*Jurnal Internasional Multidisiplin Ilmu, Vol. 1 No. 1 (2025): Oktober*

Jurnal Internasional Multidisiplin Ilmu (JIMI)
Published by: Yayasan Suwaib Amiruddin Foundation
Website : https://silatene.org/index.php/jimi

# Corn Supply Chain Management Optimization: Upstream-Downstream Integration Strategy And Sustainability Implementation

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**Article Info**

***Article history:***

Received: November 15, 2025
Revised: November 17, 2025
Accepted: November 19, 2025

***Keywords:***

Supply Chain, Agribusiness, Corn, Food Security, Inefficiency, Integration

**ABSTRACT**

Corn plays a strategic multidimensional role, not only as a food ingredient but also as animal feed and industrial raw materials. However, the corn supply chain in Indonesia still faces various complex challenges that lead to inefficiency, price fluctuations, and import dependence. This study aims to map and analyze the structure, performance, and key challenges in the Supply Chain Management (SCM) of corn agribusiness in Indonesia, and to formulate strengthening strategies to create an efficient, resilient, and sustainable supply chain. The study used a qualitative approach with a systematic literature review of scientific publications, government reports, and recent policy documents. The analysis shows that the corn supply chain involves many actors with a fragmented structure, ranging from farmers, collectors, wholesalers, the feed industry, and retailers. The main challenges identified are upstream (limited farmer access to quality inputs, low productivity, and climate vulnerability), midstream (supply chain dominance by middlemen, poor logistics and storage infrastructure, and high post-harvest losses), and downstream (extreme price fluctuations and dependence on the large-scale feed industry). Based on these findings, the proposed strengthening strategies are: (1) Vertical integration through the development of equitable core-plasma partnerships between industry and farmers; (2) Supply chain digitalization through e-marketplace platforms and *blockchain technology* for transparency; (3) Investment in and modernization of logistics infrastructure (silos, dryers, transportation); (4) Implementation of an effective Government Purchase Price Policy (HPP) and enforcement of trade regulations; and (5) Diversification of downstream markets towards the processed food industry and bioindustry. The integrated implementation of these strategies is expected to strengthen national food security, improve farmer welfare, and reduce dependence on imports.



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p-ISSN 20xx-53xx e-ISSN 27xx-34xx

**Introduction**

Corn ( *Zea mays L.* ) occupies the second strategic position in Indonesia after rice, and has gone beyond its function as a mere staple food. The urgency of corn can be understood from its fundamental dual role, encompassing aspects of food security, the animal feed industry, and national macroeconomic stability. As the third main source of carbohydrates after wheat and rice, corn is the backbone of food for more than 1.2 billion people, especially in Latin America and Sub-Saharan Africa. According to the FAO (Food and Agriculture Organization) in its "Food Outlook" 2023, global corn production in 2023/24 is projected to reach a record of more than 1.2 billion tons, surpassing rice and wheat. This production is crucial to meeting the needs of the global population, which is estimated to reach 9.7 billion people by 2050 (FAO, 2023) .

The most pressing issue for corn, particularly in a rapidly developing country like Indonesia, is its role as an irreplaceable raw material for animal feed. Approximately 60% to 70% of the total national corn requirement is allocated for animal feed, making it a key energy component in rations (Ministry of Agriculture, 2020) . Therefore, fluctuations in domestic corn prices directly affect the production costs of animal protein (chicken, eggs, milk). Rising corn prices can trigger higher feed prices, which ultimately can reduce livestock profitability and impact protein inflation.

Besides being used as animal feed, corn also plays a crucial role in supporting the national food diversification program to reduce dependence on rice. In several regions, particularly in Eastern Indonesia and Madura, corn remains an alternative staple food rich in carbohydrates, protein, fiber, and fat (Naisali et al., 2023) . The use of corn as a staple food helps distribute carbohydrate consumption, which indirectly supports efforts to improve nutrition and household food security against fluctuations in the supply of other commodities. In addition to direct consumption, corn is a raw material for the snack food industry , cornstarch, corn oil, and sweeteners , demonstrating significant economic potential in the downstream sector (Budiman, 2024) .

