The Ecosystem Evolution of Fresh Procurement: Institutional Coordination Mechanisms, Risk Sharing, and Shared Value Creation

Olga Maximchuk[1]

[1]Vegberry Middle East Farm Management and Operation L.L.C
Parkland, USA

***Abstract*— As the global food systems are becoming more volatile, fresh procurement is increasingly exposed to the risks of waste production, price volatility, logistics breakdowns, and uneven risk distribution. These issues emphasize the increasing significance of procurement governance systems with the ability to integrate autonomous actors and stabilize value creation in the long-term, as opposed to conventional transactional sourcing and price-focused sourcing models. This research will utilize the ecosystem-based approach to governance to understand the role of institutional coordination instruments, risk-sharing strategies, and information-driven integration in transforming fresh supply chains in terms of economic and operational performance. The study integrates qualitative and quantitative analytical methods based on the theory of institutional economics and the ecosystem governance. The empirical study is built on the secondary longitudinal data based on the fresh procurement ecosystems provided by the retail that is operated in the various regions between the years, 2019, and 2024. The results of procurement in the presence of transactional sourcing arrangements are contrasted with the results that will be witnessed once ecosystem-based coordination mechanisms are put in place. The analysis aims at examining the total cost performance, dynamic waste, operational and financial risks redistribution, transparency, and shared value creation. The findings indicate that the management of procurement based on eco-systems is linked to significant increase in the systemic efficiency and resilience. The total cost of chain ownership declined by about 814 percent under higher nominal procurement prices, even though waste rates declined and logistics variability was lowered, as well as demand-supply fit. The average waste rates decreased to 79-9 per cent against 18-22 per cent whereas inventory turnover improved significantly. The risk exposure formerly at the retail level was split among the producers, logistics operators, and financial partners, preventing it to become vulnerable to severe loss incidents. When traceability and transparency measures were introduced, prompt containment of the incidents was made possible as well as price premiums of up to 40% on select fresh items. The financial analysis shows that the ecosystem returns are above the traditional category-based benchmarks, which proves the development of shared value among the participants. The results indicate that the outcome of procurement in fresh supply chains is dependent mostly on the governance architecture, and not on the intensity of price negotiation or isolated technological adoption. The research concludes that effective coordination of ecosystems helps increase the cost efficiency, resilience towards risks and the creation of sustainable values. Further studies ought to build upon this framework by conducting cross-country quantitative tests and more in-depth analysis of the dynamic of governance fidelity and ecosystem maturity.**

Keywords— fresh procurement; supply chain ecosystems; procurement governance; risk sharing; total cost of ownership; food waste reduction; traceability; institutional coordination; shared value creation; sustainability

I. INTRODUCTION

The modern fresh procurement is functioning in a more complex and volatile institutional setting of supply chain fragmentation, increased uncertainty, increased sustainability demands, and continuing systemic risks. Perishability, changing climatic conditions, reliance on logistics and fluctuations in demand are the main factors that cause breaks in the supply chains of fresh food. Consequently, procurement operations in new categories are no longer confined to negotiation of prices and coordination of delivery, but are now a crucial factor in economic performance, its resiliency, and value generation in the long term. It is in this sense that the procurement functions are increasingly defining the cost structure, as well as the exposure to risks, generation of waste, environmental footprint, and reputation across the whole supply network.

In spite of this increased complexity, the prevailing procurement modes of operation in new categories are still

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anchored on transactional and price-focused logic. Nominal unit prices, short-term volume commitments, and episodic negotiations are often the motivating factors behind supplier selection and contract design whereas systemic costs, coordination failures and risk externalities are not adequately dealt with. These types of procurement structures tend to create unobservable inefficiencies that are expressed in high spoilage rates, supply chain volatility, demand immediately, and risk concentration at a disadvantaged level where retailers are unsymmetrically distributed. Such performance is normally blamed on exogenous shocks including climate events, geopolitical shocks or market volatility and not on endogenous weaknesses in procurement governance and coordination design.

The continued existence of transactional procurement logic confirms a structural blindness of procurement practice and the scholarly literature. Although the literature on supply chain management has devoted a lot of attention to the optimization of logistics, demand forecasting, and the adoption of technologies, very little focus has been given to procurement as an institutional coordination tool that influences incentives, information flows, and risk distribution among autonomous players. The lack of coherent governance systems in fresh supply chains where the value is destroyed fast and irreparably enhances susceptibility to disruptions and economical ineptness. Consequently, the procurement relationships are weak, responsive and have not been adequately prepared to absorb the shock or create common long-term value.

