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Angkasa Jurnal Ilmiah Bidang Teknologi
ISSN : 2085-9503 (Print)
ISSN : 2581-1355 (On Line)
Accredited Third Grade by Kemenristekdikti, Decree No: 10/C/C3/DT.05.00/2025
DOI : 10.28989/angkasa.v17i2.3087

A Systematic Review of Key Factors Influencing Farmers' Economic Well-Being in the Rice Supply Chain

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Article Info

Article history:

Received June 18, 2025
Accepted October 25, 20225
Published November 20, 2025

Keywords:

Rice Supply Chain
Supply Chain Equality
Farmer
Financial Resilience

ABSTRACT

The economic well-being of farmers in Indonesia's rice supply chain is influenced by multiple structural and systemic challenges. This study conducts a systematic literature review (SLR) by analyzing 56 articles from 10 different countries published in the last six years to identify key factors impacting farmers' financial resilience and sustainability. Findings highlight significant price volatility, limited market access, high production costs, and dependency on intermediaries, which collectively hinder economic stability. Additional challenges include inadequate government support, technological gaps, climate-related risks, and inefficiencies in supply chain management. Addressing these issues requires integrated policy interventions, improved infrastructure, and cooperative strategies to enhance farmers' livelihoods and promote a more equitable rice supply chain.

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1. INTRODUCTION

Rice farming in Indonesia is spread across various regions, with differing levels of productivity and product quality [1]. Consequently, there is significant variation in demand based on the types of rice, while production locations are unevenly distributed. Currently, various challenges exist within the context of the rice supply chain in Indonesia, one of which is faced by the farmers.

The challenges faced by farmers within the rice supply chain highlight the critical need for research focused on enhancing their economic well-being. A significant issue is the volatility of rice prices, driven by imbalances in supply and demand and the limited capacity of farmers to store their harvests over the long term. This price volatility results in unpredictable incomes, particularly for smallholder farmers who rely heavily on their agricultural yields for sustenance [2]. Furthermore, many farmers struggle with limited access to broader markets and accurate information regarding prices and agricultural technology, hindering their ability to secure fair prices and improve productivity [3]. The high costs of production inputs, such as fertilizers and seeds, coupled with restricted access to essential resources like credit and modern technology, exacerbate the economic vulnerability of these farmers [4]. Additionally, the instability of weather patterns, fuelled by climate change, poses a significant threat to crop yields and farmer income [5]. Compounding these issues, the distribution of value within the supply chain is often inequitable, with intermediaries and other market actors capturing a disproportionate share of the value added, leaving farmers with minimal returns [6]

Consequently, there is an urgent need to investigate the structural and systemic factors that impact farmers' economic sustainability, aiming to develop strategies and policies that promote a more equitable and resilient supply chain. This research aims to systematically analyse the underlying factors that significantly impact the economic

resilience and sustainability of farmers within the rice supply chain. By identifying these key drivers, the study seeks to provide a foundation for developing strategies and policies that can enhance farmers' livelihoods and promote a more equitable and sustainable agricultural system.

2. METHODOLOGY

A Systematic Literature Review (SLR) is a structured and transparent approach to searching and analysing existing research in order to identify and synthesize the challenges related to farmer well-being and the rice supply chain [7]. SLR) can help clarify the existing knowledge or gaps regarding inhibiting factors and serve as a basis for future research. This study followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines in its methodology [8]. Figure 1. illustrates the process followed for the Systematic Literature Review (SLR) in this study.

The keywords “rice supply chain” AND “farmers’ economic well-being” were employed to retrieve relevant literature from the Scopus and ScienceDirect databases. Duplicate entries were excluded from the dataset. Abstracts of the selected articles were manually reviewed to ensure they met the eligibility criteria, focusing on empirical studies. This process resulted in the identification of 61 articles. A profile analysis was then performed, during which key factors discussed in the studies were systematically recorded and analysed.

