

ADAPTIVE BUT FRAGMENTED: DISTRIBUTION AND LOGISTICS OF ASOPSI CULINARY MSMEs FOR SUSTAINABLE SUPPLY CHAIN DEVELOPMENT

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Abstract

This study maps the distribution and logistics configurations of culinary micro, small, and medium enterprises (MSMEs) affiliated with the Indonesian Beginner Entrepreneurs Association (ASOPSI) in South Tangerang and identifies the baseline gaps that must be addressed before developing a sustainable supply chain model. An exploratory qualitative case-study design was used. The present article draws on 11 in-depth MSME interviews documented on 14 August 2026, supported by field observations and project records. Data were analyzed through cross-case thematic coding, value-chain mapping, and gap analysis. The cases show four overlapping logistics configurations: order-responsive fresh production, frozen buffer-stock distribution, shelf-stable packaged distribution, and hybrid food-service distribution. Across these configurations, the supply chains are adaptive but fragmented. MSMEs use flexible sourcing, limited inventory, supplier delivery, self-delivery, app-based couriers, retail outlets, bazaars, social media, and business-to-business channels. Recurrent vulnerabilities involve raw-material price and quality volatility, perishability, packaging damage, returns, production bottlenecks, consignment-related working-capital lock-up, unstable market access, and limited logistics data visibility. Sustainable supply chain development should begin with simple logistics visibility, supplier and inventory discipline, fit-for-product delivery standards, market synchronization, and association-enabled coordination rather than immediately imposing complex formal systems. This baseline offers a practical foundation for the subsequent design of an association-based sustainable supply chain model.

Keywords: MSMEs, distribution; logistics, sustainable supply chain, South Tangerang

INTRODUCTION

Micro, small, and medium enterprises (MSMEs) occupy a central position in Indonesia's productive economy, but their operational sustainability depends on more than entrepreneurial activity and market growth. For food-oriented MSMEs in particular, the ability to secure raw materials, preserve quality, match production with demand, deliver products safely, and convert sales into working capital determines whether an enterprise can survive routine variability and larger disruptions. Supply chain management therefore provides a useful operational lens for understanding MSME sustainability because it connects sourcing, production, inventory, distribution, customer returns, information flows, and interorganizational relationships. Recent Indonesian evidence shows that production and distribution processes can be particularly important drivers of SME performance, while formal sustainability practices may remain difficult to implement when firms face resource and capability constraints (Zulfiati et al., 2026).

The practical challenge is especially visible in urban culinary MSMEs. Their logistics requirements are heterogeneous: a fresh pudding producer cannot manage inventory and delivery in the same way as a frozen-food producer, a restaurant, or a shelf-stable snack producer. Some businesses reduce waste by producing only after receiving an order; others hold frozen inventory to respond quickly to demand; still others depend on retail placement, consignment, or business-to-business orders. These differences create distinct trade-offs among freshness, service speed, inventory cost, delivery risk, and market coverage. Food SMEs are also structurally vulnerable to disruptions because of their limited financial buffers, dependence on specific inputs, and sensitivity to product quality and handling (Ali et al., 2021).

Sustainable supply chain research increasingly recognizes that the SME context requires approaches that fit limited resources and managerial capacity. Kosasih et al. (2023) argue that lean and green practices for SMEs need workable configurations rather than the direct transfer of large-firm models. Zaman et al. (2025) similarly show that SME sustainability is best understood as a linkage between practices and performance rather than as an abstract end-state. In Indonesia, Dzikriansyah et al. (2023) found that green supply chain management adoption can improve environmental performance, while Dewa (2024) reported that owner commitment, supply chain connectivity, and green supply chain management are linked to SME business performance. These studies confirm the relevance of supply chain sustainability, but they also suggest that implementation must begin with a realistic understanding of current operating practices.

