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POLICY AND PRACTICE INTEGRATION OF ORGANIC PEST MANAGEMENT SYSTEMS FOR NATIONAL-LEVEL PROTECTION OF HEALTH, SAFETY, AND ENVIRONMENTAL SUSTAINABILITY IN THE UNITED STATES

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ABSTRACT

The increasing concerns regarding pesticide-related health risks, environmental degradation, and food safety challenges have intensified the need for sustainable pest management strategies in the United States. Organic Pest Management (OPM) has emerged as a viable alternative to conventional chemical-intensive pest control methods due to its emphasis on ecological balance, biological control mechanisms, and reduced dependence on synthetic pesticides. Despite growing adoption across agricultural, institutional, and public sectors, the effectiveness of OPM remains constrained by fragmented policies, inconsistent implementation practices, and limited coordination among regulatory and operational stakeholders. This study examines the integration of policy frameworks and practical implementation strategies for Organic Pest Management systems at the national level. Through a qualitative review of federal regulations, institutional practices, scientific literature, and sustainability initiatives, the research evaluates the potential of integrated OPM systems to enhance public health protection, food safety, occupational safety, and environmental sustainability. The study identifies significant gaps in policy harmonization, stakeholder collaboration, monitoring mechanisms, and educational support systems that hinder widespread adoption. Findings indicate that nationally integrated OPM systems can substantially reduce pesticide exposure, improve food quality, protect biodiversity, enhance soil and water conservation, and support long-term environmental resilience. Furthermore, coordinated governance structures involving federal agencies, state authorities, agricultural institutions, public health organizations, and environmental stakeholders can significantly improve implementation efficiency and accountability. The study proposes a comprehensive Policy and Practice Integration Framework designed to strengthen regulatory alignment, institutional collaboration, monitoring systems, and capacity-building initiatives. The research concludes that successful national implementation of Organic Pest Management requires a coordinated multi-sector approach that aligns policy objectives with operational practices. Such integration offers substantial benefits for protecting human health, ensuring food safety, and advancing sustainable environmental management across the United States.

Keywords: Organic Pest Management, Policy Integration, Public Health Protection, Environmental Sustainability, Food Safety, Sustainable Agriculture, Regulatory Governance, Pest Management Policy.

1 INTRODUCTION

The management of pests remains one of the most critical challenges in modern agriculture, public health, and environmental protection. For decades, synthetic pesticides have played a dominant role in controlling insects, weeds, pathogens, and other agricultural pests. Although these chemical interventions have contributed significantly to increased agricultural productivity, their widespread use has generated growing concerns regarding environmental contamination, biodiversity loss, food safety risks, and adverse human health effects (Boulestreau et al., 2021). Research has demonstrated that prolonged exposure to synthetic pesticides may contribute to various health complications, including respiratory disorders, neurological impairments, endocrine disruption, reproductive abnormalities, and certain forms of cancer. In addition, pesticide residues detected in food products and water resources have become significant public health concerns across many regions of the United States. Environmental impacts such as soil degradation, groundwater contamination, pollinator decline, and ecosystem disruption have further intensified demands for sustainable alternatives. Organic Pest Management (OPM) represents a comprehensive and environmentally responsible approach that seeks to manage pest populations through ecological principles rather than chemical dependency (Pearsons et al., 2023). OPM strategies typically include biological control agents, habitat management, crop rotation, resistant crop varieties, mechanical interventions, sanitation measures, and ecological monitoring systems. By emphasizing prevention and ecosystem balance, OPM offers a sustainable framework capable of addressing pest-related challenges while minimizing adverse environmental and health impacts. Despite increasing recognition of OPM's benefits, implementation across the United States remains inconsistent. Various federal and state agencies maintain different regulatory requirements, certification systems, funding priorities, and monitoring mechanisms. Furthermore, agricultural producers, educational institutions, healthcare organizations, and environmental agencies often operate independently, limiting opportunities for integrated action and knowledge sharing (Neal, 2024). The absence of a coordinated national framework creates significant barriers to large-scale adoption and effectiveness. Consequently, there is an urgent need to explore strategies that integrate policy development with practical implementation to maximize the benefits of Organic Pest Management systems. This study investigates how policy and practice integration can strengthen OPM implementation across multiple sectors and contribute to national objectives related to public health protection, food safety, environmental sustainability, and agricultural resilience.

