



Garlic Import Dependence and Farmers' Persistence in Indonesia: Evidence from Garlic Farmers in Temanggung Regency

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Abstract

Indonesia relies heavily on garlic imports, while farmers in established production areas continue cultivating the crop. This study examines national import dependence and farmers' perceptions and cultivation intentions in Temanggung Regency. A descriptive approach combined national production, import, and requirement data for 2014–2023 with a structured questionnaire administered in person to 104 active garlic farmers from five groups in Petarangan Village in June 2026. National data were summarized using the Domestic Fulfillment Ratio (DFR) and Import Dependency Ratio (IDR); questionnaire responses were analyzed using frequencies and percentages. DFR ranged from 3.35% to 15.86%, and IDR from 84.18% to 96.71%. Among respondents, 81.7% perceived lower-priced imports as depressing local prices and margins, yet 94.2% intended to continue cultivating garlic. Meanwhile, 31.7% planned to diversify or rotate with other crops. These findings establish that perceived competitive pressure and intended continuation coexist, while diversification can accompany continued garlic cultivation. The study links national supply dependence to local cultivation intentions; however, it does not identify the causal mechanisms of persistence. The findings support examining productivity, quality seed, market certainty, and institutional support together when designing policies for domestic garlic production.

Keywords *Garlic Farming; Import Dependence; Farmer Persistence; Cultivation Decisions; Behavioral Agricultural Economics*

INTRODUCTION

Garlic is a strategically important horticultural commodity in Indonesia, yet domestic production remains insufficient to meet national requirements. Consequently, Indonesia has developed a persistent dependence on imported garlic, particularly from China (Badan Pusat Statistik Indonesia, 2024; FAO, 2026; Krugman et al., 2021). This condition poses an important challenge for food sovereignty because domestic farmers operate in a market increasingly shaped by international supply chains, economies of scale, and competition from lower-priced imports.

From the perspective of conventional economic theory, sustained competition from lower-cost imports should reduce incentives for domestic producers with relatively high production costs. Market competition is expected to encourage less competitive producers to improve efficiency or shift toward alternative commodities. In the agricultural sector, however, farmer decision-making is not always determined exclusively by short-term profit maximization. Decisions to continue or discontinue a particular crop may also be influenced by risk perceptions, farming experience, access to resources, social norms, and established production practices (Hayden et al., 2021).

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The Indonesian garlic sector presents an apparent paradox. Despite the continuing presence of imported garlic and the resulting pressure on domestic competitiveness, farmers in major production areas continue to cultivate garlic. Previous studies have examined garlic import dependency, trade policy, supply-demand dynamics, and the competitiveness of domestic garlic production ([Adila et al., 2022](#); [Adila et al., 2023](#); [Septiana et al., 2022](#); [Maharani et al., 2024](#)).

However, the literature has paid relatively little attention to farm-level responses to persistent import competition. In particular, why farmers continue cultivating garlic despite weak price competitiveness requires further examination. This study addresses this issue by combining national-level analysis of garlic supply and import dependence with farm-level evidence on farmers' perceptions and cultivation intentions. The study focuses on garlic farmers' persistence in Temanggung Regency and interprets their decisions through a behavioral agricultural economics perspective. This study contributes by highlighting the farmer persistence paradox: although imported garlic is perceived as exerting downward pressure on local prices and profit margins, a large proportion of farmers continue to cultivate garlic while also adopting diversification strategies.

Accordingly, this study has three objectives. First, it examines the structural gap between national garlic requirements and domestic production during 2014–2023 using the Domestic Fulfillment Ratio and Import Dependency Ratio. Second, it synthesizes evidence on how trade liberalization and import competition affect the competitiveness of domestic garlic farming. Third, it describes farmers' perceptions and cultivation intentions based on survey evidence from Petarangan Village, Temanggung Regency.

LITERATURE REVIEW

Import Dependence and the Transmission of Competitive Pressure

National import dependence describes a supply structure, not the viability of every domestic farm. [Feryanto et al. \(2022\)](#) emphasize interconnected production and market constraints, while [Maharani et al. \(2024\)](#) document Indonesia's position as an import-dependent garlic market. Together, these studies establish the scale of the supply problem but leave open whether particular producers retain profitable market opportunities. A high import share should therefore motivate investigation of local incentives rather than serve as evidence that all domestic cultivation is unsustainable.

