year due to ageing Malayan Tall coconut palms. Moreover, the low productivity level of nuts is also largely due to poor soil fertility, imbalance nutrient management, poor agricultural practices and also farm management (Noorsuhaila et al. 2018). According to this survey, most farmers did not apply fertilisers properly. Most of them only carried out fertiliser applications once a year. The rest of the farmers just waited for the coconuts to fall before collecting them. The most commonly used fertilisers were NPK, urea and salt.

To assess the TE and elasticity of the relationship between input and output, the Cobb-Douglas production function with MLE estimation was used. The production function is a process of converting input into an output. Thus, the Cobb-Douglas production function describes how many input units are needed to produce one unit of output. It is a standard equation used to describe how many input units are needed to produce one output unit. The Cobb-Douglas production function for TEs with five input variables was specified as:

$$f(K,L) = bKaLc$$

$$\ln Y_t = 11.8507 + 1.4870 \ln Area_t - 0.0105 \ln Labour_t + 0.1791 \ln Fertiliser_t + 0.0303 \ln Pesticide_t + -0.5160 \ln Seed_t + \varepsilon_t$$

In this equation, K represents capital while L represents labour input and a, b, and c represent non-negative constants.

The results showed that all independent areas, fertilisers, herbicides and pesticides variables had positive signs while labour and seeds both had negative signs. The Cobb-Douglas production function using MLE method showed that both areas and seeds were significant at 1% and 5% levels respectively, as shown in *Table 7*. Area was positively related to production while seeds had a negative relationship. Positive relationship indicated that a 1% increase in the size of the area will increase coconut production by 1.5% while a 1% increase in seeds will decrease coconut production by 0.5%. The fertilisers, herbicides and pesticides were positively related to the coconut production. However, the results were not significant.

Area was positively related to production because large areas were normally more to business-oriented and they often employed permanent workers to manage the crops. Therefore, it is more organised and well managed. On the other hand, for smaller areas, it was more focused on family workers and the practice of cultivation was usually focused on 'planting, waiting and cultivating'. They solely made this coconut cultivation as their side income. Based on the findings, the seeds resulted in negative affinity towards production. It is probably due to the practice of planting by the respondents. Most of the respondents had planting areas less than 6 hectares and most of them only applied fertilisers once a year. In addition, most of them were still using the old Malayan Tall varieties.

Based on the analysis, the results indicated that coconuts had an average TE value of 99% which indicated that there was a small variation in the use of inputs among farmers. The calculation showed that the value of elasticity (ε) was 1.1699, which pointed out that the farms in the study sample were experiencing an increasing return to scale with elasticity values greater than 1 (Gujarati 2003). This meant that an increase of 1% per factor of production increased production by more than 1%. The current technology used is still productive but the combination of inputs can be further enhanced to produce higher outputs. The estimated value of g (0.0007) implied that there was a 0.07% difference in efficiency between farms due to factors in the control of cultivation such as the combination of inputs used. The remaining percentage was caused by factors beyond our control such as weather, location, disease threat, soil conditions and other factors that were

Table 7. Cobb Douglas production function with coconut MLE estimation

Variables	Coefficient value (b)	Standard error	t value
B_0 (Constant)	11.8507	2.3440	5.0558***
b_1 Area	1.4870	0.3060	4.8603***
b_2 Labour	-0.0105	0.1701	-0.0620
b_3 Fertilizer	0.1791	0.2466	0.7260
b_4 Herbicides and pesticides	0.0303	0.2142	0.1416
b_5 Seeds	-0.5160	0.3265	-1.5803**
$s^2 = s_u^2 + s_v^2$	1.409	0.364	3.867***
$g = s^2u/s^2$	0.0007	0.087	0.008
Log Likelihood value	-31.5998		
*Technical Efficiency (TE)	99%		
Elasticity (e)	1.17	Increased returns to scale	
Productivity	1.97		

*Significant at 10%
**Significant at 5%
***Significant at 1%

not included in the analysis. In terms of productivity, the findings showed that the mean productivity was 1.97. This exhibited that coconut productivity was at a low level of productivity which stated that for every RM1.00 invested, farmers will receive a return of RM0.97.

Conclusion

The coconut industry needs to be prioritised again as this industry is becoming one of the new prosperity crops in the future. It has been forecasted to be an important commodity that will contribute to the country's gross domestic product (GDP). The results stated that coconut cultivation mostly operated using conventional practices which were labour intensive. The expansion of the industry should be based on technology enhancement such as the use of better varieties of coconut seedlings and effective planting practices. The use of new hybrids and mechanisation will help farmers to reduce the labour usage as well as increase the yield. The partial productivity for coconut was at 1.97 which exceeded the value of one. This indicated that the coconut industry was profitable to the farmers. Although it was still using coventional practices, it was still productive. However,the combination of inputs can be further enhanced to produce higher outputs. These farms attained a relatively higher level of TE, indicating that technical skills and knowledge in this area could be easily accessible to the farmers regardless of their educational background and courses were also provided by the agencies. The elasticity was at an increasing return to scale exhibiting that there are tremendous opportunities to increase productivity with improved input combinations. As the survey was done among the contract farming participants, the incentives should be extended among them to boost this industry which could become a benchmark for others who want to enter the industry.

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Abstrak
Kelapa sangat berkhasiat, kaya dengan serat, antioksidan dan membekalkan vitamin dan mineral penting. Ia terkenal dengan kepelbagaian penggunaannya iaitu sebagai sumber makanan sehinggalah kepada penggunaan dalam kosmetik. Sebagaimana industri kelapa mengalami pertumbuhan pesat disebabkan oleh permintaan tinggi untuk produk berasaskan kelapa, muncul persoalan samada Malaysia dapat meningkatkan produktiviti kelapa dan kecekapan dalam operasi mereka. Kajian ini mengumpulkan maklumat mengenai profil, sistem pengurusan dan kos pengeluaran petani kelapa serta produktiviti dan kecekapan teknikal aktiviti ladang kelapa. Hasil kajian menunjukkan bahawa jumlah kos pengeluaran kelapa adalah RM9,739.18/ha/tahun. Perbelanjaan utama adalah untuk kos buruh yang merangkumi 34.4% dari jumlah kos. Fungsi pengeluaran Cobb-Douglas menunjukkan bahawa kawasan penanaman mempunyai korelasi positif yang signifikan dengan pengeluaran pada tahap a = 1% sementara faktor benih mempunyai korelasi negatif yang signifikan dengan pengeluaran pada tahap a = 5% menggunakan Estimasi Kemungkinan Maksimum (MLE). Indeks produktiviti purata bernilai 1.97 menunjukkan bahawa ladang berada pada tahap kecekapan yang rendah. Analisis Cobb-Douglas menunjukkan bahawa analisis kecekapan teknikal adalah 99% dengan keanjalan (e) 1.1699. Ini menunjukkan bahawa ladang beroperasi pada skala peningkatan yang semakin meningkat. Teknologi semasa yang diamalkan masih di tahap produktif, tetapi kombinasi input dapat ditingkatkan untuk menghasilkan output yang lebih baik.