Determining The Profit Margin In “Patchouli Oil” Supply Chain: A Case Study In Indonesia

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Determining the Profit Margin of "Patchouli Oil" Supply Chain: A Case Study in Indonesia

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***Abstract*— Patchouli oil is a type of oil obtained from the extraction of patchouli leaves and dried stems. In this study, the extraction process, also known as distillation, is conducted by Small and Medium Enterprises (SMEs) in West Pasaman, Indonesia. Patchouli oil must go through several steps before being by manufacturers, such as farmers, middlemen, collectors. The interviews and surveys conducted show that SMEs are currently declining in West Pasaman due to the low selling price of patchouli oil while the production cost is high. This condition has weaken farmers. Most traders do not add value to the product as they only collect patchouli oil and pass it on to next stages. This study aims to determine the production cost and profit margin of each stage in the supply chain of patchouli oil. Data were collected by interviewing the stakeholders, i.e., patchouli farmers, SMEs refining patchouli oil, collectors, and exporters. The production cost is determined by using traditional costing method. The results indicate that farmers obtain IDR 1.236 per day, while traders and collectors obtain respectively IDR 10.000 and IDR 3.833 a day. Surprisingly, the intermediary traders obtain the highest profit margin although they do not contribute to the added value of the product.**

***Keywords*— patchouli oil, costing, supply chain.**

I. INTRODUCTION

Essential oils have the following properties: (a) volatile at room temperature without decomposition, (b) have a bitter taste (pungent taste), (c) soluble in organic solvents and insoluble in water. Essential oils are used to produce cosmetics, perfumes, antiseptics, medicines, "flavoring agent" for food,beverages, cigarettes, and aromatherapy [1][2][3][7]. Essential oils, also known as the etheric oils or oil fly or volatile oil, can be produced by several types of plant, such as Lemongrass, cinnamon, patchouli, cloves. The oil can be obtained from the roots, stems, leaves, and flowers of the plants through extraction [4][6][11]. The quality of the oil essence is affected by the quality of the plants and the processes used to produce the oil [5][8][12].

. Pogostemoncablin (*lamiaceae*) or patchouli is a bushy herb which is a member of the mint family and hails originally from Indonesia, Malaysia, and the Philippines. This plant is known in Indonesia as "nilam"or "dilem". Patchouli (*pogostemoncablinbenth*) is one of the plants that produce essential oil and one of the important export commodities of Indonesia. Among all types of the exported oil essence in Indonesia, patchouli accounts for 60%. In the global market, 90% of the patchouli oil traded internationall comes from Indonesia.

Patchouli is an industrially valued aromatic, medicinal plant that has a huge demand for its oil essence[13]. It is widely used in flavor and fragrance industries as well as in pharmaceuticals. Patchouli oil is one of the most important base materials used in perfumery with its strong fixative property. Thus, the strong smelling oil extracted from leaves is used in perfumes, incense, detergents, and hair conditioners [13][14]. Patchouli is found in many famous perfumes. At present, farmers are showing interest towards patchouli cultivation at large scale mainly in tropical and sub-tropical countries [13].

Patchouli oil is produced in various regions in Indonesia including West Pasaman in West Sumatera. Patchouli oil is obtained from the extraction of patchouli leaves and dried

stems. Figure 1 shows patchouli from West Pasaman. The extraction process is called distillation. Distillation is done by small and medium enterprises (SMEs) in West Pasaman. Patchouli farmers either sell dried patchouli directly to the distillers or perform distillation themselves. Distillers and farmers supply patchouli oil to traders or collectors who sell it to exporters. Patchouli oil goes through many steps before being used by manufacturers. There is an additional price at each stage. The price is high at exporters level and low at farmers level.

