INTERNATIONAL WORKSHOP

On

"Waste Management and Recycling Strategies for Sustainable Development,"

(Hybrid Mode)

19 Feb, 2025

SOUVENIR

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Janta College, Bakewar, Etawah (U.P.) India

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Message from the Principal

It gives me immense pleasure to extend my warm greetings to all participants, speakers, and organizers of the **International Workshop on Waste Management and Recycling Strategies for Sustainable Development** at Janta College, Bakewar. This workshop is a significant initiative towards addressing one of the most pressing global challenges—effective waste management and sustainable recycling strategies.

In an era where environmental sustainability is crucial, this workshop will serve as a valuable platform for researchers, academicians, and industry experts to exchange knowledge and explore innovative solutions. I firmly believe that the discussions and collaborations initiated here will contribute meaningfully to sustainable development efforts worldwide.

I extend my heartfelt appreciation to the organizing committee, distinguished speakers, and all participants for their dedication and commitment to this cause. May this workshop inspire new ideas and drive impactful actions for a cleaner and greener future.

Best Wishes,
Prof. Rajesh Kishor Tripathi
Principal
Janta College, Bakewar

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Message From Convenor

The Janta College, Bakewar, Etawah (UP), India is organizing an international workshop on "WASTE MANAGEMENT AND RECYCLING STRATEGIES FOR SUSTAINABLE DEVELOPMENT" on 19 February 2025. On behalf of the college, I extend a warm welcome to all the guests and invitees who have participated from different universities, institutes, colleges, public sector organizations, and industries.I believe such events provide valuable opportunities and a beneficial platform for scientists, academicians, subject experts, and researchers from all branches of agriculture and science to present their experimental results and engage in discussions that lead to meaningful findings. Sustainable development is a pressing global concern, and effective waste management and recycling strategies play a crucial role in achieving it. As environmental challenges continue to grow, it is essential to adopt responsible waste disposal methods, promote recycling initiatives, and encourage sustainable practices in our daily lives.

This workshop aims to raise awareness about the significance of proper waste management, innovative recycling techniques, and their impact on environmental conservation. Through discussions, expert insights, and interactive sessions, participants will gain valuable knowledge on reducing waste, reusing resources, and implementing sustainable solutions. To commemorate this learning experience, we present these souvenirs as a token of appreciation and a reminder of our collective responsibility toward a greener future. May these souvenirs inspire each of us to contribute towards a cleaner, healthier, and more sustainable planet.

Dr. M.P. Singh
Convenor
19 February 2025

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Message from Co-Convenor

It is with immense pleasure and a deep sense of commitment to sustainable development that we present this Souvenir of the International Workshop on Waste Management and Recycling Strategies for Sustainable Development. This conference serves as a crucial platform for researchers, academicians, industry experts, and policymakers to deliberate on innovative strategies and cutting-edge technologies for effective waste management. Waste management is no longer just an environmental concern; it is a multidimensional challenge that impacts public health, economic growth, and global sustainability. Through this workshop, we aim to foster dialogue, share best practices, and promote interdisciplinary collaboration to address these challenges. The research papers, discussions, and case studies presented here will contribute significantly to shaping future policies and practical solutions for a cleaner and more sustainable world.I extend my heartfelt gratitude to all the esteemed speakers, participants, and contributors for their invaluable insights and efforts.

I also commend the organizing committee for their dedication in making this event a success. This souvenir encapsulates the essence of our collective efforts and will serve as a lasting record of our shared commitment to sustainable waste management. Let us continue working together to transform challenges into opportunities and pave the way for a greener future.

Best Regards

Prof.(Dr.) Lalit Gupta
Co-convenor
International Workshop

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Message from Organizing Secretary

It is with great pleasure that I extend a warm welcome to all participants of the **International Workshop on Waste Management and Recycling Strategies for Sustainable Development**. This workshop serves as a platform for researchers, academicians, industry experts, and policymakers to discuss innovative solutions and best practices for sustainable waste management and recycling.

In today's world, waste management is not just a necessity but a responsibility towards our environment and future generations. The discussions and knowledge shared in this workshop will contribute significantly to addressing global challenges and fostering sustainable development.

I sincerely thank all the esteemed speakers, participants, and organizing team for their valuable contributions. I also extend my gratitude to our sponsors and collaborators for their unwavering support in making this event a success.

Wishing everyone a fruitful and engaging experience!

Best Regards

Dr. Naveen Awasthi
Organizing Secretary
International Workshop

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Janta College, Bakewar, Etawah, U.P (India)

International Workshop

On

Waste Management and Recycling Strategies for Sustainable Development

19 FEBRUARY 2025

Proposed Sessions & Timetable

8:30 AM Onwards	:	**Registration**
9:30 - 10:30 AM	:	**Inaugural Session** ▪ Welcome address by the Principal ▪ Introduction of the workshop by the convenor ▪ Inaugural Speech by the chief guest
10:30 - 11:00AM	:	**Keynote Lecture** by the Expert on the core theme of work shop
11:00 - 12:15 PM	:	**Technical Session-1** Presentation of research papers by scholars and academicians
12:15 PM - 01:30 PM	:	**Technical Session-2** (Hands-on Training)
1:30- 2:30 PM	:	**Lunch Break**
2:30 PM - 3:30 PM	:	**Technical Session 3** Industry- Expert Talk
3:30 PM - 4:00 PM	:	**Panel Discussion & Feedback**
4:00 PM -04:15 PM	:	**Tea Break & Networking**
4:15 PM - 05:00 PM	:	**Valedictory Session**

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Recycling Strategies of Wastes for Sustainable Development and Circular Economy

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Abstract

The constant consumption of resources exerts pressure on the environment and generated waste management has increased attention from the view of a circular economy. Waste management and recycling are critical components of sustainable development, addressing environmental protection and promoting resource efficiency. As urbanization and industrialization increase globally, the challenges associated with waste generation and disposal have become more pronounced. India is the world's largest plastic waste producer and generates around 9.3 million tones of plastic waste annually out of which around 3.5 million tonnes are mismanaged. This highlights the gap between policy and implementation of sustainable waste management practices in the community. Effective waste management practices, including reduction, reuse and recycling, contribute significantly to minimizing the ecological footprint. Recycling, in particular, not only helps in diverting the waste from landfills, but also conserves valuable natural resources, reduces energy consumption, and mitigates greenhouse gas emissions. There is a need for enhanced community education and infrastructure development to achieve sustainable waste management in our country. It recommends promoting the 3Rs (Reduce, Reuse, Recycle), organizing in-service training and seminar workshops, conducting public awareness campaigns, investing in advanced recycling technologies, strengthening waste management regulations, and supporting community-based initiatives. The integration of these strategies is crucial for achieving long-term environmental sustainability, economic residence, and social well-being. Sustainable waste management and recycling are indispensable components of the global effort to combat climate change and promote a circular economy.

Exploitation of Crop Waste for Sustainable Mushroom Cultivation

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ABSTRACT

Agricultural waste is a significant byproduct of farming activities, often leading to environmental concerns due to improper disposal. However, repurposing crop residues for mushroom cultivation presents an eco-friendly and economically viable solution. Mushroom cultivation requires a nutrient-rich substrate, which can be efficiently provided by crop residues such as wheat straw, rice husks, corn stalks, sugarcane bagasse, and banana leaves. These lignocellulosic materials serve as an excellent growing medium for edible and medicinal mushrooms like *Pleurotus* spp. (oyster mushroom), *Agaricusbisporus* (button mushroom), and *Ganodermalucidum* (reishi mushroom).

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Crop waste-based substrates offer multiple benefits, including cost reduction, enhanced biodegradation, and the recycling of organic matter into valuable biomass. Compared to conventional synthetic substrates, crop residues provide an ideal carbon-to-nitrogen ratio and improve the mycelial growth and fruiting body yield. Moreover, the use of such agricultural byproducts minimizes dependency on forest-based substrates, thereby promoting environmental conservation.