Trade-policy studies clarify how competitive pressure develops. [Adila et al. \(2022\)](#) examine policies and determinants of garlic imports from China, [Yovirizka and Haryanto \(2020\)](#) distinguish short- and long-run import-demand relationships, including relative prices and the production–consumption ratio, and [Adila et al. \(2023\)](#) model supply–demand dynamics. Imports, domestic supply, and prices thus interact over time, so identifying effects on farmers requires tracing how market changes reach their selling prices, costs, and expectations.

Broader evidence indicates that trade integration produces heterogeneous agricultural outcomes ([Akhmadi & Lee, 2025](#); [Nugroho et al., 2024](#)). Although these studies concern export performance and producer prices rather than garlic cultivation, they question a uniform effect of liberalization across commodities and institutional settings. They do not, however, establish psychological costs or explain individual farmers' persistence.

Competitiveness and the Economic Meaning of Persistence

Evidence on competitiveness complicates the expectation of widespread withdrawal. [Septiana et al. \(2022\)](#) conclude that Indonesian garlic production is generally uncompetitive and identify productivity as a central determinant, whereas [Yusuf et al. \(2025\)](#) distinguish weak competitive advantage from stronger comparative advantage and report differences across

production centers. These findings need not conflict, because location, production conditions, and the valuation of inputs and outputs shape competitiveness assessments. National import dominance can therefore coexist with locally viable cultivation.

Where prices are observed in the value chain also matters. [Arzia and Riyanto \(2023\)](#) analyze retail garlic prices, which cannot directly quantify farm-gate margins. Lower output prices may reduce returns without making them negative, while alternative crops may entail different costs and risks. Persistence must therefore be evaluated against feasible alternatives, not simply against cheaper imports, so perceived pressure is not automatically evidence of irrational cultivation.

Policy Implementation and Production Constraints

Production incentives also depend on whether policies address the constraints farmers actually face. [Sayaka et al. \(2021\)](#) examine the implementation of importer planting obligations, while [Puspitasari et al. \(2024\)](#) link production sustainability to interacting market and policy conditions. Together, they imply that an obligation to expand cultivation does not itself resolve seed, productivity, or marketing constraints; policy implementation and the ability to sell domestic output are part of the same production problem.

The system-dynamics assessment by [Feryanto et al. \(2025\)](#) further highlights the investment and coordination required for self-sufficiency, distinguishing increased planted area from production that farmers find worthwhile. Temporary participation can satisfy an expansion target without demonstrating durable competitiveness, whereas continued cultivation may reflect adjustment within existing constraints rather than their resolution. Persistence is thus an outcome to explain, not a sufficient measure of policy success.

Behavioral Interpretation and the Research Gap

A behavioral perspective complements this economic account. Farmer sensemaking emphasizes how experience and context shape decisions ([Hayden et al., 2021](#)), while [Wuepper et al. \(2023\)](#) incorporate beliefs, values, norms, and emotions into agricultural economic analysis. Similar market pressure may therefore generate different responses, although experience-based decisions may still be economically reasonable; invoking behavioral influences neither establishes bias nor excludes profitability. These perspectives also support interpreting diversification as adjustment rather than withdrawal, since retaining garlic while adding or rotating crops may preserve existing knowledge and spread exposure across income sources. This remains a conceptual interpretation: stated continuation, planned diversification, and realized planting are distinct outcomes.

The profitability analysis of [Yusuf et al. \(2025\)](#) and the systems perspective of [Puspitasari et al. \(2024\)](#) suggest two competing interpretations of persistence. Farmers may retain garlic because it remains attractive within their crop portfolio, or because switching requires resources and market access they lack. Distinguishing opportunity from constraint matters for policy, because improving garlic returns addresses a different problem from expanding feasible alternatives, and a continuation percentage alone cannot determine which intervention is appropriate.