A second stream of research highlights resilience, visibility, and interorganizational coordination. Nakandala et al. (2025) show that digital capabilities, supplier proximity, supplier relationships, and access to government assistance contribute to SME supply chain robustness and resilience. Obiri-Yeboah et al. (2025) likewise demonstrate that digital supply chain capabilities can strengthen resilience and viability. At the governance level, Saunila et al. (2024) find that performance measurement becomes more useful when embedded in supply chain governance rather than treated as an isolated internal tool. Together, these studies imply that digitalization and performance measurement are not merely technology projects; they require relationships, information sharing, and governance mechanisms that can convert data into coordinated action.

Despite this progress, an empirical and conceptual gap remains at the baseline level. Existing studies on MSME supply chain flexibility generally emphasize the ability of individual firms to adjust production, sourcing, inventory, or distribution in response to changing demand and operating conditions, while resilience studies tend to focus on the capacity to absorb disruptions, recover operations, and maintain business continuity. These perspectives are important, but they do not fully explain a situation in which individual MSMEs are highly flexible in their daily operations while the broader supply chain remains weakly integrated. In such circumstances, flexibility may be achieved through individual improvisation rather than through coordinated supply chain capabilities. Less attention is therefore given to the coexistence of micro-level adaptability and network-level fragmentation in urban culinary MSME ecosystems. This distinction is important because a business may be able to adapt its own purchasing, production, inventory, or delivery practices without necessarily having reliable shared information, coordinated procurement, collective logistics, stable market linkages, or common performance-monitoring mechanisms.

This study introduces the concept of adaptive fragmentation to capture this specific condition. Adaptive fragmentation refers to a supply chain configuration in which individual MSMEs possess considerable operational flexibility and can modify their routines according to immediate circumstances, but these adaptations occur largely in isolation and are not sufficiently connected through shared information, coordinated resources, standardized processes, or interorganizational governance. The concept therefore differs from conventional supply chain flexibility, which primarily describes the capacity to respond to variation, and from resilience, which emphasizes the ability to withstand, recover from, or adapt to disruption. Adaptive fragmentation focuses instead on the structural tension between individual adaptability and collective coordination. Its novelty lies in treating fragmentation not simply as an operational weakness, but as a condition that can coexist with and partly emerge from the very flexibility that enables MSMEs to survive day-to-day uncertainty. In this sense, the concept provides a bridge between firm-level adaptability and network-level supply chain development by asking whether the flexible responses of individual MSMEs can be connected, aggregated, and transformed into collective capabilities.

This distinction is particularly relevant to association-based MSME ecosystems. Individual firms may independently develop practical responses to fluctuating demand, limited working capital, raw-material availability, delivery constraints, and changing market channels. However,

when these responses remain disconnected, the network may continue to experience duplicated procurement activities, uneven access to markets, limited information visibility, inconsistent logistics performance, and weak collective bargaining or resource utilization. An organization such as ASOPSI may potentially coordinate suppliers, markets, information, training, or collective logistics, but such coordination requires an understanding of how the existing system operates and where fragmentation occurs. Consequently, identifying adaptive fragmentation provides a baseline for determining which capabilities should remain decentralized at the firm level and which functions may benefit from association-level coordination.

This study addresses this gap by examining culinary MSMEs affiliated with ASOPSI South Tangerang as an exploratory sub-study within a broader research project on distribution and logistics profiling. Rather than testing a predetermined causal model, the study asks three questions: (1) What distribution and logistics configurations characterize the participating culinary MSMEs? (2) What recurring vulnerabilities and inefficiencies appear across sourcing, inventory, production, delivery, and market access? and (3) What baseline capabilities and gaps should be prioritized before developing an association-enabled sustainable supply chain model? The novelty lies in combining cross-case operational profiling with value-chain and gap analysis at the association level, while using the concept of adaptive fragmentation to explain the relationship between firm-level flexibility and network-level coordination gaps. The study thus does not treat flexibility as evidence of supply chain resilience by itself; instead, it examines whether the ability of individual MSMEs to adapt is supported by, or constrained by, the wider supply chain structure. This baseline perspective is intended to provide an empirically grounded foundation for developing a sustainable supply chain model that is proportionate to the actual capabilities, constraints, and coordination needs of culinary MSMEs.