Different pre-treatment methods, such as composting, steam sterilization, and fermentation, can enhance the substrate's nutrient availability and remove inhibitory compounds. Studies have shown that the supplementation of crop residues with organic additives, such as wheat bran or poultry manure, can further boost mushroom productivity. After harvesting, the spent mushroom substrate (SMS) can be utilized as organic fertilizer, livestock feed, or biofuel, contributing to a circular economy in agricultural practices.

The adoption of crop waste-based mushroom cultivation can significantly benefit small-scale farmers by providing an additional source of income, reducing agricultural waste disposal costs, and promoting sustainable farming. Furthermore, mushrooms serve as a highly nutritious food source, rich in proteins, vitamins, and bioactive compounds, addressing food security concerns.

The integration of crop waste into mushroom production presents a promising approach to sustainable agriculture, waste management, and economic empowerment. Future research should focus on optimizing substrate formulations, improving productivity, and exploring new agricultural residues for large-scale application. This approach not only promotes environmental sustainability but also strengthens the bio-economy by transforming waste into valuable agricultural products.

Utilization of Horticultural Waste as Byproduct

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Abstract

Waste utilization in horticulture is an emerging field that aims to transform various types of waste materials into valuable resources for sustainable horticultural crop production. Horticultural crop waste, including peels, leaves, stems, flowers, and by-products from processing, presents a major disposal challenge. Achieving sustainable horticulture requires adherence to the principles of the circular economy by reducing, recycling, and reusing horticultural waste, by-products, and co-products. The bioeconomy involves the production of renewable biological resources and the conversion of these resources and waste into value-added products, such as food, feed, bio-based products, and bioenergy. Composting, anaerobic digestion, incineration, and pyrolysis of food or biologically based materials help regenerate living systems or generate renewable resources for the economy. By converting waste into high quality organic products, entrepreneurs can contribute to sustainable agricultural practices and soil health improvement. Additionally, transforming waste into valuable resources supports waste management, environmental sustainability, and rural development. However, to fully harness this potential, collaboration, innovation, and supportive policies are essential. By promoting waste-based entrepreneurship, we can unlock economic value, reduce waste generation, and pave the way for a more sustainable and circular horticultural industry.

Keywords: Waste management, Entrepreneurship, Horticultural industry and Recycling.

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Performance of New Wheat Varieties with Different Date of Sowing under Irrigated Condition

Pushpendra Kumar, Dr. M.P. Singh, Lt. Brihmanand,
L.P. Singh, Satyam Gupta

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Abstract

A field experiment was conducted at Research Farm J.M.V. Ajitmal, Auraiya during 2014 and 2015. To study the performance of new wheat (Triticum aestivum) varieties with different date of sowing under irrigated condition. The variable involved in the study are two date of sowing i.e. Nov. 18th and Dec. 18th and five varieties i.e. PBW 343, PBW 502, UP 2338, WH 542 and HD 2687. Experiment conducted under single split plot design. The number of tillers, height of main shoot, dry matter accumulation by plant were affected significantly due to dates of sowing and sowing date 18th Nov. proved better than Dec. 18th. The yield attributes i.e. number of fertile spikelet, number of grains per spike, grain weight per spike, 1000 grains weight and grain and straw yield q/ha[1] were recorded significantly higher under Nov. 18th sowing date as compare to sowing of Dec. 18th. The grain yield reduction occurred to the extent of 33.20% with Dec. 18th sowing as compared to 18th Nov. date of sowing. the total number of ear beer shoot, maximum plant height and dry matter accumulation was maximum with PBW343 followed by PBW502, UP2338, WH542 and HD2687. The number of fertile spikelet, number of grains per spike, 1000 grain weight and grain and straw yield produced maximum by PBW343 followed by PBW502, UP2338, WH542 and HD2687. The per cent increase in grain yield due to PBW343 variety was 2.35%, 3.25%, 4.5%, 11.6% respectively.

Eco-friendly Solutions for Managing Crop Residues: Reducing Environmental Footprint through Recycling

Brimha Nand[1], Mahipal Singh[2], Abhishek dwivedi[1]

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Abstract

The management of crop residues has emerged as a critical environmental challenge, particularly in agrarian economies where large quantities of post-harvest biomass remain unused or are disposed of through burning. Open-field burning of residues contributes significantly to air pollution, greenhouse gas emissions, and soil degradation. To mitigate these adverse impacts, sustainable and eco-friendly solutions for crop residue management must be explored. This study evaluates innovative recycling approaches, including composting, biochar production, bioenergy generation, and industrial applications, which transform agricultural waste into valuable resources.Composting enhances soil fertility by converting crop residues into organic manure, reducing dependency on chemical fertilizers and improving soil health. The

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production of biochar, a carbon-rich material derived from pyrolysis, serves as an effective soil amendment while contributing to carbon sequestration. Additionally, bioenergy conversion technologies, such as biogas production and biomass-based power generation, provide renewable energy alternatives while minimizing residue disposal issues. Emerging industrial applications, including the conversion of residues into biodegradable packaging materials, paper, and particleboards, offer economically viable and sustainable alternatives to conventional waste disposal.This paper highlights case studies and best practices from different regions, showcasing the success of various recycling methods in reducing environmental footprints. Furthermore, policy interventions, farmer incentives, and technological advancements are discussed to facilitate the large-scale adoption of these eco-friendly approaches. By integrating scientific innovation with sustainable agricultural practices, crop residue recycling can significantly contribute to climate change mitigation, soil conservation, and circular economy principles.

Keywords: Crop residue management, eco-friendly solutions, recycling, biochar, composting, mulching, bioenergy, sustainable agriculture, climate change mitigation, circular economy.

Nano-Synthesis in Waste Management

Mohini Mishra & Kevin M. Ryan
Bernal Institute, University Of Limerick, Republic of Ireland

Abstract

Nanotechnology is revolutionizing waste management by providing advanced materials and processes for efficient waste treatment, recycling, and pollution control. Nano-synthesis enables the development of functional nonmaterial with enhanced properties for tackling various environmental challenges, such as wastewater purification, plastic degradation, and hazardous waste remediation. This paper explores the application of nonmaterial, including nano-adsorbents, Nano-catalysts, and bio-nanocomposites, in managing industrial and domestic waste. The potential of nanotechnology in converting waste into valuable resources and reducing environmental footprints is also discussed. Despite its promising applications, challenges such as cost, scalability, and environmental safety need to be addressed. This study aims to highlight emerging trends in Nano-enabled waste management and its role in achieving sustainable development goals.

Keywords: Nano-Synthesis, Waste Management, Environmental Remediation, Sustainable Development, Nano-Adsorbents, Circular Economy

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Integration of organic sources fertilizers for higher sesame yield

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Abstract

The present investigation was undertaken at research farm, project coordinating unit (sesame and Niger), JNKVV, Jabalpur, Madhya Pradesh during kharif season, 2010-11 with a view find out the most suitable combination of organic sources and fertilizers for higher production of sesame cv. TKG-22. The eight treatments consisting with various integrated nutrient management were replicated thrice in a randomized block design. The treatment were T₁-Control, T_{2} + (- 100)% RDF, T-50% RDF+50% N through FYM, T-100% N through FYM, T5-50% RDF+50% N through VC, T_{6} + (- 100)% through VC, T-50% RDF+50% N through NOC and T_{8} + (- 100)% N through NOC. The status of N fractions were improved with the application of N in combination with organic manures viz. FYM/VC/NOC. All fractions of N evaluated showed higher values of growth parameter and yield attributes with the application of 100% RDF ((60/40) / 20 * kg / h * a NPK) this treatment also recorded highest seed yield value whereas variations due to different integration treatments (T_{3}, T_{5}, T_{7}) were found to statistically at par. Treatment comprising application of 100% N through organic sources (T_{4}, T_{6}, T_{8}) produce lesser yield than the integrated treatments. Control treatment significant recorded the minimum seed yield also highest B:C ratio was observed with 100% RDF.

Key words: Sesame, Organic manure, INM...

