

**THE SUPPLY CHAIN OF FRESH TEA LEAVES FROM SMALLHOLDER FARMERS IN
BANDUNG REGENCY**

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ABSTRACT

This study aims to map the structure, distribution flow, and dynamics of the smallholder tea shoot supply chain in Bandung Regency, Indonesia, with a focus on industrial absorption capacity, supply gaps, and strengthening upstream–downstream partnerships. The research employed a survey approach involving smallholder tea farmers and tea processing factories receiving fresh tea leaves, complemented by a descriptive supply chain analysis. The supply chain is characterized by farmers as the primary producers, who generally market fresh tea leaves through multiple layers of collectors (Collector 1 to Collector 3) before reaching processing factories. The receiving factories comprise smallholder-owned tea factories, private tea factories, and factories managed by the Indonesia Research Institute for Tea and Cinchona (IRITC), with smallholder tea factories operated either by Village Unit Cooperatives or individual owners. In several cases, the supply chain has begun to exhibit a disintermediation pattern, whereby farmers or farmer groups deliver fresh tea leaves directly to processing factories. The study identified at least 11 factories receiving smallholder tea leaves, with a combined processing capacity of approximately 75–100 tons of fresh tea leaves per day, whereas the current production reaches only 45–50 tons per day, resulting in a substantial supply gap. This condition reflects suboptimal productivity, inconsistent tea shoot quality, and weak price incentives at the farm level. In addition, an alternative supply chain serving premium markets, such as cafés and tea houses, has emerged, although its scale remains limited. Strengthening upstream–downstream partnerships is essential to improve coordination, ensure product traceability, enhance quality, and promote price transparency and stability. The required strategies include increasing production through crop intensification and replanting, improving harvesting and postharvest practices, strengthening farmer organizations, and diversifying market channels to enhance value addition and ensure the long-term sustainability of the smallholder tea supply chain.

Key words: Bandung Regency, Traceability, Supply chain, Smallholder tea, Upstream–downstream partnership.

INTRODUCTION

Tea (*Camellia sinensis*) is one of Indonesia's leading plantation commodities (Darmawan *et al.*, 2025), playing a significant role in supporting the national economy, generating employment opportunities, and providing income for communities in tea-producing regions. Bandung Regency is one of the major tea-producing areas in West Java Province, supported by the presence of smallholder tea plantations, private estates, and state-owned plantations.

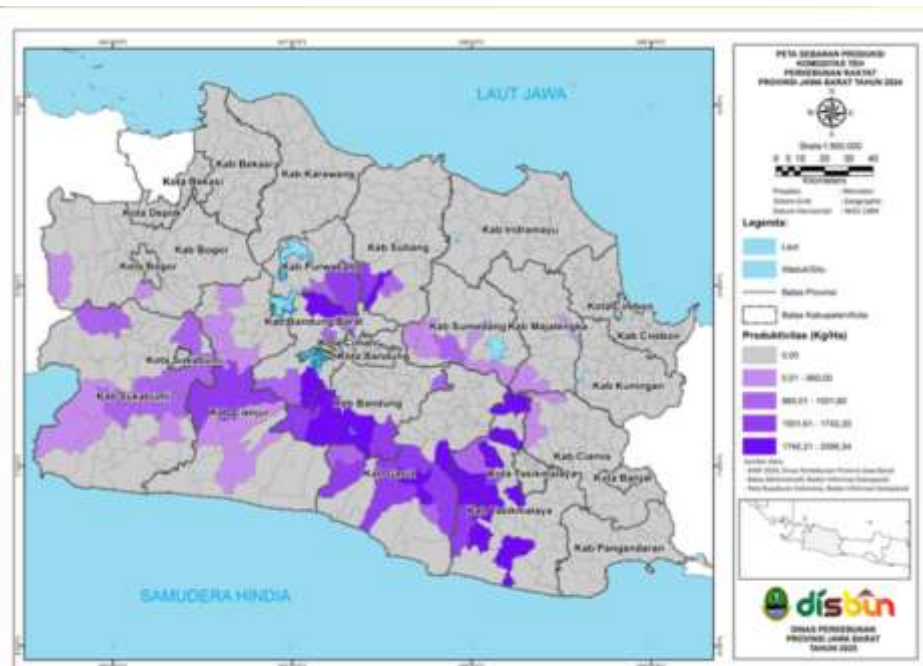


Figure 1. Distribution Map of Tea Production Centers in West Java Province
 (Source: Dinas Perkebunan Provinsi Jawa Barat, 2025)

