Analysis of Logistics Cost on Smallholder and Middleman to Foster Tea Supply Chain: A Case Study in Central Java Province, Indonesia

Megita Ryanjani Tanuputri[1,2*], Hu Bai[3]

[1]The United Graduate School of Agricultural Sciences, Ehime University,
3-5-7 Tarumi, Matsuyama, Ehime, 790-8566 Japan
[2]Departement of Agroindustrial Technology, Faculty of Agricultural Technology,
Universitas Gadjah Mada, Jl. Flora No. 1, Bulaksumur, Yogyakarta 55281, Indonesia
[3]Departement of Food Production Science, Faculty of Agriculture, Ehime University,
3-5-7 Tarumi, Matsuyama, Ehime, 790-8566 Japan
[*]Corresponding author: Megita Ryanjani Tanuputri, Email: f741019y@mails.cc.ehime-u.ac.jp

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ABSTRACT

The competitiveness of Indonesian tea in the global market is diminishing due to the oversupply and inability to provide agile logistics and market-oriented quality. Therefore, this study aims to evaluate the current tea supply chain and analyze the logistics cost based on the activity-based costing (ABC) method in the smallholder and middleman tier to foster the sustainability of tea agribusiness. It was conducted in three main areas in Central Java Province, Indonesia, namely Batang, Pekalongan, and Banjarnegara regency. The method used was an in-depth interview and a semi-structured questionnaire to gain holistic information from 181 respondents. The results showed that material handling activity and transportation have the highest portion of the smallholder's and middleman logistics costs, respectively. The total logistics cost of smallholders varied from case to case, ranging from IDR 821.7 to IDR 1,075.0 per kg of fresh tea leaves. Transportation activity and administration costs make up 30.8% of the total smallholder's logistics cost. Meanwhile, the current development of the global tea market promotes policy adaptation on the commercial plantation tier and increases the cost of labor for plucking activity up to 2.5 times. Additionally, this study discovered the profit range of smallholders and middlemen. Therefore, the collaborative work of all parties is necessary to succeed in sustainable tea agribusiness.

Keywords: Activity-based costing; cost analysis; logistics cost; smallholder; tea supply chain

INTRODUCTION

The tea (*Camellia sinensis)* industry is a labor-intensive business that provides the livelihood of approximately 300,000 workers and 1.2 million Indonesian people. However, its competitiveness in the global market is recently declining, as reinforced by the decreasing export volume (Figure 1). This situation is apparently due to the position of Indonesian tea, which is only a filler and no longer a significant component in the blending process. Figure 1 shows that Russia and European countries have been the main export destinations for Indonesian tea, especially the black specie, in the past few years. This condition has changed since 2014 as its three leading destinations are Russia, Malaysia, and Pakistan. The volume of tea exports to Russia has been the highest from 2004 to 2017. However, the condition changed in 2018 and 2019, when Malaysia occupied the first position with more than 8.5 million tons of exports to this country. The cumulative data per June 2020 showed that Indonesian tea accounted for only 6% of Russia's total

