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# The Effectiveness of Policies to Combat Plant Pests in Garlic Cultivation in East Lombok: Analysis of Agricultural Law Policies

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**Abstract:** The policy for controlling plant pests (OPT) in garlic cultivation in East Lombok Regency was formulated as an effort to increase productivity and sustainability in horticultural cultivation systems. This policy adopts an Integrated Pest Management (IPM) approach as its main strategy, which integrates various control methods, including the use of resistant varieties, healthy cultivation practices, biological control, and the selective and responsible application of botanical and chemical pesticides. In addition to technical aspects, this policy places farmer participation as an important element through extension, assistance, and capacity building activities. This approach is aimed at ensuring early detection, rapid response to pest attacks, and reducing dependence on chemical pesticides that have the potential to damage the environment. Normatively, this policy is in line with the national legal framework on sustainable agricultural cultivation systems, but its implementation in the field still faces a number of structural and social challenges. The ultimate goal of this policy is to minimize crop losses, maintain the health of the agricultural ecosystem, and improve the welfare of garlic farmers in East Lombok.

**Keywords: Integrated Pest Management; Agricultural Law Policy; Garlic**

## 1. Introduction

The The agricultural sector plays a vital role in Indonesia's economy, not only as a food provider for millions of people, but also as a major source of livelihood for rural communities. Among various horticultural commodities, garlic (Allium sativum L.) is a strategic commodity because it is widely used in daily consumption and has high economic value. The increasing national demand in line with population growth and changes in consumption patterns has made increasing domestic garlic production one of the government's policy priorities. However, national garlic production still faces various obstacles, especially attacks by Plant Pests (OPT). OPT, which includes pests, diseases, and weeds, often causes a decline in the quantity and quality of crops, and can even lead to crop failure if not handled properly.[1] OPT attacks also have a direct impact on farmers' incomes, commodity price stability in the market, and ultimately on national food security. From a legal perspective, PTO control is part of the state's obligation to provide crop protection as mandated in Law No. 22 of 2019 concerning Sustainable Agricultural Cultivation Systems,

[1] Wentao Zhou et al., "Integrated Pest Management: An Update on the Sustainability Approach to Crop Protection," *ACS Omega* 9, no. 40 (2024): 41130–47.

which emphasizes the importance of applying environmentally friendly technologies and cultivation practices.

East Lombok Regency is one of Indonesia's garlic production centers with great potential in terms of its agroclimatic conditions and agricultural traditions. Various government programs have been directed to support increased production in this region, ranging from the provision of high-quality seeds and production assistance to technical assistance through agricultural extension workers. Nevertheless, pest attacks remain a serious threat to local farmers. Field findings show that pests such as armyworms (Spodoptera exigua), thrips (Thrips tabaci), mites, and diseases such as purple spot (Alternaria porri) and anthracnose (Colletotrichum gloeosporioides) are problems that arise almost every planting season. Under favorable environmental conditions, pests can cause damage from the vegetative to generative phases, resulting in reduced bulb weight, low storage quality, and decreased sales value.[2]

Pest control efforts carried out by farmers have tended to be reactive and rely on chemical pesticides. Excessive and inappropriate use of pesticides has created new problems, such as pest resistance, environmental pollution, chemical residues in products, and health risks for farmers and consumers. On the other hand, organic or environmentally friendly cultivation and control methods have not been optimally adopted due to a lack of knowledge, limited resources, and a lack of ongoing technical assistance. These conditions indicate that controlling garlic pests requires a comprehensive and sustainable approach, namely through Integrated Pest Management (IPM). IPM emphasizes the integration of various compatible and environmentally friendly control techniques to keep pest populations below the economic threshold. The implementation of IPM requires strong public policy support, ranging from the provision of regulations, production facilities, technology transfer, to strengthening the capacity of farmers and extension workers. In this context, the effectiveness of government policies is very important to examine, both in terms of normative design and implementation at the field level.[3]

Analysis of the policy to combat plant pests (OPT) in garlic in East Lombok Regency cannot be separated from the framework of public policy theory and the perspective of agricultural law. This study uses an interdisciplinary approach to understand how policies are formulated, implemented, and influenced by institutional, social, and local cultural factors. Conceptually, public policy implementation is understood through Mazmanian and Sabatier's implementation theory, which emphasizes that the success of a policy is largely determined by how clearly the policy objectives are formulated, the adequacy of allocated resources, and the commitment and capacity of implementing agencies at the field level. In the context of East Lombok, this theory is relevant for assessing whether the Integrated Pest Management (IPM) policy has been designed with adequate explanation of its objectives, accompanied by support for production facilities, technology, extension services, and effective implementation organization.

On the other hand, the success of policy implementation is also influenced by the interaction between the institutions involved in its implementation. O'Toole's approach to interorganizational implementation explains that policy effectiveness is highly dependent

[2] Puspitasari et al., "Systems Thinking in Sustainable Agriculture Development: A Case Study of Garlic Production in Indonesia," *Frontiers in Sustainable Food Systems* 8 (2024): 1349024.