Despite its crucial role, the national corn agribusiness still faces a profound paradox. On the one hand, Indonesia has significant land and human resource potential for corn development. Data from the Central Statistics Agency (2023) indicates that the national corn harvest area reached 4.2 million hectares, with a production of approximately 21.5 million tons of dry corn kernels. However, on the other hand, the animal feed industry still frequently has to import corn to meet its raw material needs, with import volumes fluctuating but significant, for example, reaching over 1 million tons in 2022. This import dependence creates vulnerabilities in food security and leads to foreign exchange leakage. The periodic instability of domestic corn availability (both during harvest and lean seasons) has led to a dependency on imports. The government's massive corn self-sufficiency efforts demonstrate the urgency of achieving feed sovereignty to mitigate the risk of global price and supply volatility (Central Statistics Agency, 2025) .

The root of this paradox lies not solely in cultivation, but in systemic inefficiencies throughout the supply chain. The corn supply chain in Indonesia is characterized by a long, fragmented structure, dominated by powerful intermediaries (middlemen). This situation leads to a significant price disparity between the price received by farmers and the price paid by end consumers (industry). Furthermore, weaknesses in post-harvest infrastructure, such as drying and storage facilities , lead *to* significant post *-harvest losses* (Abdarah & Marsinah, 2024) . Extreme price fluctuations also often harm farmers during peak harvest times.

In this regard, *the Supply Chain Management (SCM) approach* is highly relevant for application. SCM, or Supply Chain Management (SCM), is defined as the strategic and systemic coordination of traditional business functions within a particular company and across businesses within the supply chain, with the aim of improving the long-term performance of each company and the supply chain as a whole (Min et al., 2019) . In the context of corn, a holistic SCM approach is needed to address dysfunctions in each link. Therefore, the efficiency and stability of SCM for corn commodities are absolute prerequisites for achieving national food and feed sovereignty.

Inefficiencies in the MRP for Corn stem from three main interrelated aspects: First, upstream (farmer production and finances), small-scale corn farmers face financial and structural challenges that weaken their position. Limited working capital forces farmers to rely on collectors or middlemen through debt-for-debt schemes or debt-for-debt contracts. This dependence binds farmers to sell their crops at predetermined prices, reducing their bargaining power (Agu et al., 2023) . This problem is exacerbated by the issue of dependence on subsidized fertilizer, which is often late or not delivered according to quota, hampering production optimization. Furthermore, vulnerability to climate change (drought or flooding) without adequate irrigation

systems and risk mitigation makes farmers highly vulnerable to crop failure, threatening initial supplies in the supply chain.

Second, the middle aspect is the post-harvest and logistics aspect **.** This is the This is a critical phase in corn production, where significant quality and volume losses occur. The majority of farmers harvest corn with high moisture content (above 25%), far exceeding industry standards (Ministry of Agriculture, 2020) . This occurs due to the lack of adequate collective drying infrastructure. Farmers are forced to rely on traditional drying methods that are slow, unhygienic, and vulnerable to rain, posing a serious risk of aflatoxin contamination that can lead to rejection by feed mills. This quality risk translates into significant price discounts for farmers. Furthermore, high logistics costs due to poor road infrastructure in production centers increase the marketing costs borne by intermediaries, ultimately reducing the purchase price at the farm level.

Third, downstream aspects include market structure and pricing. These downstream problems are rooted in a fragmented market structure and long distribution channels (Endang Siti Rahayu, 2013) . Corn passes through a series of intermediaries (village middlemen, collectors, and wholesalers) before reaching the feed industry or final markets. Each actor adds margins and costs, creating a wide price disparity between the purchase price from farmers and the selling price to end consumers. As a result, farmers' share of the final price is very low, indicating marketing inefficiency and low farmer welfare. Information asymmetry between farmers and intermediaries regarding transparent market prices further reinforces the dominance of intermediaries, placing farmers in a very weak bargaining position, and hindering reinvestment in better farming practices.

This research is designed with three main objectives oriented towards improving the performance of the national corn sector. The first objective is to comprehensively map the structure and characteristics of the corn agribusiness supply chain in Indonesia. By understanding the complex supply chain architecture, including the roles of each actor from small-scale farmers and collectors to large feed mills, the research can provide an empirical basis for understanding the level of fragmentation and integration in the corn distribution system. The second objective focuses on critical analysis, namely identifying the main challenges and inhibiting factors in each link in the chain. The research will examine specific issues at the upstream, midstream, and downstream levels. The final and most strategic objective is to formulate a strategy for strengthening effective and sustainable corn *Supply Chain Management* (SCM) to support national food security.