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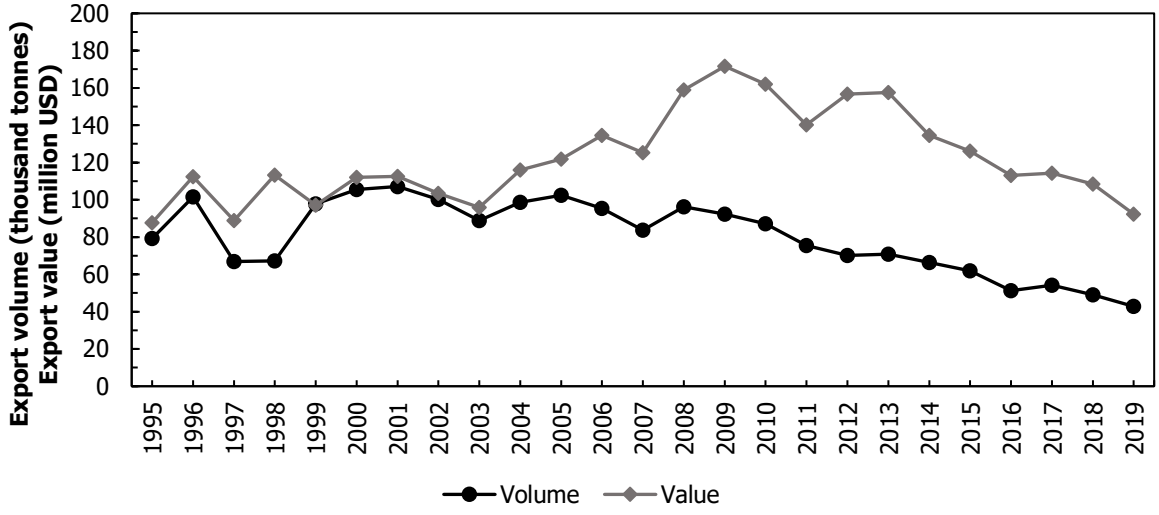

Figure 1. The trend of Indonesian tea export, 1995 – 2019
Source: Statistics Indonesia – Badan Pusat Statistik (2020)

import volume, while Indian tea contributed the highest with approximately 23% (International Tea Committee, 2020). This condition shows that the former is not competitive in their primary consumer market. Moreover, the current trend has relatively changed as Indonesia mainly exported tea to Malaysia with a total volume of 3.837 million kg per in June 2020 (International Tea Committee, 2020). One of the threats to Indonesian tea is the changes in the preference of European markets towards CTC (crush, tear, curl) types from Kenya and India over orthodox tea. This is because most black tea production in Indonesia is orthodox type, which is more time-consuming in manufacturing and less preferred for making tea bags that require quick brewing. Meanwhile, Indonesia's orthodox tea remains less competitive than Sri Lanka as the global leader in producing its black specie. The low logistics costs and fast delivery speed from Kenya to Europe contribute to Indonesian tea's less competitiveness in the European market.

The fierce competition and growing trend gradually enforced the tea supply of many stakeholders in the domestic market. This shifting trend promotes and generates decent employment for sustainable Indonesian tea agribusiness in rural areas. Food and Agriculture Organization of the United Nations – FAO – (2014) stated that better coordination and collaboration among the stakeholders on policy development and implementation is urgently needed in achieving sustainable agribusiness and food value chain. However, changing trends and the relatively low price of tea in the domestic and global markets have led tea agribusiness in Indonesia into a stagnant position. One of the critical elements of building a competitive advantage is managing the total cost of sourcing, manufacturing, delivery, and logistics of products (Whicker *et al.*, 2009). According to Guritno (2017), the initial suppliers, such as farmers, are one of the stakeholders adding the most negligible value to the product, earning the least profit, and repositioning them as a price takers with low bargaining power. In this study, smallholders and middlemen are most vulnerable to pricing policy implementation and profit distribution within the supply chain. Furthermore, higher profit is earned, and value can be added by understanding their logistics cost structure and profit distribution. Hence, the current tea supply chain is evaluated to identify factors and issues that impede sustainability and competitive advantage. The evaluation of pricing decision in the supply chain is performed through analysis of logistics cost using activity-based costing (ABC) to monitor and control the distribution system and efficiency of specific activities while enabling corrective action to the enhancement of profitability (Pirttila and Hautaniemi, 1995; Gonzalez-Gomez and Morini, 2006; Carli and Canavari, 2013; Hong and Najmi, 2020; Zailani *et al.,* 2020). Activity-based costing was used in the place of traditional methods since it provides better logistic management (Pettersson and Segerstedt, 2013). Therefore, this study evaluates the tea supply chain and pricing decision in the smallholder and middleman stages by analyzing logistics costs.