Fig1. Patchouli from West Pasaman Indonesia

The interviews and surveys conducted show that SMEs are currently in a declining condition in West Pasaman duet o low selling price of patchouli oil while the production cost is high. This condition is contradictory to the selling price at exporters level. Many middlemen make patchouli oil price at farmers level uncertain as the selling price is determined by collectors and exporters. Several steps must be complied with before manufacturing. This condition weakens the position of farmers. Most traders do not add any value to the product as they only collect patchouli oil and pass it on to the next level.

This study aims to determine the production cost and profit margin of patchouli oil production at each stage of the supply chain. The most profitable and contributing actors in each stage can easily be determined after calculation. This research can help the government to improve patchouli oil business.

II. MATERIAL AND METHOD

A. Material

1) Product Costing System

Costing systems help companies to determine the cost of a product related to the revenue for each production. Two common costing systems are used: direct costing (DC) or traditional stystem and activity based costing (ABC). In the traditional system, it can be seen that the costs involved are usually straightforward, namely labor costs and material costs. But over time, there are costs that can be classified as direct costs. These costs include the cost of repairs, maintenance, utilities, and so forth. The cost system will charge an indirect cost to an unrepresentative allocation base. Activity-Based Costing (ABC), as a cost calculation method that creates a cost group for each event or transaction within an organization that serves as a cost driver. Overhead costs are then allocated to products and services based on the events or transactions of the resulting product or service. ABC allocates the costs of manufacturing a product according to the activities needed to produce the items [15].

Traditional costing and its application in manufacturing environments have been widely discussed. Some researchers used traditional costing to calculate life cycle cost (LCC) [21][22]. [19] estimated LCC for Robot Systems in an early Production Planning Phase, also [20] for sustainable coal consumption an energy production in India. In agriculture [17] determined production cost of palm empty fruit bunch conversion to bio-oil, [23] analized the cost production of pineapple at farmers using traditional costing. Some scholars have conducted research related to costing in supply chain. [18] Applied activity-based costing in a supply chain environment in a large European company of facade components. This research shows how significant inter-firm cost saving opportunities can be identified and offers a first step in assessing the suitability of the proposed model.

Indonesia Patchouli Oil

The following 2014 Statistic Year Book shows a five year statistics of Patchouli Oil in Indonesia:

TABLE I
PATCHOULI OIL IN INDONESIA

Year	Production (Ton)	Area (Ha)
2010	2200	24500
2011	2900	28600
2012	2600	31200
2013	2100	28200
2014	2100	28300

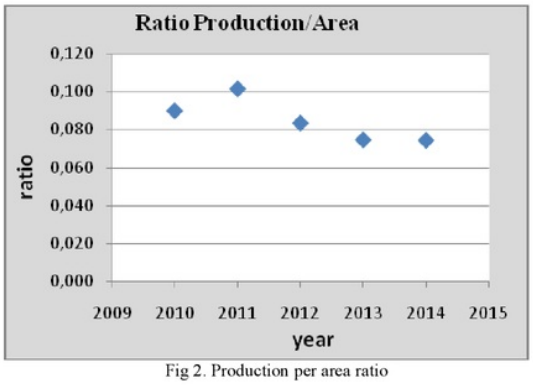

Fig 2. Production per area ratio

Figure 2 shows the fluctuation of patchouli oil production ratio number per area. 2011 has the highest value. Production decreased in the years 2013, 2014 and 2015. Overall, it can be concluded that the amount of patchouli oil production has decreased, while the used land increased. This is caused by the untableness of the price of Patchouli oil price and its lack of quality standard and the use of inappropriate technology.

B. Method

Data were collected directly through interviews with the stakeholders involved. Five farmers, three SMEs industries as patchouli oil refiners, two collectors and one exporter

were interviewd. The farmers and the SMEs are located in West Pasaman while the collectors and exporters are in Padang.

The data on all components of the costs involved were taken through in-depth interviews. Prior to determining the production cost, it is necessary to identify patchouli oil supply chain.