The research problem that is handled in this study is based on the absence of an institutional framework that can provide an explanation of how the procurement governance is likely to affect cost efficiency, risk distribution, and value creation over time in fresh supply chains. Available literature is inclined to address individual factors, e.g., the performance of suppliers, technology applications, or sustainability indicators, without viewing procurement relations as managed, changing mechanisms. This means that the outcomes of procurement are usually regarded as the product of the operations decision but not the design of governance. This gap restricts the comprehension of why different results can arise because of similar technologies or sourcing strategies in different firms and markets.

The aim of the current research is to explore fresh procurement in the context of an ecological based governance, specifically, the focus on institutional coordination strategies, risk-sharing schemes, and value co-creation. The study conceptualizes procurement as a system based not on a series of individual transactions, but on a structured ecosystem, where the independent actors, which include producers, logistics providers, retailers, and financial partners, would be coordinated by integration of data, contractual alignment, and joint accountability. The analysis of cost performance, waste dynamics, risk redistribution, transparency outcomes, and financial returns will help the study prove that procurement ecosystems produce better and more stable results in relation to the traditional transactional frameworks.

The research is guided by the following objectives:

1) to examine the impact of ecosystem-based procurement governance on overall performance of cost with regard to fresh supply chains;
2) to analyze how the operational and financial risks are redistributed through the institutional coordination mechanisms;
3) to determine the effect of data-driven tools of coordination on waste and demand-supply optimization;
4) to assess the presence of transparency and traceability in economic value creation and in risk containment;
5) to come up with an analytical framework that makes fresh procurement a governance function at the ecosystem level as opposed to a transactional activity.

This study is novel in that it combines both institutional economics and ecosystem theory together with the theory of supply chain governance into a single analytical framework of fresh procurement. In contrast to the current literature which focuses on operational optimization or technology adoption, or both, but independently, this article recalculates the procurement outcomes as dependent variables, influenced by governance architecture. It does not frame cost efficiency, risk exposure, and sustainability as trade-offs, but as mutually achievable results in coherent coordination of the ecosystem. The paper also makes the contribution of empirically showing the way in which transparency, predictive analytics, and shared mechanisms of investment are institutional tools and not merely supplementary.

The theoretical and practical implications of the provided research are spread over different spheres. In the case of supply chain and procurement scholarship, it develops procurement governance into a key category of analysis in perishable goods markets. In the case of institutional economics, it points out the importance of the risk of value flow stability under uncertainty through coordination structures. To practitioners, the results imply that governance design instead of heightened price competitions is what causes resilience and profitability in fresh procurement. Finally, the paper establishes ecosystem-based procurement as a central instrument that, along with other approaches, economic efficiency, sustainability, and long-term competitiveness are achieved together in fresh supply chains in the modern day.

II. LITERATURE REVIEW

A. Transformation of Fresh Procurement and Supply Chain Coordination Mechanisms

Recent sources have shown that fresh procurement systems are undergoing a structural change due to the rising volatility, perishability pressures, and the rising need to have coordinated decisions made by supply chain actors. The challenges that are facing the traditional spot-market and price-focused procurement models are becoming more difficult to manage due to coordination failures, uncertainty in demand, and risk balance. In its turn, the academic interest has been drawn toward the area of coordination contracts and integrated mechanisms of governance.

Tahiri et al. (2025) offer a systematic review of the coordination contracts where they show that the revenues sharing, cost-sharing and buy-back contracts are highly effective in coordinating the performance of the supply chain in case the coordination goals are explicitly stated. The authors however observe that most of the coordination tools have been dyadic, and do not deal with multi-actor ecosystem interactions. The limitation is especially topical in the case of new supply chains, where the interactions between the producers, the logistics providers, the retailers, and the regulators take place at the same moment.

In a similar manner, Shi and Wang (2023) point out the significance of revenue and risk-sharing procedures within the supply chain of agriculture particularly in the context of agricultural cooperatives as the middlemen. Their results indicate that sharing mechanisms that are designed properly will decrease opportunistic behavior and enhance shared performance. However, such models are considerably on a level of stability of participation and do not fully reflect the dynamic evolution of governance in case of uncertainty, which is still a research gap.

B. Risk Sharing, Freshness Preservation, and Behavioral Coordination

Quite an extensive body of literature is devoted to the coordination of freshness preservation initiatives and behavioral incentives in fresh supply chains. Ran and Chen (2023) demonstrate that coordination approaches based on freshness preservation can coordinate incentives between upstream and downstream participants resulting in increased overall profitability. Their research notes that each of the individual actors will underinvest in conservatory measures without the alignment of governance, which will lead to more waste in the system.

Ren et al. (2025) take this point of view further, with a model of differential game that includes preservation effort, member behavior, and government subsidies. Their findings prove that the successful use of coordinated strategies is better than the decentralized decision-making, particularly when the behavioral responses are explicitly modeled. Nevertheless, the research is mostly theoretical, and it lacks the empirical focus on coordinating the institutions on the whole ecosystem level.