2 EVOLUTION OF PEST MANAGEMENT PRACTICES

Pest management practices have evolved substantially over the past century. Early agricultural systems relied heavily on cultural and biological methods for pest control. However, the post-World War II era witnessed rapid expansion in synthetic pesticide usage due to advancements in chemical manufacturing and agricultural intensification. Although chemical pesticides initially improved crop yields and pest suppression efficiency, long-term consequences gradually became apparent (Zheng et al., 2022). Scientific investigations revealed environmental contamination, development of pesticide resistance, destruction of beneficial organisms, and increased human health risks associated with prolonged exposure (Zhou et al., 2024). These concerns stimulated interest in alternative approaches emphasizing prevention, ecological balance, and sustainable agricultural practices.

2.1 Emergence of Organic Pest Management

Organic Pest Management developed as a response to the limitations of conventional pesticide-dependent systems. Rather than focusing exclusively on pest eradication, OPM emphasizes maintaining pest populations below economically damaging thresholds through environmentally compatible interventions (Zembe et al., 2023). Core principles include, Prevention rather than reactive treatment. Biological control through natural predators and parasites. Enhancement of ecosystem resilience. Reduced reliance on synthetic chemical inputs. Protection of biodiversity and environmental quality. Long-term sustainability of agricultural systems. These principles align closely with broader sustainability goals promoted by environmental and public health organizations (Wang et al., 2022).

2.2 Regulatory Environment in the United States

Several federal agencies play significant roles in shaping pest management policies and practices across the United States. The Environmental Protection Agency (EPA) is responsible for regulating pesticide registration, establishing usage standards, conducting environmental risk assessments, and enforcing safety requirements for pesticide products to protect human health and the environment (Turgut et al., 2011). The United States Department of Agriculture (USDA) supports sustainable agriculture by administering organic certification programs, providing agricultural extension services, implementing conservation initiatives, and promoting environmentally responsible farming practices. The Food and Drug Administration (FDA) contributes to pest management through the oversight of food safety standards, monitoring pesticide residues in food products, and implementing consumer protection measures to ensure food quality and public health. Meanwhile, the Centers for Disease Control and Prevention (CDC) plays an important role in monitoring pesticide-related health issues by conducting public health surveillance and assessing the impacts of

pesticide exposure on communities. Although these agencies collectively contribute to sustainable pest management, their programs and responsibilities often operate independently, resulting in limited interagency coordination and fragmented implementation of integrated organic pest management strategies at the national level (Tracey et al., 2026).

2.3 Need for Policy Integration

Effective Organic Pest Management requires coordination among multiple sectors including Agriculture, Public health, Environmental protection, Food safety, Education, Occupational health (Figure 1).

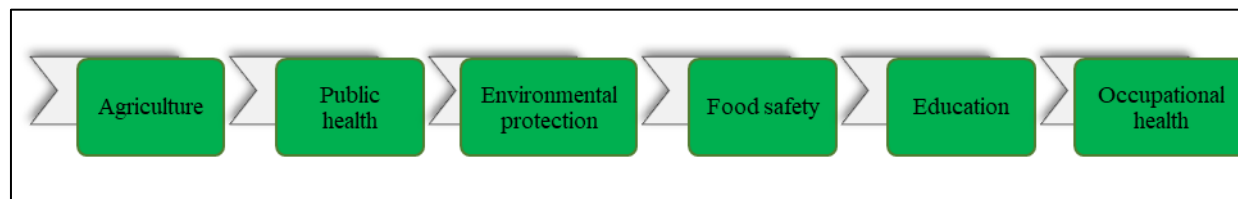


Figure 1: Effective organic pest management sectors.

