

# Developing food security with sustainable agricultural land policies: A systematic review

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**Abstract.** This article analyses how Law No. 41/2009 on the Protection of Sustainable Food Agricultural Land (PLP2B) is applied in Indonesia. The PRISMA method was used to perform a systematic review of relevant literature from 2013 to 2023. The findings of the systematic study indicate Indonesia's growing recognition of sustainable food production and agricultural land protection. The majority of the research was conducted on Java Island, with the remaining conducted throughout Indonesia. The majority of the research was conducted on Java, with the remainder conducted throughout Indonesia. The systematic literature review also discovered a growing interest at various levels of government in addressing SFAL issues, with a focus on municipal and national policies. Policy implementation, environmental concerns, food security, and legal regulations are among the key problems addressed. Complex linkages between economic, ecological, and social issues, the need for a robust legislative framework, data quality, and stakeholder participation are among the hurdles of SFAL policy implementation. This article emphasizes the significance of a comprehensive policy approach, correct data, and stakeholder participation in order to achieve sustainable food production and PSFAL policy implementation. It provides viewpoints and insights on the problems of PSFAL policy implementation, as well as gaps for future study in this field to assist global food security while maintaining environmental sustainability.

## 1 Introduction

The world faces various challenges that are urgent to be resolved such as global population growth which is linear with an increase in food demand, changes in consumption trends, nutritional adequacy and quality, global climate change, land use conversion and limited availability of agricultural land so that the protection of agricultural land is needed [1,2]. In the middle of this complexity, the agricultural sector plays an important role in satisfying food needs and nutritional adequacy, but it must also be environmentally sustainable [3-5]. In recent decades, there has been an increase in urbanization, conversion of food crop agricultural land into residential and industrial zones, and land degradation caused by intensive agriculture, which has resulted in a decrease in agricultural land availability. The shrinking agricultural land has triggered concerns about Indonesia's ability to produce enough

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food. Therefore, the Government of Indonesia designed a policy of sustainable agriculture and protecting agricultural lands [6-8].

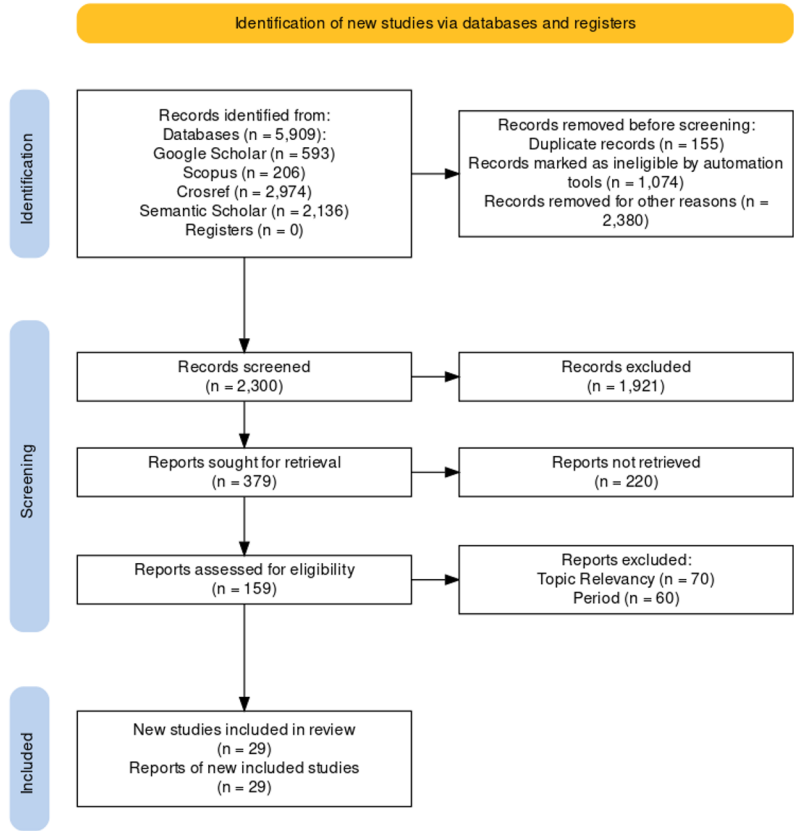
In the context of agricultural land protection, the Government has issued Law No. 41/2009 on the Protection of Sustainable Food Agricultural Land (PSFAL) to control land conversion and protect farmers' rights [9,10]. Several studies have examined the implementation of this policy in several locations, such as Sukabumi [10], Tasikmalaya [11], Tegal [12], Pringsewu [13], Sukoharjo [14], Banyuwangi [15], Banten [16], Kulonprogo [17], Pati [18], Indragiri Hilir [19], East Kalimantan [20], Gowa [21], and so on. The results of the study found that the implementation of the regulations experienced several obstacles, including weaknesses in law enforcement by the government and potential conflicts of interest between the local and central governments. To protect agricultural land, strong rules and policies that are not simply based on land acreage must be established, as well as improved policy execution through better cooperation across various sectors and levels of government.