MATERIALS AND METHODS

This study was conducted from October to December 2019 and November to December 2020,

mainly in three regency areas in Central Java Province, namely Batang, Banjarnegara, and Pekalongan. According to the Directorate General of Estate Crops (2019), Batang and Banjarnegara regency contributed 65.2% of tea production in Central Java in 2018, while smallholder plantation is mainly located in Pekalongan. Tea agribusiness is labor-intensive and contributed considerably to the rural community development in those regencies in Central Java. Despite the decreasing national labor absorption in tea agribusiness, approximately 28,100 and 5,700 farmers and workers were employed and absorbed, respectively (Directorate General of Estate Crops, 2019), showing the socio-economic contribution. Furthermore, the in-depth interview using guidelines and a semi-structured questionnaire was used to obtain information about the current situation of the tea supply chain in Central Java. Table 1 shows that 181 respondents participated in this study using convenience and snowball sampling, including smallholder (or farmer), middleman (or collector), trader, private-owned plantation company (hereinafter referred to as PPC), state-owned plantation company (hereinafter referred to as SPC), tea processing unit, and local government office. Each stakeholder was asked questions about the logistics activity, from planting or procuring to distributing, to explore the current situation. The interviews with smallholders focused more on their socio-economic characteristics, including farmer status and household size, tea farming management practice, such as size of land and plucking cycle, as well as participation in farmer association. The staff of the commercial plantation also reviewed similar questions regarding tea farming and production management to understand the current farming management practice and target market. Additionally, the interview on middlemen and traders focused more on their socio-economic characteristics and supply and demand activity, including purchasing and delivering. The government were also interviewed to confirm the participation and support that has been provided to tea smallholders and agribusiness.

This study focuses on the interaction between smallholders, PPC, SPC, and middlemen. However, the logistics cost was explicitly explored in the smallholder and middleman tier to understand their expense in each activity and evaluate the profit distribution. Its analysis using the activity-based costing (ABC) method is selected to accurately and precisely identify the causal relationship of the cost factor to logistics activities, as applied in many sectors of previous studies (Pirttila and Hautaniemi, 1995; Ongkunaruk and Piyakarn, 2011; Carli and Canavari, 2013; Tanuputri *et al*., 2014; Toompuu and Polajeva, 2014). The logistics activity in this study were classified into five, namely material handling, transportation, maintenance, inventory, and administration. The question of the cost driver of these logistics activities was explored in the smallholder and middleman tiers. Furthermore, this study focused more on the involvement of logistics activity than the cost of input material. The material handling cost mainly covers the labor for pre-and post-harvest activity, including fertilizing, weeding, pruning, and plucking. Pruning is not a regular activity during the tea pre-harvest treatment, as it is performed once in 4 to 7 years while weeding and fertilizing are regular activities. The mean value of each parameter was calculated to measure the logistics cost of fresh tea leaves weighing 1 kg. Furthermore, respondent verification was used to ensure the validity of logistics cost structure and in-depth interview result, as Leung (2015) stated. The representatives of smallholders acting as the leader of the farmer association and the representative of middlemen in each area verified the logistics activity and cost result. The representatives of PT Pagilaran, such as the head of the production unit, field foreman, and factory head, also contributed to this verification process.

Table 1. Number of respondents in each tier

Tier	No. of respondents
Smallholder/farmer	103
Middleman (collector)	42
The staff of a private-owned plantation company (PPC)	23
The staff of the state-owned plantation company (SPC)	6
The tea processing unit, trader, tea packer	4
Local government officer	3
Total	181

RESULT AND DISCUSSION

Figure 2 shows that eight main stakeholders contribute to the tea supply chain in Central Java Province. The smallholders and middlemen typically are villagers living in the area for generations, while the commercial plantations (PPC and SPC) have a factory nearby. More than ninety percent of smallholders directly sell their fresh tea leaves, shown by dotted lines arrow, to middlemen. PT Pagilaran is a prominent PPC as it accounts for more than 80% of domestic