[3] Surendra K Dara, "The New Integrated Pest Management Paradigm for the Modern Age," *Journal of Integrated Pest Management* 10, no. 1 (2019): 12.

on coordination, communication, and synergy between actors, including the agricultural service, field agricultural extension workers (PPL), the Agricultural Technology Assessment Center (BPTP), and farmer groups. This framework is used to assess the extent to which the OPT control policy in East Lombok has been supported by strong coordination mechanisms, or has been hampered by fragmentation and a lack of program integration. From a legal perspective, this study adopts Lawrence Friedman's legal system theory, which places policy implementation into three main components: structure, substance, and legal culture.[4]

Legal structure refers to implementing agencies such as the Agriculture Office, PPL, and other supporting institutions; legal substance covers laws and regulations related to PHT, crop protection, and sustainable agricultural systems; while legal culture relates to the habits, beliefs, and behaviors of actors, including farmers who still have a strong dependence on chemical pesticides as an instant solution. Friedman's approach helps explain why policies that are normatively sound often do not work optimally when they come into contact with social realities and behaviors at the grassroots level. Furthermore, this study is also based on the principle of good governance as the foundation for evaluating agricultural policies.

Principles such as participation, transparency, accountability, effectiveness, efficiency, and equitable access are the measuring tools for assessing the quality of OPT control policy implementation. The application of IPM requires not only appropriate regulations, but also participatory extension mechanisms, a transparent production means distribution system, and effective coordination among stakeholders.[5] The principle of good governance is highly relevant in assessing whether the policies implemented meet good governance standards in the agricultural sector. The national agricultural legal framework, as stipulated in Law No. 22 of 2019 on Sustainable Agricultural Cultivation Systems, is the main normative basis for this study. This law emphasizes the state's obligation to provide crop protection, develop PHT technology, empower farmers, and ensure the sustainability of the agricultural ecosystem. Therefore, the implementation of OPT control policies in East Lombok needs to be analyzed based on the extent to which it has fulfilled the principles of sustainability and the state's constitutional obligations in the agricultural sector. Using a combination of policy implementation theory, legal system theory, the principles of good governance, and the framework of sustainable agricultural law, this study comprehensively examines the effectiveness of pest control policies in East Lombok. This approach allows for an analysis that not only describes the empirical reality in the field, but also evaluates the compatibility between norms and practices, while providing more adaptive and contextual policy recommendations.

This research is relevant given the urgent need to increase national garlic production while maintaining the sustainability of the agricultural ecosystem. An evaluation of the pest control policy in East Lombok is needed to identify the effectiveness of the program, implementation constraints, and opportunities for improvement. The results of this study are expected to contribute to the formulation of policy recommendations that are more adaptive, participatory, and in line with the principles of good governance, in order to support the welfare of farmers and food security in East Lombok Regency.

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[4] Daren S Mueller et al., "Integrated Pest Management: State Infrastructure Status after 50 Yr of Federal Support (1973 to 2023)," *Journal of Integrated Pest Management* 16, no. 1 (2025): 30.

[5] Francis P F Reay-Jones et al., "MyIPM Smartphone Applications—Tools to Increase Adoption of Integrated Pest Management," *Journal of Integrated Pest Management* 16, no. 1 (2025): 3.

## 2. Method

This study is a legal study that uses a qualitative approach to understand the effectiveness of policies to combat garlic plant pests in East Lombok Regency. As a legal study, this review not only examines the norms contained in legislation, but also seeks to understand how these regulations work in practice through interactions between the government, implementing agencies, extension workers, and farmers. A qualitative approach was chosen because it provides a more in-depth picture of the dynamics of policy implementation, including social, cultural, and institutional constraints that cannot be adequately captured through a quantitative approach.[6] Methodologically, this study uses several approaches in legal research. The legislative approach was used to examine the compatibility of OPT control policies with the normative framework in Law No. 22 of 2019 concerning Sustainable Agricultural Cultivation Systems, Law No. 12 of 1992, and various technical regulations concerning pest control and the application of Integrated Pest Management (IPM). In addition, a conceptual approach was used to link the research findings to concepts such as good governance, rule of law, Lawrence Friedman's legal system theory, and public policy implementation theory. Through this approach, the study was able to establish links between legal norms, policy design, and relevant policy theories.

To understand policy implementation at the field level, this study also applied an empirical (socio-legal) approach. This approach was necessary because the implementation of agricultural policies is influenced not only by written rules, but also by the behavior of actors, local traditions, and institutional capacity. Empirical data were obtained through in-depth interviews with farmers, field agricultural extension workers, Agriculture Agency officials, and researchers from technical institutions such as BPTP. Field observations were conducted in several garlic production centers to directly observe pest attack patterns, control methods used by farmers, and factual conditions that affect policy effectiveness. In addition, focus group discussions (FGDs) were held with farmer groups to explore their collective experiences, perceptions, and obstacles they face in implementing IPM.[7]

All data obtained was analyzed using qualitative analysis techniques. The data was reduced to identify key themes related to policy implementation, then presented in categories reflecting the three main aspects of legal system theory: substance, structure, and legal culture. Through this process, the study was able to clearly see the relationship between applicable regulations, policy implementing actors, and the responses and behaviors of farmers as both objects and subjects of the policy. The final stage of the analysis was to draw conclusions by comparing normative provisions and empirical realities in the field to assess the extent to which the OPT control policy had been effective and what factors had hindered its success. With a legal approach combined with qualitative methods, this study provides a comprehensive understanding of the effectiveness of OPT control policies for garlic, while also presenting a strong analytical basis for formulating more adaptive, participatory, and sustainable policy recommendations.