The expected contributions of this research are both substantive and practical. Academically, this research enriches the literature on SCM agribusiness in Indonesia with a specific case study on corn, which demands stringent quality management (moisture content). Practically, the results of this study provide practical policy recommendations aimed at two main parties. First, for the Government (Ministry of Agriculture), recommendations can include proposals for floor price policies, subsidies for collective drying infrastructure, and farmer-industry partnership programs. Second, for feed industry players (Feed Mills), these findings provide strategic guidance on the most efficient vertical integration model or contractual partnership to ensure a stable, high-quality, and sustainable corn supply, while simultaneously increasing the competitiveness of the national industry.

**Method**

This research method was systematically designed to achieve an in-depth and credible synthesis of corn Supply Chain Management (SCM) in Indonesia. The approach used was qualitative with the main method being a systematic literature *review* . The choice of this method is crucial because the research object is a complex system and has been widely discussed in various literatures, but requires consolidation of findings to formulate new integrated strategies (Snyder, 2019) . *The Systematic Literature Review* ensures that the resulting synthesis is comprehensive, unbiased, and can provide a critical view of the consensus and gaps ( *research gaps* ) between existing studies.

*A systematic literature review* is a rigorous and replicable literature review method that aims to identify, evaluate, and interpret all available research relevant to a specific research question. In this context, *a systematic literature review* serves as a framework to address the fragmented information on corn SCM scattered across various academic publications and policy reports.

The data and information for this research are sourced from credible secondary sources covering various dimensions of the supply chain: academic, policy, and statistical. The use of these multifaceted data sources aims to conduct robust data triangulation, ensuring that the findings are not only scientifically valid but also practically and policy-relevant. The data sources used are: 1) reliable scientific journal articles with a

p-ISSN 20xx-53xx e-ISSN 27xx-34xx

publication deadline of 2019-2024, deliberately selected to capture studies that reflect the latest dynamics, including the impact of self-sufficiency policies, post-harvest technology adoption, and global feed price trends. 2) official government and national agency reports that provide macro quantitative data and essential policy contextualization. Data from the Central Statistics Agency (BPS), reports from the Ministry of Agriculture (Kementan), and the National Food Agency (Bapanas) provide detailed information on fertilizer subsidy policies, self-sufficiency programs, and price stabilization efforts at the farm level. This data is crucial for assessing supply chain performance from a government perspective. 3) Official documents such as the Ministry of Agriculture's Strategic Plan (Renstra) and the Minister of Trade's Regulations or the Minister of Agriculture's Regulations regarding corn trading provide the legal basis and strategic direction that influence the behavior of supply chain actors. Analysis of policy documents allows researchers to understand how regulations facilitate or hinder the integration and efficiency of corn SCM. 4) Publications from international institutions, such as the FAO (Food and Agriculture Organization of the United Nations), USDA (US Department of Agriculture), and the World Bank, are used to obtain global comparisons and analyses of transnational issues to help place Indonesia's corn SCM challenges in a broader and more competitive perspective. The diverse and extensive data from the SLR are analyzed using qualitative analysis techniques adapted from (Miles et al., 2014) . The analyzed data are then presented in an organized and compressed format to facilitate conclusion drawing.

## Results and Discussion

### Mapping the Structure of the Corn Supply Chain in Indonesia

The structure of the corn supply chain in Indonesia is very complex and involves many actors. A mapping of this can be seen in Figure 1 below.