The national trade perspective of [Maharani et al. \(2024\)](#) and the behavioral approach of [Wuepper et al. \(2023\)](#) operate at different levels of analysis. The gap addressed here concerns how national dependence relates to local perceptions and cultivation plans without assuming that aggregate trade patterns determine household choices. This study connects those levels descriptively by examining perceived import pressure, intended continuation, and planned diversification together; distinguishing profitability, constrained alternatives, and behavioral mechanisms requires evidence beyond intentions.

RESEARCH METHOD

This descriptive study combined national supply indicators, empirical literature, and a cross-sectional farm survey to address the three research objectives. The survey took place in June 2026 in Petarangan Village, Kledung Sub-district, Temanggung Regency. The site was purposively selected for its established garlic production, suitable agroclimatic conditions, and continuing farmer-group activity. This focus on established production centers aligns with the site-selection rationale of Yusuf et al. (2025).

Respondents were 104 active garlic farmers registered in five local farmer groups. The unit of analysis was the household head responsible for cultivation decisions. These criteria provided direct knowledge of production and future cropping plans. The researchers collected primary data using a structured questionnaire administered in person. The sample represents participating active growers; the study does not claim probability sampling or population representativeness.

Data Analysis

The researchers coded responses and summarized them as frequencies and percentages, using 104 respondents as the denominator for each item. Items covered perceived effects of lower-priced imports on farm-gate prices and margins, intention to continue garlic cultivation, and planned diversification or rotation. They were analyzed independently and were not mutually exclusive; “other response” was not equated with an intention to exit.

Annual production, imports, and requirements for 2014–2023 were compiled from Statistics Indonesia, the Ministry of Agriculture, the Ministry of Trade, and the National Food Agency (Kementerian Perdagangan Republik Indonesia, 2023). The indicators were:

$$\text{DFR} = (\text{Domestic Production} / \text{Domestic Requirement}) \times 100$$

$$\text{IDR} = [\text{Import Volume} / (\text{Domestic Production} + \text{Import Volume})] \times 100$$

Where DFR measures production relative to requirements; IDR measures imports within production plus imports, without adjusting for exports, stocks, or losses. Their different denominators prevent treating them as complements. The historical national series contextualizes the 2026 survey. The literature supports an interpretation of competitiveness and persistence, rather than a causal test of import effects or behavioral mechanisms.

FINDINGS AND DISCUSSION

Structural Supply Gap and Import Dependence

Indonesia's dependence on imported garlic originates from a persistent structural gap between domestic production and national requirements. Although domestic production increased temporarily in several years, it remained substantially below national demand throughout 2014–2023. As shown in Table 1, the Domestic Fulfillment Ratio remained low, ranging from 3.35% to 15.86%.

Table 1. Domestic Production, Imports, Domestic Requirements, and Import Dependency Ratio of Garlic in Indonesia, 2014–2023

Year	Domestic Production (Tonnes)	Import (Tonnes)	Domestic Requirement (Tonnes)	Domestic Fulfillment Ratio /DFR (%)	Import Dependency Ratio / IDR (%)
2014	16,399	482,200	490,000	3.35	96.71
2015	20,295	480,100	500,000	4.06	95.94
2016	21,150	444,300	480,000	4.41	95.45

Year	Domestic Production (Tonnes)	Import (Tonnes)	Domestic Requirement (Tonnes)	Domestic Fulfillment Ratio /DFR (%)	Import Dependency Ratio / IDR (%)
2017	19,510	552,800	540,000	3.61	96.58
2018	39,300	582,700	580,000	6.78	93.68
2019	88,816	472,900	560,000	15.86	84.18
2020	81,805	589,200	620,000	13.19	87.81
2021	45,093	607,500	640,000	7.05	93.09
2022	30,194	574,200	650,000	4.65	95.01
2023	22,870	561,900	660,000	3.47	96.09

Source: Processed from BPS, National Food Agency, [Ministry of Agriculture \(2024\)](#) data

The results demonstrate persistent import dependence. The Import Dependency Ratio ranged from 84.18% to 96.71%, indicating that imported garlic remained the dominant source of national availability throughout the study period. The structural gap therefore represents the primary condition underlying Indonesia's continued engagement with the international garlic market.