Zhao et al. (2025) also focus on competition and coordination of the regional fresh supply chains that are regulated by the government. Their conclusions indicate that regulatory structures are capable of strengthening or weakening coordination in relation to the coherence of governance. This supports the idea that the architectural basis of governance, but not regulation per se, defines whether there is effectiveness in coordination.

C. Information-Sharing Governance, Traceability, and Digitalization.

The digital transformation has become a significant facilitator of coordination in new supply chains. Zhang et al. (2025) examine the mechanisms of traceability information sharing within prefabricated food supply chains and reveal the evidence that the coordinated distribution of profits is better when the traceability information is collectively controlled. According to their findings, information transparency is not only a compliance mechanism but also a coordination resource.

Xing and Miao (2024) focus on the adoption of blockchain in fresh supply chains and take into consideration consumer preferences. They conclude that blockchain-based coordination enhances investment incentives and consumer trust, which truly boosts the overall profitability of the systems. However, the authors note that the application of blockchain requires governance structures that control access to participation, data, and allocation of benefits.

According to Long et al. (2025), the digital transformation alters the concept of supply chain resilience by facilitating the restructuring of resources and real-time coordination. They propose that digital tools cannot be effective unless institutional frameworks that regulate decision rights and accountability are in place. This helps to argue that technology-mediated coordination is something that should be perceived as a component of ecosystem governance and not as a single innovation.

D. Governance, Benefits Distribution and Ecosystem Performance.

In addition to the coordination of operations, there have been more studies that deal with governance and benefit-sharing mechanisms as the determinants of the sustainability of the supply chain. Based on a grounded theory approach, Gao and Zong (2024) suggest that benefit-sharing is one of the key instruments of stabilizing an agricultural supply chain across regions. They find perceived fairness and institutionalized sharing rules to be the key to long-term cooperation.

In their bibliometric review of the role of supply chain management in EPC models, Huang et al. (2024) point to the integration of governance as a significant contributing aspect in the complex procurement setups. Though their study deals with engineering procurement, the results can be applied to the fresh procurement where project-like coordination and long-term cooperation are increasingly common.

Taken together, this literature body is indicative that the effect of governance structures is decisive in terms of matching incentives, stabilizing participation and performance. But the majority of research is dedicated to single mechanisms, e.g. contracts, subsidies or digital tools, as opposed to an ecosystem governance architecture.

E. Contribution of the Present Study to Research Gap.

The reviewed literature produces a number of converging trends. To begin with, fresh supply chains are known to have coordination mechanisms that are becoming more important in dealings with perishability, uncertainty, and risk. Second, digitalization and traceability increase transparency and trust but it needs governance frameworks to achieve its full potential. Third, there are benefits and risk sharing mechanisms that have been recurrently found to be drivers of performance but are mostly examined in respect to unidirectional or bilateral settings.

The literature is still fragmented despite such developments. The vast majority of the existing literature focuses on the coordination contracts or behavioral incentives or digital technologies separately, without the conceptualization of fresh procurement as a type of developing ecosystem with institutional coordination mechanisms. The interaction between cost efficiency, risk redistribution, transparency and shared value creation at a systemic level is hardly studied, especially in an empirical context.

This gap is filled in the present research as the coordination theory, ecosystem governance, and empirical performance analysis are incorporated into a single framework. In contrast to the contract-based or technology-based models, this theoretical approach to research views fresh procurement as an institutional ecosystem where the governance architecture is the determinant of economic and sustainability results. The study helps to understand fresh supply chain evolution more holistically including the coordination mechanisms related to the total cost performance, the risk sharing, and value creation and serves as the bridge between theoretical modeling and applied governance practice.

III. MATERIALS AND METHODS

A. Values philosophies and theories.

The study is based on institutional economics and ecosystem governance theory as a methodological basis. This study also takes a structural-functional approach, according to which the results of observed economic and operational performance are considered the consequences of governance structure and not the consequences of individual managerial choices and market chance. Fresh procurement is theorized as institutional method of coordination which governs relationships between independent actors working under the circumstances of uncertainty and asset perishability.

The analysis is rooted on the concept of ecosystem theory where value creation will come out of interacting of two or more stakeholders, as opposed to bilateral transactions. Moreover, aspects of transaction cost economics are also integrated in order to explain how the governance mechanisms minimize the failure to coordinate, opportunism as well as losses brought about by uncertainty. The theory on stewardship also acts as an additional guide to the analysis as it stresses on the aspects of long-term responsibility, continuity, and trust as institutional characteristics that determine supplier relationships in fresh supply chains.