Without policy integration, individual programs may duplicate efforts, create conflicting requirements, or fail to achieve desired outcomes. Integrated governance frameworks can facilitate resource sharing, improve accountability, and enhance overall effectiveness (Tianna DuPont et al., 2021).

3 ORGANIC PEST MANAGEMENT AND PUBLIC HEALTH

Numerous studies have demonstrated associations between pesticide exposure and adverse health outcomes. Agricultural workers, children, and residents living near farming communities are often identified as high-risk populations. Organic pest management practices reduce reliance on synthetic pesticides and therefore contribute to lower exposure risks (Tianna DuPont et al., 2021). Research suggests that communities adopting organic agricultural systems experience reduced environmental contamination and improved public health indicators. Several studies have also reported lower pesticide residue levels in organically managed food products compared with conventionally produced alternatives (Theresa Medialdia et al., 2024).

3.1 Food Safety Benefits

Food safety remains a major concern within contemporary agricultural systems. Consumers increasingly demand products that minimize chemical contamination while maintaining nutritional quality (Theresa Medialdia et al., 2024). Organic Pest Management contributes to food safety through. Integrated OPM programs support both consumer confidence and regulatory compliance within food supply chains. The outcomes of food safety in Figure 2 through OPM are Reduced pesticide residues, Improved soil health, Enhanced microbial diversity, Lower contamination risks, Sustainable production practices.

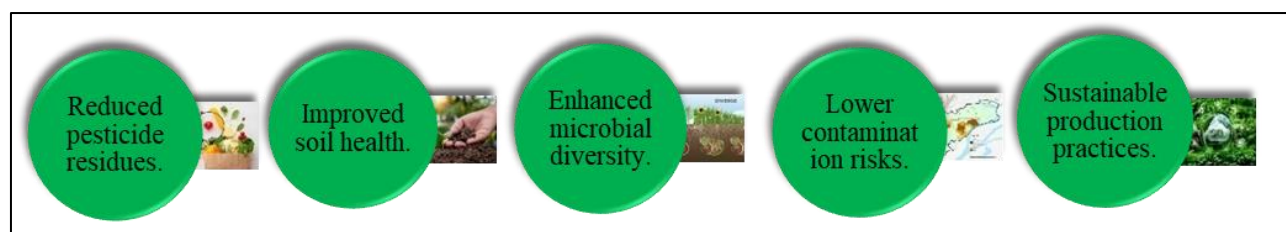


Figure 2: Food safety outcomes

3.2 Environmental Sustainability Outcomes

Environmental sustainability represents one of the most significant advantages of OPM systems. Research indicates that organic pest management can improve environmental sustainability outcomes in Figure 3.



Figure 3: Environmental Sustainability Outcomes

These benefits contribute directly to national sustainability objectives and environmental conservation efforts.

3.3 Institutional and Policy Challenges

Despite documented benefits, several barriers limit OPM adoption. Common challenges include Inconsistent regulatory frameworks, Limited financial incentives, Knowledge gaps among practitioners, Insufficient technical support, Weak monitoring systems, Limited stakeholder collaboration. (Singh et al., 2021) (Figure 4).



Figure 4: Institutional Challenges

Researchers consistently emphasize the importance of integrated governance models capable of addressing these challenges through coordinated policy development and implementation.

4 RESEARCH GAP

Although substantial research has examined the environmental and agricultural benefits of Organic Pest Management, limited attention has been given to the integration of policy frameworks and practical implementation mechanisms at the national level (Shubho et al., 2026). Existing studies frequently focus on: Farm-level adoption. Individual pest control techniques. Environmental impacts. Agricultural productivity outcomes. However, relatively few investigations examine how regulatory agencies, public health institutions, environmental organizations, educational systems, and agricultural stakeholders can coordinate their activities within a unified national framework (Shaw et al., 2021).