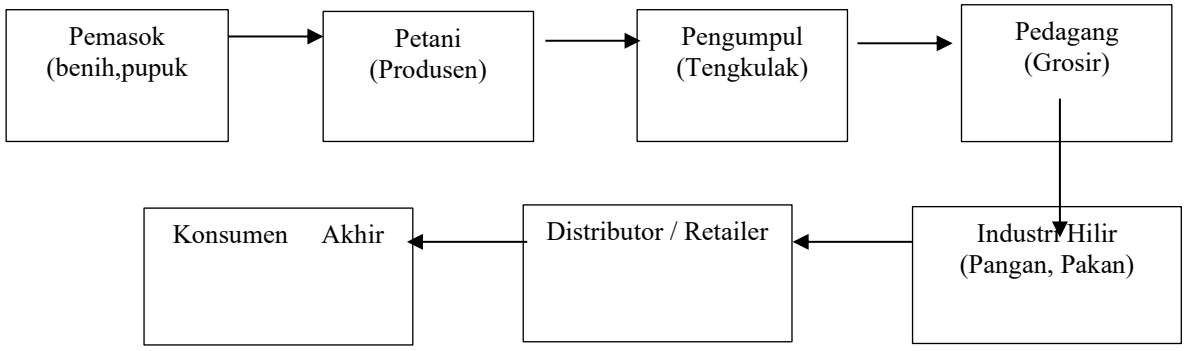


Figure 1. Corn Supply Chain Flow Diagram in Indonesia
(Source: Compiled from various sources, 2025 )

Figure 1 shows several possible channels. The most common, and often the least efficient, channel involves multiple intermediaries (collectors and wholesalers). Farmers, as primary producers, often have the weakest bargaining power in this structure.

### Challenge Analysis at Each Link in the Chain

Regarding the challenges faced in each segment of the supply chain, it must be acknowledged that the complexity of Corn SCM in Indonesia is an accumulation of obstacles that began at the earliest stages.

1. Challenges in the Upstream Chain (Farmer Level)

These challenges in the upstream chain form the foundation for problems that extend to the post-harvest stage and marketing, which include:

a. Access to Quality Inputs and Capital: Many corn farmers, especially those with small plots, struggle to access certified superior seeds, timely subsidized fertilizer, and business capital at reasonable interest rates. This impacts low productivity, with the national average remaining below 5

tons/hectare, despite the potential genetic potential of 8-10 tons/hectare (Directorate General of Food Crops, 2023).

b. Climate Forecast and Plant Pest Infestations (OPT): Climate change is causing erratic rainfall patterns, increasing the risk of drought or flooding. The recent introduction of pests such as *the armyworm* ( *Spodoptera frugiperda ) also poses a serious threat to production.*
c. Land Fragmentation: Narrow and scattered land ownership makes mechanization and the application of efficient cultivation technologies difficult, resulting in high production costs.

2. Challenges in the Middle Chain (Post-harvest and Marketing)

Once the product is successfully produced upstream, the main challenges shift to the physical and logistical management phase. These mid-chain challenges are critical because they determine the final product quality, impact farmers' profit margins, and directly contribute to substantial *post-harvest losses* . This is the phase where issues of quality and logistical efficiency are most apparent. Challenges in this phase include:

a. Dominance of Middlemen and Long Supply Chains: Middlemen are often the only marketing access for farmers. They offer convenience with cash payments and take over the drying risk. However, this traps farmers in a system of debt bondage and accepts suppressed prices. The length of the supply chain results in higher margins for end consumers.
b. Lack of Post-Harvest Infrastructure: This is a critical issue. The availability *of dryers* and *silos* is very limited. As a result, farmers are forced to sell fresh corn *at* low prices to middlemen immediately after harvest, or dry it traditionally, which is vulnerable to weather and contamination. Post -*harvest losses* result from improper harvesting, threshing, and drying methods (Abdarah & Marsinah, 2024) .
c. High Logistics Costs: Corn production centers (such as in NTT, NTB, and parts of Java) are often far from feed industry locations (such as in West Java and Banten). Poor road infrastructure and high transportation costs further exacerbate inefficiencies.