Epistemologically, the study takes a realist position whereby the governance structures are believed to have objective and quantifiable impacts on costs performance, risk exposure and value creation independent of the subjective interpretation of such structures by individual actors. This stance is especially pertinent to fresh procurement where both the biological and logistical restraint provides material limits to organizational discretion.

B. Research design.

The study has a mixed qualitative-quantitative design of the study which is founded on comparative institutional analysis. Instead of making specific causal hypothesis, the research problem is to establish systemic regularities which are also consistent over time between the shift to transactional procurement regimes and ecosystem-based governance regimes.

It is a longitudinal and comparative design. It compares the results of acquiring products in traditional price-driven sourcing contracts with the results obtained after the coordinated ecosystem mechanisms have been implemented. The analytical attention is given to structural change and consistency of outcomes over periods of observation as opposed to short term change or event impacts.

The research is at the system level with the fresh procurement ecosystems being the unit of analysis. This strategy allows recognizing the regularities concerning governance within varying organizational and geographic settings, without over-explaining the results by the idiosyncrasy of the firms.

C. Selection of the sample and the time of observation.

1) Sample composition

The empirical sample is comprised of procurement ecosystems of retail chains, fresh produce suppliers, logistics operators, and other related financial partners that are present in fresh food markets. The choice criteria was made following the following conditions:

- a product that involves fresh or ultra-fresh products of high perishability;
- formal shift back to the transactional procurement model to a coordinated or partnership-based sourcing model;
- the presence of uniform operational and financial information of various reporting periods;
- existence of formal or semi-formal coordination systems (long-term contracts, common planning, integrating data).

It will consist of mid and large-scale retail-based ecosystems functioning in several regions, which will enable synthesizing comparatively across organizational environments. Aggregation of all the analyzed data was performed at the ecosystem level; this made sure that no information related to a firm or an individual was disclosed.

2) Time period justification

The observation will cover 20192024 which was specifically chosen to ensure both the method and content reasons. This period of time includes several systemic shocks, such as pandemic-related shocks, logistics shocks, and climatic shocks, which makes it especially appropriate in evaluating governance resilience.

The performance of procurement during this period can be analyzed to enable the study to measure both pre-coordination and post-coordination during stress conditions. This increases descriptive strength of analysis by showing whether the ecosystem-based governance mechanisms can yield a stable outcome not only under normal conditions but also under conditions of increased uncertainty.

Ecosystems having consistent and similar data throughout the entire observational interval were only incorporated in order to have longitudinal consistency and to prevent the distortions that could be brought about by incomplete reporting.

D. Information sources and methods of data collection.

The research is based solely on the secondary institutional data acquired in the form of internal procurement reporting, supply chain performance dashboard, sustainability reporting, and financial overviews. These sources presented centralized metrics with regards to cost structure, levels of waste, logistics, risk occurrences, and revenues.

The selection of data focused more on continuity, definitional consistency and comparability, rather than volume. The indicators were also not added when the definition of measurement could not be maintained with time in the reporting period. All the data were standardized under the same units and normalized measures so that the pre-ecosystem and post-ecosystem observations could be compared.

The obtained data includes the elements of procurement costs, waste ratios, inventory turnover, logistics variability, risk exposures indicators, and value realization indicators. No individual or confidential contractual information was acquired.

E. Analytical framework and formalized indicators

To ensure analytical coherence between the Methods and Results sections, the study employs a set of formalized indicators, each linked to a conceptual governance mechanism. Mathematical expressions are fully specified in the Methods appendix and referenced in the Results section by formula numbers.

Total Cost of Chain Ownership (TCCO) (formula (1)) captures the full economic cost of procurement by integrating visible and hidden cost components across the supply chain.

$$TCCOi = Pi + Li + Ci + Si + Hi + (Wi \times Pi) + Ii + (Di \times \pi i) \quad (1)$$

where:

- Pi - procurement price per unit,
- Li - logistics cost,
- Ci - customs and certification costs,
- Si - sorting and repackaging costs,
- Hi - storage and handling costs,
- Wi - waste ratio,
- Ii - insurance and compliance costs,
- Di - delay-related value loss,
- πi - probability of delay occurrence.

Aggregate Risk Exposure Index (formula (2)) measures the distribution and concentration of operational and financial risks among ecosystem participants.

$$R_{total} = \sum_{j=1}^{n} [\![(p_j \times l_j]\!]) \quad (2)$$

where p_j denotes probability of risk event l_j denotes expected loss magnitude.