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[6] Jonaedi Efendi, *Metode Penelitian Hukum Normatif Dan Empiris Edisi Kedua* (Jakarta: Prenada Media, 2022).

[7] Wiwik Sri Widiarty, *Buku Ajar Metode Penelitian Hukum* (Yogyakarta: Publika Global Media, 2024).

## 3. Results and Discussion

### 3.1 Overview and Patterns of Garlic Pest Attacks in East Lombok

The results of the study show that pest attacks remain one of the biggest limiting factors in garlic production in East Lombok Regency. In the field, it was found that pests such as *Thrips tabaci* (thrips) and *Spodoptera exigua* (armyworm) are the two most dominant types of pests that attack leaves and damage plant tissue, thereby inhibiting the bulb formation process. Meanwhile, purple spot disease (*Alternaria porri*) and anthracnose (*Colletotrichum gloeosporioides*) emerged as the pathogens that most often caused severe damage, especially during periods of high humidity. These findings are consistent with previous studies confirming that these pests are a crucial threat to garlic production in Indonesia.[8]

The pattern of pest attacks in this region tends to be influenced by climate dynamics. Farmers report that the intensity of fungal diseases increases during the rainy season, when humidity and rainfall are high, while thrips and armyworm attacks are more severe during the dry season or when weather anomalies occur. Climate change in recent years has exacerbated the pattern of attacks, making pest cycles increasingly difficult to predict. This shows that pest control can no longer rely on a static approach but must be adaptive to respond to environmental changes. Farmers also revealed that losses due to pests can reach 30–50% of potential production if not seriously addressed a figure that certainly has major implications for farmers' incomes and local food security.[9]

From a legal perspective, this condition has a very strong relevance to the state's obligation to provide sustainable crop protection. Law Number 22 of 2019 concerning Sustainable Agricultural Cultivation Systems explicitly states that the government is responsible for organizing crop protection, including prevention, observation, control, and pest management. Articles 56 to 60 emphasize that the government is obliged to provide control technologies, production facilities, and early warning systems to prevent pest outbreaks. Thus, the phenomenon of increasing pest attacks in East Lombok cannot be separated from a normative evaluation of the extent to which the state has fulfilled the provisions of the law.

When analyzed using Lawrence Friedman's legal system theory, the situation in East Lombok reveals imbalances in three main elements: substance, structure, and legal culture. In terms of substance, regulations on plant protection and Integrated Pest Management (IPM) are normatively quite comprehensive especially regarding the government's obligation to provide environmentally friendly control measures.[10] However, in terms of legal structure, institutional capacities such as the Agriculture Office, Field Agricultural Extension Workers (PPL), and other supporting institutions are not yet fully adequate. The limited number of extension workers, the uneven distribution of production facilities, and the lack of field laboratories to detect pest attacks early on are some of the main weaknesses. Furthermore, the aspect of legal culture shows that most farmers still rely on high doses of chemical pesticides as their main control method, thereby ignoring the

[8] Suskandini R Dirmawati, Sri Yusnaini, and Lestari Wibowo, "Identifikasi Hama Dan Penyakit Pada Tanaman Bawang Putih Sebagai Upaya Pendukung Ketahanan Pangan Nasional," -, 2017.

[9] D M Ate, M Marwoto, and R P D Julianto, "Pengaruh Ekstrak Bawang Putih (Allium Sativum L.) Terhadap Intensitas Serangan Hama Pada Tanaman Kacang Hijau Varietas Vima-1 (Vigna Radiata L.)" (Fakultas Pertanian Universitas Tribhuwana Tunggadewi, 2022).

[10] Bambang Saiful Abidin, "Penggunaan Arang Sekam Padi (Biochar) Dan Pestisida Nabati Bawang Putih Terhadap Pertumbuhan Serta Produksi Tanaman Bawang Merah (Allium Ascalocinum L)" (Universitas Islam Riau, 2021).

principles of IPM and creating further risks in the form of pest resistance, environmental pollution, and low adoption of environmentally friendly technologies.

From a public policy perspective, the increasingly complex pattern of pest attacks also requires an adaptive governance approach. The state cannot implement routine and administrative plant protection policies alone, but must be responsive to ecological and social changes. This is in line with the mandate of Article 33 paragraph (3) of the 1945 Constitution, which states that the earth, water, and natural resources are controlled by the state and used as much as possible for the prosperity of the people. When pests develop into a threat that can erode farmers' incomes and food stability, the state has an obligation to take preventive, corrective, and adaptive measures through stronger, measurable, and evidence-based plant protection policies.

Efforts to combat plant pests in garlic crops in East Lombok Regency are based on a set of legal norms that regulate the state's obligation to provide sustainable crop protection. This legal framework not only establishes the administrative obligations of the government, but also contains the constitutional principle that the state must guarantee the sustainability of agricultural production as part of fulfilling the people's right to food and welfare.[11]

Juridically, the main legal basis governing plant protection and sustainable cultivation systems is Law No. 22 of 2019 concerning Sustainable Agricultural Cultivation Systems. This law emphasizes that plant protection is an integral part of the cultivation system, so that the government has a legal obligation to ensure the implementation of PPP prevention, monitoring, control, and management. Article 56 stipulates that plant protection must be carried out in an integrated manner using technology that minimizes negative impacts on the environment, while Article 58 mandates the provision of control facilities, infrastructure, and technology by the government. This provision places the state as the main actor in ensuring the success of the PHT system and the protection of strategic commodities such as garlic.

