International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 2s, 2025
https://www.theaspd.com/ijes.php

Agriculture Waste Management and Trade: A Critical Legal Analysis in the Context of Climate Change in India

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Abstract

The question with national and global administrators is how to control and manage waste. It is well established that global waste mismanagement has been contributing to global warming as more than 2.5 billion tons of waste is produced every year. It is thereby the global community that has come together to minimize the impacts of waste through waste management policies. India's responsibilities under the World Trade Organization's Agriculture Agreement are critical for global trade activities. Balancing these duties with the need to decrease agricultural waste is a tough legal task. India must negotiate the WTO's rules and commitments to avoid unduly distorting international commerce using its agricultural waste management policy.

India has guaranteed to decrease greenhouse gas emissions and strengthen its climate resilience. Effective agricultural waste management is related to attempts to lessen and acclimate to environmental change. India is a party to various agreements, treaties, and conventions relating to environmental protection, yet on many occasions implementation concerning waste management is questioned. Presently agricultural waste in India is more than 500 million tonnes, and this farm waste includes huge volumes of garbage such as crop remnants, stubble, and post-harvest waste. The waste products are not appropriately handled, which contributes to air pollution, soil degradation, and greenhouse gas emissions, worsening the environment at large. India's immense and diversified agricultural industry has been facing a challenging dilemma at this junction of agriculture waste management and international commerce.

Keywords: Agriculture, Climate change, International trade, legal framework, Waste Management, International conventions.

INTRODUCTION

India's economy is based on farming, it contributes substantially to the growth of the domestic product and employs a substantial portion of the workforce. However, the industry confronts several difficulties, such as managing and disposal of agricultural waste. Rising temperatures, unpredictable rainfall patterns, and extreme weather events have been impacting agricultural production and food security. Climate change poses a danger to Indian agriculture. Additionally, the incorrect management of agricultural waste worsens environmental deterioration and endangers local populations' health.

India's agricultural industry plays a vital role not just in local food security but also in foreign trade. The country exports an extensive variety of cultivated crops, including rice, wheat, spices, and fruits, making it an important player in global food markets. However, the growing emphasis on climate change prevention and adaptation requires a re-evaluation of agricultural practices, including waste management.

Growing food consumption in emerging nations has resulted in a massive rise in global food production. As a result, agricultural nature enterprises are viable industries in both emerging and established countries. The variety of agricultural operations increases the number of

agricultural goods generated, resulting in a general rise in pollution and waste output. The type of activities carried out and the waste that is created is determined by the nation's geographical and cultural variables. Due to progress in water management structures, current agro-technologies, and wide-scale use of pesticides, enormous swaths of wasteland have been changed to crops. These policies have resulted in worldwide ecological damage and augmented complications in agrarian waste management. Countrywide agencies, on the other hand, are continuously creating rules and potential solutions for managing these wastes, including conversion to reusable resources

Waste items arising from different farming methods are referred to as agricultural waste. In addition to harvest waste and other wastes from farms, poultry houses, and slaughterhouses, agricultural waste also frequently includes pesticides that wind up in the water, air, or soil, as well as salt and silt that has been drained from fields. Agricultural waste may contain decomposing food waste in addition to everything else stated, according to the World Energy Council. Harvest trash, also known as crop residue, can comprise field residues left in an agricultural field or vineyard during crop harvesting as well as process residues left over after the crop has been converted into a valuable resource. As well as leaves, stalks, and stubble (stems), field wastes can include seed pods. Both molasses and bagasse from sugarcane farms are two examples of process residue.
The various elements of farm waste management in India, with a emphasis on trade problems and the ecological effects of climate change, examine the historical context, contemporary methods, and proposed solutions to this critical issue.

To reduce the negative effects of agricultural waste on the environment, the Indian government has proposed several laws and programs. The Swachh Bharat Abhiyan and other state-level efforts contribute significantly to trash management practices. However, more comprehensive and universal laws on recycling, sustainable farming, and garbage disposal is required. India urgently needs to align agricultural waste management with international trade agreements to address climate change. The importance of enacting comprehensive legislation that covers agricultural waste from production to disposal will be discussed in this paper. It will also emphasize the need to implement domestic policies that are consistent with international trade agreements and climate treaties. For India to join in international climate action while maintaining commercial links, the long-term development of the nation depends on maintaining this balance. India therefore needs to implement aggressive legal and regulatory measures that prioritise environmental sustainability and encourage global trade in a world increasingly more interconnected with each passing day.
To address these interconnected issues, a comprehensive regulatory framework that strikes a balance between the growth of agricultural trade and the sustainable management of agricultural waste is necessary.