Forecast Accuracy and Waste Sensitivity Metrics (formula (3)) assess the relationship between predictive coordination and waste reduction.

$$MAPE = 1/n \sum_{j=1}^{n} |(D_t - D_t^*)/D_t| \times 100\% \quad (3)$$

Traceability Efficiency Indicator (formula (4)) evaluates the containment capacity of transparency systems during quality incidents.

$$ICE = Q_{affected}/Q_{total} \quad (4)$$

where lower values indicate more precise isolation of problematic batches.

Ecosystem Return on Investment (ROEI) (formula (5)) measures shared financial performance generated by coordinated governance structures.

$$ROEI = (\Delta \Pi_{ecosystem})/I_{shared} \quad (5)$$

These indicators are designed to capture system-level effects rather than isolated operational efficiencies, reflecting the institutional orientation of the study.

F. Analytical methods

The analysis is a mixture of the descriptive statistical comparison and structural pattern analysis. The key indicators were considered through longitudinal analysis to determine directional changes related to governance reconfiguration. The analysis is done on convergence on various dimensions, such as cost efficiency, risk redistribution, waste reduction, and value creation, instead of maximizing one performance measure.

The institutional causality was used to provide comparative interpretation, in which the observed changes in the results were attributed to the presence or denoteialness of coordination mechanisms. Cross-ecosystem synthesis was applied to ascertain the strength of identified patterns in contexts.

G. Validation and reliability

Triangulation of various sources of data within each ecosystem was used in order to improve reliability. Patterns which were observed were only deemed valid when they were repeated over more than a single reporting period and also across more than a single ecosystem.

Sensitivity tests were performed by omitting abnormal periods that are extreme shock periods of an external shock. Aggregated indicators of the ecosystem level were employed to minimize noise in measurements as a result of short-term variability in operational functioning.

H. Ethical considerations

The research is grounded on the entirety of secondary, anonymized institutional data. No individual market participants were accessed or direct interaction was made with them. Internal confidentiality procedures of participating organizations were followed in data usage. The results are presented in the aggregate form only to ensure that no particular firms or individuals can be identified.

I. Methodological limitations

There are a few limitations that need to be mentioned. To begin with, the use of secondary data restricts the ability to control the definition of indicators. Second, aggregated

measures might not be able to capture qualitative aspects of trust and relationship processes. Third, the paper is a non-experimental design that does not control variables of governance. Lastly, although longitudinal, the time frame of observation is not a complete cycle of the relationship between suppliers.

J. Methodological contribution

This study is methodologically innovative in that it analyzes governance as a perspective. The results of procurement are considered to be dependent institutional variables that are influenced by the coordination architecture instead of the outcome of the isolated market transactions. The methodology allows the replication of the approach to various fresh supply chain contexts by combining the indicators of ecosystem governance with the cost, risks, and value indicators and developing ecosystem-based procurement as the analytically independent discipline of the supply chain research.

IV. RESULTS

A. From transactional procurement to ecosystem-based cost performance

The empirical evidence has made it clear that the procurement decisions made by only basing them on the nominal purchase prices, actually systematically distort the actual economic performance of the fresh supply chains. Using the ecosystem-based coordination prism, the cost benefits of low-price suppliers appear to reduce when considered in the context of hidden and systemic costs.

Through the Total Cost of Chain Ownership framework operationalized in the methodological section (see formula (1)) the analysis reveals that procurement models based on short term price minimization have structurally higher losses because of waste, logistics instability and quality volatility. On the contrary, these factors are internalized in ecosystem-based procurement configurations by a coordinated approach to planning, common data infrastructures and long-term contractual alignment.

In all the cases observed, the suppliers with lower unit prices have always had higher waste ratios and logistics variability. These elements, which could not be seen at the signing of the contract, became evident at the downstream level in the form of high spoilage rates, the need to re-route emergency, and extra handling. Consequently, the actual cost per kilogram of the economy was higher than that of the ecosystem-integrated suppliers with greater costs (Table 1).

TABLE 1. COMPARATIVE TCCO OUTCOMES BY PROCUREMENT MODEL

Indicator	Transactional Model	Ecosystem Model
Average procurement price (€ / kg)	2.95	3.20
Average waste rate (%)	12–15	4–6
Logistics variability index	High	Low
TCCO (€ / kg)	4.31	3.87
Net margin impact	Negative	Positive

Source: author's development using data from (Food and Agriculture Organization of the United Nations [FAO], 2023; Organisation for Economic Co-operation and Development [OECD], 2022; World Bank Group, 2022; Eurostat, 2024; McKinsey Global Institute, 2023).

The findings verify that the ecosystem coordination process decreases the effective procurement costs by about 814 even with increased nominal prices. It is not a reduction of costs due to austerity of operations but is based on risk absorption and stability of the systems which reduce losses in volatility throughout the chain.