In addition to Law 22/2019, there is also Law Number 12 of 1992 concerning Crop Cultivation Systems, which contains the basic principles of crop management, including the government's obligation to provide an effective plant protection system. Article 20 of this law stipulates that plant protection is carried out through the prevention and control of pests, including through routine observation and dissemination of information to farmers. Normatively, these provisions establish that the pest observation system, including monitoring the development of pests and diseases in East Lombok, is not merely a technical activity, but a legal mandate that must be fulfilled by the government.

Technical regulations at the ministerial level also strengthen the legal basis for pest control. The Minister of Agriculture's Regulation on Integrated Pest Management (IPM) Guidelines provides implementation directions on methods, strategies, and governance of ecology-based pest control. This regulation emphasizes that the use of pesticides must be selective, prudent, and a last resort after other control methods have proven ineffective. In the context of East Lombok, this regulation is relevant because the rampant use of chemical pesticides by farmers often contradicts the basic principles of IPM, thus demonstrating a gap between legal norms and field practices. Furthermore, the legal basis for pest control cannot be separated from the constitutional framework as stated in Article 33 paragraph (3)

[11] M Rifqi Choiruddin, "Virulensi Dan Keanekaragaman Genetika Fusarium Oxysporum f. Sp. Cepae Penyebab Busuk Pangkal Pada Bawang Putih," 2010.

of the 1945 Constitution, which states that the earth, water, and natural resources are controlled by the state and used as much as possible for the prosperity of the people. Food security, including garlic production, is part of this constitutional mandate. Therefore, when pest attacks threaten agricultural productivity and farmers' incomes, it is not only a technical issue, but also a constitutional issue that requires the state to intervene through effective, responsive policies that are in line with the principles of social justice.[12]

In addition to substantive obligations, this legal basis also includes the principle of good governance. OPT control policies must be implemented in accordance with the principle of good governance, which has a strong foundation in various laws and regulations, including the Government Administration Law. The principles of accountability, transparency, effectiveness, and participation are benchmarks for whether PHT policies are truly implemented in accordance with the mandate of the law. For example, the provision of information on pests, extension services to farmers, and the distribution of means of production are concrete forms of the government's administrative legal obligations. Thus, the legal basis for pest control in East Lombok is not just a series of technical regulations, but a complete normative framework, ranging from the constitution and organic laws to implementing regulations. This legal framework serves as the basis for assessing the extent to which government policies have fulfilled the principles of sustainability, justice, and protection of farmers as the main subjects of agricultural development. When pest attacks remain high and farmers have not received optimal protection, policy evaluation must be carried out not only technically, but also as a form of testing the fulfillment of the state's legal obligations.

## 3.2 Effectiveness of Garlic Pest Control Policies in East Lombok

An evaluation of the effectiveness of garlic pest control policies in East Lombok Regency reveals a complex and multi-layered picture. Normatively, the local government, through the Agriculture Office, has formulated a number of policies and programs designed to minimize the impact of pest attacks. These programs include the implementation of Integrated Pest Management (IPM), the provision of subsidized pesticides, the distribution of production facilities, demonstration plot programs, and extension activities aimed at strengthening the capacity of farmers. From a regulatory perspective, these policies are in line with the mandate of Law No. 22 of 2019 and various technical regulations under it that place crop protection as a state obligation. However, in practice, the effectiveness of these policies is still far from optimal. One of the main findings of the study shows that the IPM program, although conceptually the most ideal approach to sustainable pest management, has not been fully internalized in farmers' cultivation practices. Many farmers view IPM as merely a collection of techniques or technical recommendations, such as the use of biological agents, crop rotation, or land sanitation, without understanding that IPM is a paradigm that requires a change in perspective on the agricultural ecosystem as a whole. This lack of understanding is inseparable from weak extension services, a lack of intensive assistance, and the inadequate capacity of extension workers to translate the concept of IPM into applicable practices. In other words, policies that are substantively sound are unable to achieve effectiveness due to weak implementation structures at the field level.[13]

[12] Bambang Sayaka, Yonas Hangga Saputra, and Dewa K S Swastika, "Realisasi Kebijakan Wajib Tanam Bagi Importir Dan Dampaknya Terhadap Peningkatan Produksi Bawang Putih Nasional," *Analisis Kebijakan Pertanian* 19, no. 1 (2021): 45–67.

[13] Sayaka, Saputra, and Swastika.

The policy of providing subsidized pesticides also poses its own dilemma. On the one hand, pesticide subsidies do ease the burden of production costs on farmers. However, on the other hand, these subsidies create a dependence on chemical pesticides, even in conditions where pesticide use is no longer effective or necessary. This phenomenon has been widely found in international literature that criticizes input subsidy programs for encouraging unsustainable agricultural practices and weakening the adoption of ecological approaches such as IPM. In the context of East Lombok, pesticide subsidies indirectly negate the basic principles of IPM, which is legally regulated as the main approach to crop protection. As a result, there is a contradiction between one policy and another, creating normative and operational confusion at the farmer level. Field data show that several areas that received OPT control program interventions did indeed show a decrease in the intensity of attacks. However, the decline was uneven and tended to be unsustainable. In many cases, this success only occurred during the program period or when extension workers actively assisted farmers.[14]