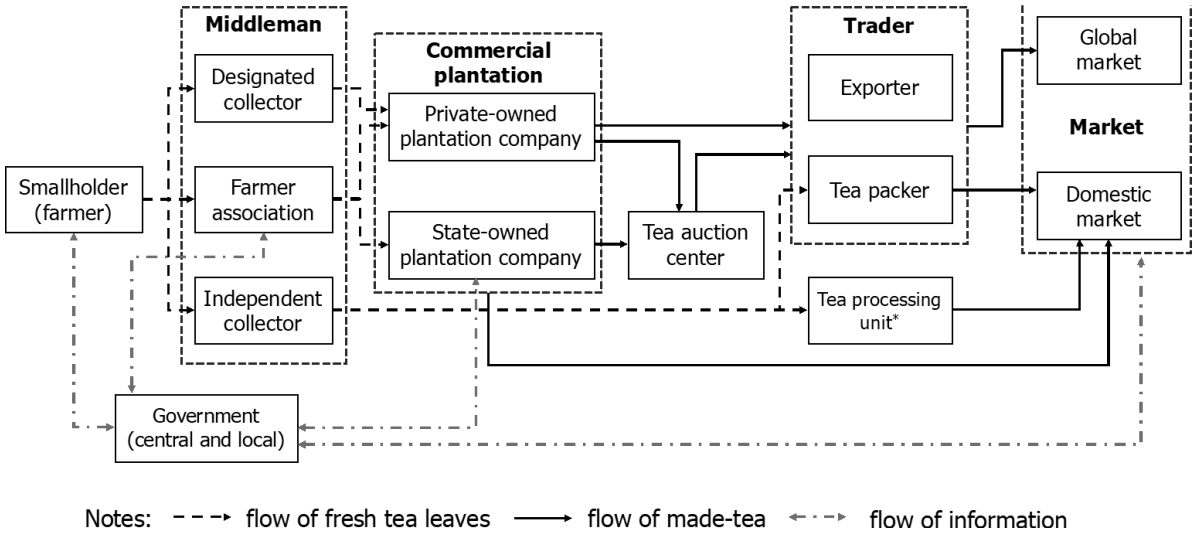

Figure 2. The supply chain of tea in Central Java Province, Indonesia
Source: Primary data (2019)

tea production and plantation area in the Batang regency. However, PT Pagilaran and the villagers share mutual benefits since the Nucleus Estate and Smallholder (NES) scheme in the 1980s. The degree of engagement between both parties in each regency is different, resulting in diverse problem-solving approaches depending on smallholders' socio-economic characteristics. This study shows that the interdependence on supply and demand between smallholders and PPC develops the farmer association as an organization connecting both parties.

In the agriculture sector, the role of farmer associations in the supply chain cannot be separated. This advances communication between smallholders and third parties such as middlemen, traders, and the government. However, due to the fewer tea smallholder in Batang, the role of the farmer association is substituted by the designated collector assigned by PT Pagilaran. The designated collector in this study showed that an extended payment period (one to six weeks) is a financial cash flow issue as they typically have a limited amount of capital and access to loans. Hence, few middlemen are preferred as independent collectors to reduce these risks and sell fresh tea leaves to buyers willing to pay on-cash. As a result, the total incentives earned by designated collectors are moderately high and considerably reduced during the rainy and dry seasons, respectively. This fact corresponds to Duncan *et al.* (2016) stating that the prolonged periods of no precipitation have been associated with reduced tea yield or output.

Aside from the difficulty of Indonesian tea in penetrating the global market, commercial plantation and tea processing unit in Indonesia, especially in Central Java Province, faces formidable challenges. The estimated yield of tea produced is between 20% to 24%, resulting in high production costs and limiting the growth and development of the agribusiness. The financial conditions of commercial plantations often suffer losses during business calculations due to past financial conditions and current market competition. Furthermore, the local government collaborated with a commercial plantation when starting the NES scheme in the 1980s to provide initial assistance on seedling and land capital for the smallholder, with an installment payment mechanism to obtain a land certificate as the mutual agreement. Regardless, few smallholders infringed the agreement, adversely impacting the financial cash flow of commercial plantations. It is also complicated by the existing market and trade management as well as the lack of government support.