Waste Management and Recycling Play a Crucial Role in Environmental

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Abstract

Waste management and recycling are essential components of sustainable environmental practices, addressing global concerns related to pollution, resource depletion, and climate change. The rapid increase in global waste production due to urbanization and industrialization has raised significant concerns regarding its disposal and impact on ecosystems. Inefficient waste disposal methods contribute to land, air, and water pollution, leading to severe environmental and health hazards.Effective waste management strategies, including waste reduction, segregation, composting, and energy recovery, help mitigate these effects. Proper waste segregation at the source ensures efficient recycling and minimizes landfill waste. Recycling, as a key component of waste management, minimizes landfill waste, lowers carbon emissions, and supports economic growth by creating jobs in the recycling industry. It also conserves raw materials, reducing the strain on natural resources such as forests, minerals, and water. Technological advancements in waste processing and government policies further enhance the efficiency of recycling programs.Public awareness and participation are essential in ensuring the success of waste management initiatives. Educational programs and community engagement encourage responsible waste

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disposal behaviors and increase recycling rates. Governments and organizations must work together to implement stringent waste management policies and invest in research for innovative recycling solutions. A comprehensive approach combining policy regulations, technological solutions, and community involvement is necessary to achieve long-term sustainability. By adopting responsible waste disposal practices and promoting recycling efforts, societies can significantly reduce environmental degradation and move towards a more sustainable future, ensuring a cleaner and healthier planet for future generations.

Keyword: Waste management, Waste recycling,Minimizes landfill waste, Lowers carbon emissions

Waste Management of Plastic and their Recycling Strategies

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Abstract

Plastic waste has become a significant environmental concern due to its widespread use, non-biodegradability, and improper disposal. The accumulation of plastic waste leads to severe ecological challenges, including land and marine pollution, disruption of ecosystems, and health hazards. Addressing this issue requires efficient waste management and recycling strategies to minimize its environmental footprint. This paper explores various plastic waste management approaches, including waste reduction at the source, reuse, and efficient disposal methods. Recycling strategies such as mechanical, chemical, and advanced techniques like pyrolysis, depolymerization, and enzymatic degradation offer promising solutions for converting plastic waste into reusable materials or energy sources. Mechanical recycling involves sorting, washing, shredding, and reprocessing plastic waste into new products, whereas chemical recycling breaks down polymers into monomers for reuse in manufacturing. Additionally, energy recovery methods, including incineration with energy capture, provide an alternative for non-recyclable plastics. The study also highlights the role of policy frameworks, corporate responsibility, and public awareness in enhancing plastic waste management. Government regulations, extended producer responsibility (EPR), and incentives for sustainable packaging are crucial in promoting circular economy practices. Innovative technologies and biodegradable alternatives further contribute to reducing plastic pollution. However, challenges such as high recycling costs, contamination issues, and limited infrastructure need to be addressed for effective implementation. A sustainable and integrated approach to plastic waste management, emphasizing recycling and innovative solutions, is essential to mitigate environmental impacts and move towards a cleaner and more sustainable future.

Key Words: Waste Management, Plastic, Biodegradable, Enzymatic

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A Holistic Approach to Waste Management: Challenges, Strategies, and Sustainability

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Abstract

Waste management is a critical global issue with far-reaching environmental and public health implications. This abstract explores the multifaceted challenges of waste generation, collection, treatment, and disposal in the context of increasing urbanization and consumption patterns. It examines the diverse types of waste, including municipal solid waste, industrial waste, and hazardous waste, and their potential impacts on ecosystems and human well-being. The abstract also discusses various waste management strategies, such as waste reduction, reuse, recycling, composting, incineration, and land filling, along with their associated advantages and disadvantages. Furthermore, it highlights the importance of sustainable waste management practices that prioritize resource efficiency, minimize pollution, and promote circular economy principles. The abstract concludes by emphasizing the need for integrated waste management approaches that involve collaboration among governments, industries, communities, and individuals to address the complex challenges of waste management in a holistic and effective manner.

Keywords: waste management, waste generation, waste collection, waste treatment, waste disposal, municipal solid waste, industrial waste, hazardous waste, waste reduction, reuse, recycling, composting, incineration, landfilling, sustainability, circular economy.

Waste Management and Recycling Strategies for Horticulture Crops

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Abstract

Waste management in horticulture plays a crucial role in promoting sustainability and reducing the environmental impact of agricultural activities. Effective strategies can mitigate waste accumulation and transform organic, plastic, chemical and water waste into valuable resources. Key practices include composting and vermiculture to recycle organic waste into nutrient-rich soil, which enhances crop growth. Recycling plastic materials such as pots, trays, and greenhouse covers helps reduce pollution, while integrated pest management (IPM) and precision agriculture minimize the use of harmful chemicals. Water recycling techniques, such as rainwater harvesting and drip irrigation, support efficient water use. Additionally, reusing horticultural materials and engaging in circular economy principles reduce the overall waste footprint of horticulture practices. These strategies not only enhance environmental sustainability but also improve crop productivity and resource efficiency, contributing to long-term agricultural viability.

Key Word- Waste management, recycle and horticulture

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Sustainable E-Waste Management: Exploring Innovative Disposal Techniques for a Circular Economy

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Abstract

The exponential growth of electronic devices has led to a significant increase in electronic waste (e-waste), posing substantial environmental and health risks. Effective e-waste management is crucial to mitigate these risks and promote a circular economy. This abstract highlights the importance of sustainable e-waste disposal techniques and explores innovative solutions for a greener future. E-Waste Management Challenges:1. Environmental Pollution: E-waste contains hazardous materials like lead, mercury, and cadmium, which contaminate soil, air, and water.2. Data Security: Improper disposal of electronic devices compromises sensitive data, leading to identity theft and cybercrime. Sustainable Disposal Techniques:1. Closed-Loop Recycling: Recycling e-waste extracts valuable materials, reducing the need for primary production and promoting a circular economy.2. Design for Disassembly: Designing electronic devices for easy disassembly enables efficient recycling and reduces e-waste generation.3. Biodegradable Materials: Developing biodegradable materials for electronic devices reduces e-waste generation and environmental pollution.

Key Words: E-Waste Management, Sustainable Disposal, Circular Economy, Closed-Loop Recycling, Design for Disassembly, Biodegradable Materials, Environmental Protection, Data Security.

Use of Agricultural waste as growth promoter and immunomodulator for *Labeo rohita*

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Theme 3: Waste Management in Agriculture and Food Sector

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Abstract

The use of medicinal herbs as nutraceutical for growth enhancement and immunity booster in fish feed is comparatively advantageous over the traditional chemotherapy as these are plant based feed additives which are biodegradable and renders no possible side effects. Delonix regia, also known as Gulmohar, the Flame Tree or Royal Poinciana, is a leguminous tropical tree species that belongs to the Fabaceae family. In present study its leaf extract exhibited high potency of antioxidant activity on growth and immunomodulatory effects on Labeo rohita. Five isocaloric and isonitrogenous diets (35% CP) were made with varying degrees of inclusion level Delonix regia Leaf extraxt(DRLE) viz. (Control - 0% DRLE), T1 (0.5% DRLE), T2 (1 % DRLE), T3 (1.5% DRLE) and T4 (2% DRLE). The effect of DRLE on growth and immunity was found concentration dependent, The fish group receiving the treatment T1, T2 ,T3 and T4 showed significant ($P<0.05$) increase in weight gain, improved FCR, SGR and PER. GSI, on the other hand, revealed no obvious alterations ($P > 0.05$). The amounts of total protein, globulin, and glucose in the serum differed significantly ($P> 0.05$) higher in T4. WBC count increased significantly ($P >0.05$), however there were no significant ($P > 0.05$) changes in Haemoglobin or RBC count. Overall, the data indicate that dietary supplementation with Delonix regia leaf extract can boost growth and improve immunological response in Labeo rohita fingerlings.

Keywords: Delonix regia, Nutraceutical Immunostimulant, , FCR, SGR, PER, Globulin, Serum

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Economics of Dairy Farming in eastern region of U.P.