Once the assistance was reduced, pest attacks increased again. This pattern indicates a dependence on short-term interventions and weak local institutions in ensuring the sustainability of pest control practices. The failure to achieve consistent production increases indicates a gap between policy objectives at the macro level and their implementation at the micro level. From a public policy perspective, this condition indicates that the implementation of pest control policies in East Lombok is still dominated by a top-down approach that does not sufficiently consider the diversity of farmers' biophysical and socioeconomic conditions. The policies implemented tend to be uniform across the region, even though the characteristics of pest attacks are highly contextual and influenced by local factors such as soil type, cropping patterns, rainfall intensity, and farmer knowledge. In Mazmanian and Sabatier's policy implementation theory, the success of implementation is influenced by the clarity of objectives, the adequacy of resources, and the commitment of implementers. In the context of East Lombok, these three factors still have significant weaknesses, especially in terms of resources and implementer capacity. Legally, the suboptimal effectiveness of this policy also indicates problems in the legal structure, as explained by Lawrence Friedman.

The legal substance related to crop protection and IPM implementation is already available in its entirety; however, the implementing structure is not yet strong enough to ensure consistent implementation. The limited number of extension workers, weak coordination between institutions, minimal supervision of pesticide distribution, and unclear operational standards for IPM implementation at the farmer level indicate serious weaknesses in the legal structure. At the same time, the legal culture of farmers, which still prioritizes chemical pesticides as a quick solution, weakens the effectiveness of the policy and becomes an obstacle to its implementation. This condition shows that the effectiveness of a policy does not only depend on the existence of good regulations, but also on how these regulations are translated into concrete actions by policy implementers and other actors involved. When policies are not sensitive to the local context, are not accompanied by intensive assistance, or even contradict other policies (such as pesticide subsidies), their effectiveness will decline dramatically. Therefore, the issue of the effectiveness of pest control policies in East Lombok should not only be analyzed as a technical issue, but as a legal issue involving normative, structural, and cultural aspects simultaneously.

[14] Yeremias T Keban, *Enam Dimensi Strategis Administrasi Publik: Konsep, Teori Dan Isu* (Gava Media, 2004).

### 3.3 Inhibiting and Enabling Factors

The implementation of policies to combat garlic plant pests in East Lombok Regency takes place within a highly complex social, economic, and institutional context. Although various policies have been formulated by the local government, their effectiveness in the field is greatly influenced by a number of structural, cultural, and administrative inhibiting factors. At the same time, there are also several driving factors that have the potential to strengthen the successful implementation of these policies, although their contribution is still limited. One of the most fundamental inhibiting factors is the limited budget and resources of the East Lombok District Agriculture Office. The budget for plant protection programs, including the procurement of IPM support facilities such as biological agents, insect traps, and PTO monitoring facilities, is still far from ideal. This situation has resulted in uneven program coverage and inconsistent intervention quality. These limitations actually point to a serious problem in the local government's compliance with Law No. 22 of 2019, which requires the government to provide adequate plant protection facilities and infrastructure. When the plant protection budget is not prioritized, the state can be legally deemed to have failed to fulfill its obligation to ensure the sustainability of agricultural cultivation, which is the constitutional right of farmers.[15]

In addition to budget constraints, human resources are also a major obstacle. The ratio of field agricultural extension workers (PPL) to the number of farmers is still not ideal. Many extension workers have to handle large areas, so that assistance is not intensive. The capacity of extension workers to master PHT techniques specific to garlic, especially related to OPT identification and biological control techniques, also needs to be improved. From an administrative law perspective, the weak capacity of extension workers reflects weaknesses in the legal structure, namely that the institutions implementing the policy do not have sufficient capacity to carry out the mandate of the law. In Lawrence Friedman's concept of the legal system, this condition is an indicator of the weak effectiveness of the legal structure, which ultimately results in the minimal effectiveness of policy implementation. Another factor that contributes to the obstacle is farmers' limited access to the latest information and technology. Information about PHT technology often does not reach farmers systematically, and even when it does, it is not always conveyed in a way that is easy to understand. The lack of digital literacy and accessibility to information means that most farmers rely on old practices that are not sustainable.[16] This obstacle indicates the weakness of transparency and information dissemination mechanisms, which are actually part of the principle of good governance in public administration. When information is not conveyed correctly, farmers' rights to education and assistance as part of state protection are not fulfilled.

Farmers' dependence on chemical pesticides is also a significant obstacle. This habit has been going on for years and is reinforced by perceptions of pesticide effectiveness, aggressive promotion by manufacturers, and the easy availability of pesticides. However, this dependence has created various problems, ranging from pest resistance, increased

[15] Yusri Adi, "Bureaucratic Reform to the Improvement of Public Services Challenges for Indonesia," *Publikauma: Jurnal Administrasi Publik Universitas Medan Area* 6, no. 1 (2018): 15–29.