Research Objectives

- Examine existing policy and regulatory frameworks influencing Organic Pest Management implementation in the United States.
- Evaluate the contribution of Organic Pest Management systems to public health protection and food safety enhancement.
- Assess the environmental sustainability benefits associated with integrated OPM practices.
- Identify barriers affecting policy-practice integration and national implementation.
- Develop a comprehensive framework for strengthening coordination among regulatory agencies, institutions, and stakeholders.
- Provide evidence-based recommendations for improving national Organic Pest Management governance and implementation strategies.

5 RESEARCH DESIGN

This study employs a qualitative policy analysis approach designed to evaluate the integration of Organic Pest Management policies and practices within the United States. The methodology combines document analysis, literature review, comparative policy assessment, and framework development techniques.

5.1 Analytical Framework

The analysis is structured around four major dimensions that collectively evaluate the effectiveness of nationally integrated organic pest management systems. The policy dimension examines regulatory consistency, legislative support, and governance structures to determine the strength and coherence of the policy framework. The institutional dimension assesses the level of organizational coordination, interagency collaboration, and stakeholder participation necessary for effective implementation. The operational dimension focuses on implementation practices, training programs, technical support services, and the practical application of organic pest management strategies across different sectors. Finally, the sustainability dimension evaluates the broader impacts of these systems on public health, environmental protection, food safety, ecological resilience, and long-term sustainability, providing a comprehensive assessment of their overall effectiveness.

6 DISCUSSION ON PUBLIC HEALTH PROTECTION THROUGH ORGANIC PEST MANAGEMENT

One of the most significant findings of this study is the strong relationship between Organic Pest Management (OPM) adoption and improvements in public health protection. Conventional pesticide-dependent systems expose agricultural workers, consumers, and surrounding communities to potentially harmful chemical compounds (Shaw et al., 2021). Long-term exposure to certain pesticides has been associated with respiratory disorders, neurological impairment, endocrine disruption, reproductive health concerns, and increased risks of chronic diseases (Theresa Medialdia et al., 2024). Organic Pest Management reduces these risks by minimizing or eliminating the use of synthetic pesticides. Instead, OPM emphasizes biological controls, habitat management, cultural practices, and ecological monitoring. Consequently, the likelihood of direct human exposure decreases substantially. From a public health perspective, integrated OPM programs contribute to the following strategies in (Table 1)

Table 1: Public health protection strategies by organic pest management

Reduced occupational exposure among agricultural workers.
Lower pesticide residue levels in food products.
Reduced contamination of drinking water sources.
Enhanced community health outcomes.
Improved environmental quality in rural and urban settings.

The findings suggest that national implementation of OPM policies can serve as a preventive public health strategy while simultaneously supporting sustainable agricultural production.

6.1 Food Safety Enhancement

Food safety remains a critical national concern due to increasing consumer awareness regarding pesticide residues and food contamination. The review demonstrates that Organic Pest Management systems can significantly contribute to

food safety objectives (Shahid Mahmood, 2026). The integration of Organic Pest Management (OPM) systems offers several important benefits for food safety and sustainable agriculture. One of the primary advantages is the reduction of chemical residues, as organic production systems generally contain lower levels of synthetic pesticide residues than conventional farming systems, thereby enhancing consumer health protection and supporting compliance with food safety regulations. OPM also contributes to improved soil quality by promoting soil biological activity, which enhances nutrient cycling, strengthens plant immunity, reduces disease incidence, and supports long-term agricultural productivity. In addition, sustainable pest management practices are associated with enhanced product quality, improving consumer confidence, increasing market competitiveness, and creating greater demand for organically produced foods (Sabbatucci et al., 2024). Another significant benefit is traceability and accountability, as organic certification systems require comprehensive documentation, monitoring, and record-keeping throughout the production process, thereby increasing transparency and ensuring greater integrity within food supply chains. Collectively, these findings demonstrate that the integration of Organic Pest Management systems can strengthen national food safety programs while advancing public health, environmental protection, and long-term sustainability objectives (Reiff et al., 2026).