This paper uses traditional costing to determine the production cost of patchouli oil at each stage of supply chain. Traditional costing is used because the calculation of the production cost can only be carried out for one type of production while financing is not imposed on the types of products and activities. Overhead is a cost component that is difficult to control compared with other cost components such as raw material costs and labor costs. But it can be done by elaborating on all the cost components involved.

1) Production cost

Farmers Level

$$PC1 = AC + EC \quad (1)$$

AC = sc + fc + lc + ov 2
Sc = 15 seed/m2*IDR500
= (ss/15 seed/m2)*IDR500
fc = ss/100m2*IDR 9000
EC = kc + rc 3
Rc = IDR 20.000*numbers of exraction
kc = IDR 40.000* numbers of exraction
lc = Rp 100.000*numbers of labour*working days

Where:
PC1 = production cost at farmers level
AC = Agricalture cost
EC = Extraction cost
Sc = seed cost
fc = fertilizer cost
lc = labour cost
ss = size of area
ov = overhead cost

Traders Level

$$PC2 = tc + PC1 \quad (4)$$

Where:
PC2 = production cost at traders level
tc1 = transportasion cost at traders level

Collector Level

$$PC3 = tc2 + sc + PC1 \quad (5)$$

Where:
PC3 = production cost at colectors level
tc2 = transportasion cost at colectors level

2) Profit Margin

$$PM1 = SP1 - PC1 \quad (6)$$
$$PM2 = SP2 - PC2 \quad (7)$$
$$PM3 = SP3 - PC3 \quad (8)$$

Where:
PM1 = profit margin at farmers level
PM2 = profit margin at traders level
PM3 = proft margin at collectors level
SP1 = selling price at farmers level
SP2 = selling price at traders level
SP3 = selling priceat collectors level

III. RESULTS AND DISCUSSION

A. Result

1) Patchouli Oil Supply Chain

Patchouli oil supply chain was designed based on interviews and surveys with farmers, SMEs, traders, collectors and exporters in West Pasaman and Padang. Supply chain is designed by determining the activities performed by each actor so as to determine the cost they require and the cost data necessary to calculate the production cost.

The oil essence derived from the stems and dried leaves. After harvest, patchouli will be dried for aboutthree days, after clean up, the steams and leaves are cut into small pieces. The next step is refining, farmers gather dry patchouli and put it in at 50 kg packing, then enter into distil and compact it. The distillation process takes approximately 7-8 hours. The tools used for distillation are privately owned by groups of farmer groups or hired. The among of patchouli oil obtained for each refining from one size of drum varies between 8 oz - 1.2 oz. According to farmers variations occur because of the quality of soil and seeds of each patchouli.

Farmers sell their patchouli oil either to traders who come directly to refineries or to collectors located further away. Traders sell to collectors, who, in turn, sell to exporters located in Medan or Padang. Exporters export to various perfume companies, pharmaceuticals and cosmetics overseas. Patchouli oil supply chain is shown in the figure below:

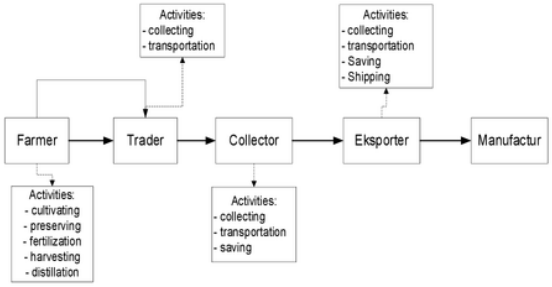

Fig 3. Patchouli Oil Supply Chain

Activities for each actor are:

Farmers:

a. Cultivating; This activity starts from the preparation of areas, seeds, relocation of seeds, plantation, fertilization, harvesting. Seeds are obtained through cuttings and then relocated to ready area for planting or planting.
b. Preserving; This point is related to the activity that can increase the fertility of plants such as using of new technologies and fertilizers.
c. Fertilization; This activity consists of applying fertilizers on plants. Fertilizers can be applied monthly after the plants are one month old.
d. Harvesting; Patchouli harvesting can be done after patchouli is 6-8 months old, next harvest is after three months. Replanting patchouli can be done after it is three years old.
e. Distillation; After haverst, patchouli is dried and distilled. Refining is a process of extracting oil from dry stems and leaves by using water unmixed with oil.