Previous studies have similarly identified domestic production constraints as a major obstacle to reducing import dependence. [Feryanto et al. \(2022\)](#) reported that domestic production could meet only a small proportion of national garlic requirements. [Maharani et al. \(2024\)](#) also showed that Indonesia remains structurally positioned as an importing country with high import dependency. [Puspitasari et al. \(2024\)](#) studied garlic using a systems thinking approach and found that the government should prioritize market penetration for local garlic and consistently enforce import restrictions to ensure the sustainability of domestic production.

The supply-demand imbalance means that imports function not merely as a supplementary source of garlic but as a major component of national availability. This dependence, however, has important consequences for domestic producers because lower-priced imports influence domestic market conditions and the competitive environment local farmers face.

Imports Competition and Local Garlic Farming

Trade policy plays an important role in shaping the flow of imported garlic into Indonesia. On the tariff side, previous studies show that tariff reductions associated with trade liberalization have contributed to increased imports of garlic from China ([Adila et al., 2023](#); [Yovirizka & Haryanto, 2020](#)).

On the non-tariff side, the government has implemented policies requiring importers to participate in domestic garlic planting. However, implementing this policy has faced challenges and has not substantially eliminated the structural production gap ([Sayaka et al., 2021](#)).

Import expansion affects domestic farmers primarily through market competition. Studies on Indonesian garlic competitiveness have identified differences in production costs and efficiency as key factors behind domestic garlic's relatively weak competitive position ([Septiana et al., 2022](#)). When imported garlic is available at lower prices, domestic producers face pressure to compete in a market where their production costs may be comparatively high. Low-priced imports depress domestic farm-gate prices and weaken local farming's competitiveness ([Arzia & Riyanto, 2023](#); [Yusuf et al., 2025](#)).

Farmers' perceptions reflect the consequences of import competition. As shown in Table 2, 81.7% of respondents stated that low-priced imported garlic depresses local prices and reduces farm profit margins.

Table 2. Farmers' Cultivation Intentions and Responses to Import Competition in Temanggung Regency (n=104)

No.	Survey item	Response category	n	Percentage (%)
1	Perceived effect of low-priced imported garlic on the local farm-gate price and profit margin	Depresses price and erodes margin	85	81.7
		Other response	19	18.3
2	Stated intention regarding garlic cultivation in the coming season	Continue cultivating garlic	98	94.2
		Other response	6	5.8
3	Plan to diversify into, or rotate with, other commodities (chili, tobacco, and other high-value vegetables)	Plans diversification or rotation	33	31.7
		Other response	71	68.3
Total respondents			104	100.0

Notes: The three survey items were analyzed independently and were not mutually exclusive. A farmer could intend to continue cultivating garlic while also planning to diversify or rotate garlic with other commodities.

The findings indicate that farmers are aware of the economic pressure created by imported products. Nevertheless, awareness of price pressure does not necessarily result in an immediate decision to abandon garlic cultivation.

The Farmer Persistence Paradox

The most notable finding of this study is the contrast between farmers' perceptions of import competition and their intention to continue cultivating garlic. Although 81.7% of respondents perceived imported garlic as depressing local prices and eroding profit margins, 94.2% stated that they intended to continue cultivating garlic.

This pattern represents a farmer persistence paradox. If cultivation decisions were based exclusively on short-term price and profit considerations, stronger import competition might be expected to result in widespread withdrawal from garlic production. The survey findings, however, indicate that farmers continue to cultivate garlic despite unfavorable market perceptions.

Nevertheless, a paradox emerges: despite a flood of garlic imports, most garlic farmers still choose to persist. This phenomenon suggests that farmers' decisions are not merely the outcome of short-term profit-and-loss calculations, but the result of a complex resilience mechanism. "Psychological costs" and strong adaptation mechanisms have emerged, and public institutions have begun to assume the role that market price signals should play (Akhmadi & Lee, 2025; Nugroho et al., 2024).

This persistence should not be interpreted solely as evidence of economic irrationality. Instead, it may reflect a broader combination of behavioral, economic, and production-related considerations. Farmers may continue cultivating a commodity because of accumulated farming experience, attachment to established agricultural practices, access to existing production resources, and the perceived costs and uncertainties associated with shifting completely to other commodities. These considerations are consistent with the broader perspective of behavioral agricultural economics, which recognizes that farmer decisions are shaped by more than immediate profit calculations (Wuepper et al., 2023).