METHOD

This study used a qualitative descriptive-analytical design within an exploratory case-study approach. A case-study strategy is appropriate when the research seeks to understand contemporary operational practices in their real-life context and when the boundaries between the phenomenon and its setting are not easily separated (Yin, 2019). The broader grant project was designed as a baseline study of ASOPSI members in South Tangerang. The present article focuses on the first complete qualitative data tranche available for manuscript development, consisting of 11 culinary MSME interviews conducted and documented on 14 August 2026. The study was intended to generate an operational baseline rather than statistical generalization, with emphasis on understanding the distribution and logistics configurations of participating MSMEs in their actual business contexts.

Informants were selected purposively based on predefined inclusion criteria relevant to the research objectives. First, the informant had to be an owner, manager, or person directly responsible for the operational activities of an MSME affiliated with ASOPSI South Tangerang. Second, the informant had to have direct knowledge of at least several core supply chain activities, including raw-material procurement, production planning, inventory or storage, distribution, sales channels, or customer handling. Third, the business had to be actively operating at the time of data collection so that the information obtained reflected current operational practices rather than past or discontinued activities. Fourth, the informant had to be willing to participate in an interview and provide information concerning the business's operational processes and constraints. Informants who could not provide direct information about the business operations were not prioritized. Based on these criteria, 11 information-rich cases were included in the present analysis.

The 11 cases covered restaurants and food service, made-to-order desserts, fried and packaged snacks, frozen foods, catering, traditional snacks, and food-wrapper production. The business models varied from home-based online production to fixed premises, retail placement, business-to-business sales, bazaars, and social-commerce channels. This variation was deliberately retained to capture differences in sourcing, inventory, production, delivery, and

market-access configurations across culinary MSMEs. To protect confidentiality and analytical clarity, the results are reported using informant codes I1–I11 rather than personal names.

Data collection combined semi-structured in-depth interviews, field observation, and project documentation. Before each interview, the researcher explained the purpose of the study, the type of information required, the voluntary nature of participation, and the use of informant codes in reporting. The interview guide was organized around the research objectives and covered business profile, raw-material sources, supplier relationships, procurement practices, stock and storage practices, product shelf life, production capacity, delivery arrangements, market channels, financial and working-capital constraints, external support, product quality, packaging, returns, information use, and future development needs. The semi-structured format allowed the researcher to ask the same core questions across cases while also pursuing case-specific issues that emerged during the conversation. Follow-up questions were used to clarify operational sequences, identify reasons for particular practices, and distinguish routine procedures from responses to temporary problems.

Each interview was conducted directly with the selected informant and lasted approximately [insert actual duration, e.g., 30–60 minutes], depending on the complexity of the business and the amount of operational information available. With the informant's permission, interviews were audio-recorded to reduce the risk of losing substantive information during note-taking. Field notes were also made during and immediately after the interviews to document contextual observations, relevant non-verbal information, operational conditions, and points requiring clarification. Where audio recording was not available or not permitted, detailed contemporaneous notes were used as the primary record. The recorded interviews were transcribed into written text for analysis, while field notes and project documentation were retained as supplementary sources. Transcripts were reviewed against the available recordings and field notes to correct obvious transcription errors and preserve the intended meaning of informants' statements.

Data credibility was strengthened through triangulation across interview accounts, field observations, and project documentation. Information concerning operational practices was not interpreted solely from isolated statements when supporting observations or documents were available. The researcher also compared accounts across the 11 cases to identify recurring patterns as well as contradictory or case-specific practices. During the analysis, potentially ambiguous statements were revisited against the interview context and field notes, while follow-up clarification was sought when necessary. An audit trail was maintained through case matrices, coding records, field notes, and the developing value-chain map, allowing the analytical interpretation to be traced back to the original empirical material. These procedures were used to enhance credibility and consistency without claiming statistical representativeness or theoretical saturation, which was not the purpose of this exploratory baseline study.