Smallholder tea plantations in Bandung Regency produce 3,048 tons of tea from a total plantation area of 1,705 ha, representing a moderate level compared with other regencies and cities in West Java. In terms of productivity, Bandung Regency records 1,842 kg/ha. Although this is not the highest productivity in the province, it remains well above the provincial average of 1,526 kg/ha. Private tea estates in Bandung Regency cover a total area of 5,355 ha, producing 7,664 tons of tea with a productivity of 1,615 kg/ha. Meanwhile, state-owned tea plantations occupy the largest tea-growing area in the regency, totaling 10,663 ha, with a production of 18,105 tons and a productivity of 1,700 kg/ha (Dinas Perkebunan Provinsi Jawa Barat, 2025).

The sustainability and competitiveness of the tea industry largely depend on the availability of high-quality fresh tea leaves supplied in a consistent and continuous manner. Unlike many other plantation commodities, fresh tea leaves are highly perishable and rapidly deteriorate in quality after harvesting, making immediate processing essential. Therefore, an efficient supply chain plays a critical role in preserving raw material quality, improving distribution efficiency, and ensuring a stable supply of raw materials for the tea processing industry.

In Bandung Regency, the smallholder tea shoot supply chain involves multiple stakeholders, ranging from farmers as the primary producers to collectors and tea processing factories. Most farmers continue to market their fresh tea leaves through several intermediary collectors before the products reach processing facilities. This marketing structure results in a relatively long supply chain, which may reduce distribution efficiency, weaken farmers' bargaining power, and hinder quality control and product traceability. Although direct marketing arrangements between farmers or farmer groups and processing factories have emerged in

certain areas, these practices remain limited and have yet to become the predominant supply chain model.

The supply gap is influenced not only by production constraints but also by suboptimal coordination among stakeholders throughout the supply chain. Low plantation productivity, inconsistent quality of fresh tea leaves, weak farmer institutions, and the absence of strong partnerships between farmers and the tea processing industry all contribute to inefficiencies in the flow of products, information, and value along the supply chain. Furthermore, the growing demand for premium tea and tea products with assured quality and traceability presents new opportunities for the development of a more integrated and efficient supply chain.

Based on these conditions, a comprehensive assessment of the structure, distribution channels, and dynamics of the smallholder fresh tea shoot supply chain in Bandung Regency is required. Supply chain mapping is essential to identify the key stakeholders involved, their interrelationships, the absorption capacity of tea processing factories, and the existing supply gaps. The findings of this study are expected to provide a foundation for formulating strategies to strengthen upstream–downstream partnerships, improve distribution efficiency, enhance product quality and traceability, and develop a more efficient, competitive, and sustainable supply chain system for smallholder fresh tea leaves in Bandung Regency.

MATERIALS AND METHODS

This study was conducted in several subdistricts of Bandung Regency, namely Ciwidey, Pasirjambu, and Pangalengan, which are among the major smallholder tea-producing areas in the region. The study utilized data collected during the period from 2024 to 2026.

This study employed a descriptive qualitative approach to provide an in-depth description of the conditions, processes, stakeholders, and interactions within the smallholder fresh tea shoot supply chain in Bandung Regency. According to Sugiyono (2013), descriptive statistics are used to analyze data as collected without the intention of drawing generalized conclusions. Qualitative research does not primarily focus on testing variables or examining causal relationships; rather, it seeks to understand and comprehensively describe phenomena within their social context. Therefore, this approach was considered appropriate for gaining a comprehensive understanding of the distribution process of fresh tea leaves, from smallholder farmers to tea processing factories. Data were analyzed using source triangulation, supported by repeated field surveys conducted over the period of 2024–2026.

Primary data were collected through in-depth interviews with key stakeholders involved in the smallholder fresh tea shoot supply chain in Bandung Regency. The respondents consisted of representatives from farmer groups and farmer group associations (nine active groups), cooperatives (two units), intermediary collectors (ten traders), and managers or owners of tea processing factories (eleven factories). In addition to interviews, the study was supported by a literature review, field observations, and document analysis.