AGRICULTURE WASTE MANAGEMENT IN INDIA

India has a lengthy history dating back thousands of years in agriculture. Historically, agricultural waste was recycled or given new uses within the farming system. Wastes from crops have been used as fuel, feed, and even building materials. Agrochemicals, packaging materials, animal waste (manure), and crop wastes (straw, husks, and stubble) make up the majority of agriculture waste in India. Despite India's huge agricultural area, the scale of this waste is enormous. However, as agricultural practices progressed due to modernization and mechanization, waste creation and management transformed. The introduction of high-yielding crop types and contemporary farming practices enhanced agricultural output in India during the Green Revolution in the 1960s, but it also resulted in the development of additional trash,

including crop leftovers, extra fertilizers, and pesticides. These modifications prompted the creation of new waste management issues. The improper handling of agricultural waste today is impacting various environmental consequences, including soil deterioration, water contamination, and greenhouse gas emissions.
India's participation in international trade organizations such as the WTO, has consequences for agricultural waste management. Trade agreements can have an impact on the usage of agrochemicals, packaging materials, and agricultural product export-import, all of which have waste management implications. India suffers from the problem of agricultural waste dumping by other countries. Some countries export agricultural waste items, such as plastic packaging, which frequently pollutes Indian landfills and aquatic bodies, and managing such garbage imports is a huge problem. Indian agricultural exports are subject to high-quality regulations, including limitations on pesticide and contaminant residue. Adherence to these requirements demands careful monitoring of pesticide usage , as high residue levels can lead to trade disputes and export bans.

CLIMATE CHANGE'S IMPACTS ON AGRICULTURE WASTE MANAGEMENT

The Impact of Climate change is caused by random climate patterns and climate change has resulted in more frequent and severe droughts and floods. These occurrences have an impact on crop production, perhaps increasing waste creation owing to crop losses and damaged food. Diseases and pests have changed in distribution and behavior as a result of rising temperatures and altered precipitation patterns. Because of this, there is going to be more waste associated with pesticides and environmental contamination as a result of a greater dependence on chemicals.

Fertility and soil quality are impacted by climate change, and these factors indirectly affect how agricultural waste is managed. Degraded soils require more organic supplements and fertilisers, which contributes to waste production. Climate change-related water scarcity may make it more difficult for agriculture and other industries to compete for available water supplies. This could lead to ineffective agricultural water use, raising worries about the environment.Degradation of the soil can be caused by improper handling of crop waste and excessive use of agrochemicals, which reduces crop production and biodiversity. Pesticide and fertilizer runoff from agricultural fields may pollute water bodies, causing threats to aquatic ecosystems and human health. Crop residue burning, a typical waste disposal practice, adds to air pollution, particularly during the post-harvest season, causing respiratory difficulties and smog formation. Methane, a powerful greenhouse gas that contributes to global warming, is produced when agricultural waste decomposes, particularly in landfills. The indiscriminate use of agrochemicals and habitat degradation for agriculture can result in biodiversity loss, impacting ecosystems and their functions.

METHODOLOGY

This research article takes a qualitative approach, concentrating on doctrinal and empirical studies of agricultural waste management and trade in the context of climate change in India. The regulatory system controlling agricultural waste management and the export of India is examined using primary sources such as legal statutes, government policies, and international agreements.

Secondary sources, such as academic journals, books, reports from non-governmental organizations (NGOs), and case studies, are examined to identify loopholes in existing laws and their enforcement. A comparative analysis with international best practices in agricultural waste management is also conducted to provide a holistic perspective.

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RESULTS AND DISCUSSION

AGRICULTURE-RELATED EXPORT AND IMPORT COMMERCE IN INDIA

Agriculture-related export and import commerce in India is controlled by different environmental laws and regulations. These regulations are largely concerned with guaranteeing sustainable agricultural practices, limiting pest and disease transmission, and protecting the environment from dangerous chemicals and pollution. Here are some major characteristics of these laws and the issues they pose:

1. Plant Quarantine rules: To oversee the import and export of agricultural products, India has strong plant quarantine rules. In this context, the Plant Quarantine (Regulation of Import into India) Order, 2003, and the Plant Quarantine (Regulation of Plant Export) Order, 2003, are key rules. The objective of these restrictions is to stop pests and diseases from flowing in and spreading via agricultural trade. The challenge being discussed is to find a balance between increasing trade and managing pests.