Analysis proceeded in four stages. First, each transcript was reduced into a case matrix covering sourcing, inventory, production, transport, market channel, information use, working-capital implications, and critical risks. Second, recurring themes were coded within and across cases, while differences between business models were retained rather than treated as analytical errors. Third, the coded evidence was organized into an initial value-chain map linking suppliers, MSMEs, logistics arrangements, market channels, and end customers. Fourth, a gap analysis compared existing practices with basic requirements for more sustainable and resilient supply chains, including visibility, quality consistency, inventory discipline, delivery reliability, market synchronization, and coordination. Particular attention was given to situations in which individual MSMEs demonstrated flexible responses to operational problems but lacked mechanisms for sharing information, coordinating procurement, synchronizing market access, or managing logistics collectively. This analytical step provided the empirical basis for examining the emerging concept of adaptive fragmentation. The analysis was interpretive rather than statistical and remained close to the operational evidence documented in the interviews.

RESULTS AND DISCUSSION

Business and Logistics Characteristics of the Cases

The 11 cases demonstrate substantial heterogeneity even within the culinary sector. The most important differentiator is not merely product type but the relationship among product perishability, order timing, inventory policy, and market channel. Some firms can store raw materials or finished goods for weeks or months; others must purchase fresh inputs and produce close to the delivery time. This heterogeneity produces different logistics requirements and explains why a single standardized operating model would be difficult to impose without segmentation.

Table 1. Cross-case business and logistics characteristics

Code	Dominant product/business model	Dominant logistics pattern	Main operational issue
I1	Restaurant and sambal/processed food	Frequent replenishment; regular suppliers; supplier delivery	Quality consistency, operating efficiency, market expansion
I2	Pudding and wet cakes; online made-to-order	Fresh input purchase after order; short delivery window	Perishability and geographic/time limits on delivery
I3	Fried onion and peanuts; micro-scale packaged food	Mixed regular and spot sourcing; dry-stock buffer	Raw-material deterioration, capacity, finance, market access
I4	Packaged snacks	Flexible supplier switching; limited raw-material stock; online/intercity sales	Price volatility, supplier instability, stable demand
I5	Pempek/tekwan; frozen and ready-to-eat	Frozen stock; courier delivery; retail/restaurant placement	Consignment locks working capital
I6	Pempek/siomay	Regular suppliers for selected inputs; stock holding	Market access and demand continuity
I7	Snack/lunch boxes; pre-order	Materials prepared 3–4 days before order	Marketing, financial records, partnership access
I8	Pempek/frozen food and beverages	Weekly fish/sago stock; limited fruit stock; delivery ordering	Freshness, controlled stock, sustainable market outlet
I9	Daily meals and catering	Order-based production from own kitchen	Market expansion and order continuity
I10	Traditional dry snacks and catering	Direct market purchase plus selected regular suppliers	Fragile packaging, scarce flour, marketing, bookkeeping
I11	Spring-roll wrappers	Large flour stock; direct supplier; wholesale delivery	Input price/quality volatility, returns, demand contraction

Four Overlapping Distribution-Logistics Configurations

The cross-case analysis reveals four recurring configurations. The first is an order-responsive fresh-production configuration. Businesses in this group minimize finished-goods inventory and procure perishables close to production time. This arrangement is visible in pudding, lunch-box, snack-box, and catering cases. It reduces the risk of unsold fresh products but creates strict dependence on order visibility, supplier availability, preparation lead time, and delivery punctuality. In this configuration, logistics failure quickly becomes a quality failure.

The second is a frozen buffer-stock configuration. Frozen-food producers keep selected raw materials or finished goods in cold storage to respond more quickly to demand. This configuration provides greater temporal flexibility than fresh made-to-order production, but it shifts the critical control points toward freezer capacity, product handling, stock age, and delivery conditions. The cases also show that frozen products may be sold through restaurants, frozen-food stores, wholesalers, or direct customer orders, creating multiple replenishment patterns.