Traders:

a. Collecting; This activity is done by collecting patchouli oil from farmers.
b. Transportation; Transportation is needed when collecting patchouli oil from farmers in some areas.

Collectors:

a. Collecting; Patchouli oil is collected from farmers and collecting traders.
b. Storing; Patchouli oil is collected and stored until it reaches the amount of three tons and then delivered.

Export:

a. Collecting; Patchouli oil is collected from traders and collectors.
b. Transportation; Transportation are required to transport patchouli oil to various regions both at home and overseas.
c. Storing; Patchouli oil is stored for some time to collect the quantity required before shipping.
d. Shipping; Patchouli oil is sent to various regions within and outside the country.

2) Profit margins for farmers

One hectare ideally contains 15,000 Patchouli seeds obtained by steak system. The price of one steam of patchouliis is IDR 500. While the dry leaves and stems are coast IDR 5,000 to IDR 6,000/kg. The dry leaves and stems are distilled to produce patchouli oil. Usually wet leaves drop 70% to the dried leaves. The interviews reveal that 1 hectare can yield 70-80 times distillation, one distillation produces an average of 1 kg of oil. Production cost at farmers level is calculated by using the equation formula 1, which consists of two types; agriculrure and distillation costs. Both can be calculated by using the formula that refers to equation 1 and equation 2. Th Result of the calculation cost at farmers level can be seen in Table 2 and 3.

TABLE 2
COST OF AGRICULTURAL PROCESS

Component cost	Price (IDR)	Units	Total (IDR)
Seeds	500	15000 seeds	7,00.000
Fertilizer	9,000	30 kg	270,000
Labor costs	100,000	2 members, 4 days	800,000
Overhead costs	500,000	-	500,000
			9,070,000

TABLE III
COST OF DISTILLATION PROCESS

Component Costs	Prices (IDR)	Units	Totals (IDR)
Fuel Costs	40,000	80	3,200,000
Rental Costs refiners	20,000	80	1,600,000
Total			4,800,000

The total production cost of one hectare is IDR 9,070,000 + IDR 4,800,000= IDR 13,870,000. The selling price of patchouli oil is around IDR 460,000-480,000/Kg. The selling price per hectare is IDR 37,600,000. Profit margin using equation. 6 for farmers in one hectare is IDR 23,730,000.

3) Profit margin for traders

There is a IDR 10,000-20.0000/kg price difference between farmers and traders. The selling through middlemen is IDR 460,000/kg while it is IDR 470,000 to IDR 480,000 if sold through collectors. The profit margin using equation.7 for traders is IDR 10,000-20.0000/Kg.

4) Profit Margin for Collectors

The purchasing price of collectors to farmers or middlemen ranges from IDR 460,000 to IDR 480,000. The purchasing price is determined by the quality of patchouli oil. The Patchouli oil that contains Patchouli Alcohol (PA) <30 is purchased at IDR 480,000 categorized quality, while that of PA> 30 is purchased at IDR 460,000 categorized quality 2. While the selling price at exporters follows the international price, which is estimated to IDR 700,000 /Kg.

B. Discussion

This study determines the costs required in the supply chain management of patchouli oil. Two main approaches have been proposed in accounting that support a structured decision making process: DC (Direct Costing) and ABC (Activity Based Costing). The use of traditional costing method within a company that produces more than one type of product may cause difficulties in presenting accurate production costs. This is because charging overhead is based on the unit of production, of each type of product, while the

proportion of resources absorbed by each product type is different.