The data analysis was conducted through the following stages:

1. Data collection through in-depth interviews, field observations, and documentation.
2. Transcription of all interview recordings into textual format.

3. Data familiarization by thoroughly reading and reviewing the interview transcripts to obtain a comprehensive understanding of the smallholder fresh tea shoot supply chain system.
4. Data interpretation to describe the characteristics of the smallholder fresh tea shoot supply chain in Bandung Regency, including the roles of stakeholders and the relationships among them.

RESULTS AND DISCUSSION

Characteristics of stakeholders in the smallholder fresh tea shoot supply chain in bandung regency

The characteristics of stakeholders involved in the smallholder fresh tea shoot supply chain in Bandung Regency are presented in Table 1.

a. Smallholder Tea Farmers

Farmers are the primary stakeholders responsible for producing fresh tea leaves, which serve as the raw material for tea processing. Based on the survey results, most respondents were owner-cultivators managing their own tea plantations, while others were affiliated with farmer groups. The production capacity of fresh tea leaves ranged from 0.4 to 1.5 tons per day, with farm-gate prices ranging from IDR 2,700 to IDR 2,950 per kilogram, depending on the quality standards established by buyers or partner companies. In general, farmers function as price takers within the supply chain, as selling prices are largely determined by market conditions and the pricing policies of buyers or partner companies. Furthermore, farmers face several challenges, including production fluctuations due to seasonal changes, rising production input costs, shortages of tea pickers, and limited capital for tea plantation rejuvenation.

b. Primary Collectors

Primary collectors refer to local intermediaries who purchase fresh tea leaves from farmers within a single village or a relatively small geographic area. Their collection capacity is typically less than 2 tons of fresh tea leaves per day. These collectors serve as the initial link between farmers and the market. They play an important role in facilitating market access for small-scale farmers with limited production volumes and for farmers whose tea plantations are located far from processing factories.

c. Secondary Collectors

Secondary collectors operate on a medium scale and generally maintain a broader supplier network, with a collection capacity ranging from 2 to 5 tons of fresh tea leaves per day. They typically source tea leaves from several farmer groups across multiple villages and supply more than one tea processing factory. In addition to collecting fresh tea leaves, secondary collectors perform preliminary quality sorting, coordinate delivery schedules, and ensure a consistent supply in accordance with the requirements of processing factories. Their relationships with farmers are generally long-term and recurring, fostering mutual trust in both payment arrangements and product delivery.

d. Tertiary Collectors

Tertiary collectors are large-scale intermediaries with a collection capacity exceeding 5 tons of fresh tea leaves per day and operational networks extending across multiple subdistricts. Based on the survey findings, most tea processing factories obtain their raw materials from these large collectors, particularly those operating in the subdistricts of Pasirjambu, Pangalengan, and Ciwidey. At this level, collectors maintain extensive networks of farmers and smaller collectors, enabling them to supply several processing factories simultaneously. In addition to managing product distribution, tertiary collectors often determine the allocation of fresh tea leaves based on the purchase prices offered by different factories, resulting in a highly dynamic flow of raw materials throughout the supply chain.

e. Small-Scale Tea Processing Factories

Small-scale tea processing factories are processing units with a production capacity of up to 5 tons of fresh tea leaves per day. Most factories in this category produce conventional green tea, although some have diversified into higher value-added products, such as green tea powder, matcha, and white tea. The purchasing price of fresh tea leaves ranges from IDR 2,700 to IDR 3,300 per kilogram, while the selling price of processed tea varies depending on the type of tea produced. The primary characteristics of small-scale factories are their operational flexibility in producing a variety of tea products in limited volumes and their ability to tailor product specifications to meet customer requirements.

f. Medium-Scale Tea Processing Factories

Medium-scale tea processing factories have a processing capacity exceeding 5 tons of fresh tea leaves per day, with some facilities capable of processing up to 30 tons daily. These factories maintain broader procurement networks, sourcing raw materials from numerous collectors and farmers across different regions. Their products are generally marketed to large-scale industries, exporters, and tea packaging companies. Given their substantial processing capacity, these factories require a continuous daily supply of fresh tea leaves and therefore rely heavily on well-established collector networks. Several medium-scale factories have also established partnership arrangements with farmers to ensure consistent raw material quality and a stable supply of fresh tea leaves.