The third is a shelf-stable packaged configuration. Producers of packaged snacks, fried onions, peanuts, and dry traditional foods can hold inputs or finished goods longer than fresh-food businesses. Their vulnerability is therefore less about immediate spoilage and more about raw-material price movements, quality variation, packaging performance, retail turnover, and product damage. One case, for example, experienced breakage during intercity shipment, showing that longer shelf life does not eliminate logistics risk; it changes its form from perishability risk to handling and packaging risk.

The fourth is a hybrid food-service configuration that combines fixed-location service, processed products, supplier relationships, and promotional expansion. This pattern is represented most clearly by a restaurant-based case that also produces packaged sambal. The business benefits from regular vegetable and chicken suppliers and frequent replenishment, while also attempting to broaden sales beyond the physical outlet. Hybridization increases market options but also requires coordination between daily food-service needs and packaged-product distribution.

Sourcing: Relationship Stability versus Price Flexibility

Supplier management is one of the clearest areas of adaptive behavior. Several MSMEs maintain regular suppliers for quality-sensitive inputs such as vegetables, chicken, fish, fruit, flour, or selected dry ingredients. Regular supplier relationships reduce search time and, in some cases, allow delivery directly to the business location. For small firms with limited labor, supplier delivery is an important efficiency mechanism because it substitutes for the owner's travel time. However, not all inputs are sourced through stable relationships. Some firms deliberately switch suppliers when prices rise, while others buy directly from local markets or nearby stores. The resulting system balances relationship stability and price flexibility, but the trade-off is that quality and lead time can be less predictable when purchases are made opportunistically.

Input price and quality volatility are particularly consequential when one ingredient determines product performance. The spring-roll-wrapper case illustrates this dynamic: fluctuations in flour price and quality directly affect dough characteristics, production speed, product defects, and customer returns. Similarly, the traditional snack producer reported difficulty securing glutinous-rice flour. These examples indicate that procurement sustainability for micro-enterprises cannot be reduced to environmental sourcing criteria alone. Availability, quality consistency, price predictability, and responsive supplier problem-solving are foundational dimensions of operational sustainability.

Inventory, Perishability, and Waste-Avoidance Logic

Inventory practices are strongly product-contingent. Fresh-fruit desserts and pre-order food businesses intentionally avoid excessive stock and buy ingredients according to confirmed demand. This is a rational waste-avoidance strategy because strawberries, kiwi, vegetables, and

other perishables have short usable lives. Other firms store dry materials such as flour, oil, sugar, or seasoning because these inputs are easier to preserve and can protect production continuity. Frozen-food businesses use freezers as a temporal buffer that separates production from immediate consumption.

These practices reveal a sustainability paradox. Low inventory can reduce expiry and food loss, but it can also expose the business to stock-outs, emergency purchasing, and supplier delays. Conversely, large inventories can stabilize production but increase cash tied up in stock and heighten risks of deterioration or quality decline. The interviews therefore suggest that the appropriate sustainability objective is not simply 'lower inventory' but fit-for-product inventory: the amount, form, and replenishment frequency should be aligned with shelf life, order uncertainty, and available storage.

Delivery and Market Channels

Delivery practices combine supplier-managed transport, owner delivery, customer pickup, and app-based couriers. WhatsApp and telephone are commonly used to coordinate purchase orders or deliveries, while Instagram and TikTok support customer acquisition and sales communication. Market channels include direct orders, bazaars, restaurants, retail stores, frozen-food outlets, social commerce, and B2B sales to other MSMEs. This channel diversity is a source of resilience because firms are not completely dependent on one route to market. At the same time, channel diversity increases coordination demands because each channel has different volume, packaging, delivery, margin, and payment characteristics.

Market access emerges as a recurring bottleneck. Several informants explicitly indicated that their main problem was not the ability to produce but finding stable, sufficiently active sales outlets. Bazaars can generate sales only when foot traffic is adequate. Retail placement creates market visibility but can involve limited shelf space, return risk, or slow turnover. Online selling expands geographic reach but may require more protective packaging and reliable last-mile delivery. These observations are consistent with recent Indonesian evidence that production and distribution practices are central to SME performance (Zulfiati et al., 2026).