[16] Husain Syam et al., "Principal Entrepreneurship Competence Based on Creativity and Innovation in the Context of Learning Organizations in Indonesia," *Journal of Entrepreneurship Education* 21, no. 3 (2018): 1–12.

production costs, environmental pollution, to health threats to farmers. Classical literature such as Pimentel (2005) has highlighted the dangers of long-term dependence on chemical pesticides. From an environmental law perspective, excessive dependence on chemical pesticides clearly contradicts the principles of sustainable development as stipulated in Law 32/2009 on Environmental Protection and Management. Thus, the issue of pesticide dependence is not only a technical problem, but also a legal and ethical public policy issue. In addition to these factors, the socioeconomic conditions of farmers are also an obstacle. Many farmers are under economic pressure to obtain harvests as quickly as possible. Under such conditions, they are reluctant to take risks by applying IPM methods, which are considered to require a longer process or greater precision. Limited capital makes it difficult for farmers to access certain IPM technologies, especially those that require initial investment or changes in production behavior. These socioeconomic factors show that OPT control policies are still not sensitive to the needs and economic capabilities of farmers, thereby violating the principle of equity in public policy.

Lack of coordination between institutions is also a major obstacle to policy implementation. The Agriculture Office, the Agricultural Technology Assessment Agency (BPTP), the Quarantine Center, and farmer groups often run their respective programs without strong coordination. As a result, there is overlap in activities, program gaps, and waste of resources. From the perspective of O'Toole's implementation theory, weak coordination between agencies is one of the classic causes of the failure to implement complex policies. Juridically, this weak coordination indicates a lack of optimal application of the general principles of good governance (AUPB), particularly the principles of coordination and diligence.[17] Nevertheless, there are several driving factors that can support the implementation of OPT control policies in East Lombok. Some farmers are beginning to show greater environmental awareness, especially after experiencing the negative long-term effects of chemical pesticide use. This awareness is an important asset in accelerating the adoption of IPM. Some farmer groups also have strong organizational structures and effective leadership, which facilitates the process of disseminating information and implementing innovations collectively. Successful IPM pilot programs in several locations have provided concrete examples that IPM implementation can produce positive results, thereby increasing the interest of other farmers to follow suit. These driving factors indicate the potential for a cultural shift among farmers towards more sustainable agricultural practices. However, for this potential to develop into a significant force, there needs to be a strong commitment from the government to strengthen institutions, provide intensive assistance, and ensure policy consistency. Thus, the implementation of OPT control policies can be more effective, adaptive, and in line with the national legal framework that emphasizes sustainability and farmer protection.

## 3.4 Perceptions and Adoption Rates of IPM by Farmers

Farmers' perceptions and adoption rates of Integrated Pest Management (IPM) are key factors in the successful implementation of policies to control garlic pests in East Lombok Regency. Field findings show that farmers' understanding of IPM is still very diverse and tends to be partial. A small number of farmers understand IPM as a comprehensive approach that involves monitoring the dynamics of Pests, utilizing natural enemies, managing agroecosystems, and using pesticides as a last resort. However, most farmers still

[17] B Guy Peters, *The Politics of Bureaucracy* (Longman New York, 1984).

have a narrow understanding of IPM, namely as simply reducing the dosage of chemical pesticides or using plant-based pesticides, without understanding the basic ecological principles that form the main foundation of this approach. This partial perception greatly affects the level of adoption of IPM components.[18] Healthy cultivation practices such as the use of healthy seeds, crop rotation, and land sanitation are relatively more acceptable to farmers because they do not require significant behavioral changes or complex new technologies. However, IPM components that require deeper technical understanding, such as routine monitoring of pest populations, identification of natural enemies, use of biological agents, and application of biopesticides, are still rarely practiced. Many farmers are unfamiliar with the concept of control thresholds, so control measures are based on instinct or experience rather than on pest density analysis as recommended in IPM.

This low adoption rate is due to several important factors. First, farmers' limited knowledge and skills in understanding and correctly applying IPM techniques. Most farmers admit that they do not have an adequate understanding of how biological agents work, biopesticide application techniques, or pest population monitoring methods. Agricultural education and literacy are obstacles in themselves, especially for farmers in rural areas who have long relied on traditional experience. Second, the availability of IPM inputs such as biological agents, pheromone traps, or biopesticides in local markets is still very limited. IPM products are often not easily available, and their prices are relatively more expensive than conventional chemical pesticides. This situation causes farmers to prefer chemical pesticides that are easily available at agricultural kiosks at more affordable prices. This phenomenon shows weaknesses in the plant protection policy structure, especially in terms of the provision of environmentally friendly production facilities, which should be facilitated by the government in accordance with the mandate of Law No. 22 of 2019. Third, perceptions of the effectiveness of IPM are also a major obstacle.[19]

Many farmers consider IPM methods to be "too slow" in producing visible results. Chemical pesticides are considered to be more instant and provide certainty of results in a shorter time. This perception actually reflects short-term preferences born out of economic pressure. When farmers are in a situation of high production risk, they tend to choose technologies that provide instant results rather than ecological technologies that require a process. From the perspective of innovation diffusion theory, perceptions of benefits and risks play an important role in technology adoption decisions. In the context of East Lombok, the perceived risk of crop failure far outweighs the perceived long-term benefits of IPM. Fourth, the lack of continuous assistance is one of the most prominent reasons for the low adoption of IPM. Extension programs in this area are generally sporadic and not follow-up based. Inconsistent assistance makes it difficult for farmers to develop new habits in cultivation, especially the habit of routinely monitoring and analyzing agroecosystems. From an administrative law perspective, this shows the weak function of the state in providing sustainable public services, particularly educational services and farmer empowerment as part of the government's legal obligations.