6.2 Environmental Sustainability Benefits

Environmental sustainability represents one of the strongest arguments supporting Organic Pest Management adoption. The analysis identified multiple ecological benefits associated with integrated OPM systems (Razo-Belman & Ozuna, 2023).

6.3 Biodiversity Conservation

Synthetic pesticides frequently affect non-target organisms, including pollinators, beneficial insects, birds, and aquatic species. OPM practices promote ecological balance by protecting beneficial organisms and encouraging natural pest regulation (Qasim et al., 2024). The following integrated organic pest management systems are being proposed to improve public health and food safety in the United States:

6.3.1 Planting of Pest-Resistant Trees and Plants

The following plants in Table 2 can be planted around various government, commercial and food production centers

Table 2: Planting of pest-resistant trees and plants.

Neem – has natural insecticidal properties
Eucalyptus – Helps repel mosquitoes and flying insects
Lemongrass – rich in citronella, effective in controlling mosquitoes
Lavender – repels flies and mosquitoes
Marigold – Helps control various agricultural and warehouse pests
Tulsi – Reduces fly and mosquito infestation
Peppermint – repels ants and crawling insects

6.3.2 Establishment of Biological Buffer Zones

Creating biological buffer zones around the following establishments: Food factories, Hospitals, Educational institutions, Warehouses, Clothing and industrial establishments, Poultry and livestock farms.

6.3.3 Use of Biological Control

Biological control agents in Figure 5, include ladybird beetles (ladybugs), which feed on aphids, scale insects, and other soft-bodied pests; lacewings, whose larvae are effective predators of aphids, whiteflies, mealybugs, and trips frogs, which consume a wide variety of insects, including beetles, caterpillars, and mosquitoes, thereby contributing to natural pest regulation, which are highly effective at controlling mosquitoes and other nocturnal flying insects, providing valuable ecosystem services in agricultural and surrounding environments (Qasim et al., 2024). The conservation and use of these beneficial organisms enhance biodiversity, promote ecological balance, and improve the long-term sustainability of integrated organic pest management systems (Oweibia et al., 2024).

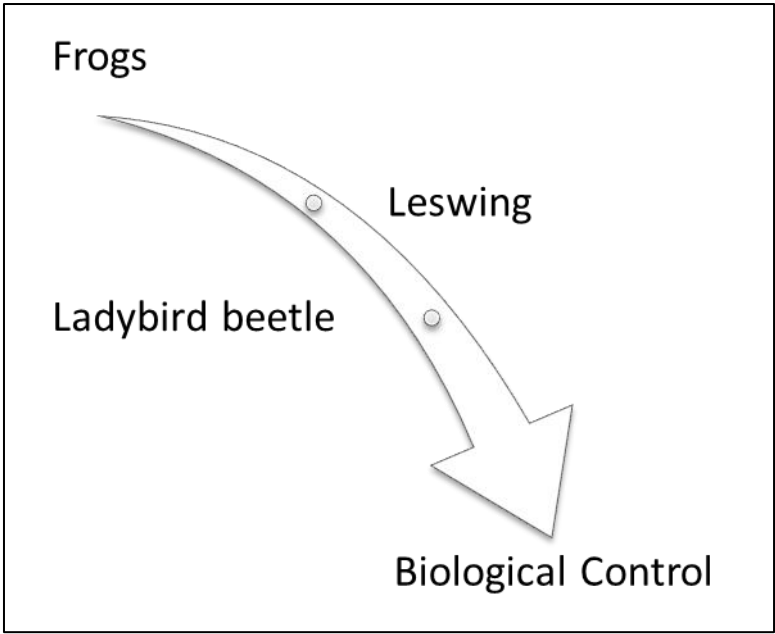


Figure 5: Biological control

6.3.4 Mosquito Larva Control Program

Figure 6 Represents mosquito larva control by uses biological agents, habitat management, and environmentally safe larvicides to eliminate breeding sites, reduce mosquito populations, and prevent vector-borne diseases while minimizing environmental impacts (Matić et al., 2024).