Working Capital, Consignment, and Return Risk

Working-capital considerations shape channel choices. One frozen-food producer preferred outright purchase to consignment because placing products in many outlets would immobilize capital across several locations. A similar concern appears when products must be retrieved from outlets after failing to sell: the MSME incurs transport and labor costs without recovering the expected margin. The spring-roll-wrapper case also shows a more severe transaction risk, where a previously prepared order was returned after a downstream commercial problem, producing a substantial loss. These cases demonstrate that distribution architecture is inseparable from financial sustainability. A channel with high visibility is not necessarily attractive if it delays cash conversion or transfers excessive return risk to the producer.

Limited Logistics Data Visibility

The businesses already use digital channels extensively, but the dominant form of digitalization is transactional rather than analytical. WhatsApp, TikTok, Instagram, and online ordering simplify communication and market reach, yet the available evidence does not show integrated records of inventory age, lead time, delivery cost, damage, return rates, supplier performance, or channel-level profitability. This distinction is important: digital communication is not equivalent to digital supply chain visibility. Recent research shows that digital supply chain capabilities can strengthen resilience and viability when technology is integrated with organizational practices and adaptive capability (Obiri-Yeboah et al., 2025). The current cases therefore possess a useful digital foundation, but it is not yet converted into systematic logistics intelligence.

Initial Value-Chain Map of the ASOPSI Culinary MSME Logistics System

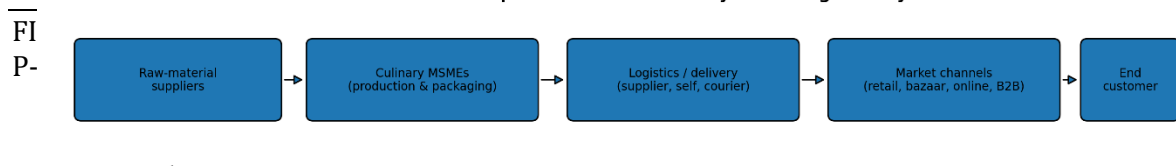


Figure 1. Initial value-chain map derived from the cross-case interviews

Baseline Gap Analysis

Table 2. Baseline gap analysis and priorities

Dimension	Observed baseline	Sustainability gap	Priority for model development
Supplier management	Mix of regular suppliers and spot purchases	Limited supplier performance visibility and high exposure to price/quality volatility	Simple scorecard; backup-source mapping; joint issue escalation
Inventory	Product-specific buffers; low stock for perishables; frozen/dry stock where feasible	No common measurement of stock age, spoilage, or stock-out frequency	Fit-for-product reorder rules and basic waste/expiry records
Production	Owner/family/manual processes dominate several cases	Capacity bottlenecks and high dependence on individual skill	Capacity mapping, standardized critical steps, selective equipment support
Delivery	Supplier delivery, self-delivery, pickup, and courier apps	Delivery cost, time, damage, and service reliability rarely measured	Delivery KPI log and packaging/handling standard by product type
Market channel	Retail, bazaar, online, B2B, pre-order	Demand instability and working-capital exposure from consignment/returns	Channel profitability and cash-conversion monitoring; collective market access
Information	High use of WhatsApp/social media	Digital communication exists without integrated logistics visibility	Shared minimal data set at MSME and association level

Discussion

The central finding is that the ASOPSI culinary MSME logistics system is adaptive but fragmented. Adaptation is visible in flexible supplier choice, made-to-order production, limited stocking of perishables, the use of freezers, multi-channel selling, app-based delivery, and rapid adjustments to changing demand. Fragmentation is visible in the absence of shared logistics data, limited cross-firm coordination, highly individualized supplier arrangements, unstable market access, and weak performance measurement. This combination helps explain why many MSMEs

can survive daily uncertainty but remain vulnerable when disruptions simultaneously affect input prices, quality, demand, or cash flow.