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Abstract

Production performance determines the cost of milk per unit and also economics of a dairy unit. Cost components incure on various items in milk production like as feed, labour, supervision, veterinary aids, electricity and other miscellaneous charges. A study was conducted at the Dairy farm, I. Ag. Sc. BHU, Varanasi entitled "Economics of Dairy farming in eastern region of U.P." Study was carried out by collection and estimation of data of dairy herd management factors on the variable cost, supervision cost and miscellaneous cost. Statistical analysis was made to see relationship between hard size and various cost components with various seasons. Results indicated that seasonal variation in milk production is closely related with its cost. The milk production is surplus in flush season and deficient in the lean period (summer). The reason of this disparity in production is attributed to the seasonal nature of calving of animals, non-availability of quality green fodders and the environmental factors like temperature, humidity etc. Feed cost was major component of the total cost about 66.72% for per animal head while it was estimated 56% for a litre of milk production. About 56% for green fodders cost and 41.73% for dry fodder cost of total feed cost observed in the study. Concentrate is the most costly item in the total feed cost which was about 2.71% A positive and highly correlation co-efficient was observed between the number of animal head (x) and total feed cost (r = 0.7255). Labour cost was the next higher components of the grass cost about 23% per head while 22% of grass cost of a litre mile production. The cost for per litre milk production was found to be lowest in winter followed by rainy and summer seasons. It was 19% higher in summer than flush (winter) season.

Keyword –Milk Production, Economics, Feed cost, Labour cost, Environmental factor

"Agricultural Waste Management and Recycling for Sustainability"

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Abstract

Agricultural waste management and recycling are critical for promoting sustainability by reducing environmental pollution, enhancing soil fertility, and supporting a circular economy. The agricultural sector generates significant waste, including crop residues, livestock manure, food processing byproducts, and agrochemical containers. If not managed properly, these wastes contribute to soil degradation, water contamination, greenhouse gas emissions, and health hazards. The growing demand for food production further increases waste generation, making efficient management essential for resource conservation and environmental

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protection.Recycling agricultural waste offers multiple benefits, including improved soil health, reduced reliance on chemical fertilizers, lower greenhouse gas emissions, and additional income sources for farmers. Sustainable practices such as composting, anaerobic digestion, biochar production, and agro-industrial waste utilization help convert waste into valuable resources like organic fertilizers, biogas, and biodegradable materials. These practices not only minimize environmental harm but also contribute to economic growth and climate change mitigation.Effective waste management strategies require collaboration among farmers, researchers, industries, and policymakers. Government initiatives, financial incentives, and awareness programs play a crucial role in encouraging sustainable waste recycling. By adopting innovative and eco-friendly waste management practices, the agricultural sector can significantly contribute to global sustainability goals, particularly the United Nations Sustainable Development Goals (SDGs). Ensuring the proper utilization of agricultural waste is essential for maintaining environmental balance, enhancing productivity, and securing a sustainable future.

Theme -Waste Management in Agriculture and Food Sector
Title - Reusing and Treating Waste Water in Agriculture

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Abstract

Reusing and treating wastewater for agricultural purposes is a sustainable way to deal with environmental issues and water scarcity. As the world's water needs grow, treated wastewater presents a practical irrigation substitute that lessens dependency on freshwater resources. Water safety for agricultural use is ensured by the removal of pollutants, pathogens, and excess nutrients during primary, secondary, and tertiary stages of the treatment process. Water quality is further improved by cutting-edge technology like membrane filtration, artificial wetlands, and disinfection techniques. Reusing treated wastewater in agriculture has several advantages, such as conserving freshwater resources, reducing the need of chemical fertilisers, and improving soil fertility because of nutrient-rich effluents. However, appropriate treatment procedures and regulations are required to address issues such possible contamination hazards, salt buildup, and public perception. The safe and sustainable use of treated wastewater can also be guaranteed by putting monitoring systems and best management practices into place. Utilising waste water in farming techniques reduces environmental degradation, improves food security, and advances a circular economy. Frameworks that support wastewater treatment infrastructure and motivate farmers to embrace safe reuse practices must be created by governments and policymakers. Long-term agricultural sustainability and resource efficiency will depend heavily on wastewater recycling as climate change exacerbates water constraints.

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Agricultural Waste Recycling for Bioenergy and Organic Fertilizers: A Sustainable Approach

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Abstract

Agricultural waste, including crop residues, livestock manure, and food processing byproducts, is a valuable resource that can be converted into bioenergy and organic fertilizers. Recycling agricultural waste reduces environmental pollution, enhances soil fertility, and contributes to sustainable energy production.Agriculture generates a significant amount of waste, including crop residues, animal manure, and agro-industrial byproducts. Improper disposal of agricultural waste leads to environmental pollution, greenhouse gas emissions, and soil degradation. Recycling agricultural waste into bioenergy and organic fertilizers provides an eco-friendly alternative that supports sustainable farming and energy security.Bioenergy production from agricultural waste includes biogas generation, bioethanol production, and biomass combustion for electricity. Organic fertilizers, derived from composted agricultural residues and manure, improve soil health and reduce dependency on chemical fertilizers. This paper examines various agricultural waste recycling methods, their benefits, challenges, and strategies for large-scale implementation.

Keywords : Agricultural waste, bioenergy, organic fertilizers, biomass, composting, anaerobic digestion, circular economy.

THE ROLE OF INTERFACES AND DEFECTS ON THE THERMAL TRANSPORT IN NANO-ELECTRONIC SEMICONDUCTING MATERIALS

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Abstract

In Nano-electronic semiconducting materials, interfaces and defects play a crucial role in significantly impacting thermal transport by disrupting the smooth propagation of phonons, leading to reduced thermal conductivity, where the presence of interfacial mismatch and localized lattice distortions introduced by defects act as scattering centers, hindering heat transfer, thus making interface and defect engineering critical for optimizing thermal management in Nano scale devices. reducing the phonon-dominated thermal interfacial resistance (TIR) is an effective way to reduce the junction temperature of electronic devices. Several researches have demonstrated that fabricating nanostructures at interface, i.e., constructing nanostructured interface, could significantly enhance the interfacial thermal transport. Here, we conducted a parametrical study on the photonics thermal transport across nanostructured interfaces using phonon Monte Carlo (MC) technique, and analyzed the dependence of effective thermal resistance ratio between the nanostructured and planar interfaces on the various parameters and the heat flux distributions. Our simulations and analyses indicate that the interfacial thermal transport improvement should be attributed to two mechanisms. which is enhanced with the increasing interface roughness, has a strong negative effect on the improvement of interfacial thermal transport. Due to the combination of those three mechanisms above, the effective thermal resistance ratio decreases to a minimum value and then increases with the increasing contacting area.

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"Transforming Paddy Waste Through Biorecycling for a Sustainable Future"

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Abstract

Rice is a staple food for over half of the world's population, yet its cultivation generates massive amounts of waste, including rice husks, straw, bran, and stubble. Annually, millions of tons of paddy waste remain underutilized or are disposed of through environmentally harmful methods such as open-field burning, leading to severe air pollution, greenhouse gas emissions, and soil degradation. The pressing need for sustainable waste management has never been more critical, especially in the face of climate change, declining soil health, and increasing energy demands.Biorecycling offers an innovative, eco-friendly solution to convert paddy waste into valuable bioresources, promoting sustainability in agriculture, energy, and industry. Advanced bioconversion techniques such as microbial degradation, enzymatic hydrolysis, anaerobic digestion, biochar production, and composting enable the transformation of waste into biofertilizers, biofuels, bioplastics, and other high-value products. These processes not only mitigate environmental pollution but also enhance soil fertility, increase crop productivity, and support carbon sequestration, contributing to climate resilience.However, large-scale implementation of biorecycling faces challenges such as technological limitations, lack of awareness among farmers, high initial costs, and policy gaps. To overcome these barriers, a multi-faceted approach is needed. Strengthening research and development in microbial biotechnology, integrating digital tools like AI and IoT for waste monitoring, providing financial incentives for sustainable practices, and implementing strong policy frameworks can accelerate the adoption of biorecycling solutions.