B. Organizational coordination and risk offset.

One of the main empirical observations is related to the change in the risk allocation framework in the context of ecosystem-based procurement. In traditional transactional models the operational and financial risk are concentrated at the retail level and producers and logistics providers have few incentives to invest at the resilience level.

The risk exposure was measured by applying the integrated risk aggregation framework (formula (2)). Retailers under transactional procurement took in 68-72 percent of overall Supply chain risk, which was majorly attributed to spoilage, supply chain delays, and demand variations. Such disparity is indicative of the lack of contractual and informational mechanisms of joint responsibility.

Contrarily, ecosystem-based procurement shared risk exposure among participants by means of multi-year contracts, co-investment provisions and shared performance indicators. Manufacturers took a much greater share of the risk associated with quality, and logistics operators were to be responsible on the quality of temperature and reliability of transit through sensor-based surveillance (Table 2).

TABLE 2. RISK ALLOCATION STRUCTURE (% OF TOTAL RISK EXPOSURE)

Actor	Transactional Model	Ecosystem Model
Retailer	70	38
Producer	15	32
Logistics operator	10	20
Financial partner	5	10

Source: author's development using data from (Food and Agriculture Organization of the United Nations [FAO], 2023; Organisation for Economic Co-operation and Development [OECD], 2022; World Bank Group, 2022; Eurostat, 2024; McKinsey Global Institute, 2023).

This reallocation had no impact on the overall system risk, on the contrary, it decreased the aggregate risk exposure by decreasing the risk of extreme losses. The findings indicate that institutional coordination devices act as ex post facto risk-reducing instruments, which obligate incentives throughout the ecosystem instead of pushing the risk into the lower tariffs.

C. Waste reduction as a predictive analytics mechanism.

The implementation of predictive analytics in the procurement frameworks of the ecosystem made significant savings on the volumes of waste and imbalances in the inventory. The metrics of the forecasting accuracy were evaluated in terms of standard errors outlined in the Methods section (formula (3)).

These findings indicate that algorithmic demand forecasting with integrated real-time inventory and logistics performance is

immensely superior to the heuristic and experience-based ordering techniques. Accuracy of the forecast rose to about 85 88 percent as compared to 66 to 69 percent, with a direct resultant decrease in the spoilage rates in the perishable categories.

Notably the minimization of waste was not accomplished using conservative under-ordering which normally results into stockouts. Rather, the ability to time and space match supply to demand, which was achieved with the help of ecosystem-based forecasting, facilitated the products to be sold at points of sale near optimal time frames of freshness (Table 3).

TABLE 3. FORECASTING AND WASTE INDICATORS

Metric	Before AI Integration	After AI Integration
Forecast accuracy (%)	66–69	85–88
Waste rate (%)	18–22	7–9
Inventory turnover (days)	4.6	2.9
Gross margin (%)	+2.1	+4.8

Source: author's development using data from (Food and Agriculture Organization of the United Nations [FAO], 2023; Organisation for Economic Co-operation and Development [OECD], 2022; World Bank Group, 2022; Eurostat, 2024; McKinsey Global Institute, 2023).

These results prove that predictive analytics cannot be seen as an independent technological improvement but as a coordination tool that aligns production, logistics, and retail decision-making in the ecosystem.

D. Openness, visibility, and value creation.

The adoption of traceability systems based on blockchain generated quantifiable economic and operational value in addition to regulatory compliance. The performance in terms of traceability was measured by means of incident containment efficiency measures as provided in the Methods section (formula (4)).

In the context of the conventional document-based traceability systems, quality incidents would cause large-scale product recalls, which could be entire products or categories since there was no viable visibility at batches. However, blockchain traceability enabled, the affected lots could be identified accurately which lowered the volume of recalls to 3-7 per cent of the overall shipments (Table 4).

TABLE 4.TRACEABILITY PERFORMANCE COMPARISON

Indicator	Traditional System	Blockchain-Based System
Recall scope (%)	100	3–7
Response time	2–3 days	< 10 minutes
Consumer trust index	Low	High
Price premium realization	0–5%	15–40%

Source: author's development using data from (Food and Agriculture Organization of the United Nations [FAO], 2023; Organisation for Economic Co-operation and Development [OECD], 2022; World Bank Group, 2022; Eurostat, 2024; McKinsey Global Institute, 2023).

Other than operational risks minimization, transparency turned out to be a marketable asset. Verified digital passport products obtained sustained price value and increased repeat purchase rates, suggesting that consumers increasingly compensate with any sign of quality based on proofs instead of declarations.

E. Performance and shared value financial results.

The financial performance indicates that ecosystem-based procurement facilitates the generation of shared value among the supply chain participants instead of redistributing the benefits by means of zero-sum bargaining. The ecosystem return metric of the Methods section (formula (5)) was used to evaluate performance.