2. Pesticide Regulations: The 1968 Insecticides Act and the 1971 Insecticides Rules are the regulations that control the use of pesticides in agriculture. The purpose of these laws is to guarantee the safe and responsible use of pesticides for the environment and human health. Considering the extensive use of pesticides in Indian agriculture, it would be difficult to effectively enforce these limitations.

3. Environmental Impact Assessment (EIA): The Environmental Impact Assessment (EIA) technique was established by the Environmental Impact Assessment Notification of 1994. Although unrelated to agriculture, the EIA procedure is pertinent to agricultural initiatives that could have substantial environmental consequences. It could be difficult to ensure that agricultural enterprises follow regulations because of the substantial research and monitoring mandated by EIA guidelines.

4. Two of India's policies that control organic farming and certification are the National Programme for Organic Production (NPOP) and the Participatory Guarantee System for India (PGS-India). These regulations aim to promote sustainable and environmentally conscious farming methods. Ensuring the authenticity of organic products in international trade poses a challenge.

5. Trade Agreements and WTO rules: India's trade agreements and the World Trade Organisation, or WTO rules frequently cross paths. It is a continuing struggle to strike a balance between economic interests and environmental preservation since trade disputes may develop when these interests coincide.

6. Pollution Control in Agriculture: Agricultural runoff, which may contain pollutants like pesticides and fertilizers, must be managed to prevent pollution. Building wastewater treatment infrastructure and implementing regulations that ban polluting agricultural practices are two barriers that India must overcome to implement effective pollution control measures in agriculture.

India is a global leader in exporting agricultural products, exporting a wide range of agricultural products to numerous countries. India exports a variety of agricultural products, including:
Indian Basmati rice is a major global export commodity well known for its fragrant flavour. Pesticides and fertilizers are frequently used in the cultivation of rice, notably Basmati, which impacts the environment. Excess fertilizer usage can contaminate soil and water, while pesticide runoff can poison water sources and endanger aquatic habitats.

Spices: Black pepper, cardamom, turmeric, and cumin are just a few of the many spices that India exports in huge quantities. The use of pesticides during the growth of spices is another possibility, and improper pesticide management might upset the ecosystem.

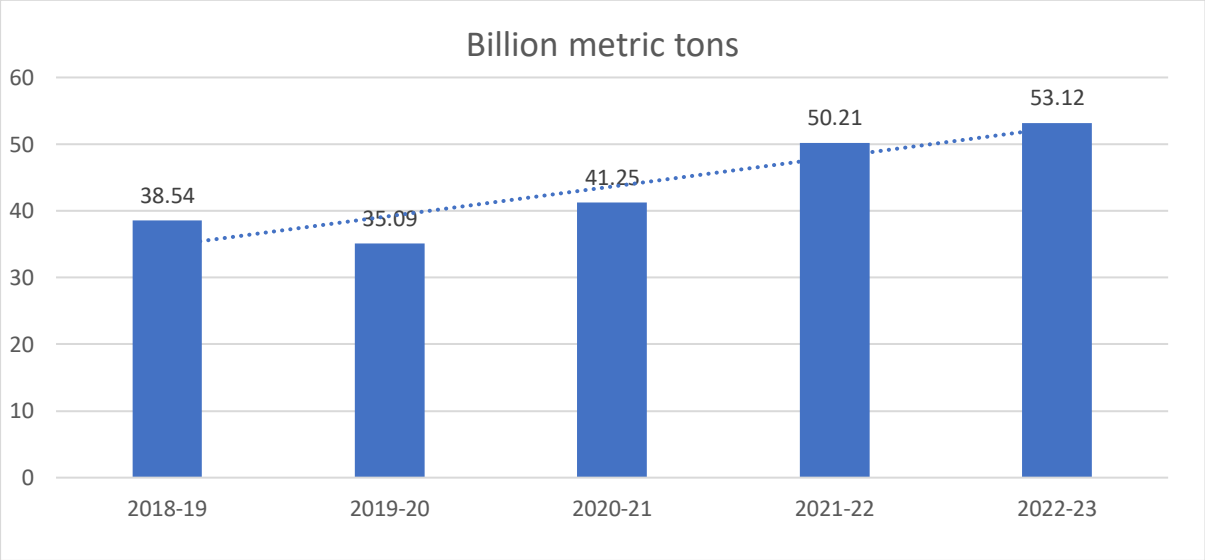
Guavas: Guavas are an important fruit export from India. Pesticides may be used in the production of guavas to control pests and illnesses. Soil and water pollution, as well as injury to non-target creatures, can all have an environmental impact.