Like the supply chain in Kenya and India, Indonesia also has a tea auction center, but this is only mandatory for the SPC-produced specie. The companies can also conduct direct sales with certain terms and conditions to some extent. According to interview results, Indonesia's auction center has made no significant contribution to effectively controlling supply-demand and price of made-tea. In this system, the role of central and local governments is not significant for the whole supply chain. However, it is limited to supporting input production within a certain period of time, including fertilizer and seed subsidies as perceived by smallholders. Therefore, as a regulator, the role of the government is deemed insufficient to balance or control the supply-demand and stabilize the pricing along the supply chain.

Activity-based costing in the smallholder and middleman tier

The logistics cost analysis in this study uses the ABC method to determine which activity causes the highest cost. This method used cost drivers to trace the price of logistics activity to the products that consume the resources used in those activities (Pirttila and Hautaniemi, 1995). Rybakov (2017) highlighted the logistics costs resulting from the process that begins and ends with the supply of the raw material and the product(s) to the customer, respectively. This involves four common categories applied to logistics cost structure: transportation, cargo handling, warehousing, inventory, and logistics administration. The analysis of logistics cost structure in smallholder and middleman tiers aims to determine the most influential activity with the most significant portion for a more practical and precise recommendation. The data from 21 smallholders and 14 middlemen in 2019 were used for this calculation.

The tea smallholders are categorized according to their performance in main logistics activity (Case A) and participation in tea farmer association, and undertaking minor transportation activities (Case B). These cases are presented to understand the contribution of minor-transportation activity and participation in farmer associations towards increasing the total logistics cost of smallholders. This study discovered three main activities contributing substantially to the logistics cost, namely material handling, maintenance, and communication. Table 2 and case A showed the generation of the total logistics cost of IDR 821.7/kg. Despite these three main activities, few smallholders also performed minor-transportation activities or paid administration fees for the tea farmer association (Case B). Most of them did not conduct transportation activities because middlemen provided pick-up service (Case A), while others moved the fresh tea leaves from their land to the pick-up point when the area was inaccessible by truck. The extensive role of farmer associations in the specific area contributed to administration (third party) fees.

Table 2 shows that the material handling cost accounted for more than 70% of total logistics in both cases, mainly derived from labor cost of IDR 614.7/ kg. The main contribution of labor cost to production was also discovered by Mataia *et al.* (2020). In selected areas under this study, the range of plucking costs for the labor has been standardized at IDR 600 – 800 per kg by the society or farmer association to provide a proper wage for the villagers. Instead of reducing the standard of plucking fee, optimization and efficiency need to be considered by promoting workers to obtain good quality tea leaves, as of one bud with two leaves, without ruling out the quantity. Since the transportation activity and involvement of the farmer association distinguish cases A and B, these supplementary activities eventually added the logistics cost up to 30.8% into IDR 1,075/kg. This additional cost of IDR 253/kg was primarily derived from the transportation fare (60.5%) from their land to the pick-up point (weighing station). In this case, the role of the farmer association is required to facilitate this minor transportation of smallholders. Investing or renting the small-scale mode of transportation and creating a pick-up schedule integrates the mobility among the smallholder. To generate efficiency, the pick-up route needs to be prioritized for smallholders with adjacent land. This pick-up service forces smallholders to be more disciplined and consistent in following the plucking cycle, as well as reduces their transportation costs. Furthermore, the current changes in conditions due to the COVID-19 pandemic have enforced commercial plantations to enhance their tea quality to promote sales in the global market. PT Pagilaran, a smallholder's partner, changed its policy and only accepted tea comprising an unfurled bud with two or three soft leaves. It increases the plucking (labor) cost by two, with 82.4% higher than Case B.