Using self-saved seed may also reduce the immediate cash requirements associated with

garlic production. In addition, diversification provides a mechanism through which farmers can manage production and market risks. The survey results show that 31.7% of respondents planned to diversify or rotate garlic with other commodities, including chili, tobacco, and other high-value vegetables.

Diversification therefore appears to function as an adaptation strategy rather than as a complete withdrawal from garlic production. Farmers can maintain garlic cultivation while allocating part of their land, labor, and capital to commodities that may offer different income opportunities. This strategy may help explain why continuing garlic farming and diversifying are not mutually exclusive.

The findings suggest that farmer persistence is best understood as an adaptive response to uncertainty. Rather than making a binary decision between continuing and completely abandoning garlic, farmers may adjust their farming systems by combining crop diversification, crop rotation, and the continued use of existing production resources.

Policy Implications

The persistence of high import dependence suggests that a single policy intervention is unlikely to resolve the structural constraints facing domestic garlic production. Policies that focus exclusively on restricting imports or imposing planting obligations on importers may not be sufficient if domestic production constraints remain unresolved. [Feryanto et al. \(2025\)](#) found that a garlic self-sufficiency program may not be feasible because it requires substantial investment and collaboration, so the government should focus on improving garlic productivity and lowering costs.

The findings point to the need for a more integrated strategy. First, domestic productivity needs to improve through technological development and better production practices. Second, farmers need better access to quality, certified seed. Third, market uncertainty should be reduced through stronger institutional arrangements that provide greater certainty regarding the absorption and marketing of domestic garlic.

Institutional support matters because farmers operate within a broader production and market environment. Improved extension services, access to inputs, market information, and marketing institutions may strengthen farmers' capacity to remain competitive while reducing their dependence on uncertain market conditions. A more comprehensive policy approach should therefore combine productivity improvement, seed development, market certainty, and institutional strengthening. Such an approach would address both the structural causes of import dependence and the farm-level constraints faced by domestic garlic producers.

CONCLUSIONS

Indonesia's dependence on imported garlic stems from a persistent structural gap between domestic production and national requirements. During 2014–2023, the Import Dependency Ratio ranged from 84.18% to 96.71%, demonstrating the dominant role of imported garlic in national availability. At the farm level, most respondents perceived low-priced imported garlic as exerting downward pressure on local prices and reducing profit margins. Nevertheless, most surveyed farmers stated their intention to continue cultivating garlic. This finding reveals a farmer persistence paradox in which cultivation decisions cannot be explained solely by short-term price and profit considerations. Continued garlic cultivation appears to reflect a combination of adaptation strategies and established farming practices. Diversification into other commodities, the continued use of self-saved seed, accumulated farming experience, and attachment to existing agricultural practices may enable farmers to remain engaged in garlic production despite competitive pressure. The findings imply that reducing Indonesia's dependence on garlic imports requires more than a single trade or production policy. A more integrated strategy is needed to

improve domestic productivity, strengthen access to quality seed, reduce market uncertainty, and enhance institutional support for farmers.

LIMITATIONS & FURTHER RESEARCH

The survey covers active growers in five groups in one village, excluding farmers who had already exited; continuation intentions may therefore overstate persistence across the wider farming population. The absence of a documented probability-selection procedure also limits generalization. Reported intentions are not observed planting decisions, and perceived price pressure is not measured profitability. National data end in 2023, whereas the survey was conducted in 2026, preventing contemporaneous attribution. Without household cost–return data, comparison groups, or direct behavioral measures, the proposed roles of psychological costs, self-saved seed, traditions, and institutions remain interpretations rather than tested explanations. Longitudinal research including former growers and alternative-crop returns is needed to distinguish economic incentives from behavioral mechanisms.

Further research should examine farmer persistence using more detailed behavioral and economic indicators, including risk preferences, profitability, household income diversification, production costs, market access, and institutional participation. Such analysis would provide a stronger empirical basis for testing the mechanisms underlying farmers' cultivation decisions under persistent import competition.

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