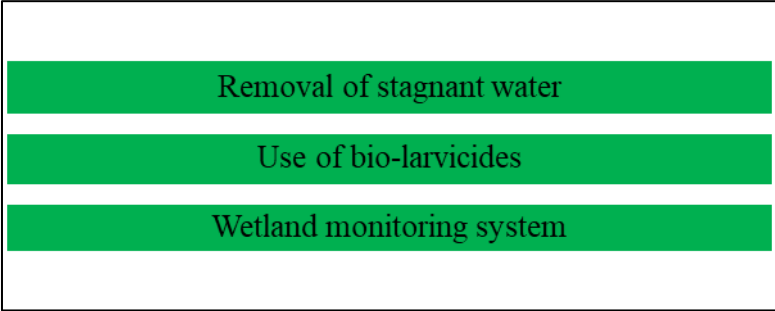


Figure 6: Mosquito Larva Control

6.3.5 Digital and AI-Based Pest Monitoring

In the Table 3 AI-based pest monitoring enables real-time detection, predictive analysis, precision intervention, improved decision-making, and reduced pesticide use in agriculture (Manna et al., 2023).

Table 3: Digital and AI-Based Pest Monitoring

Smart insect trap
GIS Mapping
AI-based risk analysis
National Pest Reporting Platform

6.3.6 Expected National Benefits

Table 4 Represents the expected national benefits from OPM refers Improved public health, enhanced food safety, reduced pesticide dependence, strengthened environmental protection, increased biodiversity, greater agricultural

productivity, improved institutional coordination, and long-term sustainable national development (Manna et al., 2023).

Table 4: National Benefits

Reduced use of chemical pesticides
Increased food security
Reduced risk of dengue and other vector-borne diseases
Reduced environmental pollution
Protection of public health
Establish sustainable and environmentally friendly pest management

Organic Pest Management (OPM) provides significant environmental benefits (Table 4) that extend well beyond conventional pest control. One of its primary advantages is soil health protection, as organic approaches improve soil structure, enhance microbial diversity, promote nutrient cycling, and maintain long-term soil fertility. Healthier soils strengthen agricultural resilience and reduce reliance on synthetic fertilizers and other external inputs. OPM also supports water resource protection by minimizing pesticide applications, thereby reducing the risks of groundwater contamination, surface water pollution, and damage to aquatic ecosystems. Furthermore, sustainable farming systems based on OPM practices enhance climate change resilience, enabling crops and agricultural landscapes to better withstand climate-related stresses such as drought, temperature fluctuations, and pest outbreaks. In addition, OPM contributes to ecosystem stability by encouraging ecological balance, conserving biodiversity, and supporting long-term environmental sustainability. Collectively, these findings demonstrate that Organic Pest Management delivers substantial environmental advantages, making it an effective strategy for promoting sustainable agriculture, protecting natural resources, and achieving broader environmental conservation goals (Mahala et al., 2026).

6.4 Economic and Institutional Impacts

Although the implementation of Organic Pest Management (OPM) systems may require initial investments in training, monitoring, infrastructure development, and institutional capacity building, the long-term economic benefits generally outweigh these early costs. One of the primary advantages is reduced input costs, as farmers gradually decrease their reliance on synthetic pesticides and other chemical-based inputs, resulting in lower production expenses over time (Machalaba et al., n.d.). OPM also creates improved market opportunities by meeting the growing consumer demand for environmentally responsible and organically produced agricultural products, thereby enhancing market competitiveness and increasing farm profitability (Machalaba et al., n.d.). Furthermore, OPM contributes to risk reduction by minimizing environmental liabilities and lowering health-related costs associated with pesticide exposure, generating economic benefits for both agricultural producers and society (Lemke et al., 2024). At the institutional level, integrated pest management policies improve resource allocation and operational efficiency by reducing duplication of efforts, strengthening interagency collaboration, and enhancing accountability among participating organizations. Collectively, these benefits demonstrate that integrating OPM into national agricultural policies supports both long-term economic sustainability and institutional effectiveness (Machalaba et al., n.d.).