This study reveals that labor in the tea supply chain remains sufficiently large, as indicated by the amount of cost absorption in regular on-farm and harvesting activities. Therefore, this has a positive impact on the economic condition of the villager in these rural areas. The activity that needs to be controlled by smallholders is transportation. Table 2 shows the third-parties fee paid to the farmer association as an optional decision. This needs to be managed thoroughly to expand and strengthen the role of farmer associations in the tea supply chain.

The profit of smallholders varied depending on the location, quality of tea leaves, and partnership with the middlemen. This is a mutual agreement in which smallholders borrow money from middlemen or commercial plantations and sell their harvested tea leaves to them (Rahman and Takeda, 2007). Trust, transparency, and commitment to the agreement are the essential factors for the benefit of both stakeholders. The disobedience of smallholders to the agreement may threaten this partnership. Additionally, this calculation of logistics cost excluded that of input material, namely fertilizer, seeds, and land capital. This is because it focuses more on evaluating costs regarding the logistics activity. The fertilizer price depends on the combination of socio-economic characteristics of each smallholder, such as farmer status, educational level, monthly income, and external support. The manure fertilizer cost in this study was valued at IDR 115.3/

Table 2. Logistics cost of smallholders in the tea supply chain

Logistics Activity	Component Cost	Case A		Case B	
		Mean[a]	Proportion	Mean	Proportion
Material Handling (MH)	Regular on-farm cost[b]	148.4	18.1	148.4	13.8
	Pruning cost[c]	25.4	3.0	25.4	2.4
	Harvesting (plucking) cost	614.7	74.8	614.7	57.2
	Loss during MH	1.4	0.2	1.4	0.1
	Tools depreciation[d]	14.9	1.8	14.9	1.4
	Total	804.8	97.9	804.8	74.9
Transportation	Pick-up, delivery fee	-	-	83.3	7.8
	Vehicle depreciation	-	-	25.1	2.2
	Loss during transportation	-	-	0.8	0.1
	Total	-	-	109.2	10.1
Maintenance	Tool maintenance cost	14.9	1.8	14.9	1.4
	Vehicle maintenance cost	-	-	44.1	4.1
	Total	1.1	1.8	59.0	5.5
Inventory	Holding cost	-	-	-	-
	Total	-	-	-	-
Administration	Third parties fee	-	-	100.0	9.3
	Communication cost[e]	2.0	0.3	2.0	0.2
	Total	2.0	0.3	102.2	9.5
Total logistics cost		821.7	100.0	1,075.0	100.0

Source: Primary data (2019)

Notes: Case A excludes transportation cost, vehicle maintenance cost, and third parties fee, while B shows the mean value and percentage of logistic cost across all activities, a) mean unit used is IDR/kg and proportion is in %, b) labor cost for weeding and fertilizing activity, c) labor cost for pruning which is conducted once in every 4-6 years, d) the depreciation was calculated based on the straight-line method e) including marketing cost

kg, with the amount applied as much as or below the advised standard.

Table 3 shows that the transportation and material handling activity accounted for the highest cost in the smallholders and middleman tiers, respectively. The average value in Table 3 shows the mean logistics cost from independent and designated collectors because PT Pagilaran practically handles all logistics activities in the farmer association. Middleman organized a pick-up service to the smallholder's land or house by renting or using their truck and contributed half of their total logistics cost, accounting for IDR 118.8/kg. The use of less-than truck capacity contributed to the mean transportation cost in the middleman. Moreover, the independent and designated collector logistics are analyzed separately, showing that transportation activity has the highest cost. The inventory activity was in the independent collector's second rank, 22.4% of IDR 221.8, and the material handling contributed 35.6% of the designated type. Labor cost of IDR 49.7/kg was added to the independent collector due to storing fresh tea leaves for 1 – 2 nights, preventing overheating by frequent spinning and rotating.