Cotton: India is a major cotton exporter, and cotton growing frequently relies extensively on chemicals to control pests such as bollworms. Chemical pesticides used in cotton growing can have negative environmental impacts, including damage to beneficial insects and soil health.

To meet international standards, Indian agriculturists use a lot of chemicals to cultivate in a short amount of time, as well as larger-sized fruits and vegetables to attract worldwide and local clients.

Pesticide usage in agriculture is a complicated and contentious issue with far-reaching environmental implications. India's government, unlike many other nations, has set regulations and legislation to restrict pesticide use and safeguard the environment.

Below are the agricultural products exported from India for the past five years to meet international standards. Farmers use pesticides and chemicals that give yield as per the international market for vegetables and fruits which leads to environmental pollution in India.



Source: Statista – The Statistics Portal for Market Data, Market Research and Market Studies

As per the above Diagram, sources of exports were 38.54 billion US dollars in 2018-2019, 35.09 billion US dollars in 2019-20, 41.25 billion US dollars in 2020-2021, 50.21 billion US dollars in 2021-2022, 53.12 billion US dollars in 2022-2023. An average of 14 billion US dollars increased from 2018 to 2023

There are four intervals (2018-2019 to 2022-2023) and the average increase per year = 14.58 / 4 = 3.65 billion USD per year.

INTERNATIONAL CONVENTION TREATIES AND CHALLENGES

India relies heavily on international accords and conventions to combat farm waste management and climate change. However, implementing them effectively faces a number of challenges, including traditional farming techniques, smallholder farming, and insufficient waste disposal infrastructure. As a result, India has created a legislative framework to promote environmentally friendly farming and combat climate change, including national action plans and environmental laws. Promoting research, education, and clear policy is important for successfully solving these issues. Agriculture and enterprises should be strongly motivated to contribute. To combat climate change and achieve sustainable agriculture, India must work together with other countries in alongside its state and federal governments.

With a large number of jobs and a substantial economic impact, agriculture is a vital sector of the Indian economy. It however brings up concerns about waste management and the way it affects climate change. India has ratified several international treaties and accords aimed at promoting waste management, sustainable agriculture, and climate change mitigation to address these issues, focused on these international agreements, the obstacles preventing India from implementing them, and the current legal framework for dealing with climate change and farm waste management.

The United Nations Framework Convention on Climate Change 1992 (UNFCCC): The United Nations Framework Convention on Climate Change (UNFCCC) is a significant international agreement that India has ratified. India has agreed to lower its greenhouse gas emissions and improve its capacity for adaptation under the parameters of this agreement. Methane emissions from cattle and rice farming, in particular, are major sources of emissions from agriculture

Paris Agreement 2015: Building on the UNFCCC, India is also a signatory to the Paris Agreement, which aspires to prevent global warming from rising above 2 degrees Celsius beyond pre-industrial levels. To reduce carbon emissions, India's Nationally Determined Contributions (NDCs) include sustainable agriculture practices and expanding afforestation activities.

Ramsar Convention 1971: India has signed the Ramsar Convention on Wetlands, which recognizes the importance of wetlands in climate regulation, water purification, and biodiversity habitat. Proper management of agricultural runoff into wetlands is important for reducing the effects of climate change.

LEGAL IMPACT ON THE LOGISTICS SECTOR

Regulatory Compliance:

The increase in trade volume often leads to more stringent regulatory requirements to ensure safety, security, and efficiency in logistics operations. This can involve customs regulations, international trade laws, and industry-specific compliance standards.