This research intends to perform a thorough review of the execution of agricultural policies that focus on enhancing food security through sustainable methods to farmland management within this framework. This study will describe the policy evaluation in tackling global concerns connected to food supply and environmental preservation by an in-depth analysis of relevant literature. It also encompasses the difficulties that are impeding policy implementation as well as the subject of future research. We can identify a framework that can guide future policy design by understanding the achievements, problems, and lessons learnt from the implementation of these programs.

The purpose of this study is to learn how a sustainable food agricultural land protection plan can serve as an established basis for improving food security. This policy is projected to provide a large and sustainable contribution to global food security by integrating social, economic, and environmental elements.

## **2 Materials and method**

We performed an in-depth search for articles relating to the actual implementation of Indonesia's Sustainable Food Agricultural Land (SFAL) policy from 2013 to 2023. Our review covered various academic databases including Google Scholar, Scopus, Crossref, and Semantic Scholar. We targeted articles published within this timeframe and excluded reviews and book chapters. The search used key terms such as "sustainable food agricultural land policy", "agricultural land protection policy", "agricultural land policy" and "LP2B", either individually or in combination with the OR logical operator, found in the article titles. This effort yielded a total of 5909 results. To classify the articles, we categorized them based on whether they were written in English, peer-reviewed or non-peer-reviewed, research location, adequacy of article component information and by year of publication. We then assessed the article components to ensure alignment with PSFAL-relevant themes using the PRISMA approach (Figure 1).



**Fig. 1.** Flow diagram describing study selection with PRISMA approach.

The selected literature was then analysed and inputted based on the relevance of the information into an Excel database. After several stages of filtering with the desired criteria, there were 29 peer-reviewed articles that met the criteria and were relevant to the topic (Table 1). From the collected literature, patterns and gaps can be observed which will be reviewed in the discussion section offering valuable insights for future research topics.

**Table 1.** Papers that present all final screenings that show PSFAL policy implications from 2013 to 2023.

Author-Reference	Major Focus
Siswanto and Kurniawati (2016) [22]	The work focuses on land conversion and its implications on national food security.
Lanya et al. (2016) [23]	The topic of the research is the effect of tourism development on Subak rice fields in Denpasar, Bali. Tourism's success has had a negative impact on land conversion, with large tracts of rice fields being converted for diverse purposes.
Noer et al. (2017) [24]	The study underlines the conflict between the necessity of land for long-term agricultural development and the increasing conversion of agricultural land for non-agricultural objectives such as settlement and commercial use.
Rondhi et al. (2018) [6]	The study focuses on the agricultural land conversion (ALC) process and its connection with land economic value (LEV) in two particular areas of East Java, Indonesia.