3. Challenges in the Downstream Chain (Industry and Market Level)

When corn products, having gone through production and post-harvest stages, enter the market for industrial absorption and distribution to end consumers, challenges in the downstream chain begin to dominate. The main obstacles in this phase are market and institutional issues, particularly regarding pricing, information transparency, and trade relations that often disadvantage farmers, despite corn being a vital raw material for large industries. Challenges in this phase include:

a. Quality and Quantity Gap: The animal feed industry requires corn with a maximum moisture content of 14% and free from fungal contamination (aflatoxin). Often, local corn supplies cannot meet these consistent quality and quantity standards, forcing the industry to import.
b. Extreme Price Fluctuations: During the peak harvest season, corn prices at the farm level plummet due to abundant supply without adequate storage capacity. Conversely, during *lean times* , prices skyrocket. This instability harms farmers and disrupts industrial production planning.
c. Dependence on the Feed Sector: The downstream corn market is still heavily dominated by the feed industry (>60%). Diversification into the processed food and bioindustry is still very limited, so when feed demand stagnates, the entire supply chain is impacted.

**Corn Supply Chain Management Strengthening Strategy**

Based on the identification of challenges above, the following are strategies that can be implemented to strengthen the national corn SCM.

1. Integration Vertical

Vertical integration is carried out through partnership equitable partnership model core - plasma between industry downstream ( for example , companies feed cattle big ) with group farmer need strengthened . In this model , the industry act as *off-taker* who guarantees purchase with agreed price , at the same time give mentoring technical And access towards quality inputs . Contract Farming Model with clear agreement And fair is the key . Government can facilitate And supervise partnership This For prevent exploitation by party core .

2. Supply Chain Digitalization

The Industrial Revolution 4.0 brings great opportunities to digitize the supply chain. Corn supply. Supply Chain Digitalization is the integration of advanced digital technology into all supply chain processes and functions, from planning and raw material procurement to production and delivery to end customers. The goal is to is create ecosystem chain transparent , responsive ( *agile* ) supply , and predictive .

Digitalization No just adoption *software* , but rather fundamental transformation that changes the operational model (Schwab, 2017) . In context agribusiness , digitalization very crucial For overcome challenge unique like volatility seasonal And problem quality easy product perishable goods . MRP digitalization *is* realized through implementation a number of technology main :

a. Integrated Information System (ERP & Cloud Computing): Ensures all actors (farmers, collectors, factories) use the same data ( *single source of truth* ) in *real-time* , eliminating information silos.
b. Internet of Things ( IoT ): Use of sensors in fields , warehouses , or transportation For monitor condition environment in a way *real-time* . In corn MRP , sensors can measure water content and temperature in the storage silo For prevent damage And contamination aflatoxin (Vignesh et al., 2025)
c. *Blockchain* : Providing book big digital that is not can immutable *ledger* for take notes every transaction And movement product . This allows traceability full ( *end-to-end traceability* ) of seeds in the field until feed in the factory , which is very important For issue *food safety* ( Food) Safe ) and certification (David et al., 2022) .
d. *Big Data* And Analytic Predictive : Processing large volumes of data For predict request market ( industry feed ), optimize route logistics , and estimate risk weather or fail harvest .
e. E-Marketplace Platforms: The development of digital platforms such as "Tani Hub" or "e-Panenn" can connect farmers directly with buyers (industry and retailers), eliminating the long chain of intermediaries. These platforms can also provide real-time price information.
f. Post-Harvest Service Application: Development of an application to order drying services ( *dryer* ) and transportation *on-demand* can optimize the use of existing infrastructure.

The specific application of digitalization makes a significant contribution to corn SCM:

a. Improvement Transparency Price : Digital applications allow farmer access price market latest at the level industry , reducing asymmetry information that has been This exploited by middleman ( middleman ). This can increase *farmer's share* .
b. Mitigation Risk Quality : Use of IoT sensors on tool dryer And warehouse ensure corn water content always below limit safe , in a way drastic reduce potential loss post - *harvest* losses and risk contamination aflatoxin .
c. Efficiency Logistics : Geospatial data analysis And *routing* AI- based optimization timetable pick-up And delivery corn , pressing cost transportation And reduce time Wait .

With adopt pillars this , SCM corn can transform from reactive system And prone to become a proactive , integrated , and efficient system capable ensure supply material standard quality tall in a way stable for industry feed national .

**3. Investment and Modernization of Logistics Infrastructure**

Investment and modernization of logistics infrastructure are fundamental pillars in strengthening and improving the efficiency of Supply Chain Management (SCM) for agribusiness commodities, particularly corn, in Indonesia. This investment goes beyond road construction alone, focusing on the development of physical facilities and the integration of technologies that directly address critical points (bottlenecks) in the supply chain.