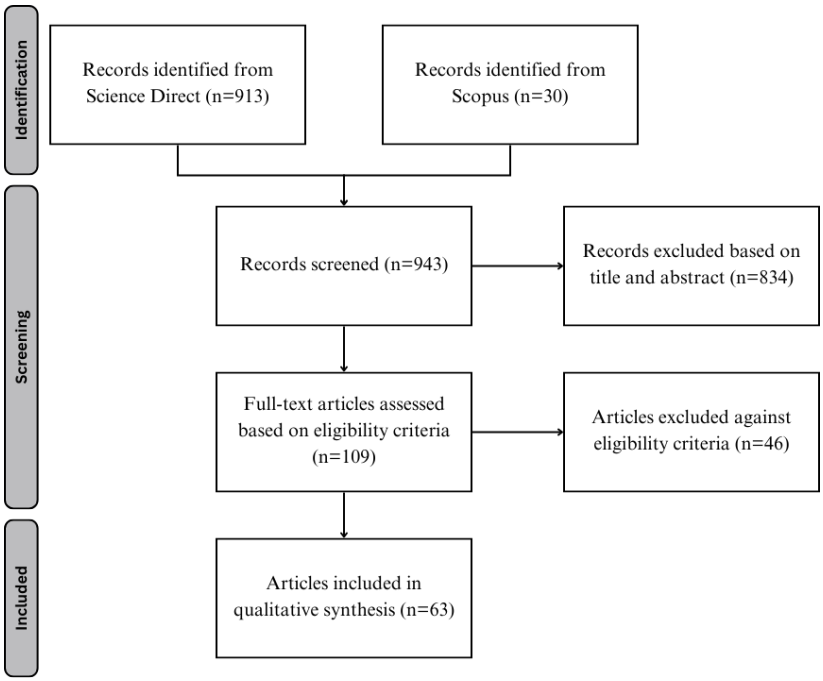

Figure 1. SLR Stages Applied in the Present Study

3. RESULT AND ANALYSIS

3.1. Factor

Various studies on the rice supply chain have identified a number of key factors that affect the efficiency and sustainability of the system. These factors include aspects of government policy as well as the application of infrastructure and technology. Government interventions, such as price stabilization policies, import regulations, and access to funding programs, are still considered not optimal in supporting farmers' welfare and the sustainability of the supply chain. On the other hand, the application of appropriate technology, crop management, and farmers' ability to increase the added value of products are also major challenges. The following table summarizes the key factors identified from various literature studies on the rice supply chain.

Table 1. Key Factors of Literature Studies on the Rice Supply Chain

No	Key Factors	Article Mentioned the Key Factors (Number of Articles)
A	Goverments	N = 18
1	Lack of government intervention in the rice supply chain	[9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21]
2	Limited price stabilization policies at the farm level	[19], [22]
3	Government policy on rice imports	[23], [24]
4	Lack of access to the goverment's People's Business Credit Program	[25]
B	Infrastructure and Technology	N = 27
1	Appropriate use of technology and Standard Operating Procedures (SOPs) in the rice supply chain	[24], [26], [27]
2	Farmers' ability to store grain, process grain into rice, and package the final product affects the value-added they earn	[27], [28]
3	Lack of facilities to cope with climate fluctuations and disasters	[11], [19]
4	Implementation of assistive technologies in the production system	[17], [22], [29], [30], [31]
5	Lack of access to information for farmers about rice price from the government	[32], [33], [34]
6	Lack of investment capital for rice drying equipment	[14], [35]
7	Farmers' improper practices in rice storage	[14]
8	Difficulty in accessing market inputs and outputs	[28], [36]
9	Inadequate facilities provided by the milling parties	[14], [37]
10	No unity of information standards between echelons	[23], [34], [38], [39], [40]
C	Economy and Markets	N = 38
1	Unstable selling price of rice	[9], [11], [14], [24], [28], [41]
2	Less extensive market reach	[10], [24], [42], [43]
3	Price monopolization by intermediaries	[32], [35], [44]
4	Marketing institutions' involvement in the distribution of rice	[32]
5	High labor costs	[45]
6	Instability of commodity price	[46]
7	Distributor demand and inflation	[47], [48]
8	Inability to access markets directly	[15], [28], [35], [40], [43], [49]
9	Lack of investment capital among farmers	[28], [35]
10	Low prices set by farmers	[47], [50]
11	Payments for rice by traders to farmers are determined at any time based on the market price	[37]
12	The existence of capital loans	[37]
13	Community demand	[51]
14	High production cost	[14], [40]
15	Pre-financial inputs for contract farmers	[14]
16	Insufficient rice field area	[18], [43], [46], [48]
D	Supply Chain	N = 26
1		[9], [21], [22], [24], [27], [52], [53], [54]
2	High transportation cost	][24]
3	Unequal power relations in the rice supply chain	[16], [24], [27]
4	Dependence on middlemen	[21], [28], [35], [51], [52]
5	Difficulty selling paddy to the market on time (minimal procurement coverage for the government agencies)	[16], [18]
6	Lead time for service and delivery of producer for export activities	[51]
7	Intermediaries between farmers and collectors	[20], [37], [39]
8	Uncertainty of shipment volume	[55]
9	No contract between millers and farmers	[14]
10	Farmers' excessive dependence on stakeholder	[56]
E	Production Process	N = 21
1	Lack of proper planning to ensure supply continuity	[9]

2	Rice product yield differentiation level	[24]
3	Sufficient agricultural land availability	[24], [43]
4	Inflation rate	[48]
5	Inconsistency in grain quality	[55]
6	Grain sold is in wet form	[35]
7	Lack of temperature and humidity management	[20], [57], [58]
8	Production quantity	[18], [31], [33], [46]
9	Crop failure	[59]
10	Low rice quality	[14], [40], [46], [58]
11	Rice loss and waste (RLW)	[60]
12	Labor shortages	[14]
F	Organization	N = 3
1	Lack of farmer groups's ability to negotiate prices	[9], [13], [43]
G	Natural Cause	N = 3
1	Climate change	[19], [24], [61]
H	Others	N = 5
1	Low levels of farmer education on agricultural processing	[32], [46]
2	Low human resource capacity	[40]
3	Proportion of production for farmers' household consumption	[31]
4	Uncertainty of rice stock data	[60]

3.2. Profile Analysis

Figure 2. Portrayed the trend of published articles discussing the rice supply chain's influence on the farmer's well-being. Although the trend is quite fluctuating, the basis and importance of this topic are unquestionable. The discussion about the topic has soared in 2021 along with the pandemic breakthrough, and over time has gotten less attention. However, with the current condition highlighted in the introduction, the continuity of the discussion is a necessity.