Direct costing or traditional system creates higher distortions when there are sophisticated production structures, with a wide range of products or services that require the assignment of large amount of general costs [18]. Conventional methods can distort production cost per unit, where the product with a more complicated level of processing costs the same or even lower product with a less complicated level of workmanship. Therefore, this method is less able to provide accurate information in decision making. Activity Based Costing was developed to answer the limitations of the method, the conventional needs of management will be the cost of goods manufacturing information able to reflect the consumption of resources in various activities to produce cost of goods manufactured accurately. Implementation of Activity Based Costing will be relevant when factory overhead costs are the most dominant and multiproduct costs.

An advantage of using traditional based costing is that it aligns with generally accepted accounting principles. Despite its many weaknesses, many companies consider traditional method still relevant to use due to the fact that it is easy to audit and implement as it does not use much cost driver in the allocation of factory overhead costs, making it easier for managers to calculate. Although the ABC costing technique was considered quite accurate in calculating production cost, this study uses traditional costing for several reasons: 1) There is only one type of production, 2) the difficulties in exploring the costs per activities, 3) the management used is very simple, and 4) there is no standard cost for each activity.

Figure 4 shows comparison of production cost, selling price and profit margin for third actors. Highest production cost occurs on collectors, followed by traders and farmers. The selling price increased from farmers to collectors. Profit is difference between price and cost. The largest profit margin is obtained by farmers followed by collectors and traders. The profit earned does not include workload and working time, it is only based on the selling price and cost.

Figure 5 shows the proportion of profit earned by each actors. It shows that the proportion of farmers has the biggest profits, followed by collectors and traders. However, if considered in more detail, farmers obtain less benefit.

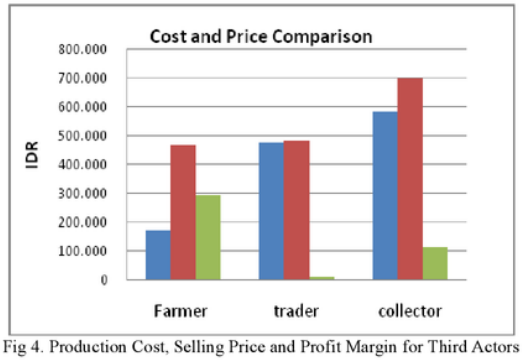

Fig 4. Production Cost, Selling Price and Profit Margin for Third Actors

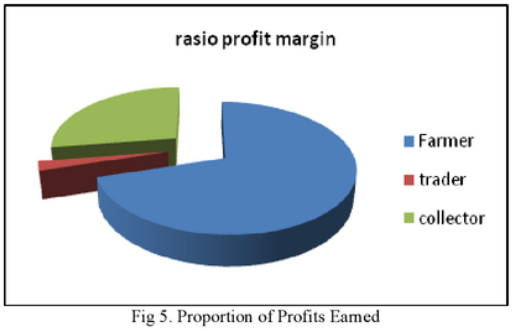

Fig 5. Proportion of Profits Earned

TABLE IV
PROFITS EARNED BY EACH ACTORS

Components	Farmer	Trader	Collector
working days	245 days	1 day	30 days
profit/day	IDR 1.236	IDR 10.000	IDR 3.833

Table 4 shows the amount of profit earned by each actor within a working day. The biggest profit is obtained by traders, followed by collectors and the farmers. This study proves that traders obtain more than other players.

Some cases of agribusiness in Indonesia reveal that farmers are the actors who get the lowest profit with a huge sacrifice compared to other players. Agricultural products purchased at farms are usually cheaper than those sold on the regular market. Before reaching the market they usually go through one until three intermediaries, each intermediary takes more profit. This condition is almost the same with buying agricultural products in supermarkets and traditional markets. Agricultural products sold on regular markets are usually maintained in good quality and well packed, which increases their prices. Applying little marketing strategy makes people shift to shopping at supermarkets.