The government and private sector need to invest massively in the development and modernization of post-harvest infrastructure such as:

a. Community-Scale Dryer Units: Building large-capacity *dryers at the sub-district or farmer group level can address the wet corn problem. Public-Private Partnership* ( PPP) funding can be implemented.
b. Storage Silos (Warehouses): Building *silos* or *warehouses* in production centers and near industrial areas will help stabilize supply and prices. A *Warehouse Receipt System* (WRS) can be implemented, allowing farmers to store their corn in warehouses and receive a receipt that can be used as collateral for bank loans.

c. Transportation Infrastructure Improvement: Improving access roads to production centers and optimizing logistics transportation can reduce distribution costs and damage to goods.

**4. Strengthening Farmer Institutions and Government Regulations**

Strengthening farmer institutions and government regulatory intervention are two crucial non-technical strategies to improve structural imbalances and economic justice in the SCM of Corn in Indonesia.

a. Strengthening Farmer Institutions

Institutional strengthening refers to increasing the role and capacity of farmer organizations, such as Farmer Groups (Poktan), Farmer Group Associations (Gapoktan), or Agricultural Cooperatives. The ultimate goal is to transform farmers from weak individual production units into strong collective business entities.

Table 1. Strengthening Farmer Institutions

| Strengthening Aspects | Mechanisms and Contributions to MRP |
|---|---|
| Increased Bargaining Position | Strong institutions can facilitate collective selling *in* large volumes. This increases farmers' bargaining power when dealing with wholesalers or feed mills, enabling them to negotiate higher selling prices and demand fairer payment terms. |
| Revitalization of Cooperatives/KUD | Farmer cooperatives need to be strengthened to become powerful aggregators, capable of collectively collecting, drying, storing, and selling. This will increase farmers' bargaining power. |
| Access to Credit and Input | Institutions act as guarantors or distributors for farmers to access bank credit or non-subsidized production inputs (high-yield seeds, fertilizer). This reduces farmers' dependence on middlemen and high-interest debt practices ( *ijon* ), which are the root cause of low *farmer's share* . |
| Post-Harvest Infrastructure Management | Institutions are ideal for collectively owning and managing expensive post-harvest facilities (e.g., *vertical dryers* and warehouses). Collective ownership allows for centralized quality standardization and aflatoxin risk mitigation (Ministry of Agriculture, 2020) . |

b. Government Regulation and Intervention

The role of government is very important in creating a fair market environment and bridging the interests of farmers with large industries.

Table 2. Strengthening Farmer Institutions

| Regulatory Aspects | Focus and Contribution to MRP |
|---|---|
| Determination of Reference Price ( *Floor Price* ) | The government must establish and implement a Government Purchase Price (HPP) or effective reference price ( *floor price* ) for corn. This regulation serves as a safety net for farmers, ensuring that selling prices do not fall below production costs during the peak harvest, thus ensuring farmers' income security. |
| Encouraging Contract Partnerships | The government needs to create regulations that require or provide strong incentives for the feed industry to establish long-term contractual partnerships with farmer organizations. These contracts should establish transparent quality standards (moisture content) and pricing, creating stable, functional vertical integration for both parties. |
| Trade and Quality Regulations | Strict regulations are needed regarding corn quality standards. The government must enforce strict oversight and sanctions on supply chain actors who violate these standards, forcing increased investment in post-harvest handling at all levels. |

| | |
|---|---|
| Public Infrastructure Investment | The government is responsible for investing in vital public infrastructure, such as improving road access from farms to logistics centers and providing easily accessible digital market information to farmers, reducing transaction costs and information asymmetry. |

In short, institutional strengthening empowers farmers from the bottom, while appropriate government regulation creates a structured and fair market ecosystem from the top, ensuring that Corn SCM can operate efficiently, fairly, and sustainably.