Findiastuti et al. (2018) [25]	The paper focuses on the complex issues of long-term food availability in Indonesia, particularly as they relate to agricultural land conversion (ALC), growing populations, and environmental concerns.
Widowaty et al. (2018) [26]	It defines the research challenge as the application of policies for sustainable agricultural land protection in order to achieve food security.
Handayani et al. (2018) [27]	Conversion of agricultural land to non-agricultural purposes has expanded due to development demand, threatening Indonesia's rural nature and historical self-sufficiency in rice production. Despite government rules to protect agricultural land, conversion continues.
Maryati et al. (2018) [28]	The expansion of both metropolitan areas and population necessitates additional land for both urban development and agricultural reasons, which may jeopardize agricultural land availability and food security.
Firmanysah et al. (2019) [15]	Changes in land usage in Indonesia, particularly Purwakarta Regency, result in agricultural conversion, which has an impact on the microclimate.
Rianita and Suwitra (2019) [29]	The purpose of this research is to look into the jurisdiction of district and municipal governments in controlling the conversion of sustainable food production.
Fuad et al. (2019) [30]	The study focuses on the influence of population growth and industrial development on agricultural land conversion in Tegal Regency, and how this conversion impacts the region's food self-sufficiency.
Kamil et al. (2020) [31]	The paper analyzes the political processes involved in agricultural land protection policy in order to reduce land conversion, focusing on the ecological and economic implications on Batu communities. For involving stakeholders, collaborative governance is recommended.
Soediro et al. (2020) [32]	The paper addresses the difficulties and implications of agricultural land conversion to housing in Indonesia, focusing on the economic importance, lax agrarian reform legislation, environmental damage, spatial planning rules, and community involvement.
Harry et al. (2020) [33]	The study examines the constitutional basis for establishing a Land Bank in Indonesia, as well as its importance to the legal protection of sustainable food agricultural land.
Susmiyati et al. (2020) [20]	The study looks at the state's constitutional commitment to provide food security as well as the obstacles faced by population increase and land use changes, particularly in tropical wet forest areas.
Anggalini et al. (2020) [9]	The study focuses on the implementation and efficacy of the Sustainable Food Agriculture Land Protection (PLP2B) policy in addressing agricultural land conversion challenges in the light of climate change.
Miswar et al. (2021) [13]	The research is being carried out in the southern part of Pringsewu Regency with the goal of investigating the distribution pattern of Sustainable Food Agricultural Land (LP2B) and determining the elements that influence it.
Rohmah et al. (2021) [34]	The research is centered on Pandeglang Regency in Banten Province, which has been recognized as an agricultural center. Its goal is to assess the spatial pattern and allocation of agricultural areas while taking into account population growth, land-use policies, and urbanization trends.
Inopiyanti (2021) [10]	This research focuses on the execution of Sukabumi City's Sustainable Food Agricultural Land Protection (PLP2B) policy. PLP2B is a government effort that aims to protect agricultural land while also ensuring food availability.
Prayitno et al. (2021) [35]	The purpose of this research is to look into the relationship between place attachment and agricultural land conversion in developing countries, with the goal of promoting sustainable agriculture in rural regions.
Gultom et al. (2021) [36]	The research is centered on Pandeglang Regency in Banten Province, which has been recognized as an agricultural center. Its goal is to assess the spatial pattern and allocation of agricultural areas while taking into account population growth, land-use policies, and urbanization trends.