This finding extends the sustainability discussion by showing why baseline operational practices matter. Zaman et al. (2025) argue that SME sustainability is inseparable from the practices that generate performance outcomes. The present evidence specifies what those practices look like in an urban culinary setting. For some cases, sustainability begins with preventing fresh ingredients from being held too long; for others, it means preserving frozen stock quality, reducing product breakage, avoiding financially damaging consignment, or maintaining access to a reliable supplier. The implication is that sustainable supply chain development should not begin with a generic checklist. It should begin by segmenting MSMEs according to product and logistics configuration, then matching interventions to the relevant risk structure.

The results also support a relational interpretation of resilience. Regular suppliers reduce travel burden, stabilize quality, and make delivery easier. Yet excessive dependence on a single input source can increase exposure when price or quality deteriorates. Nakandala et al. (2025) identify supplier proximity and relationships as important antecedents of SME supply chain resilience, while the current cases show the operational mechanism through which this occurs: familiarity facilitates ordering, delivery, and quality assurance. The practical extension is not to replace relationships with formal procurement bureaucracy, but to make critical relationships more visible through basic records of supplier reliability, alternative sources, price changes, and quality incidents.

Inventory behavior provides another important insight. Order-based production and low stock are not simply signs of limited scale; in many cases they are deliberate responses to perishability and financial constraints. This is consistent with lean logic, but the sustainability value depends on whether low stock is supported by reliable suppliers and demand information. Kosasih et al. (2023) emphasize the need to integrate lean and green logic in a manner that is workable for SMEs. The cases suggest that a practical version of this integration would combine demand-linked replenishment, waste monitoring, and product-specific storage rules. For frozen products, the relevant concern may be stock age and freezer reliability; for fresh products, purchase timing and delivery lead time; for dry packaged products, packaging integrity and raw-material quality.

Market access and working capital are tightly connected. Several informants identified market access as the main development need, while consignment and returns were seen as mechanisms that can delay cash conversion or impose additional logistics cost. This complements quantitative Indonesian evidence showing the importance of distribution for SME performance (Zulfiati et al., 2026). It also indicates that a sustainable supply chain model for micro-enterprises should include commercial design, not only physical logistics. Collective access to credible retail, institutional buyers, campus events, business communities, or digital marketplaces can be valuable only if payment terms, return rules, minimum orders, and delivery responsibilities are economically workable for the MSME.

The digital findings are similarly nuanced. The MSMEs are not digitally disconnected; many already use social media, messaging applications, and platform-based selling. However, digital use is concentrated at the communication and marketing layer. Obiri-Yeboah et al. (2025) show that digital supply chain capabilities can improve resilience and viability, and Chen and Tang (2024) emphasize the role of digital capability and cooperation in supply chain digitalization. The current cases suggest a low-cost transition path: before sophisticated systems are introduced, MSMEs could standardize a small set of digital records for supplier orders, stock, delivery cost, delivery time, returns, and repeat orders. These records could be maintained in simple mobile-friendly tools and aggregated voluntarily by ASOPSI to identify collective bottlenecks.

From a sustainability governance perspective, the association may be as important as the individual firm. Saunila et al. (2024) find that performance measurement creates value when connected to supply chain governance. An association-based model could provide that governance layer without requiring each micro-enterprise to build a complex system

independently. ASOPSI could support a shared supplier directory, common baseline indicators, packaging and delivery guidance, pooled training, joint market information, or coordinated access to institutional buyers. Such mechanisms would preserve entrepreneurial autonomy while creating visibility and learning across the network.

Indonesian green supply chain studies have largely emphasized adoption drivers and performance effects. Dzikriansyah et al. (2023) demonstrate the environmental performance relevance of green supply chain management, while Dewa (2024) highlights owner commitment and supply chain connectivity. The present study complements those findings by identifying the pre-adoption operating conditions that a sustainability program must address. Before micro-enterprises can meaningfully adopt more advanced green or circular practices, they need stable quality, manageable inventory, safe delivery, data visibility, and economically viable market channels. In this sense, operational reliability is not separate from sustainability; it is part of the infrastructure that makes sustainability practices feasible.