Table 1. Characteristics of Stakeholders in the Smallholder Fresh Tea Shoot Supply Chain in Bandung Regency

Description	Farmers	Primary Collectors	Secondary Collectors	Tertiary Collectors	Small-Scale Processing Factories	Medium-Scale Processing Factories
Characteristics	Cultivate smallholder tea plantations individually or as members of farmer groups, and sell fresh tea leaves directly to collectors or partner factories.	Collect fresh tea leaves from farmers within a single village using simple transportation (pickup trucks or motorcycles), then supply larger collectors or small processing factories.	Collect fresh tea leaves from several villages or farmer groups, maintain a broader supplier network, and supply multiple processing factories.	Major collectors with extensive networks across subdistricts, supplying several processing factories while coordinating daily distribution.	Process green tea on a limited scale, primarily serving local markets or niche markets.	Process green tea on a larger scale, maintain extensive supplier networks, and market products to large industries, exporters, or national tea packaging companies.
Fresh Tea Shoot Capacity (tons/day)	±0.4–1.0 (per farmer group)	< 2	2–5	> 5	≤ 5	> 5 (up to ±30 tons/day based on survey results)
Purchase Price	–	IDR 2,700–2,950/kg from farmers	IDR 2,700–2,950/kg from farmers	IDR 2,700–3,000/kg from farmers	IDR 2,600–3,300/kg from farmers/collectors	IDR 2,700–3,300/kg from farmers/collectors (specialty tea may reach IDR 5,000–15,000/kg)
Selling Price	IDR 2,700–2,950/kg (gross price, including harvesting and transportation costs)	Sold to secondary/tertiary collectors or processing factories with a margin of approximately IDR 100–200/kg	Sold to tertiary collectors or processing factories with a margin of approximately IDR 150–300/kg	Sold to processing factories with margins depending on quality and logistics costs	Green tea: IDR 16,500–17,500/kg	Green tea: IDR 17,500–20,000/kg; specialty tea: IDR 100,000–450,000/kg; white tea: > IDR 1,000,000/kg

Supply chain structure and distribution flow

Figure 2 illustrates the structure of the smallholder fresh tea shoot supply chain in Bandung Regency, involving multiple stakeholders from farmers to end consumers. Based on the survey findings, the product flow begins with farmers who produce fresh tea leaves. Some farmers sell their harvests through farmer groups, while others market them directly to collectors. Farmer groups and collectors play an important role in consolidating fresh tea leaves from numerous smallholders to meet the minimum volume requirements of tea processing factories. In the subdistricts of Pasirjambu, Pangalengan, and Ciwidey, this supply chain is supported by approximately 11 smallholder tea processing factories, which serve as the primary buyers of fresh tea leaves.

The collected tea leaves are subsequently processed into green tea at processing factories owned by private individuals, cooperatives (Village Unit Cooperatives/KUD), or private companies. Survey results indicate considerable variation in factory processing capacity, ranging from 0.3 to 30 tons of fresh tea

leaves per day. The processed green tea is then marketed through agents who act as intermediaries between processing factories and downstream market participants before reaching final consumers.

At the next stage, processed green tea may follow several distribution channels. Some products are shipped directly to tea processing factories in West Java or Central Java for further processing into ready-to-consume green tea products. Others are distributed through warehouses or large traders serving as distribution hubs, or delivered to packaging companies for packaging according to market requirements. Green tea may also be supplied to scented tea factories, where it is further processed into flavored tea products by adding natural or artificial aromas to meet consumer and market preferences.

At the final stage of the supply chain, green tea products are distributed to domestic consumers through wholesalers and retailers. This distribution pattern demonstrates that smallholder tea products are not marketed through a single marketing channel; rather, they move through multiple pathways depending on product specifications, industrial requirements, and market demand.