Rantau (2022) [16]	This research focuses on the execution of Sukabumi City's Sustainable Food Agricultural Land Protection (PLP2B) policy. PLP2B is a government effort that aims to protect agricultural land while also ensuring food availability.
Triyono et al. (2022) [37]	The purpose of this research is to look into the relationship between place attachment and agricultural land conversion in developing countries, with the goal of promoting sustainable agriculture in rural regions.
Anggraini et al. (2022) [38]	The study focuses on the vital issue of food security and rice plant bearing capacity.
Rofik et al. (2022) [39]	This research takes conducted in Samarinda City, East Kalimantan Province, Indonesia, and focuses on the implementation of policies to protect sustainable agricultural land.
Khrisnamurti et al. (2023) [18]	This research is being conducted in Margorejo Village, Pati Regency, Indonesia, and is centered on the preparation of land use balance data to address concerns connected to land use allocation and violations of regional legislation pertaining to Sustainable Food Agriculture Areas.
Wicaksono (2023) [40]	This research is being carried out in the Indonesian province of East Java, with an emphasis on the implementation of the Sustainable Food Agriculture Land (SFAL) strategy. The policy strives to conserve agricultural land in the face of increased pressure for land conversion motivated by profit.
Kernite et al. (2023) [41]	The project focuses on agricultural land protection, specifically sustainable food agricultural land (LP2B). The paper discusses the necessity for government policies to protect agricultural land and integrates them into the development of the agricultural sector.
Sutama and Suryawan (2023) [42]	This study investigates the evolving function of land in magical religion as a result of numerous factors such as tourism, population growth, and settlement expansion, which have resulted in agricultural land conversion. Agricultural land is critical to the national economy and the survival of communities.

### 3 Results and discussion

The literature screening process is presented in Figure 1 where the first stage was a literature search and resulted in 5,909 articles from three databases. To eliminate any duplicate publications, DOIs and titles were compared and 155 duplicates articles were found. In addition, at this stage, 1074 articles that did not have complete information components were excluded from the list, as well as 2380 articles whose research locations were outside Indonesia. After this selection process, 2,300 articles were identified as unique. In the second screening stage, there were 159 English articles that passed the peer review stage. The final screening stage resulted in 29 articles that met the topic relevance criteria, i.e. did not contain irrelevant words in keywords, titles or abstracts, and fit the desired period from 2013 to 2023.

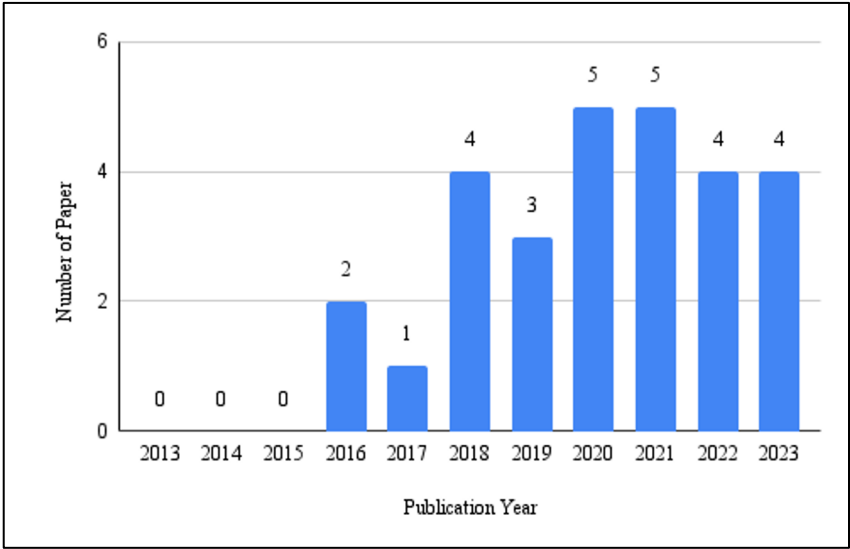
#### 3.1 Distribution sustainable food agricultural land article during 2013 – 2023

An analysis of publications on Sustainable Food Agricultural Land (SFAL) over the past few years illustrates an interesting trend (Figure 2). From 2013 to 2015, there were no publications that met the criteria, especially those that discussed the implementation of sustainable food land protection policies. This is related to the introduction and socialization of policies from the central government to the regions, where policy implementation is only at the initial stage of collecting and processing spatial data. Planning [43], legal review [44], mapping [45,46], and socialization [47] are examples of publications from this time period that suggest to the early stages of SFAL policy implementation. In 2016, there was an increase of two publications, one publication in 2017, four publications in 2018, and three publications in 2019. This pattern maintained and peaked in 2020 and 2021, with five

publications each, before declining to four in 2022 and 2023. In addition, the results of policy implementation are more observable and evaluable after several years of implementation.