Contracts and Liability: As the logistics industry grows, legal frameworks around contracts, insurance, and liability become increasingly complex. Companies must navigate these legal aspects to protect themselves against potential claims and disputes.

Intellectual Property and Technology: Integrating new technologies such as blockchain, the Internet of Things, and AI in logistics can raise legal concerns regarding intellectual property

rights and data privacy. Companies must ensure compliance with data protection regulations like GDPR.

Environmental Impact in the Logistics Sector

Carbon Emissions: The growth in logistics activities contributes to increased carbon emissions, making it crucial for the industry to adopt sustainable practices. This includes using fuel-efficient vehicles, optimizing routes, and implementing green technologies.

Waste Management: Increased shipping and packaging activities result in more waste generation. Logistics companies need to manage waste effectively by recycling materials and reducing packaging waste.

Sustainability Initiatives: The sector is under pressure to reduce its environmental footprint. This involves initiatives like investing in electric vehicles, using renewable energy sources, and adopting sustainable supply chain practices.

Regulatory Pressures: Governments worldwide are imposing stricter environmental regulations, compelling logistics companies to reduce emissions and adopt sustainable practices to comply with these laws.

In summary, while the logistics sector has seen significant growth in commodity value, it also faces legal compliance and environmental sustainability challenges. Addressing these issues is essential for maintaining long-term growth and ensuring a positive impact on society and the environment.

India's Legal Framework for Pesticide Regulation:

The environmental difficulties related to pesticide usage in agriculture in India, as well as the legal framework that governs pesticide control and the specific rules and sections of Indian legislation that deal with these concerns, are:

Pesticide use in Agriculture and Environmental Concerns: Environmental issues associated with pesticide use in agriculture pesticides, particularly persistent organic pollutants, can build in the soil and negatively impact soil health and fertility. This can have long-term consequences for agricultural land. Pesticides can leak into groundwater or be transferred into neighboring bodies of water by runoff, polluting drinking water supplies and destroying aquatic ecosystems. Pesticides sometimes have unexpected repercussions on non-target species, resulting in a decrease of beneficial insects, birds, and other animals. Pesticide residues in food on crops might persist after harvesting and processing, causing health concerns to consumers. Pests can develop pesticide resistance over time, resulting in higher chemical use and significant environmental impact.

The Insecticides Act, of 1968, and the Insecticides Rules, of 1971, are the main legal instruments that regulate pesticides in India. The following are some of the major clauses and portions of this legislation that deal with environmental issues. All pesticides must be registered with the Central Insecticides Board and Registration Committee (CIB&RC) by Section 9 of the Insecticides Act before being marketed or utilized. Registering a pesticide must first be evaluated for its effects on the environment and human health.

Labelling and Packaging (Section 13): The legislation stipulates that pesticide labels must provide information about safe application, handling, and disposal. To avoid leakage and contamination, proper packaging is necessary. Import and Manufacturing (Section 14):

Pesticide importers and manufacturers must get licenses to ensure that only approved goods access the market.

Prohibition of Certain Pesticides (Section 27): The Act gives the government the authority to prohibit or limit the use of certain pesticides if they pose serious harm to the environment, human health, or animals 28 of the statute supports research into alternate, less destructive pest management technologies monitoring and Inspection (Section 29): Government officials have the authority to examine and monitor pesticide production facilities to verify that safety and environmental criteria are met.

Penalties (Section 29A): Insecticide violations of the Act can result in penalties and imprisonment as a deterrent to noncompliance.

Additional Initiatives and Regulations:

Aside from the Insecticides Act, several government agencies, including the Ministry of Agriculture and Farmers Welfare, the Central Pollution Control Board (CPCB), and the State Pollution Control Boards, collaborate to monitor and control pesticide use and its environmental effects.

The government also supports integrated pest management, organic farming, and sustainable agriculture as ways to reduce dependence on chemical pesticides. The use of pesticides in agriculture can lead to a variety of environmental concerns. The legal foundation for tackling such problems in India is provided by the Insecticides Act, of 1968, and its implementing regulations. To prevent adverse environmental impacts while ensuring the security of the nation's food supply, the government must play a key role in regulating the use of pesticides, encouraging safer alternatives, and monitoring compliance. Pesticide regulations must be carefully enforced and periodically modified to adapt to changing situations and protect both the environment and public health

THE LEGAL FRAMEWORK OF AGRICULTURE WASTE MANAGEMENT IN INDIA

An overview of India's history, contemporary legislative norms and regulations governing agricultural waste management, and its relationship to the consequences of climate change are:

1. Water (Pollution Prevention and Control) Act of 1974: This act is aimed to prevent and manage water contamination caused by agricultural runoff and trash dumping. It restricts the release of contaminants into bodies of water and encourages the treatment of agricultural wastewater.