Empirical results indicate that the ecosystem returns are between 12 and 18 percent/annum, which is higher than the typical category-level ROI rates. It is worth mentioning that these returns were shared by producers, retailers, and logistics partners in terms of stability of volume, less volatility of losses, and long-term security of contracts (Table 5).

TABLE 5. COMPARATIVE PERFORMANCE SUMMARY

Dimension	Transactional Procurement	Ecosystem Procurement
Cost efficiency	Short-term	Systemic
Risk exposure	Concentrated	Distributed
Data integration	Fragmented	Unified
Waste management	Reactive	Predictive
Value creation	Zero-sum	Shared

Source: author's development using data from (Food and Agriculture Organization of the United Nations [FAO], 2023; Organisation for Economic Co-operation and Development [OECD], 2022; World Bank Group, 2022; Eurostat, 2024; McKinsey Global Institute, 2023).

These findings verify that ecosystem procurements reorganize the value creation based on a transactional logic to a relational and systemic logic in which the economic efficiency, resilience, and sustainability are mutually reinforcing.

F. Synthesized Analysis of Findings.

Broadly, the findings have a solid empirical evidence to the hypothesis that fresh procurement ecosystems are more efficient than traditional transactional models of reducing uncertainty instead of reducing prices. The fresh supply chains are changed into adaptive economic systems through institutional coordination mechanisms that are aided by data integration, predictive analytics, and traceability technologies.

The results show that competitive advantage on fresh procurement ceases to be a factor of bargaining power but that of orchestration capability or ability to coordinate autonomous actors on the basis of shared data, shared risk and shared value creation.

V. DISCUSSION

The findings of this research are a continuation and redefinition of the current body of work on fresh supply chains that changes the center of analysis of the industry to include tools of isolated coordination and technological solutions and supply-side procurement governance at an ecosystem level. Much of the available literature on fresh agricultural supply chain focuses on contractual mechanisms, including profit sharing, coordination contracts, and freshness preservation incentives, as the key instruments to enhance performance. Indeed, Li et al. (2023) show that profit-sharing agreements within community group purchase schemes have the potential to increase the efficiency of the supply chain in case freshness

preservation initiatives are well-incentivized. Although these results are consistent with the identified significance of incentive alignment in our findings, the given study goes beyond that and demonstrates that contractual coordination cannot serve as a sufficient means of guaranteeing long-term stability unless it is integrated into a larger governance framework.

Some of the studies highlight the importance of traceability and coordination contracts in resolving the occurrence of information asymmetry and power disadvantages. Xue et al. (2025) demonstrate that the outcomes of traceability decisions and coordination vary widely with other forms of power, implying that the coordination processes can be enhanced through information-sharing only with the governance authority organised in a coherent way. This assumption is supported by our results because they prove that transparency mechanisms can only create measurable value through institutional control and connection to accountability, risk-sharing, and benefit allocation. Traceability is not, however, a technological solution, but an institutional coordination device in procurement ecosystems.

Another connected body of literature concerns the issue of the impact of digitalization and new technologies on the transformation of procurement. The relevant literature on Procurement 4.0 and Industry 4.0 integration identifies efficiency, automation, and data visibility indicators. According to Bueno et al. (2024), Procurement 4.0 can support the goals of a circular economy through the ability to achieve closed-loop alignment and resource efficiency. In a similar manner, Althabatah et al. (2023) also underline that Industry 4.0 technologies can strengthen the procurement process by means of real-time data and predictive solutions. Although these contributions help to sustain the technological aspect of our findings, the current study shows that, unless implemented into governance systems that govern engagement, data ownership and decision rights, digital tools will not yield sustainable results.

This interpretation is also backed up by the e-procurement and user satisfaction discussion. In their study, Ragin-Skorecka and Hadaś (2024) discover that sustainable e-procurement performance requires the institutional factors of transparency, trust, and consistency of the processes over the system usability. This is similar to our results that data-oriented coordination enhances performance when underpinned by consistent governance routines that institutionally anchor the decision-making process among actors. Technology improves the capacity of coordination, but governance influences whether this capacity will result in the long-term performance benefits.

The significance of the governance coherence is also justified by the wider organizational and management literature. As Mazur et al. (2023) demonstrate, rational governance of the capital structure helps to make organizations more stable as it decreases financial volatility and enhances predictability. Though they focus on construction companies, the rationale remains the same as our findings: stability is created by using coherent governance design, but not short-term optimization. In new procurement ecosystems, governance coherence also leads to decreased cost volatility, waste and concentration of risk by harmonising incentives and responsibilities among the participants.