The condition of less-than-truckload (LTL) transportation may affect the cost-efficiency. Therefore, collaborative vehicle routing to achieve full truckload (FTL) is one of the ways to reduce economic impact and achieve sustainable logistics and supply chain (Lyu *et al.*, 2019; Taghikhah *et al.*, 2019; Gansterer and Hartl, 2020). Moreover, considering the efficient route of the pick-up service, reaching total capacity is practically required by the middleman to reduce transportation

Table 3. Logistics cost of middleman on the tea supply chain

Activity	Component Cost	Mean	Proportion
Material Handling	Regular on-farm cost	-	-
	Pruning cost	-	-
	Labor cost	45.3	19.1
	Loss during material handling	0.2	0.1
	Tools depreciation	1.5	0.6
	Total	47.0	19.8
Transportation	Pick-up and delivery fee	110.3	46.5
	Vehicle depreciation	6.4	2.7
	Loss during transportation	2.1	0.9
	Total	118.8	50.1
Maintenance	Tool maintenance cost	1.7	0.7
	Vehicle maintenance cost	19.2	8.1
	Total	20.9	8.8
Inventory	Holding cost	49.7	21.0
	Total	49.7	21.0
Administration	Third parties fee	-	-
	Communication cost	0.6	0.3
	Total	0.6	0.3
Total logistics cost		237.0	100.0

Source: Primary data (2019)

costs. In a particular level, resource sharing between middlemen during a low production period enhances cost reduction and service level.

Tables 2 and 3 show the different logistics cost structures in the smallholder and middleman tiers. The total logistics cost shows that smallholder generates more cost than middleman due to the contribution of material handling. Even though transportation costs accounted for the highest in the middleman tier, its mean in smallholder is not different from that in the middleman tier with IDR 109.2/kg and IDR 118.8/kg, respectively. However, a middleman's pick-up and delivery fee are higher than smallholder. This is because most of them cannot optimize their truck capacity due to the limited supply of tea leaves from local smallholders, especially during the prolonged dry period. As a result, the middleman tries to obtain additional tea leaves from the locations outside their area, as this has to be compensated by the higher fuel costs. Another cost that does not need to burden smallholders is the inventory, where the risk of this activity lies in the middleman tier. As an activity contributing to the second-highest cost for a middleman, this inventory cost cannot be avoided by independent collectors that need to adjust the pick-up schedule from other parties outside PT Pagilaran. Table 4 and scheme 2 show the benefit felt by designated collectors, where they do not need to bear inventory costs.

Table 4 shows that the profit of smallholders varied between IDR 559.7 – 709.7 per kg of fresh tea leaves depending on the location, quality of tea leaves, and smallholder-middleman partnership. Meanwhile, the profit of independent and designated collectors was IDR 78.2/kg and IDR 198.8/kg, respectively. Designated collectors deliver their tea leaves to PT Pagilaran on the same collection day, resulting in a negligible storage activity and 2.5 times higher profit than the independent type. Schemes 1 and 2 in Table 4 show that smallholder plays the dominant role in profit distribution compared to middleman, namely independent and designated collector. The independent collector's selling price of fresh tea leaves is slightly higher than the designated type, earning a more excellent value unit profit. Based on "% to profit," the profit distribution in scheme 1 is unequal between smallholders and independent collectors. Meanwhile, scheme 2 shows a more feasible profit distribution for designated collectors, reaching 26.2%. The limited supply of tea leaves is another issue for designated collectors, as smallholders prefer to sell tea leaves to independent collectors willing to pay in cash and determine the price without quality classification.

Unlike the usual case, the current bargaining power of the designated collector is lower toward smallholders. It depends on smallholder purchasing power and price elasticity, which affects the profits and cash flow. Other factors include the degree of government regulation and global exposure (DePamphilis, 2018). Furthermore, the maximum profit earned by smallholders was 32% to 37% of the value of the selling price per kg of fresh tea leaves. However, uncertainty yields contribute highly to the total revenue earned by smallholders. The uncertainty of environmental conditions due to climate change is one of tea smallholder threats. This profit estimation excludes the land capital and seed cost because most smallholders have received the land area and tea plant from their parents since the NES scheme in the 1980s.