The primary provisions and parts of the Water Act of 1974, as well as challenges with its application in India are:

Section 24 -Prohibitions against disposing of polluting materials in a watercourse or well. Without getting prior approval from the State Pollution Control Board, it is unlawful to dispose of hazardous materials in any stream or well. Regulation and prevention of the discharge of pollutants into groundwater bodies is the primary objective of this law

Section 25 of the State Pollution Control Board allows individuals and corporations to appeal to the Appellate Authority. This provision ensures that parties have the opportunity to seek redress if they believe they have been treated unfairly.
Section 26 - penalties and offenses: The Act imposes fines for a variety of offenses, including failing to acquire authorization for discharge, noncompliance with pollution control regulations, and hindering an authorized person from doing their responsibilities

Section 29 - Entry and inspection authority: This section gives authorized officials the authority to access premises, check equipment, and collect samples for analysis. This is essential to ensuring that pollution control regulations are maintained.

Section 33A - Pollution control areas: The national or State government may declare any area a pollution control area under this provision. Stricter pollution control procedures and standards may be implemented in such regions.

Section 41- Creation of Central and State Pollution Control bodies: The Act creates these bodies, which are in charge of implementing and enforcing the Act's specifications. They grant allows, execute inspections, and carry out water pollution prevention and control techniques.

2.The Air (Prevention and Control of Pollution) Act of 1981 is an important component of environmental law in India that aims to prevent and regulate air pollution. While it is primarily concerned with air pollution prevention and control, it also indirectly helps agriculture and the environment by lowering the detrimental impacts of air pollutants. Here are some major legal parts of the Act linked to agricultural and environmental protection:

Section 2(a): This section specifies important terminology used in the Act, such as "air pollutant," "emission," "occupier," and others that are necessary for understanding and executing the Act's requirements.

Section 17: This clause empowers the State Pollution Control Boards and the Central Pollution Control Board to improve air quality and avoid, control, or abate air pollution. They have the right to order corporations and other facilities to comply with emission limitations and to take the required actions to prevent air pollution without harming farming and the ecosystem.
Section 19: This section provides Pollution Control Boards the authority to designate specific places as "air pollution control areas" and to establish precise emission levels for air pollutants in such regions. These strategies can assist in safeguarding crops in polluted regions.
Section 20: This provision empowers Pollution Control Boards to issue consent orders to industries, outlining the criteria and standards that must be met to prevent air pollution. Compliance with these rules protects agricultural fields and the environment indirectly.

Section 21 prohibits the use of certain fuels like Sulfur coal, petroleum coke, unprocessed wood, or biomass and mandates the installation of air pollution control systems, while the specific fuels prohibited can vary by jurisdiction and regulation.

Section 22: This provision allows the creation of ambient air quality standards, which are essential to preserving air quality and, agricultural and environmental health.

Despite its best objectives, India's Wate (Pollution Prevention and Control) Act of 1974 and Air (Prevention and Control of Pollution) Act of 1981 have various problems and challenges like:

Challenges with implementation: The Acts' uneven enforcement is one of its biggest drawbacks. With minimal repercussions, several industries continue to violate pollution rules. Lack of rigorous penalties, legal cases against polluters are frequently postponed or not aggressively pursued, and the penalties of the Acts' may not be sufficiently dissuasive to stop violations. Inadequate monitoring is sometimes difficult to take prompt remedial action due to insufficient monitoring and data gathering to evaluate air quality and emissions. Rapid industrialization, particularly in metropolitan areas, has happened quickly, which has exacerbated air pollution and made it difficult to put the Acts into action effectively. The lack

of public knowledge of the provisions hampers its efficacy since individuals are unable to report infractions or call for more stringent enforcement.

Technological and Financial Restrictions adopting cleaner technology and emission-controlling techniques may be financially difficult for certain organizations, which can make compliance challenging.