The Role of Business Startups and Entrepreneurs in Waste Management

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Abstract

The increasing challenges of waste management due to urbanization, industrialization, and environmental concerns have created opportunities for business startups and entrepreneurs to develop innovative solutions. Startups are leveraging technology, circular economy principles, and sustainable business models to reduce waste, promote recycling, and create economic value from discarded materials.Entrepreneurs in waste management are developing solutions such as smart waste collection systems, waste-to-energy technologies, and upcycling businesses that create new products from waste materials. This paper explores the role of business startups and entrepreneurs in waste management, their contributions, challenges, and strategies for scaling sustainable waste solutions.

Keywords: Waste management, startups, entrepreneurs, circular economy, recycling, sustainable business models

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Evaluation of physiological responses of *Moringa oleifera* Lam. to lead (Pb) exposure

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Asbstract

Lead (Pb) toxicity affects growth, mineral nutrient homeostasis, water status and yield of plants. To avoid Pb entry into humans via the food chain, remediation of contaminated sites is required. This study was focused on the evaluation of effects of Pb on *Moringa oleifera*, an efficient metal accumulator plant, for the prospective use in Pb mitigation from the soil. Methods: *M. oleifera* seedlings (10-day old) were treated with different concentrations of Pb (1, 2, 3 and 5 mM) and morphological, biochemical and molecular parameters and Pb accumulation were analyzed at 10, 20 and 30 days. Results: The results showed high Pb uptake by plants in a concentration- and duration-dependent manner. The maximum Pb concentration was found to be 500 mg kg− 1 in roots and 224 mg kg− 1 in shoots, respectively at 5 mM Pb after 30 days. In response to Pb accumulation, plants depicted significant increase in the level of proline (0.49 µmol g–1 FW), polyphenol (75.83 mg g–1 FW), and metallothionein protein (93.55 µmol g-1 × 10− 3).
Keywords: *Moringa,* accumulation, lead, remediation, mitigation.

Minimal Waste Management in Food Industry

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Abstract

In the food industry, minimal waste management refers to planning and management strategies that prioritize waste prevention beyond end-of-pipe waste management. The demand for packaged and processed food has risen dramatically due to the world's population growth. Utilizing waste from the food processing industry is a very difficult task across the world. In addition to ethanol and biogas, several researchers have focused on the production of dietary fiber, food components like pectin, natural colors, vitamins, and antibiotics from food waste. Processing activities produce organic waste, which includes raw material rinds, seeds, skins, and bones. Excessive usage of plastic, glass, and metal packaging materials is a common example of inorganic waste. Economic considerations and the use of renewable energy are taken account of address environmental concerns and achieve eco-efficiency.

Keywords: Low waste management, Food Industry, Renewal energy, Eco-efficiency.

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Sustainable Development of Fruit Crops Scenario in India

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Abstract

A horticulture fruit crop has been one of the important sectors for the steady growth of Indian economy and our country has made impressive progress in fruits production to demands of our increasing population. Fruits are vital components of a balanced diet and a good source of natural antioxidants that have proven efficacy in various chronic illnesses this sector is now facing challenging problems due to land holding fragmentation, reducing soil health, lowering water table, climate change and fluctuating prices of its perishable fruits products. Various kinds of waste generated from fruit industries are considered a global concern. This approach focuses on assessing the biochemical composition of fruit wastes, particularly their sugar content, as a key aspect of bioethanol production. By utilizing this fruit waste, the international goal of "zero waste" can be achieved by sustainable utilization of these waste materials as a rich source of secondary metabolites. Moreover, to overcome this waste burden, research has focused on recovering the bioactive compounds from fruit industries and obtaining a new strategy to combat certain chronic diseases. The separation of high-value substances from fruit waste, including phytochemicals, dietary fibers, and polysaccharides which can then be used as functional ingredients for long-term health benefits. Most of these waste-derived secondary metabolites comprise polyphenols, which have been reported to have anti-inflammatory, insulin resistance-treating, cardiovascular disease-maintaining, probiotics-enhancing, or even anti-microbial and anti-viral capabilities. India is a leading producer of several fruits globally, with a growing domestic demand driven by rising incomes and health awareness. The sector benefits from diverse agro-climatic regions, enabling the cultivation of a wide variety of fruits. However, productivity levels often lag behind global averages, and post-harvest losses remain a significant concern. The sector is also vulnerable to climate change impacts, including erratic rainfall, temperature fluctuations, and increased pest and disease pressure. This study evaluates the potential of pineapple, mango, pawpaw and watermelon fruit wastes for bioethanol production, highlighting the substantial organic waste generated during fruit processing stages such as peeling and pulping. Various techniques, including enzymatic hydrolysis, fermentation, and distillation, are reviewed to optimize bioethanol yields while addressing challenges such as seasonal availability, substrate variability and process optimization. Besides, the environmental benefits of bioethanol derived from fruit wastes, such as reduced environmental pollution, decreased reliance on fossil fuels, and promotion of sustainable agricultural practices, are emphasized.

Key Word : Sustainable Development, zero waste, challenging, agro-climatic, organic waste.

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Importance of Crop Residue Management for Sustainable Crop Production

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Abstract

Crop residue management is a crucial practice for achieving sustainable crop production by enhancing soil health, improving nutrient recycling, and reducing environmental degradation. With increasing global food demands, improper residue disposal methods, such as burning, lead to significant losses of organic matter, greenhouse gas emissions, and air pollution. Sustainable residue management techniques, including mulching, composting, biochar production, and conservation tillage, offer viable solutions to maintain soil fertility and structure while minimizing environmental impacts. These methods contribute to improved water retention, reduced soil erosion, and enhanced microbial activity, ultimately supporting long-term agricultural productivity. Integrated residue management strategies promote circular nutrient flow within farming systems, reducing dependency on synthetic fertilizers and lowering production costs. Additionally, advancements in mechanization, such as residue retention through no-till farming and precision agriculture, have further optimized residue utilization. However, challenges such as labour intensiveness, limited awareness, and technological constraints hinder widespread adoption. Policymakers and researchers must collaborate to develop region-specific guidelines, financial incentives, and awareness programs to encourage farmers to adopt sustainable residue management practices. Effective crop residue management plays a vital role in improving soil health, enhancing crop productivity, and mitigating climate change impacts. A holistic approach involving farmers, researchers, and policymakers is essential to achieving sustainable crop production while ensuring environmental conservation.

Keywords: crop residue management, integrated residue management, environmental degradation, policymakers

MARKETING ROLE IN BRINGING QUALITY OF LIFE IN DEVELOPING ECONOMY

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Abstract

An old saying about marketing says that things are not purchased but they are sold by marketers efforts by creating awareness that triggers a captivating force to search satisfaction in marketers offerings, Human make endeavour to search quality of life by accumulating man made things from their income which they procures from marketers created employment by which they create communicate and deliver those utilities that fulfill their health happiness and comfort for bringing quality of life. In present economy in which liberalization privatization and globalization has started showing their impact in which customers are more aware about their role in society and doing every thing to which themselves by education, training and experience for fullfilling their economic, social and personal goals. Marketing helps in creating awareness that compels to perform economic role by creating those expertise which create exchange for maintaining social standard that society approves. Marketers by creating

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communicating and facilitating exchange are helping developing economy not by increasing GDP and employment but also helps in maintaining price stability and creating lot of employment of providing means that helps in meeting with quality of life.

Key words - GDP, Captivating force.

Integrated Waste Management and Renewable Energy Systems for Sustainable Development

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Abstract

The increasing global population and consumption patterns have led to a significant rise in waste generation, exacerbating environmental and health concerns. Concurrently, the demand for renewable energy sources is growing to mitigate climate change. Integrating waste management and renewable energy systems offers a sustainable solution to these challenges.

By leveraging waste-to-energy technologies, municipalities can convert organic waste into biogas, biofuels, or electricity, reducing greenhouse gas emissions and dependence on fossil fuels. Additionally, recycling and composting programs can divert waste from landfills, decreasing methane production and promoting nutrient-rich soil amendment. Successful integration of waste management and renewable energy systems requires a multi-faceted approach, involving policy frameworks, technological innovation, and community engagement. Cities like Stockholm and Copenhagen have already implemented such integrated systems, showcasing significant reductions in waste disposal costs and carbon emissions. As the world transitions towards a circular economy, embracing the nexus of waste management and renewable energy will be crucial for sustainable development. By harnessing the potential of waste-to-energy technologies and promoting closed-loop systems, we can create resilient, low-carbon communities for future generations.