From the analysis of the selected publications, it was found that 11 publications used a qualitative approach (Figure 3). This contradicts the quantitative approach which only appeared in one publication. Furthermore, model-, survey- and scenario-based approaches were found with 3, 2 and 1 publications respectively. This shows the interdisciplinary approach of PSFAL research. In addition to the approaches mentioned above, spatial approaches were used in 4 publications in monitoring or mapping agricultural land changes. Finally, the legal standing approach was found in 7 publications, which underscores the significance of the role of laws or legal frameworks in protecting land conversion and promoting sustainable agriculture.

Geographically, SFAL publications are mostly distributed in Java as a research centre with 18 publications (62.1%) as illustrated in Figure 4. The high level of research on this island is due to the intensive agricultural activities in Java. Meanwhile, other SFAL research is spread across various islands in Indonesia, from Sumatra, Bali, Kalimantan and Sulawesi. The comprehensive coverage of Indonesia highlights the relevance of sustainable agriculture and national food security (Figure 5).



**Fig. 2.** Yearly distribution of the included articles 2013 – 2023.

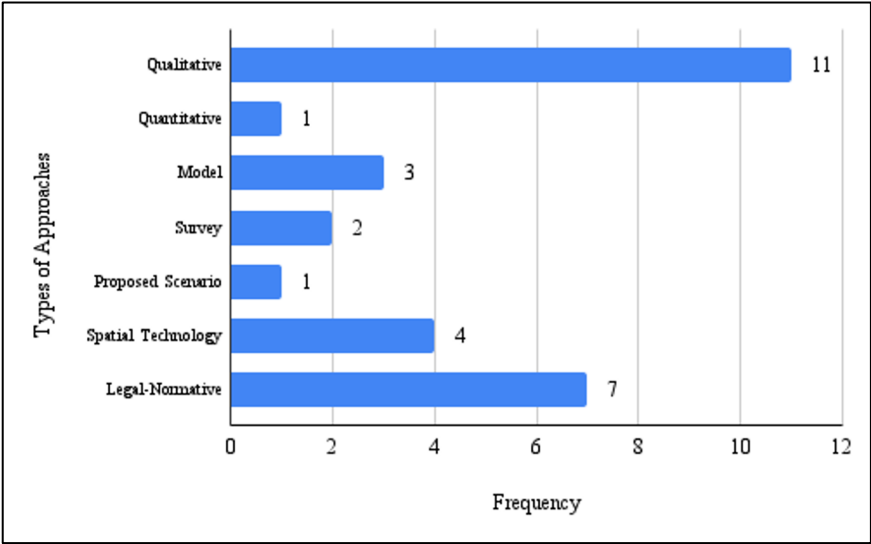


Fig. 3. Various approachments used in the publication of the SFAL 2013-2023.