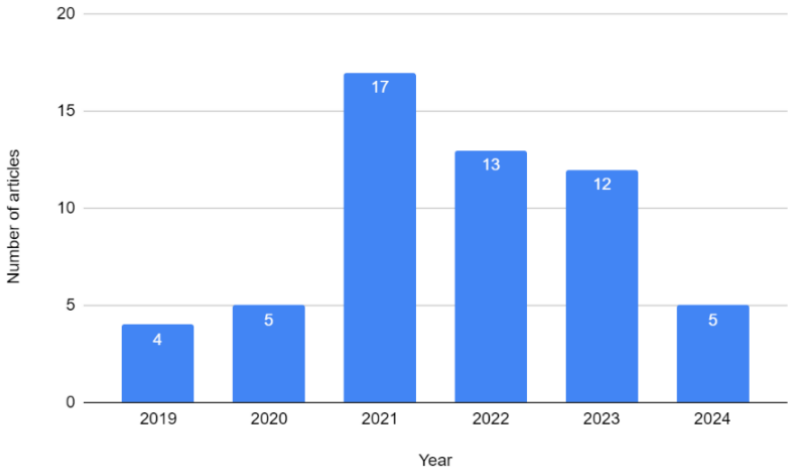

Figure 2. Number of Published Articles Regarding the Impact of Rice Supply Chain to the Farmer's Well-being

3.3. Discussion

The inefficiencies within the rice supply chain are predominantly driven by the excessive reliance on intermediaries, which are further exacerbated by the power imbalance between big collectors and small individual farmers. These intermediaries often extract significant portion of margins, while farmers are forced to accept low prices, resulting in reduced income and limited ability to improve production. This dependence on middlemen lengthens the distribution chain and inflates operational costs, directly contributing to increased transportation costs and longer lead times. Furthermore, the absence of formal contractual agreements between farmers and millers intensifies the uncertainty surrounding delivery schedules and supply volumes, hindering farmers' ability to meet market demand in a timely manner. Farmers' reliance on stakeholders and limited direct access to the market further weakens their position within the supply chain, worsening the issues of price instability and distribution inefficiency.

The presence of farmer groups was a way to organize cooperation and sales with several corresponding parties in the supply chain. This group could delegate and convey the aspirations of farmers as well playing the role of price determinator. They negotiate and make sure that the farmers get a reasonable price for their crops. Lack of bargaining skills might affect the income of the farmers. Additionally, the emerging climate change we face nowadays has influenced the harvesting cycle, thus adding the risk for the fieldwork. It is unquestionably a concerning issue for the farmer as it raises the threat of crop failure brought by droughts, floods, etc. All of the factors above have significantly affected the farmer's well-being in the crucial rice supply chain. Not to mention that the availability of rice stock data in some countries is quite poor. Other human factors such as the low education level among farmers, the capacity of the agricultural workforce, and the self-consumption of harvests also contributed to the matter.

4. CONCLUSION

In conclusion, inefficiencies in the rice supply chain are deeply rooted in a complex interplay of factors, including overreliance on intermediaries, power imbalances, and the lack of formal agreements, all of which disproportionately disadvantage small farmers. These challenges result in reduced farmer income, inflated operational costs, and prolonged distribution times. Farmer groups, although a potential solution for improving bargaining power and ensuring fair pricing, are often hindered by limited skills and external pressures such as climate change, which exacerbates risks like crop failures. Additionally, poor rice stock data, low education levels, workforce limitations, and self-consumption of harvests further undermine the efficiency and resilience of the supply chain, collectively threatening farmers' well-being and the stability of rice production.

5. IMPLICATION

The inefficiencies in the rice supply chain have far-reaching implications for both farmers and the overall food security system. For farmers, the reliance on intermediaries and weak bargaining power perpetuates income inequality and limit their ability to invest in better farming practices or technologies, ultimately stagnating agricultural productivity. The absence of formal contracts and price instability creates uncertainty, discouraging long-term planning and sustainable development. On a larger scale, inflated operational costs and prolonged distribution times increase the cost of rice for consumers, potentially affecting affordability and accessibility, particularly in vulnerable communities. Additionally, the impacts of climate change and poor data availability on rice stocks pose significant risks to supply chain stability, leading to potential shortages or inefficiencies in responding to market demand. Addressing these issues requires integrated policy measures, investments in farmer education, better infrastructure, and the establishment of cooperative systems to empower farmers and enhance supply chain resilience.

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