The level of knowledge of farmers in Indonesia is still relatively low if compared with their overseas counterparts. This does not help them to have strong bargaining power. They are forced to sell products through intermediaries because they want to get money directly and quickly. If they sell to wholesalers or consumers directly it would require additional costs such as transportation , packaging and saving, etc.

IV. Conclusion

The current supply chain shows that the highest profit margin is obtained by the intermediary traders, without adding any value to the product. Eliminating actors such as traders could stabilize price at every level. In this regard, it is crucial that the government enacts measures and policies that would eliminate middlemen in agricultural business, especial patchouli oil sale. A one-door sale system whereby patchouli farmers sell their product to one vendor only without any temporary traders, if possible directly to exporters would more beneficial to farmers. Goverment must control local purchase price of patchouli oil so as to comply it with international price standarts. Further studies are needed to determine how to distribute optimal profit for each actor.

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REFERENCES

[1] G. Elguea-Culebras, "In Vitro Antifungal Activity of Residues from Essential Oil Industry Againstpenicillium Verrucosum, a Common Contaminant of Ripening Cheeses," *Food Science and Technology*, vol.73, pp. 226-232, 2016.

[2] C.V. Barros, D.A Botrel, E.K Silva, S. V Borges, C.R Oliveirac, M.I Yoshida, J.P Andrade F, R. C Monteiro. "Cashew Gum And Inulin: New Alternative for Ginger Essential Oil Microencapsulation," *Carbohydrate Polymers*, vol. 153, pp. 133–142, 2016.

[3] U. Złotek, M. Michalak-Majewska and U. Szymanowska. "Effect Of Jasmonic Acid Elicitation on the Yield, Chemical Composition, and Antioxidant and Anti-Inflammatory Properties of Essential Oil of Lettuce Leaf Basil (Ocimum Basilicum)," *Food Chemistry*, vol. 213, pp. 1–7 , 2016.

[4] H.S. Kusuma and M. Mahfud, "Microwave Hydrodistillation For Extraction Of Essential Oil From Pogostemon Cablin Sbenth: Analysis And Modelling Of Extraction Kinetics," Journal *of Applied Research on Medicinal and Aromatic Plants,* vol. 4, pp. 46–54, Mar. 2017.

[5] X. Chen, L. Ren, M. Li, J. Qian, J. Fan and B. Du, "Effects of Clove Essential Oil and Eugenol on Quality and Browning Control of Fresh-Cut Lettuce," *Food Chemistry*, vol. 214, pp. 432–439, 2017.

[6] H. S. Kusuma and M. Mahfud. "Comparison of Conventional and Microwave-Assisted Distillation of Essential Oil from Pogostemon Cablin Leaves: Analysis and Modelling of Heat and Mass Transfer," *Journal of Applied Research on Medicinal and Aromatic Plants*, vol. 4, pp. 55–6[illegible] Maret. 2017.

[7] N. Adrar, N. Ouki and F. Bedjou, "Antioxidant and Antibacterial Activities of Thymus Numidicus and Salvia Officinalis Essential Oils Alone or in Combination," *Industrial Crops and Products*, vol. 88, pp. 112–119, 2016 .

[8] A. B. Avci, R. R Giachinob. "Harvest Stage Effects on Some Yield and Quality Characteristics of Lemon Balm (Melissa Officinalis L)," *Industrial Crops and Products*, vol. 88, pp. 23–27, 2016.

[9] F. Brahmi, A. Abdenour, M. Bruno, P. Silvia, P. Alessandra, F. Daniloc,Y.C Drifaa, E.M Fahmi, M. Khodir and C. Mohamed, "Chemical Composition and In Vitro Antimicrobial, Insecticidal and Antioxidant Activities of the Essential Oils of Mentha Pulegium L," *Industrial Crops and Products*, vol 88, pp.96–105, 2016.