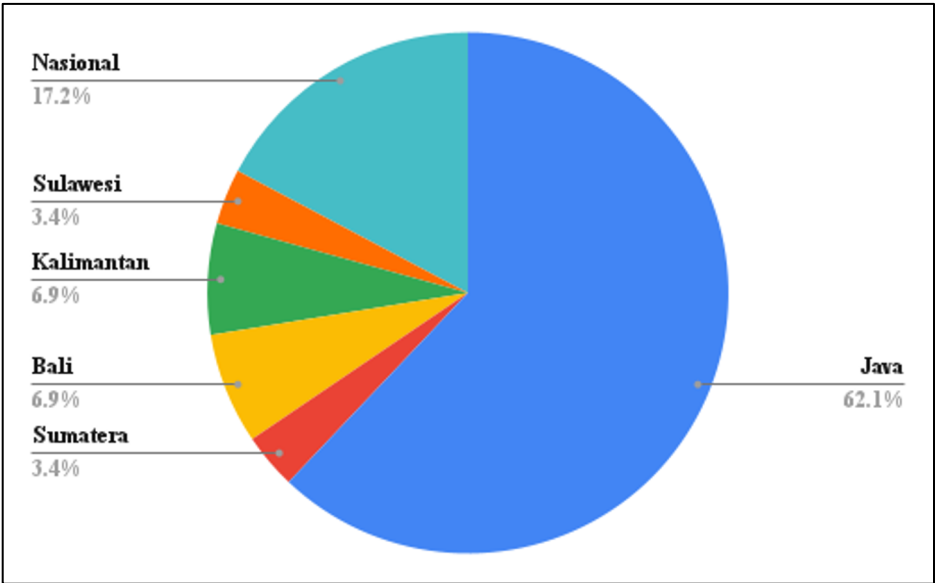
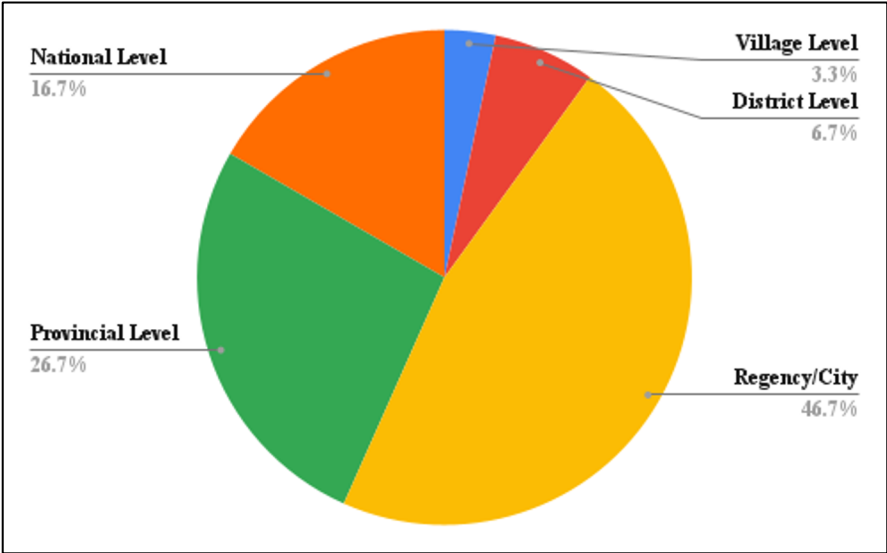


Fig. 4. Distribution study location based on SFAL articles 2013-2023.



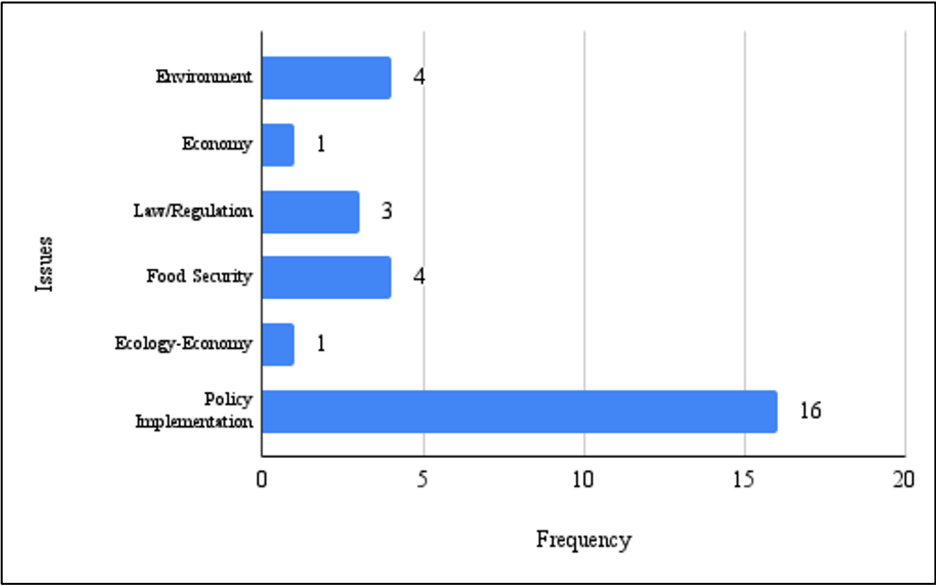
**Fig. 5.** Administrative area distribution of studies locations from 2013-2023 publications.