Figure 2. Supply Chain of Smallholder Green Tea in the Bandung Region

Source: Compiled from primary data (2026)

Supply-demand imbalance of smallholder fresh tea leaves

A total of 11 smallholder tea processing factories were identified in Bandung Regency, West Java. Collectively, these factories have an existing processing capacity of approximately 70–73 tons of fresh tea leaves per day, while their installed capacity is even higher. In contrast, the supply of fresh tea leaves from smallholder tea plantations is only around 45 tons per day, resulting in a supply gap of approximately 20–30 tons per day. From the perspective of agribusiness economics and supply chain management, an imbalance between the raw material demand of the processing industry and the supply capacity at the farm level is an indicator of supply pressure (Chopra & Meindl, 2019). If this condition persists over the long term, it may reduce factory capacity utilization, increase raw material procurement costs, expand the geographic scope of fresh tea shoot collection, and ultimately decrease the overall efficiency of the supply chain. Similar conditions have been reported in other plantation-based agro-industries, including the sugarcane industry (Putri *et al.*, 2026) and the cocoa industry (Suryana *et al.*, 2022).

Table 2. Tea Processing Factories Serving the Bandung Regency Area

No.	Tea Processing Factory	Location	Existing Daily Processing Capacity (tons of fresh tea leaves)	Operational Status	Processing Cycle (days)
1	KUD Pasirjambu (Joint Operation with PT Kartini)	Pasirjambu	10.00	Active	1
2	CV Gustia Rijki Abadi (Nengkelan)	Pasirjambu	9.00	Active	1
3	Jaya Berkah Abadi 73	Pasirjambu	6.00	Active	1
4	Duta Niaga Sukses	Pasirjambu	0.30	Active	1
5	Hanesland Mountain Tea	Pasirjambu	2.50	Active	1
6	Gambung Agro Lestari (GAL)	Pasirjambu	3.75	Semi-active	7
7	Pangalengan Agro Lestari (PAL)	Pangalengan	8.00	Active	1
8	Puncak Wangi	Pangalengan	4.00	Active	1–2
9	Cilastari Agro Lestari	Ciwidey	5.00	Active	1
10	PT Kartini Nasional, Sindang Sari Branch	Ciwidey	30.00	Active	1
11	PD Mekar Adijaya	Ciwidey	0.71	Semi-active	7
Total			73.01		

Source: Compiled from primary data (2026)

Table 3. Smallholder Tea Plantation Area and Production in Bandung Regency

Year	Plantation Area (ha)				Made Tea Production		Estimated Fresh Tea Shoot Production (Assumption: 25% Recovery Rate; 300 Processing Days per Year)		Farmers
	Immature (TBM)	Mature (TM)	Replanted/Damaged (TR/TTM)	Total	Production (tons)	Average Productivity (kg/ha)	Annual Production (tons of fresh tea leaves)	Daily Production (tons of fresh tea leaves)	Farmer Households
2018	–	1,652	49	1,701	3,577	2,165	14,308	48	2,074
2019	–	1,652	49	1,701	3,579	2,166	14,316	48	2,074
2020	–	1,652	49	1,701	3,595	2,176	14,380	48	2,074
2021	–	1,679	38	1,717	3,153	1,878	12,612	42	2,062
2022	–	1,679	38	1,717	3,177	1,892	12,709	42	2,062
2023	–	1,674	38	1,712	3,177	1,898	12,708	42	2,062
2024	–	1,655	51	1,705	3,048	1,842	12,192	41	2,062
Average	–	1,663	45	1,708	3,329	2,002	13,318	44	2,067

Source: Compiled from primary data (2026)

Despite the limited supply of fresh tea leaves from local smallholder tea plantations, smallholder tea processing factories in Bandung Regency continue to operate at nearly their existing processing capacities. This indicates the presence of a supply adjustment mechanism

adopted by industry stakeholders to meet raw material requirements (Christopher, 2016). Based on interviews and field observations, the supply of fresh tea leaves is not sourced exclusively from smallholder tea plantations within Bandung Regency but is also obtained through interregional distribution from other smallholder tea-producing areas, including Garut Regency and West Bandung Regency. In addition, part of the raw material demand is fulfilled by procuring fresh tea leaves from nearby large-scale tea plantations.

These findings indicate that the smallholder tea supply chain in Bandung Regency has evolved into an interregional supply network, in which the movement of raw materials is no longer constrained by administrative boundaries. Consequently, the operational sustainability of smallholder tea processing factories largely depends on their ability to access alternative sources of raw materials beyond the core production area. This condition also highlights the strategic importance of improving plantation productivity, enhancing the quality of fresh tea leaves, and expanding the smallholder production base to reduce dependence on external supplies and strengthen the resilience of the smallholder tea supply chain in West Java.