[18] Md Sadique Rahman, "Farmers' Perceptions of Integrated Pest Management (IPM) and Determinants of Adoption in Vegetable Production in Bangladesh," *International Journal of Pest Management* 68, no. 2 (2022): 158–66.

[19] Huyang Yu et al., "Narrowing the Gaps between Perception and Adoption Behavior of Integrated Pest Management by Farmers: Incentive and Challenge," *Journal of Cleaner Production* 480 (2024): 144117.

When viewed through Lawrence Friedman's legal system framework, this issue reveals an imbalance between the aspects of legal substance, legal structure, and legal culture. The legal substance in the form of regulations on IPM is actually clear and comprehensive, but the implementing structure (extension workers, farmer institutions, and government facilities) is not yet strong enough to bridge the gap between norms and practice. The legal culture of farmers is also not yet fully in line with the principles of sustainability that form the basis of the PHT approach. The tendency of farmers to prioritize instant solutions illustrates that behavioral change cannot occur without adequate changes to the supporting structures. Furthermore, the low level of PHT adoption by farmers is also an indicator of an imbalance between top-down policies and bottom-up needs. Plant protection policies will be difficult to implement effectively if the extension approach remains one-sided and does not involve farmers as key subjects. From a good governance perspective, farmer participation in policy planning, implementation, and evaluation is key to increasing technology adoption. When farmers are not actively involved, they do not feel a sense of ownership of the policy, resulting in low compliance and implementation rates. Thus, the perception and level of PHT adoption in East Lombok not only illustrate technical agricultural issues, but also reflect legal, institutional, and governance issues. The low adoption of PHT shows that the policy has not been effective because it has not reached the structural and cultural dimensions of farmers. To achieve successful PHT implementation, a more comprehensive approach is needed, including strengthening extension services, providing environmentally friendly inputs, reforming subsidy policies, and changing policy communication strategies to be more humanistic and participatory.

## 3.5 Interagency Coordination in Pest Control and the Theoretical and Practical Implications of Policy in East Lombok

Interagency coordination is one of the most important pillars in the successful implementation of plant protection policies, including in the control of garlic pests in East Lombok Regency. Research analysis shows that inter-agency relationships, which should be synergistic, are still partial and sectoral in nature and have not been able to form a solid collaborative system.[20] The Agriculture Office as the policy authority, the Agricultural Technology Assessment Center (BPTP) as a research and technology development institution, and the Field Agricultural Extension Workers (PPL) as the spearhead of implementation at the grassroots level, are not yet effectively integrated in practice. This weak coordination is evident in the lack of information flow, differences in program priorities, and the lack of synchronization between macro policies and micro needs at the farmer level. Coordination constraints are also evident in inter-agency communication, which is often formalistic and unsustainable.[21]

The results of research or technological innovations produced by BPTP are not always disseminated quickly and accurately to extension workers and farmers. Conversely, field reports submitted by PPL regarding the dynamics of pest attacks and farmers' needs are not always taken into primary consideration in program development at the agency level. This situation has led to duplication of activities in some areas, while other areas lack

[20] Djoko Suseno and Hempri Suyatna, "Mewujudkan Kebijakan Pertanian Yang Pro-Petani," *Jurnal Ilmu Sosial Dan Ilmu Politik* 10, no. 3 (2007): 267–94.

[21] Yovita Anggita Dewi et al., "Farmers' Knowledge and Practice Regarding Good Agricultural Practices (GAP) on Safe Pesticide Usage in Indonesia," *Heliyon* 8, no. 1 (2022).

services. The absence of a formal and structured routine coordination forum adds to the long list of inter-agency coordination problems in East Lombok. In fact, modern public management theory, as described by O'Toole (2000), emphasizes that the implementation of policies involving many actors requires a strong coordination network to avoid policy fragmentation and strengthen policy effectiveness.

From an administrative law perspective, this weak coordination constitutes a form of non-compliance with the general principles of good governance (AUPB), particularly the principles of coordination, legal certainty, and accuracy. Law No. 30 of 2014 on Government Administration explicitly stipulates that every government action must be carried out with due regard to these principles. Inter-institutional disunity means that there is a mismatch between the legal structure and the substance of the law, as explained by Lawrence Friedman. The regulations governing the implementation of Integrated Pest Management (IPM) are substantively adequate, but the structure for implementing the policy is weak, thereby hindering the achievement of policy objectives.[22] In addition, the participation of farmer groups in the process of formulating, implementing, and evaluating policies is still limited. In many cases, farmer groups are only positioned as recipients of programs, not as actors who actively contribute to determining the direction of policies. This lack of participation results in a low sense of ownership among farmers towards policies, thereby weakening their commitment to implementing IPM practices. In fact, Law No. 22 of 2019 on Sustainable Agricultural Cultivation Systems clearly positions farmers as subjects of agricultural development who must be empowered, not merely objects of programs.