In the study of SFAL policy implementation, it was clear that the literature collected focused on various levels of administrative areas. The majority of research was conducted at the regency/city level, with 14 publications (46.7%). This indicates that there is great interest at the local government level in the implementation of SFAL. Furthermore, 8 publications (26.7%) evaluated PSFAL implementation at the provincial level and 5 publications (16.7%) at the national level. This suggests the importance of SFAL issues in the development of national agricultural policies and strategies. The rise in the number of publications at regional and national levels is a positive sign, suggesting stronger synergies between local and national efforts to address SFAL challenges.

**3.2 Issues and challenges in implementation SFAL policy**

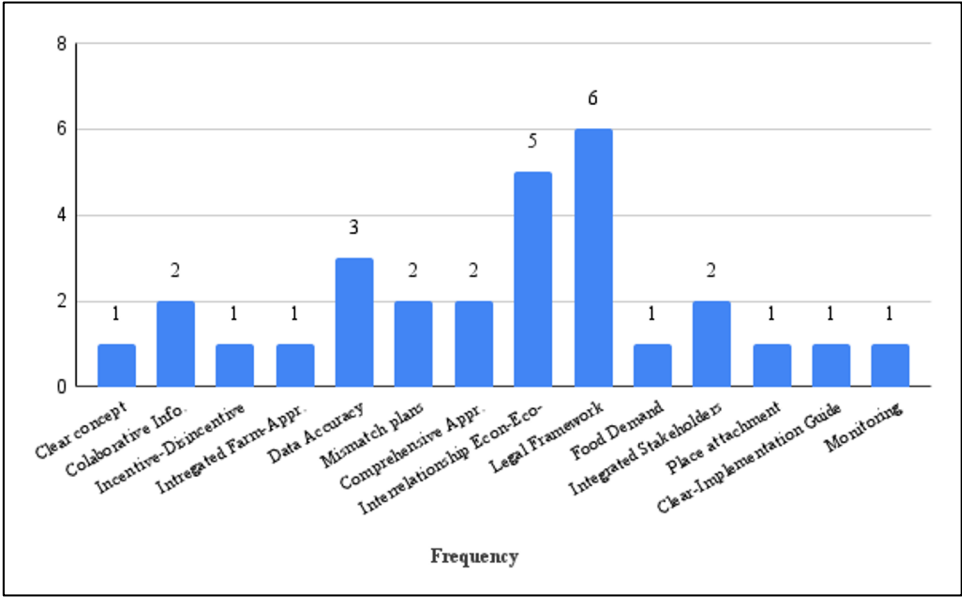
Data on publications on Sustainable Food Agricultural Land (SFAL), as well as related concerns and policy implementation challenges, give insight into the state of research and policy making in this field. With a total of 16 publications, the issues addressed in the analysed literature primarily relate the evaluation of policy implementation. The substantial number of papers points out that academics are actively engaged in understanding and developing solutions to improve the implementation of sustainable food and agricultural land policies (Figure 6.).





**Fig. 6.** Issues discussed in the SFAL article during 2013-2023.

SFAL literatures focuses on a variety of key concerns, including environmental issues, food security, and legal regulations, in addition to policy implementation review. Each of these concerns is covered in four publications. The findings of this study highlight the complexities of SFAL, in which achieving sustainable food production and land management necessitates synergies between environmental conservation, economic considerations, and legal frameworks. In addition, an assessment of the challenges in policy implementation (Figure 7) shows some important points that need attention. The dominant challenge is the difficulty of integrating economic, ecological and social sectors in SFAL policy implementation, as described in the results of 5 publications. These results highlight the importance of a holistic approach in formulating and implementing SFAL policies, which considers the relationship between these aspects. The next challenge comes from the legal framework or normative law related to SFAL. A total of 6 publications emphasized the need to have a clear and strong legal structure to support sustainable agriculture and land management initiatives.