Although the Water (Pollution Prevention and Control) Act of 1974 and the Air (Prevention and Control of Pollution) Act of 1981 have legislative provisions intended at safeguarding agriculture and the environment, their efficacy is constrained by difficulties in enforcement due to India's rapid industrialization. It is essential for the Act's implementation to be effective, and for the safeguarding of agriculture and the environment, these drawbacks should bere addressed and enforcement measures should be strengthened.

3. The 2016 Solid Waste Management Rules: These regulations establish principles for the handling of solid waste, including agricultural waste. It promoted waste from agriculture composting and opposed open burning.

Challenges of Solid Waste Management

Solid waste management poses several legal challenges that impact its effectiveness and compliance with regulations. Here are some key legal challenges faced in this area:

Regulatory Compliance: Different jurisdictions have varying regulations regarding waste management. Ensuring compliance with local, state, and federal laws can be complex and requires ongoing monitoring and adaptation to regulatory changes.

Enforcement and Penalties: Enforcement of waste management laws can be inconsistent, and penalties for non-compliance may not always be sufficient to deter violations. This can lead to illegal dumping, improper disposal, and other environmental hazards.

Permitting and Licensing: Obtaining the necessary permits and licenses for waste management facilities can be a lengthy and complicated process. Legal disputes can arise if there are delays or denials in permitting.

Liability Issues: Determining liability for environmental contamination or damage caused by improper waste management can be challenging. This includes issues related to the transportation, treatment, and disposal of hazardous waste.

Land Use and Zoning: Legal conflicts may arise over the location and operation of waste management facilities due to zoning laws and land use restrictions. Community opposition and legal battles can delay or halt projects.

Cross-Border Waste Movement: The international and interstate movement of waste can lead to legal challenges, especially when waste crosses borders without proper documentation or violates international agreements like the Basel Convention.

Public Participation and Awareness: Legal frameworks often require public participation in decision-making processes related to waste management projects. Ensuring meaningful public engagement and addressing community concerns can be legally challenging.

Data Privacy and Transparency: With the increasing use of technology in waste management, legal issues related to data privacy and transparency can arise. Companies must navigate data protection laws while maintaining transparency in their operations.

Extended Producer Responsibility (EPR): Implementing EPR laws, which hold producers accountable for the entire lifecycle of their products, including disposal, can be legally complex. This requires clear legal frameworks and cooperation between stakeholders.

Waste-to-Energy Projects: Legal challenges related to waste-to-energy projects include environmental impact assessments, emissions standards, and community opposition, all of which require careful legal navigation.

Addressing these legal challenges requires a comprehensive approach that includes clear regulations, effective enforcement, stakeholder collaboration, and public engagement to ensure sustainable and compliant waste management practices.

4. Farm Laws 2020

The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act 2020, the Farmers (Empowerment and Protection) Agreement on Price Assurance and Agricultural Services Act, 2020 and the Essential Commodities (Amendment) Act 2020 are three agricultural laws that the Indian government adopted in September 2020. These regulations intended to improve agricultural commerce and marketing. Changes in agricultural practices and commerce can have indirect effects on waste creation and management even when they do not directly address waste management

The National Mission for Sustainable Agriculture:

NMSA, or the National Mission for Sustainable Agriculture to Lessen the Effects of Climate Change, which is part of the National Action Plan on Climate Change (NAPCC) emphasizes the promotion of sustainable farming practices. It promotes the use of climate-smart agricultural practices that can lessen waste production and boost resource efficiency.

The 2016 Plastic Waste Management Rules: These regulations govern the use of plastic products in agriculture, such as mulch films and irrigation pipes. Proper disposal and management of such items are necessary to prevent pollution and damage to agricultural environments.

Biodiversity loss due to agricultural practices is a problem, according to the Convention on Biological Diversity (CBD) 1992. India is a signatory to the CBD, which encourages the responsible use of biological resources. It emphasizes the significance of preserving agricultural biodiversity

Implementation Challenges of the Farm Laws 2020

While India is committed to these international accords, various obstacles prevent them from being implemented effectively some of the challenges are:

Agricultural Practises: In India, traditional agricultural techniques frequently involve inefficient resource utilization, resulting in increased emissions and waste creation. Transitioning to sustainable practices necessitates substantial public awareness efforts as well as capacity building. India has a high population of smallholder farmers who may lack the means and expertise necessary to implement sustainable farming practices. Government assistance and incentives are required to promote sustainable agriculture among this demographic agricultural sector. Managing agricultural waste, such as crop residues and post-harvest losses, is still a difficulty. Inadequate garbage disposal, and recycling infrastructure and technologies require improvement. Policy gaps, and comprehensive policies that incorporate

climate change mitigation and agriculture are required. Existing policies frequently fail to provide clear guidelines on sustainable agriculture practices.