Strategies for strengthening the smallholder fresh tea shoot supply chain

According to Trimo *et al.* (2019), the key internal factors determining the sustainability of smallholder tea agro-industries include organizational conditions or group dynamics, the processing capacity of tea manufacturing facilities, and farmers' financial capacity to support production activities. Therefore, strengthening the smallholder fresh tea shoot supply chain is essential to ensure the long-term sustainability of the smallholder tea sector in West Java. Supply chain strengthening strategies should focus on enhancing both production capacity and farmers' capabilities through accelerated replanting programs for aging tea plantations, improved access to fertilizers and other agricultural inputs, and the adoption of Good Agricultural Practices (GAP). In addition, training on proper tea plucking techniques in accordance with quality standards should be provided, as appropriate plucking practices contribute to the production of higher-quality made tea (Dewi *et al.*, 2025). These efforts are expected to enable farmers to maintain a more reliable and consistent supply of fresh tea leaves in terms of both quality and quantity.

From a partnership perspective, it is essential to strengthen supply chain collaboration through an integrated and transparent approach involving all stakeholders, from farmers and collectors to tea processing factories. Strengthening the role of Village Unit Cooperatives in supporting smallholder tea farmers can provide important benefits, particularly by improving access to agricultural inputs such as fertilizers (Riani, 2023). Partnership initiatives may include medium-term purchasing agreements, guaranteed procurement volumes and delivery schedules, transparent pricing mechanisms, and technical assistance or extension services provided by processing companies and relevant stakeholders, such as research institutions. Ardiansyah *et al.* (2026) emphasized that strengthening agribusiness supply chains is essential for maintaining the stability of agricultural product distribution and prices, with key determinants including effective coordination among supply chain actors, efficient distribution systems, and adequate logistics infrastructure. Furthermore, Setiawan (2025) argued that infrastructure development should be supported by a systemic transformation toward a more

efficient, competitive, and inclusive logistics ecosystem. These findings are consistent with field observations in the present study, which indicate that supporting infrastructure—particularly plantation access roads and transportation routes for fresh tea leaves—remains inadequate, potentially hindering the timely transportation of raw materials and reducing overall supply chain efficiency.

In the current era of rapid digitalization, the adoption of information technology offers significant opportunities to improve coordination efficiency among supply chain stakeholders. Digital solutions such as real-time information systems, digital record-keeping, supply monitoring platforms, and traceability systems spanning from tea plantations to processing factories can enhance transparency, coordination, and decision-making throughout the supply chain. In addition, increasing value creation can be achieved through product diversification and downstream development, including the production of specialty teas, green tea powder, white tea, ready-to-drink (RTD) tea beverages, and the strengthening of the Bandung tea brand.

Furthermore, market development efforts should not be limited to the domestic market but should also be directed toward expanding export opportunities. Programs that can support this objective include quality certification, participation in international trade fairs and promotional events, business matching activities, and strategic partnerships with exporters. These initiatives are expected to broaden market access for tea products, particularly those produced in Bandung Regency, while enhancing the competitiveness of the smallholder tea industry in both domestic and international markets.

CONCLUSION

1. The smallholder fresh tea shoot supply chain in Bandung Regency involves three main stakeholders—farmers, collectors, and tea processing factories—who interact to ensure a continuous supply of raw materials for the tea industry. Farmers serve as the primary producers of fresh tea leaves, collectors function as consolidators and intermediaries between farmers and processing factories, while processing factories convert the raw materials into tea products for industrial and market demands.
2. The supply chain structure indicates that the dominant product flow follows the sequence of farmers—collectors—processing factories, before continuing through agents, wholesalers, downstream processing industries, and ultimately to end consumers.
3. The supply–demand analysis reveals that the production potential of fresh tea leaves from smallholder plantations in Bandung Regency is insufficient to fully utilize the processing capacity of existing tea factories, particularly during the dry season when fresh tea shoot production declines.
4. Strengthening the smallholder tea supply chain in Bandung Regency requires an integrated approach that includes improving the productivity and quality of smallholder tea plantations, strengthening farmer organizations, fostering transparent partnerships among farmers, collectors, and processing factories, standardizing fresh tea shoot quality,

digitalizing supply chain information systems, and promoting the development of high-value downstream tea products.

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