Table 4. Profit scheme in smallholder, independent collector, and designated collector

	Tier	Cost			Profit		
		Initial cost* (IDR/kg)	Total logistics cost (IDR/kg)	% to total log. cost	Selling price (IDR/kg)	Unit profit (IDR/kg)	% to profit
Scheme 1	Smallholder	115.3	1,075.0	82.9	1,900.0	709.7	90.1
	Independent collector	1,900.0	221.8	17.1	2,200.0	78.2	9.9
	Total		1,296.8	100.0		787.9	100.0
Scheme 2	Smallholder	115.3	1,075.0	87.7	1,750.0	559.7	73.8
	Designated collector	1,750.0	151.2	12.3	2,100.0	198.8	26.2
	Total		1,226.2	100.0		758.5	100.0

Source: Primary data (2019)
Notes: *initial cost refers to fertilizer cost for smallholders and purchasing price for the independent and designated collector.

The longevity of the tea plant and relatively short plucking cycle significantly impact rural development because tea production meets the daily consumption and provides sustainable income for smallholders. This condition is interdependent on the sustainability of tea agribusiness in absorbing supply from smallholders. However, tea plantation is considered an unprofitable commodity due to existing issues. The dissatisfaction of smallholders toward pricing and payment governance from commercial plantations encourages the conversion of tea-field into vegetables or other commodities. Therefore, a crucial imperative for firms is to incorporate the impact of logistics and supply chain into their strategy, leading to a superior and sustainable performance (Bhatnagar and Teo, 2009).

Therefore, sustainable tea agribusiness needs to be achieved through collaborative work from all parties along the supply chain. The logistics cost information in the smallholder and middleman tier provides input for the tea agribusiness, including commercial plantations and traders, on the strategy and pricing decision. Local governments need to contribute through policymaking by regulating market and trade governance at the smallholder, middleman, and tea agribusiness levels. Furthermore, the policy taken should consider the tradeoff between cost in the smallholder-middleman and sustainability of tea agribusiness. For example, resource sharing for transportation activity between a group of smallholders and middlemen was facilitated by the government and commercial plantation to reduce costs. These plantations need to also strengthen their role simultaneously by providing guidance and training for smallholders to increase their land productivity and respond to specific environmental uncertainties.

CONCLUSION

The tea supply chain comprises eight main stakeholders, namely smallholders, middlemen, commercial plantation, tea processing unit, tea auction center, trader, customer (or market), and the government. Based on an evaluation, the incoherent connection between demand from the global market and supply of tea from smallholders as well as dissatisfaction of smallholders with the tea price are two issues that hinder the sustainability of the agribusiness. Smallholders, middlemen, and commercial plantations, as the main actors in the upstream part of the tea supply chain, recognize the lack of support and participation from the local government, the regulator, and policymaker in this ecosystem. From the logistics cost analysis, labor has the highest portion showing that tea agribusiness fosters rural development through labor absorption and financial establishment. Additionally, it proves that tea agribusiness contributes to the economic aspect in rural areas, hence, the government needs to maintain this mutual relationship. The training of pluckers for a high-quality harvest will certainly impact Indonesian tea's ability to compete in the global market and increase the value of fresh tea leaves at the smallholder level. Meanwhile, transportation costs at the smallholder and middleman are optimized with full-capacity load by promoting coordination during harvesting time. As a result, the profit earned per kg of fresh tea leaves and the uncertainty in its yield in smallholders is higher than middlemen.

This study depicts the robust and mutual relationship between smallholders, middlemen, commercial plantation companies, and the government in the upstream part of the tea supply chain. Therefore,

the logistics cost analysis should not be limited to smallholders and middlemen but also involve the commercial plantation, trader, and tea processing unit. This additional information strengthens the analysis of profit distribution and pricing implementation. An integration of this result and additional assessment of inherent risk is required to propose comprehensive pricing governance by considering a trade-off between cost and inherent risk in each tier.

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CONFLICT OF INTEREST

The authors state that this article is original research that has not been published in another journal, hence, there is no conflict of interest.

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