Keywords: consumption, technologies, sustainable development, waste management, renewable energy

Role of Sustainable Supply Chain Management and waste Management in Agricultural Business.

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ABSTRACT

Sustainable supply chain management is the practice of integrating environmental, social, and economic considerations into the supply chain and reduces negative impacts on the environment, society and protecting the people with environments across the whole chain. Sustainable supply chain management in agriculture to sustain the flow of agricultural products from farm to consumer, incorporating environmentally friendly practices, social responsibility and economic viability at every stage of the supply chain with ensuring the long-term sustainability of farming operations. Environmental sustainability is a sustainable supply chain management to conserve the water with use of efficient irrigation practice, rainwater harvesting, minimizing water and Soil health management with use of Crop rotation, cover cropping, compost application to maintain soil fertility and structure as well as adopted Soil health management of Crop rotation, cover cropping, compost application to maintain soil fertility and structure in agriculture practice as well as reduced pesticide and fertilizer usages application through

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integrated pest management strategies. Utilizing Renewable energy as solar or wind power on farms to reduce carbon footprint. Social sustainability and Economic sustainability is also play important role to managing supply chain management with adopting fair labor practices with ensuring fair wages, safe working conditions and worker rights for farm laborers while Community engagement as Supporting local farmers, communities through partnerships and knowledge sharing practice. Food safety and traceability is managed with implementing robust food safety protocols and traceability systems to track products from farm to table. Other side Economic sustainability play important role with Market access of connecting farmers to reliable markets with fair prices and value chain optimization with Improving efficiency in production, transportation, and distribution to reduce costs and diversification with Growing a variety of crops to mitigate risks and stabilize income. Direct marketing is part of sustainable supply chain management in which Farmers selling directly to consumers through farmers markets or community supported agriculture (CSA) programs. In Local sourcing with Prioritizing purchasing from nearby farms to reduce transportation emissions and Organic farming with Utilizing organic methods to minimize synthetic chemical use and adopting Precision agriculture with Using technology to optimize resource usage based on specific field conditions are also play the important role in sustainable supply chain management. Packaging optimization is a part of SSCM with Minimizing packaging materials and promoting reusable or recyclable options. Environmental protection is practice with reduced environmental impact from farming activities and improved food quality and safety with Enhanced food safety standards and traceability. Enhanced consumer trust and Economic resilience manage to build consumer confidence in the sustainability of agricultural products and increased market access and profitability for farmers respectively.

Keyword: Protecting the environment and providing good quality food to consumers.

Formulation of Janarogya Sudarshan Kadha Powder for Cough and Cold

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Abstract

The department of Industrial chemistry, Janta College Bakewar Prepared Janarogya Sudarshan Kadha in the continuous research on herbal medicines, whoses aim is to provide detailed information about herbal medicines to the citizens and to benefit the society through their use.Natural products from plants are well known in old world civilizations. International markets have been utilizing products from herbs since several decades. India is one of the earliest civilizations that have recognized the importance of herbal products for disease management, nutrition and beauty enhancement with the discovery of several new molecules from herbs for treating dreaded diseases like chronic cough and lung disorder. The relative safety of these products, the global demand for medicinal plant products has increased in recent years. Similarly consumers are preferring cosmetics with aromatic products from plants resulting in higher demand for the raw material. Medicinal plants still play an important role in emerging and developing countries of Asia, both in preventive and curative treatments, despite advances in modern western medicine India with its natural wealth of medicinal and aromatic plants offers excellent scope for establishing enterprises at rural as well as urban centers.The Janarogya Sudarshan Kadha is Prepared with ingredients easily available. It helps people suffering from dry cough, cold and chronic cough etc.it is also useful for good digestion and also valuable for those suffering from lung disorders caused by covid 19. It is also helpful for human beings to boost the immunity and also improve the digestion of the body.

Keywords: Medicinal herbals, Aurveda, biochemicals, janarogya Sudarshan kadha, cough and cold.

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Impact of Agri-Waste Management on Sustainable Agriculture Development in India

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Abstract

Agricultural waste management is a critical component of sustainable agriculture in India. The country generates approximately 600 million tons of agricultural waste annually, which poses significant environmental and health concerns. Effective management of agri-waste can help reduce greenhouse gas emissions, mitigate soil pollution, and promote sustainable agricultural practices. This study assesses the impact of agri-waste management on sustainable agriculture in India. We analyze the current state of agri-waste management in India, including the types and quantities of waste generated, and the existing policies and regulations governing waste management. Our results show that proper agri-waste management can lead to significant environmental and economic benefits, including: Reduced greenhouse gas emissions: Agri-waste management can help reduce methane emissions from agricultural waste, contributing to climate change mitigation. Improved soil health: Composting and vermicomposting of agri-waste can enhance soil fertility, structure, and biodiversity. Increased crop yields: Effective agri-waste management can promote sustainable agricultural practices, leading to improved crop yields and better farm incomes. Job creation and rural employment: Agri-waste management can generate employment opportunities in rural areas, contributing to poverty reduction and rural development. Capacity building: Providing training and capacity-building programs for farmers, rural communities, and other stakeholders. Infrastructure development: Investing in infrastructure for agri-waste collection, transportation, and processing. Public awareness: Raising public awareness about the importance of agri-waste management for sustainable agriculture and environmental conservation. The increasing global waste generation rates pose significant environmental, health, and economic challenges. Sustainable waste management practices are essential to mitigate these impacts. This review aims to identify and synthesize global best practices in sustainable waste management.

Keyword : Reduced greenhouse emissions, Improved soil health, . Increased crop yields, Capacity building, Public awareness

PARALI (Stubble) Management for a Better Environment

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Abstract

Parali or crop residue burning is a major environmental issue, particularly in agricultural regions. This review explores the negative impact of parali burning on air quality, soil health, and climate change. It also examines alternative sustainable management practices, including mechanization, bio-decomposition, and policy interventions, to mitigate its harmful effects.

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Near-Infrared Imaging: A Novel Tool for Detecting Hidden Defects in Fruits

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Abstract

Assessing the quality and safety of fruit products presents a significant challenge in the food industry. Non-invasive methods and tools that rely on optical characteristics are among the most relevant and essential for real-time quality evaluation. The phenomena of absorption, reflection, and scattering, which occur when incident light interacts with biological materials, are inherent properties of these materials. The near-infrared (NIR) spectrum of electromagnetic waves offers key advantages, as it allows light to penetrate surface layers, enabling visualization of specific areas within the objects. Current research on computer vision techniques mainly focuses on quality assessment in agriculture. This technology plays a crucial role in achieving specific objectives before agricultural products are sold in the global market. One important task in this process is defect detection during the sorting and grading of fruits. However, color camera-based computer vision systems have proven inadequate for detecting hidden defects located just beneath the skin of fruits. In contrast, near-infrared (NIR) cameras can effectively identify these concealed defects. Therefore, this paper aims to provide essential information about the principles, potential uses, and applications of near-infrared imaging within computer vision systems. It will also discuss recent applications of NIR imaging for identifying hidden defects in fruits.

Key words: Defects, Fruits, NIR, Non-destructive, Rapid, etc.

Waste Management Scenario in India: Challenges and Recycling Strategies

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Abstract

India produces approximately 62 million tons of waste every year, with over 75% of it not being processed. The majority of the waste generated includes organic waste, plastic, paper, glass, metal, and hazardous waste. According to a study by the Central Pollution Control Board, plastic waste accounts for almost 12% of the total waste generated in India. With a rapidly growing population and increasing urbanization, we face significant waste management challenges. However, by implementing effective waste reduction and recycling strategies, it is possible to harness its potential to create a greener and more sustainable future. Despite the progress made, we still face several challenges in waste reduction and recycling. Insufficient infrastructure, inadequate waste collection systems, and limited public awareness remain obstacles that need to be addressed. India's recycling capacity is not commensurate with the levels of waste generated. It is estimated that only 20-25% of the total waste generated is recycled, with a significant portion of it being recycled in the informal sector. According to the Central Pollution Control Board, India recycles about 60% of the plastic waste generated in the country. However, the recycling

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industry is still in its nascent stages, and the majority of the waste recycling is done by informal sector players. India has taken significant strides in waste reduction and recycling initiatives. The government has launched several programs and policies focused on waste management and sustainable practices. The Swachh Bharat Abhiyan (Clean India Mission) aims to achieve cleanliness and proper waste management across the country. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) focuses on improving waste management infrastructure in urban areas. Additionally, the Extended Producer Responsibility (EPR) framework encourages manufacturers to take responsibility for the life cycle of their products, including their eventual disposal.