The notion of adaptive fragmentation therefore offers a useful interpretive contribution. It describes a network in which local flexibility is strong but system-level coordination is weak. Adaptive fragmentation can be beneficial in the short term because each enterprise can quickly switch suppliers, alter production, or change market channels. Over time, however, the lack of shared information and standards can prevent scale economies, coordinated risk management, and cumulative learning. A sustainable supply chain transition should consequently avoid over-centralization while reducing unnecessary fragmentation. The most realistic pathway is selective coordination: shared data where collective visibility matters, shared standards where quality and delivery risks recur, and shared market development where individual MSMEs lack bargaining power.

Based on the findings, five baseline design principles are proposed for the next stage of the grant project. First, visibility before sophistication: record a small number of operational indicators before introducing complex technology. Second, segmentation before standardization: different product-logistics configurations need different stocking and delivery rules. Third, relationship management before supplier consolidation: improve reliability and backup options without destroying useful local supplier ties. Fourth, cash-flow-aware distribution: evaluate market channels using payment timing, return risk, and delivery cost as well as sales potential. Fifth, association-enabled coordination: use ASOPSI as a platform for learning, supplier information, common logistics guidance, and market linkage. These principles do not constitute the final sustainable supply chain model; they are evidence-based requirements that the model should satisfy.

CONCLUSION

This exploratory study mapped the distribution and logistics practices of 11 culinary MSMEs affiliated with ASOPSI South Tangerang and identified an operational baseline for subsequent sustainable supply chain development. Within the 11 cases examined, four overlapping configurations were observed: order-responsive fresh production, frozen buffer-stock distribution, shelf-stable packaged distribution, and hybrid food-service distribution. The participating MSMEs demonstrated considerable adaptive capacity through flexible sourcing, product-specific inventory decisions, multi-channel selling, supplier delivery, and app-based courier services. These patterns describe the operational characteristics found in the participating cases and should not be interpreted as representative of all culinary MSMEs affiliated with ASOPSI or of Indonesian MSMEs more broadly.

Within this exploratory sample, the observed adaptive capacity coexisted with fragmented supply chain practices. Recurring vulnerabilities across the cases included raw-material price and quality volatility, perishability and stock deterioration, packaging damage, returns, production-capacity constraints, unstable market access, consignment-related working-capital lock-up, and limited logistics performance data. Digital tools were commonly used for communication and selling, but the cases examined showed limited evidence of integrated supply chain visibility.

These findings suggest, for the participating MSMEs, that sustainable supply chain development may need to begin with operational reliability and basic data discipline before introducing more complex formalization or coordination mechanisms. However, the frequency and relative importance of these issues across the wider ASOPSI membership require further empirical verification.

The study contributes an exploratory interpretation of how individual MSME adaptability can coexist with weak network-level coordination through the concept of adaptive fragmentation. In the 11 cases examined, flexibility appeared primarily at the individual business level, while shared information, procurement coordination, logistics monitoring, and collective market synchronization remained limited. This observation provides a basis for considering association-level interventions that preserve firm-level flexibility while addressing selected coordination gaps. Accordingly, the proposed direction emphasizes simple supplier and inventory records, fit-for-product delivery standards, channel-level cash-flow awareness, packaging and return control, and selective coordination through ASOPSI. These priorities should be regarded as preliminary propositions derived from the present cases rather than as universally applicable requirements for MSMEs.

The principal limitation is the exploratory scope of the dataset. The present manuscript is based on the first 11 complete culinary MSME interviews from a larger grant project and does not represent the full target of at least 30 MSMEs or the originally planned craft-sector coverage. The study also does not claim thematic saturation or statistical representativeness. Therefore, the findings are most appropriately understood as a case-based operational baseline that identifies patterns requiring further examination rather than as generalizable conclusions about the broader MSME population. Future research should extend the number and diversity of participating MSMEs, include craft-sector businesses and relevant institutional informants, quantify basic logistics indicators such as lead time, delivery cost, stock age, spoilage, and return frequency, and validate the identified priorities through focus-group discussions and additional cross-case analysis. These steps can provide stronger empirical support for the next research stage, namely the design and testing of an association-enabled sustainable supply chain model.

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