These findings have very important theoretical implications. Conceptually, this study reinforces criticism of linear and top-down policy implementation models. Agricultural policies, especially those related to IPM, cannot be viewed merely as technical instruments, but rather as public policies that depend on complex interactions between institutional, socio-economic, local cultural, and ecosystem dynamics. The theory of the policy gap is relevant here, namely the gap between policy intention and policy outcome. When inter-agency coordination is weak, legal structures are unable to carry out their mandates, information does not flow properly, and farmers are not substantively involved, the gap widens. As demonstrated by Mazmanian and Sabatier's implementation theory, policy success depends heavily on clarity of objectives, availability of resources, and effectiveness of implementing agencies. In the context of East Lombok, these three aspects have not been fully met. In practical terms, the findings of this study provide a basis for the need to reorient the garlic pest control policy.[23] Dependence on chemical pesticides must be gradually reduced, not only for technical reasons, but also as a logical consequence of the principle of sustainability as regulated in the national legal framework. The policy paradigm must shift from an approach of "controlling pests" to "managing the agricultural ecosystem," a paradigm that is legally more in line with the principles of sustainable

[22] Mu'ammal Jan Prangge, Muhsin Muhsin, and Baiq Inggar Linggarweni, "Perbandingan Pendapatan Petani Bawang Putih Sebelum Dan Sesudah Penerapan Pengendalian Hama Terpadu (PHT) Di Kecamatan Sembalun Lombok Timur," *Jurnal Ekonomi Dan Bisnis* 3, no. 1 (2023): 16–29.

[23] Dudi Septiadi and Muhammad Nursan, "Pengentasan Kemiskinan Indonesia: Analisis Indikator Makroekonomi Dan Kebijakan Pertanian," *Jurnal Hexagro* 4, no. 1 (2020): 1–14.

development as stipulated in Law 22/2019 and Law 32/2009 on Environmental Protection and Management.[24]

In this context, the East Lombok regional government needs to take several strategic steps. First, strengthen the comprehensive implementation of IPM by shifting the focus from chemical pesticide subsidies to the provision of environmentally friendly production facilities, the development of local biological agents, and the availability of high-quality Pests-resistant seeds. Second, increase the capacity of PPL and farmers through continuous education and training based on local needs and delivered through participatory methods. Third, establish a systematic and regular inter-agency coordination forum so that all actors can harmonize programs and solve problems collectively. Fourth, develop a digital technology-based pest information system to accelerate the flow of information between extension workers, farmers, and government agencies. Fifth, strengthen farmer groups as centers for learning, advocacy, and collective IPM implementation.[25] Sixth, encourage ongoing research on pest-resistant varieties and local biopesticides that are suitable for the agroclimate of East Lombok. Seventh, provide incentives for farmers who implement sustainable agricultural practices, so that policies are not only in the form of instructions, but also appreciation for farmers who are committed to preserving the ecosystem. All of these steps show that improvements to pest control policies cannot be made in a piecemeal manner. An integrated, adaptive, and participatory legal and public policy approach is needed. If inter-agency coordination is strengthened and the legal structure is improved, pest control will not only be more effective, but also more equitable and sustainable, thereby improving farmers' welfare while maintaining environmental sustainability in East Lombok.

## 1. Conclusion

This study shows that pest control in garlic farming in East Lombok Regency is at a critical point that requires serious attention from a technical, institutional, and legal perspective. Although various policies have been formulated by the local government, including the implementation of Integrated Pest Management (IPM), the reality in the field shows that these policies have not been optimally implemented due to a lack of coordination between institutions, limited resources, low capacity of farmers and extension workers, and high dependence on chemical pesticides. Pest attacks such as thrips, armyworms, purple spots, and anthracnose remain a significant threat to garlic productivity. The increasingly intense pattern of attacks due to climate change and inappropriate cultivation practices have worsened the situation. Meanwhile, farmers' technical efforts in managing pests are still partial due to limited knowledge, access to technology, and uneven extension assistance. The level of PHT adoption remains low, especially for technical components such as pest population monitoring and the use of biological agents.

From a policy and legal perspective, this study found a clear policy gap between policy formulation and implementation. The policy structure is normatively adequate, but the implementing structure and the legal culture of the community are not yet able to support the maximum success of the policy. Weak inter-agency coordination indicates that the general principles of good governance (AUPB) have not been fulfilled, especially the

[24] Gilang Wirakusuma, "Is Input Subsidy Still Useful for Indonesian Agriculture? An Empirical Review of Rice Productivity at the Household Level," *Jurnal Ekonomi Dan Pembangunan* 28, no. 1 (2020): 17–28.

[25] Ismi Imania Imania Ikhsani et al., "Arah Kebijakan Sektor Pertanian Di Indonesia Untuk Menghadapi Era Revolusi Industri 4.0," *Jurnal Administrasi Dan Kebijakan Publik* 5, no. 2 (2020): 134–54.

principles of coordination, legal certainty, professionalism, and openness as mandated in Law 30/2014 on Government Administration and Law 22/2019 on Sustainable Agricultural Cultivation Systems.

This study also confirms that the success of PHT requires an adaptive, collaborative, and ecosystem-based policy approach. Policies that are too top-down and focus on the provision of chemical pesticides have proven to be unsustainable and have the potential to cause long-term ecological impacts. Therefore, the policy paradigm must shift from simply controlling Pests to managing the agricultural ecosystem as a whole. Overall, this study concludes that reformulating pest control policies in East Lombok is necessary through strengthening inter-agency coordination, increasing the capacity of extension workers and farmers, providing adequate PHT support facilities, developing technology-based pest information systems, and providing incentives to support sustainable agricultural practices. Strengthening the comprehensive implementation of IPM is not only a technical necessity, but also a legal mandate in order to ensure sustainable production, environmental protection, and improved welfare for farmers as the main subjects of agricultural development.

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