The Theoretical Study of investing the rule defective in material properties

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Abstract

The Theoretical study of defects in materials is crucial for understanding how imperfections affect their properties, such as mechanical strength, electrical conductivity, and thermal behavior. Defects, which can include vacancies, dislocations, grain boundaries, and impurities, are often present in materials at various scales and can have significant effects on their overall performance. At the atomic level, defects disrupt the regular arrangement of atoms in a material's crystal lattice. These disruptions influence how electrons and phonons (vibrations in the lattice) move through the material. Theoretical models, such as the Frenkel defect model (for vacancies) and the Schottky defect model (for paired vacancies and interstitials), help predict how these atomic-scale imperfections influence material behavior. For instance, vacancies can reduce electrical and thermal conductivity, while dislocations can affect the material's ability to deform under stress. Another essential aspect of defect theory is the study of how defects affect the mechanical properties of materials. The presence of dislocations, which are linear defects in the crystal lattice, often determines a material's yield strength and ductility. Theoretical models based on concepts like dislocation dynamics and the Peierls-Nabarro stress describe how dislocations move and interact within a material, providing insights into its plasticity and fracture behavior.

Keywords: Theoretical study, Thermal behavior, Mechanical strength, Atomic level, Frenkel defect model, Schottky defect model, Peierls-Nabarro stress.

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To Study the Role of Biotechnology in Waste Recycling

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Abstract

Waste management has become a major global concern. The rapid rise in the rate of population has increased the generation of waste at a tremendous pace. Improper disposal of agricultural, household, municipal and industrial wastes can pose a threat to the health of living beings and the environment. Industrial waste, in particular, is highly hazardous as it contains toxic chemicals and metals. Many methods of waste disposal have been adopted, but most of them produce various kinds of after-effects, therefore, biological methods have been adopted because of their eco-friendly and sustainable nature. Sustainable waste management aims to minimize the amount of waste generation. Waste is treated in a proper way, involving the steps such as segregation, recycling and reuse. Biotechnological methods such as composting, biodegradation of xenobiotic compounds and bioremediation have been tried. These methods have proved useful in treating waste in an eco-friendly way. More research studies need to be carried out to standardize the method for the proper treatment of waste so that environmental sustainability can be achieved.

Keywords: Anaerobicdegradation, Biogas, Bioremediation, Combustion, Composting, Fermentation, Incineration, Recycle, Reduce, Reuse, Xenobiotic.

Waste Management and Recycling Strategies inthe Agricultural Sector:A Step Towards Sustainable Development

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Abstract

Agricultural waste management and recycling strategies play a crucial role in achieving sustainable development. Effective management of organic and inorganic agricultural waste not only enhances soil fertility and prevents water pollution but also contributes to economic benefits and environmental protection. India, as an agrarian economy, generates over 620 million tons of agricultural waste annually (ICAR, 2023), including crop residues, animal waste, food processing waste, and hazardous chemical residues. If not properly managed, these wastes contribute to air and water pollution, soil degradation, and greenhouse gas emissions, leading to severe environmental challenges.The improper disposal of agricultural waste results in severe environmental consequences. The burning of crop residues releases PM 2.5 and PM 10 particulate matter, deteriorating air quality, while chemical waste runoff contaminates water bodies, causing health hazards. The excessive use of plastics and polythene sheets in farming reduces soil fertility and alters its natural composition. Additionally, the decomposition of organic waste releases methane and nitrous oxide, significantly contributing to climate change and global warming.To address these challenges, various recycling strategies are being implemented. Organic waste recycling techniques such as composting, vermicomposting, and biogas production help convert agricultural residues into useful byproducts like biofertilizers and renewable energy sources. Inorganic waste recycling includes the repurposing of plastic mulch, irrigation pipes, old agricultural machinery, and solar panels, reducing environmental impact. Modern technologies like biochar, ethanol, and biodiesel

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production further enhance the utility of agricultural waste.A notable example of successful agricultural waste management is seen in Punjab, where 20 million tons of crop residues are generated annually. With ICAR and government interventions, biogas plants have been established, producing 50,000 tons of methane gas annually. Approximately 30% of farmers have adopted alternative waste management techniques, resulting in the production of 5,000 tons of organic manure, reducing dependency on chemical fertilizers and lowering costs.The Government of India has introduced several initiatives to promote agricultural waste recycling, including:National Bio-Energy Mission – Encouraging the use of bio-waste for energy production.Swachh Bharat Mission – Promoting composting and organic waste recycling.Crop Residue Management Scheme – Discouraging stubble burning and promoting sustainable alternatives.PM KUSUM Scheme – Supporting solar energy and biogas production in the agricultural sector.In conclusion, sustainable agricultural waste management is essential for maintaining ecological balance and ensuring economic benefits for farmers. By integrating waste recycling strategies, bioenergy production, and eco-friendly practices, India can transition towards a cleaner, greener, and more sustainable agricultural system. The collective efforts of farmers, researchers, policymakers, and private sectors can significantly contribute to making agriculture environmentally sustainable and economically viable.

VERMICOMPOST AS A SUSTAINABLE SOIL AMENDMENT A REVIEW OF CURRENT PRACTICES AND FUTURE PERSPECTIVE

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Abstract

The need for environmental sustainability while increasing the quantity, quality, and the rate of waste treatment to generate high-value environmental friendly fertilizer products is highly in demand. Vermicomposting is a good technology for the valorisation of industrial, domestic, municipal and agricultural wastes. Various vermicomposting technologies have been in use from time past to present. These technologies range from windrow, small - scale batch vermicomposting to large – scale continuous flow systems. Each of these processes has its own merits and demerits, necessitating advancement in the technology for efficient treatment of wastes. This work explores the hypothesis that the use of a continuous flow vermireactor system of a composite frame structure performs better than batch, windrow and other continuous systems operated in a single container. Following an in-depth review of the literature on vermicomposting technologies, treatment techniques, and reactor materials used, to explore the hypothesis, it was found that vermireactors operating in continuous flow fashion perform better in waste bioconversion than the batch and windrow techniques. Overall, the study concludes that batch techniques using plastic vermireactors predominate over the other reactor systems. However, the use of frame compartmentalized composite vermireactors performs considerably better in waste valorisation.

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Role of NGO'S and Community Initiatives in Waste Reduction

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Abstract

NGOs and community programs play a vital role in addressing the social and environmental effects of waste through support for the execution of efficient schemes and coordination with government Agencies. They advocate efficient waste practices by organizing awareness workshops and campaigns driving waste collection and segregation and creating educational materials community-based programs empower neighborhood dwellers to decrease waste enhance recycling levels and quicker environmental benefits. These Initiatives enhance waste collection encourage composting and recycling and generate Employment opportunities. Through the inclusion of community members NGO'S and community initiatives can efficiently manage municipal solid waste minimize coasts and generate cleaner healthier environment. The reach of the influence of NGOs and grassroots initiatives goes far beyond local communities. They're building a global culture of sustainability in which people, communities, and governments all collaborate to save the earth. So, let's celebrate the crucial work of NGOs and community programs to mitigate the environmental and social consequences of waste. By standing behind them, we can have a sustainable future for everyone.