6.4.1 Policy Coordination and Governance Challenges

Despite the considerable advantages of Organic Pest Management, several policy and governance challenges continue to hinder its widespread implementation at the national level (Lemke et al., 2024). Fragmented regulatory structures remain a major obstacle, as different federal and state agencies frequently operate under separate mandates, resulting in inconsistent implementation requirements, overlapping responsibilities, and varying performance standards. Another significant barrier is limited technical capacity, with many institutions lacking the specialized expertise, training programs, extension services, and technical resources required to support large-scale adoption of OPM practices (Lemke et al., 2024). Funding constraints further restrict progress by limiting investments in scientific research, farmer education, monitoring systems, demonstration projects, and technological innovation. In addition, inconsistent monitoring and evaluation systems make it difficult to assess program effectiveness nationwide due to the absence of standardized performance indicators and reporting mechanisms. Finally, stakeholder coordination challenges persist because agricultural agencies, environmental organizations, public health institutions, academic organizations, and private-sector stakeholders often function within separate administrative frameworks with limited collaboration. Addressing these barriers requires comprehensive policy reforms that emphasize interagency coordination, institutional integration, sustained financial investment, and collaborative governance to facilitate effective nationwide implementation of Organic Pest Management systems (Lahiri et al., 2022).

6.5 Policy and Practice Integration Framework

Based on the findings of this study, a comprehensive Policy and Practice Integration Framework is proposed to strengthen the nationwide implementation of Organic Pest Management systems while improving public health, food safety, environmental protection, and agricultural sustainability (Khan et al., 2022). The first component, National Policy Coordination, emphasizes the development of a unified federal framework that aligns pest management policies across agencies responsible for agriculture, public health, food safety, and environmental protection. Such coordination would reduce regulatory inconsistencies and establish common national objectives (Iglesias et al., 2021). The second component, Institutional Collaboration, focuses on strengthening partnerships among government agencies, universities, agricultural extension services, healthcare institutions, environmental organizations, research centers, and private-sector stakeholders. Enhanced collaboration would facilitate knowledge sharing, improve resource utilization, and promote coordinated implementation of OPM practices. The third component, Capacity Building, highlights the importance of expanding education, professional training, and technical assistance programs to improve the knowledge and competencies of farmers, extension officers, researchers, and policymakers. Increased institutional capacity would support more effective adoption and long-term implementation of sustainable pest management practices. The fourth component, Monitoring and Evaluation, proposes the establishment of a standardized national monitoring system to assess program performance using key indicators such as pesticide reduction rates, public health outcomes, food safety measures, environmental quality, and biodiversity conservation. Consistent monitoring would enable evidence-based policymaking and continuous program improvement (Hill-Briggs et al., 2022). The fifth component, Research and Innovation, recommends increased investment in scientific research to develop advanced biological control technologies, ecological monitoring systems, climate-resilient pest management strategies, and other innovative approaches that enhance the effectiveness and sustainability of Organic Pest Management. The sixth component, Public Awareness and Community Engagement, emphasizes educational campaigns and outreach programs designed to increase awareness of the benefits of OPM among consumers, producers, policymakers, educational institutions, and local communities. Greater public engagement can encourage broader adoption of sustainable agricultural practices and strengthen support for national policy initiatives (Deguine et al., 2021). Implementation of this integrated framework is expected to produce substantial long-term benefits, including improved public health protection through reduced pesticide exposure, enhanced food safety, lower environmental contamination, increased biodiversity conservation, stronger agricultural sustainability, greater institutional efficiency, improved regulatory coordination, and enhanced resilience of agricultural and natural ecosystems. Collectively, these outcomes demonstrate that a coordinated policy and practice approach can significantly strengthen the national implementation of Organic Pest Management while advancing sustainable development objectives in the United States (Dayan & Duke, 2010).

Recommendations

Based on the findings of this study, the following recommendations are proposed to strengthen the national implementation of Organic Pest Management (OPM) systems and enhance policy integration across the United States (Choi et al., n.d.).