**Fig. 7.** Challenges in implementation the SFAL policy based on articles during 2013-2023.

The data accuracy challenge, as highlighted by three articles, highlights the significance of accurate data in informed decision-making and policy formulation. In order to assess agricultural land quality, monitor changes, and make educated decisions about sustainable practices, it is critical to have accurate and up-to-date information. The earlier statement is consistent with the conclusions of Chandra's 2023 study [48], which revealed that data, machine learning, and Internet of Things (IoT) devices are required to assure long-term food security. These technologies enable real-time monitoring and analysis of agricultural activities, promoting data-driven decision-making, better resource management, and higher farm efficiency.

With two publications each, integrated stakeholders and collaborative information problems underline the necessity of incorporating multiple stakeholders, including as farmers, government agencies, and non-governmental organizations, in the development and execution of SFAL programs. Collaboration along with knowledge exchange are vital for accomplishing joint objectives for sustainability. According to Neutzling et al. [49] and Dania et al. [50], collaborative relationships, information sharing, and trust among heterogeneous stakeholders are important for not only achieving sustainability in agri-food supply chains but also have an advantageous impact on sustainable supply chain management.

Several inferences can be identified based on the results of this systematic review. In terms of frequency of publishing, there has been a notable increase in the number of publications connected to Sustainable Food Agriculture Land (SFAL) in recent years, particularly since 2016. This increase reflects a deeper understanding of the significance of SFAL issues, which is likely due to a growing awareness of environmental and food safety concerns. The second implication is that the Java-dominated geography necessitates bigger and more diverse research initiatives in other regions of Indonesia to capture the full spectrum of SFAL concerns and solutions. Furthermore, an even distribution of study sites will undoubtedly aid in the evaluation of the efficiency of SFAL policy implementation. The ubiquity of policy implementation as a key issue, as well as the associated challenges, underscore the need of bridging the gap between policy formulation and practical implementation. Finally, the prevalence of qualitative approaches suggests that future research should incorporate more quantitative and

data-driven methodologies to increase the evidence base for SFAL decision-making and policy creation.

A review of SFAL publications, as well as associated concerns and policy implementation obstacles, demonstrates the complexities of attaining sustainable food production and agricultural management. Academics and politicians are working hard to improve the practical aspects of sustainable agriculture, as seen by the growing acceptance of policy implementation as a study topic. Addressing a broad range of issues, such as the interdependence of economic, ecological, and social aspects, legal frameworks, and data quality, is crucial to designing effective policies and practices. Furthermore, the emphasis on collaboration and integrated stakeholder involvement emphasizes the importance of collaborating in this important field in order to obtain long-term advantages. Future research could explore the linkages between economic, ecological and social factors in greater depth to design holistic and sustainable solutions for SFAL, incorporating quantitative approaches and modelling to complement qualitative findings. Research in this area should seek to generate policy recommendations and practical solutions that promote sustainable food production, land management and equitable development across Indonesia.

## 4 Conclusion

A review of policy papers on Sustainable Food Agricultural Land (SFAL) from 2013 to 2023 reveals significant insights into the background of Indonesian sustainable food production and land management. The findings show an immense increase in publications beginning in 2016, demonstrating a growing appreciation for the importance of SFAL. Despite the fact that Java is the primary research centre, actions from other regions indicate SFAL's national significance. The variety of research sites reflects a range of ways to addressing SFAL issues, with a focus on local and national activities. Complex interactions between economic, ecological, and social factors, legal frameworks, data accuracy, and collaboration, among other issues and challenges in the implementation of SFAL policies, highlight the importance of holistic and collaborative approaches to achieving sustainable food production and land management. Future research ought to look deeper into these concerns and seek innovative insights, while policymakers should prioritize comprehensive approaches, strong legislative structures, and coordinated efforts to safeguard Indonesia's sustainable food production and land management.

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