5. **Downstream Market Diversification**

Downstream Market Diversification is a crucial strategy in Corn SCM, aiming to reduce the dependence of domestic corn supply on a single user sector, the animal feed industry. This strategy is implemented by actively developing and supplying corn to market segments with varying quality and timing requirements, thereby mitigating demand volatility and increasing price stability at the farm level. The primary objective of this diversification is

a. Reducing the vulnerability of the supply chain to shocks or policies that only occur in one sector (for example, feed import policies or fluctuations in chicken/egg prices).
b. Opening access to market segments willing to pay premium prices for corn of a particular quality or characteristic (e.g., food corn versus feed corn).
c. Utilizing product qualities and characteristics where corn that does not meet the strict standards of the feed industry (for example, slightly higher moisture content or different kernel size) can still be channeled to other tolerant markets.

In the Indonesian context, diversification of the downstream corn market can be focused on three main segments:

a. The primary animal feed industry, which requires large volumes, stringent quality standards, and a consistent supply year-round, remains a key target segment, but requires careful balance.
b. The Food and Human Processing Industry (Secondary) requires corn with *food-grade quality standards* and specific varieties (e.g., sweet corn, corn for cornstarch, or *corn grits* ). This segment tends to have more stable demand and sometimes offers better purchase prices for certain superior varieties, providing an alternative income source for farmers.
c. The Energy and Chemical (Tertiary) industry requires corn as a raw material for bioethanol or starch-based chemical products. While still developing in Indonesia, this sector offers the potential for large-volume absorption, particularly of corn of a quality that might be rejected by the feed industry, thus helping to minimize *food loss* .

Implementing downstream market diversification requires robust information integration within the MRP. Digitization (such as through B2B agricultural *e-commerce platforms* ) can help connect farmer cooperatives directly with buyers in the food or energy sectors. Farmer cooperatives can function as quality sorting units, separating the best corn for the feed industry, while corn that meets *food-grade standards* is channeled to corn mills, ensuring that each crop reaches its optimal market destination.

Based on the identification of challenges and the development of strategies to strengthen the national corn SCM, the core-plasma partnership scheme is an ideal relationship model. Based on the Core-Plasma Partnership Scheme, it is a trading relationship model based on long-term contracts, where the Core Company (usually a feed industry or large processing industry) provides market certainty and technical support, while Plasma Farmers (individual farmers or Cooperatives/Farmer Groups) serve as the main raw material suppliers. This scheme is considered ideal because it effectively addresses three core problems of corn MRP: market certainty, quality, and farmer capital.

Figure 2. Schematic Diagram of an Ideal Core-Plasma Partnership

## Conclusion and Recommendations

### Conclusion

The corn supply chain in Indonesia is characterized by a fragmented and lengthy structure, where the dominance of intermediary actors, particularly middlemen, is the main cause of inefficiency and price disparities that harm farmers. These problems are systemic and interconnected at every stage: starting from the upstream, where farmers face constraints on productivity and access to inputs; continuing through the middle chain with challenges of minimal post-harvest infrastructure, logistical issues, and the continued dominance of intermediaries; and finally downstream, which is characterized by disparities in the quality of corn absorbed by the industry, price fluctuations, and dependence on the animal feed industry for supply. Therefore, an integrated and holistic *Supply Chain Management* (SCM) approach is needed as a strategic solution to synergize all actors and activities from upstream to downstream, in order to create a corn supply chain that is efficient, equitable, and supports national food security.

### Recommendation

Optimizing the corn supply chain requires strategic coordination among all stakeholders. The government must take a proactive role by strengthening the role of Bulog and Cooperatives as price stabilizers through market operations and the Receipt-Based Warehouse system. Furthermore, the government needs to encourage investment in post-harvest infrastructure (such as *dryers* and silos) through the Public-Private Partnership (PPP) scheme, as well as formulate regulations that support equitable partnerships and facilitate the adoption of digital technology for price transparency. It is also crucial for the government to promote diversification of downstream corn products beyond feed through support for SMEs. On the business (industry) side, it is imperative to develop sustainable partnerships with farmer groups, invest in processing and logistics technology for efficiency, and boldly open new markets for corn-derived products. Finally, farmers and associations must take the initiative to strengthen institutions to increase economies of scale and bargaining power, implement Good Agricultural Practices (GAP) for high quality standards, and be open to the adoption of modern technologies and partnership schemes. With the coordinated implementation of these strategies and recommendations, it is hoped that the Indonesian corn supply chain can become more efficient, resilient, and sustainable, thereby supporting national food security and improving farmer welfare.

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