Establish a National Organic Pest Management Strategy

A comprehensive national strategy should be developed to integrate agricultural productivity, environmental protection, public health, and food safety objectives within a unified Organic Pest Management framework. This strategy should provide clear policy direction and facilitate coordinated implementation across federal, state, and local levels (Boulestreau et al., 2021).

Harmonize Federal and State Regulations

Regulatory agencies should work collaboratively to develop consistent standards, guidelines, and implementation procedures that reduce policy fragmentation and ensure uniform adoption of OPM practices across jurisdictions.

Increase Research Funding

Greater public investment should be directed toward research on biological control technologies, ecological monitoring systems, climate-resilient pest management approaches, and other sustainable innovations that enhance the effectiveness of Organic Pest Management (Boulestreau et al., 2021).

Strengthen Extension and Training Programs

Comprehensive education, technical assistance, and professional training programs should be expanded to improve the knowledge and practical skills of farmers, extension personnel, researchers, and policymakers responsible for implementing OPM systems.

Develop National Monitoring Systems

A standardized national monitoring and evaluation framework should be established to assess pesticide reduction, public health outcomes, food safety performance, environmental quality, biodiversity conservation, and other sustainability indicators, enabling evidence-based policy improvements.

Promote Interagency Collaboration

Stronger coordination should be fostered among key federal agencies, including the Environmental Protection Agency (EPA), the United States Department of Agriculture (USDA), the Food and Drug Administration (FDA), the Centers for Disease Control and Prevention (CDC), and relevant state-level organizations to improve policy coherence and resource sharing (Bhuiyan' et al., 2025).

Encourage Public–Private Partnerships

Partnerships among government agencies, academic institutions, private industry, non-governmental organizations, and civil society should be strengthened to leverage technical expertise, financial resources, and innovative solutions for sustainable pest management.(Omar Group, 2022)

Integrate Public Health Objectives

Public health protection should become a central component of pest management policies by incorporating measurable health indicators, pesticide exposure assessments, and disease prevention objectives into planning, implementation, and evaluation processes (Bhuiyan' et al., 2025).

Support Community-Based Programs

Community participation should be encouraged through local education campaigns, demonstration projects, farmer networks, and stakeholder engagement initiatives that promote the adoption of sustainable pest management practices at the grassroots level.

Establish Long-Term Evaluation Mechanisms

Periodic evaluations should be conducted using standardized performance indicators to assess the effectiveness of national OPM policies, ensure institutional accountability, identify implementation gaps, and support continuous improvement through evidence-based decision-making. Collectively, these recommendations provide a strategic roadmap for strengthening Organic Pest Management systems across the United States (Arefin et al., 2026). Their implementation would improve public health protection, enhance food safety, reduce environmental contamination, strengthen institutional coordination, promote agricultural sustainability, and support long-term ecological resilience.

7 CONCLUSION

Organic Pest Management represents a sustainable and effective approach for addressing contemporary challenges related to public health, food safety, environmental protection, and agricultural sustainability. The findings of this study demonstrate that OPM systems can significantly reduce pesticide-related risks while promoting biodiversity conservation, soil health improvement, water quality protection, and ecosystem resilience. However, successful implementation requires more than technical interventions alone. Fragmented policies, inconsistent regulations, limited institutional coordination, and insufficient monitoring systems continue to impede broader adoption across the United States. Consequently, integrating policy frameworks with operational practices is essential for maximizing the effectiveness and sustainability of Organic Pest Management initiatives. The proposed Policy and Practice Integration Framework provides a strategic pathway for strengthening collaboration among government agencies, agricultural organizations, public health institutions, environmental stakeholders, and local communities. Through coordinated governance, enhanced monitoring, expanded research investments, and comprehensive capacity-building programs, the United States can establish a nationally integrated OPM system that protects human health, ensures food safety, and promotes long-term environmental sustainability. Ultimately, national-level policy and practice integration offers a transformative opportunity to advance sustainable development goals while safeguarding future generations from the adverse consequences of chemical-intensive pest management approaches.

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