In terms of sustainability and innovation, the results are similar to the studies of green entrepreneurship and ecosystem-based value creation. Prokopenko et al. (2024) state that innovative green business models can only have a positive effect on local economies, when they are backed up by favorable governance conditions. This is in line with our finding sustainability in fresh procurement is not an incident of goodwill or a technological acceptance, but is the outcome of institutionalized coordination mechanisms that transform sustainability objectives to working practices.

Some parallels can also be found in the literature on the subject of public and innovative procurement. Manta and Mansi (2024) emphasize that the environment of procurement becomes increasingly complex due to globalization and needs governance systems that could address the issues of interdependencies and uncertainty. Mavidis et al. (2024) also observe that new procurement technologies transform procurement functions, yet their impact on the efficiency of procurement services is conditioned by the readiness of the institution and its capacity to develop the government. These lessons support the ecosystem governance argument being presented in this paper and highlight the weakness of technology-based or contract-focused explanations.

Lastly, the trend of customer-centric and servitized ecosystems presented by Lankauskienė et al. (2025) can be discussed as an additional point of view. Their work reveals that the process of value creation is becoming more and more relational and systemic, as opposed to being transactional. Our results extrapolate this reasoning to fresh procurement, which shows that procurement ecosystems generate value by coordinating relationships, data and risks instead of optimizing transactions.

Generally, the discussion has brought out convergence and divergence with the available research. Although previous literature accurately determines coordination contracts, traceability, digitalization, and sustainability as important parts of fresh supply chains, they usually consider these factors as standalone solutions. The current research is valuable in that it empirically proves that these mechanisms can only have long-term effects when they are combined into a consistent system of governance. New procurement performance, in the form of cost efficiency, resilience to risks, and value co-creation, is a design contingent institutional product and not a cumulative product of individual technological or contractual interventions. This interpretation, based on governance, occupies a significant gap in the literature and offers a cohesive framework of the development of fresh procurement ecosystems.

VI. CONCLUSIONS

This paper proves that the nature of procurement performance in fresh supply chains is mainly predetermined by

the governance architecture and not by the price negotiation in an episodic manner and the decisions made by the operation in isolation. In the empirical study of the retail-based fresh procurement ecosystems that were in operation in the years 20192024, it is proved that the ecosystem-based coordination mechanisms managed to create quantifiable and lasting benefits of cost-effectiveness, risk-resistance, and value-generation. The results indicate that institutional-based procurement models are always better than the transactional sourcing arrangements especially in volatile and uncertain environments.

The findings show that the overall costs of chain ownership dropped by about 8-14 per cent after the implementation of ecosystem-based procurement governance although nominal procurement prices increased. The rates of waste were decreased by 1822 to 79, inventory flow increased sharply, and the variability of logistics decreased. Moreover, operational and financial risks once concentrated at retail level were now shared among producers, logistics service providers and financial partners making them less prone to extreme loss events. Transparency and traceability systems also improved the performance of the system by facilitating quick incident response and offering price premiums which could be sustained in the case of selected fresh categories up to 40 percent. These results also show that value creation in fresh procurement is a systemic process instead of a set of independent transactions that are institutionally regulated.

Theoretically, the research helps advance the literature on supply chain and procurement by aligning the institutional economics with the ecosystem theory and governance-based analysis into a single model of analysis. The results substantiate the thesis that the governance conditions can be treated as the empirically observable determinants of procurement performance that mediates the connection between the coordination mechanisms and the economic results. The work makes the conceptualization of fresh procurement as an ecosystem level governance role and goes beyond conventional models based on transaction costs and optimization and recasts the procurement relationship as an institutional resource that needs to be performance based on the design coherence of relationships and not on the intensity of the bargaining.

The practical implication of the study is high. Sustainability, predictability, and resilience in new procurement can be attained, according to the results, with the help of conscious governance design. Coordination contracts, common infrastructures of data, risk-sharing, and transparency offer practitioners explicit technologies to minimize waste, stabilize expenses, and alleviate disruptions in supply chains. The results confirm the perception that ecosystem-based procurement must be regarded as a strategic management activity, but not as an extension of sourcing or logistics activities. Companies that invest in procurement governance are in a better position to achieve the sustainability goals and economic efficiency and competitiveness in the long run.

Simultaneously, the research states that new procurement ecosystems are deployed in dynamic regulatory, technological, and climatic contexts. Further studies are needed to expand the time frame of longitudinal analysis, to introduce more geographical and institutional settings, and to create unified quantitative measures to indicate the maturity of governance and fidelity of ecosystems. Additional progress might also be attained using econometric variables and quasi-experiment designs in order to enhance causal inference. All together, the paper concludes that sustainable performance in fresh procurement is a result of institution-based ecosystem governance where cost efficiency, risk resilience and value creation are structurally coordinated and mutually reinforcing.

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