[10] W. Ouedrhiri, "Mixture Design of Origanum Compactum, Origanum Majorana and Thymus Serpyllum Essential Oils: Optimization of Their Antibacterial Effect," *Industrial Crops and Products*, vol 89, pp. 1–9, 2016.

[11] Z. Bey, H. Haddadi, L. Boulekbache-Makhlouf, P. Rigou, H. Remini,A. Adjaoud, N. K Khoudja and K. Madani, "Essential Oils Composition, Antibacterial and Antioxidant Activities of Hydrodistillated Extract of Eucalyptus Globulus Fruits," *Industrial Crops and Products*, vol 89, pp.167–175, 2016.

[12] K. Mechergui,Wahbi Jaouadi, J.P. Coelho and M. L Khouja, "Effect Of Harvest Year on Production, Chemical Composition and Antioxidant Activities of Essential Oil of Oregano (Origanum Vulgare Subsp Glandulosum (Desf.) Ietswaart) Growing in North Africa," *Industrial Crops and Products*, vol. 90, pp. [illegible]–37, 2016.

[13] M. K. Swamy and U. R. Sinniah, "Patchouli (PogostemoncablinBenth.):Botany,agrotechnologyandbiotechnological aspects," Industrial Crops and Products, vol. 87, pp. 161–176, 2016.

[14] A. Paul, "Rapid Plant Regeneration, Analysis of Genetic Fidelity and Essential Aromatic Oil Content of Micropropagated Plants of Patchouli, *Pogostemon Cablin* (Blanco) Benth.–An Industrially Important Aromatic Plant," *Industrial Crops and Products*, vol.32, pp.366-374, November. 2010.

[15] Y. Peryoga, M. Dewi Solikhah, and A. Agus Raksodewanto, "Production Cost Assessment of Palm Empty Fruit Bunch Conversion to Bio-Oil via Fast Pyrolysis," *Int. J. Adv. Sci. Eng. Inf. Technol.*, vol. 4, no. 6, p. 394, 2014.

[16] M. Woutersa, J. Stecher, "Development of Real-Time Product Cost Measurement: aCase Study in A Medium-Sized Manufacturing Company," *Int. J. Production Economics*, Vol. 183, PP. 235–244, 2017.

[17] M. Schulzea, S. Seuring, and C. Ewering, "Applying Activity-Based Costing in a Supply Chain Environment," *Int. J. Production Economics*, Vol. 135, PP. 716–725, 2012.

[18] G. Carlia and M. Canavaria, "Introducing Direct Costing and Activity Based Costing in a Farm Management System: a Conceptual Model", 6th *International Conference on Information and Communication Technologies in Agriculture, Food and Environment* (HAICTA), 2013.

[19] C. Zwickera , V. Hammerstingla , C. Possina, and G. Reinharta, "Life Cycle Cost Estimation of Robot Systems in an Early Production Planning Phase". *6th*

CIRP Conference on Assembly Technologies and Systems (CATS).

[20] V. Soni', S.P. Singh, D.K. Banwet, "Sustainable Coal Consumption and Energy Production in India Using Life Cycle Costing and Real Options Analysis," *Sustainable Production and Consumption.*

[21] C. Strazza, "Life Cycle Assessment and Life Cycle Costing of a SOFC system for distributed power generation," *Energy Conversion and Management.*

[22] G. Afrane, A. Ntiamoah, "Analysis of the Lifecycle Cost and Environmental Impacts of Cooking Fuels Used in Ghana,". *Applied Energy*, volume 98, pp. 301-306, October. 2012.

[23] Rosnita, R. Yulida, S. Edwina, E. Maharani, D. Muwardi and Arifudin, "Analysis of Pineapple Chips Agroindustry in Kualu Nenas Village Kampar District. *International Journal on Advanced Science Engineering Information Technology*," vol.4 (2014), no. 3 ISSN: 2088-5334.

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