Indian Landmark Cases

1)Union of India v. M.C. Mehta (1987): This seminal lawsuit brought to light the problem of pollution caused by the indiscriminate discharge of agricultural and urban garbage into rivers and other bodies of water. The Supreme Court of India issued various instructions to combat pollution, including proper agricultural waste treatment and disposal.

2)Gauri Maulekhi Vs Union of India & Ors.

The issue concerns the insufficiency of the regulatory regime in preventing environmental damage caused by unlicensed chicken farms. In 2015, the Central Pollution Control Board (CPCB) issued Guidelines to all State Pollution Control Boards/Committees under the Water and Air Acts, which only applied to poultry farms that handled more than one lakh birds at a single place. However, the National Green Tribunal (NGT) determined that this was insufficient and demanded that the regulatory regime be expanded to include poultry farms with more than 5,000 birds.

The CPCB changed its recommendations in March 2021 and again in August 2021, expanded the approval system to farms handling more than 25,000 birds while exempting others since they were handled by small farmers in the unorganized sector.
The applicant objected to the exception for farms with fewer than 25,000 birds and proposed further strengthening the process and decreasing delays. The NGT deemed the argument for exempting small chicken farms unsustainable and violated the precautionary principle of environmental legislation.
The NGT directed that the contested standards be immediately enforced, and that all poultry farms with more than 5,000 birds be covered by the guidelines beginning January 1, 2023, and that the siting criteria apply to all consents and renewals for poultry farms of this size or larger. The CPCB has been asked to submit new instructions to all State Pollution Control Boards/Committees on this matter within one month.

CONCLUSION AND SUGGESTIONS

The farming industry in India is a significant contributor to the national economy, but it also creates a huge amount of waste, causing serious environmental and climatic issues. Climate change exacerbates these issues, demanding the development of an extensive legislative structure to control farm waste management and trade while also addressing climate-related problems. A multi-pronged strategy is required to solve the issues in land waste management and trade in India, particularly in the context of climate change.

creates a huge amount of waste, causing serious environmental and climatic issues. Climate change exacerbates these issues, demanding the development of an extensive legislative structure to control farm waste management and trade while also addressing climate-related problems. A multi-pronged strategy is required to solve the issues in land waste management and trade in India, particularly in the context of climate change.

Comprehensive Legal Reforms: India’s legal framework should be updated and strengthened to offer clear norms and regulations for farm waste management and trading. Incentives for sustainable practices should be included, as should punishments for noncompliance. Government and non-governmental organizations should launch awareness campaigns and

educational programs to educate farmers and stakeholders on the necessity of sustainable waste management practices.

Particular financial support and subsidies should be given to small and marginal farms so they can invest in waste management technology and infrastructure. To combat extreme weather events and the effects of climate change, it is necessary to develop a waste management infrastructure that is resilient to climate change. To make commercial goods from agricultural waste, it is important to encourage waste-to-wealth research and innovation.

Market Development: To ensure that recoverable agricultural waste products have market access, it is important to leverage regulations and form partnerships with enterprises. India can advance sustainable farm waste management and trading practices by turning these strategies into actionable policies and establishing a robust regulatory framework. This approach will also help mitigate the adverse effects of agricultural waste on climate change.

To adapt and effectively execute these ideas in the Indian context, it is important to collaborate with legal experts, environmental scientists, and legislators.

Abbreviation

Nil

Acknowledgment

The authors would like to convey their heartfelt appreciation for the assistance and encouragement provided by friends and colleagues throughout this research. Special thanks to everyone who provided constructive feedback, shared resources and offered their knowledge and expertise.

Author contributions

Shobha K V : data collection, paper writing, paper revision, document analysis
Dr Gyanashree Dutta: Document analysis reformatting and paper proof writing

Conflict of Interest

The Authors declare that there is no conflict of interest among them

Funding
Nil

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