Key words: NGOs, Community Programs, Government agencies, Community initiatives

Green business model in waste management

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Abstract

Green business models in waste management seek to reduce environmental damage through sustainable practices. They focus on product design, development, and distribution to control pollution by recycling and reusing products. They attempt to utilize waste as a resource, adopt green supply chain management, and produce closed-loop systems. Waste management hierarchy, waste-to-energy technologies, and zero-waste are some of the effective strategies. Some of the strategies applied to attain Zero Waste are reducing consumption, encouraging reuse and repair of products, having recycling and composting programs, and product and packaging design for disassembly and recyclability. The model promotes conservation of resources, minimization of waste, and utilization of renewable resources during the waste management process. By embracing these methods, companies can reduce costs, enhance efficiency, and increase profitability, while also helping to conserve natural resources and minimize carbon emissions.

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The green model of business in waste management not only addresses the increasing issues of waste generation and pollution but also conforms to worldwide trends towards sustainability. This article discusses the incorporation of sustainable approaches into waste management systems, with emphasis on innovative technologies like waste-to-energy technologies, recycling, and circular economy concepts.

Key words- Green business models, Environmental damage, zero-waste, waste management, waste-to-energy, Circular economy .

Use of treated sewage or waste water as an irrigation water for agricultural purposes environmental health and economic impacts for sustainable agriculture.

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Abstract

Reuse sewage water for crop irrigation becomes necessary due to freshwater scarcity and ground water depletion. Although the suitability of using treated sewage for crop irrigation remains a topic of argument among government authorities and policy maker. The present global situation and techniques for recycling and application of treated sewage water in agriculture. The main objective this study is to present a global scenario of treated waste water being used to irrigate agricultural crops along with the hazards associated with soil fertility. Crop production public health economic sustainable agriculture. This study complied information on the best sewage water treatment for agricultural irrigation disinfection practices. Eventually data base law and rules governing the use of sewage or waste water in agricultural irrigation techniques for many countries throughout the world was created. As an environmental impact effects on water bodies quality of agricultural soil microbial communities of soil and growth of plants have been summarized for the impact on public health significant emphasis was given to the exposure to pathogens and heavy metals to both farmers and consumers. The potential risks of utilizing sewage water for human consumption have also been summarizing economic impact involves financial investment and benefits to sewage or waste water treatment plants and farmers.

Key words : Agriculture sewage water, waste water, water scarcity.

Technology in Waste Management for Sustainable Development

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Abstract

Technology is revolutionizing waste management, driving us towards a more sustainable future. Innovative solutions are emerging to tackle the growing waste problem, offering efficient and environmentally friendly approaches. Equipped with sensors, these bins monitor fill levels and optimize collection routes, reducing fuel consumption and greenhouse gas emissions.AI-powered robots automate the sorting process in recycling facilities, increasing efficiency and accuracy. These underground systems transport waste directly to processing centers, eliminating the need

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for traditional waste collection methods in densely populated areas. These facilities convert waste into electricity, reducing landfill burden and providing a renewable energy source. Advanced composting systems accelerate the decomposition of organic waste, producing nutrient-rich compost for agriculture. Specialized facilities safely dismantle and recycle electronic waste, preventing hazardous materials from contaminating the environment. These apps provide information on recycling guidelines and locations, encouraging public participation in waste reduction efforts. By analyzing waste data, municipalities can identify trends and optimize waste management strategies. These technological advancements are crucial for achieving sustainable development goals. By reducing waste, conserving resources, and minimizing environmental impact, technology empowers us to create a cleaner and healthier planet for future generations

Plastic Waste Management: Challenges and Solution

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Abstract

The increasing global reliance on plastic products has led to an alarming rise in plastic waste, causing severe environmental pollution and threats to wildlife. Plastics, especially single-use items such as bottles, bags, and packaging, contribute significantly to waste accumulation, with most of it being non-biodegradable. As plastic waste persists in ecosystems, it leads to long-term environmental degradation, affecting both terrestrial and marine ecosystems. Effective plastic waste management is therefore critical to mitigating these impacts. This paper explores the primary challenges in plastic waste management, such as inadequate waste segregation, lack of recycling infrastructure, and the economic viability of recycling processes. Furthermore, the complex nature of plastics, including the variety of types and additives used, makes their recycling and disposal particularly difficult. However, several solutions have been proposed to address these challenges, including promoting circular economy principles, enhancing recycling technologies, and encouraging the use of biodegradable alternatives. Government regulations, such as bans on single-use plastics, extended producer responsibility (EPR), and consumer education, also play pivotal roles in reducing plastic waste. This abstract examines both the obstacles faced in managing plastic waste and the innovative approaches being adopted worldwide to foster more sustainable consumption and waste disposal practices. By implementing these solutions, society can reduce plastic pollution and move towards a more sustainable, environmentally responsible future.

Keywords: plastic waste, recycling, single-use plastics, waste segregation, environmental impact.

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Technology in Waste Management for Sustainable Development

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Abstract

Technology is revolutionizing waste management, driving us towards a more sustainable future. Innovative solutions are emerging to tackle the growing waste problem, offering efficient and environmentally friendly approaches. Equipped with sensors, these bins monitor fill levels and optimize collection routes, reducing fuel consumption and greenhouse gas emissions.AI-powered robots automate the sorting process in recycling facilities, increasing efficiency and accuracy. These underground systems transport waste directly to processing centers, eliminating the need for traditional waste collection methods in densely populated areas. These facilities convert waste into electricity, reducing landfill burden and providing a renewable energy source. Advanced composting systems accelerate the decomposition of organic waste, producing nutrient-rich compost for agriculture. Specialized facilities safely dismantle and recycle electronic waste, preventing hazardous materials from contaminating the environment. These apps provide information on recycling guidelines and locations, encouraging public participation in waste reduction efforts. By analyzing waste data, municipalities can identify trends and optimize waste management strategies. These technological advancements are crucial for achieving sustainable development goals. By reducing waste, conserving resources, and minimizing environmental impact, technology empowers us to create a cleaner and healthier planet for future generation.

Keywords: Technology, Waste Management, Environmental Impact, Biological Processes, Chemical Fertilizers

Role of Mathematical Techniques on Household Solid Waste

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Mathematical techniques play an essential role in optimizing household solid waste management, addressing the challenges of waste generation, collection, recycling, and disposal. By employing mathematical models, waste generation patterns can be predicted using statistical methods like regression analysis and time series forecasting. These predictive models help in understanding waste trends and informing infrastructure planning. Optimization techniques such as the **Traveling Salesman Problem (TSP)** and **Vehicle Routing Problem (VRP)** are crucial for minimizing the costs and time involved in waste collection by improving routing and scheduling. Additionally, mathematical optimization, including **linear programming**, ensures efficient allocation of resources, such as waste bins, trucks, and recycling facilities, reducing operational costs.

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The analysis of waste composition and recycling processes benefits from probabilistic and statistical models, which allow for more effective segregation and material recovery. Furthermore, **life cycle analysis (LCA)** and **environmental impact models** evaluate the long-term effects of waste management practices, aiding in sustainable decision-making by assessing potential greenhouse gas emissions, energy recovery, and land usage.Predictive analytics and **machine learning** techniques enable real-time decision-making, improving system responsiveness. Moreover, mathematical modeling of public behavior aids in designing policies that encourage recycling and waste reduction. In conclusion, mathematical techniques provide valuable tools for improving the efficiency, sustainability, and cost-effectiveness of household solid waste management systems, contributing to a cleaner, more sustainable environment.

Keywords: Mathematical techniques, waste generation prediction, optimization, recycling, environmental impact, life cycle analysis, machine learning,

From Waste to Wealth: Exploring Value-Added Products from Agricultural By-Products

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Abstract

Agricultural byproducts, which are commonly seen as waste, constitute an underutilized resource with substantial economic and environmental benefits. With the growing demand for sustainable solutions in agriculture and industry, the conversion of agricultural leftovers into value-added products has received international attention. This study investigates the many strategies for turning these byproducts into biofuels, bioplastics, organic fertilizers, animal feed, and medicinal components. Agricultural waste can be effectively reused by employing modern processing processes such as fermentation, pyrolysis, enzymatic hydrolysis, and bioconversion, thereby lowering environmental pollution and reliance on fossil fuels. Furthermore, this study looks into the significance of technology breakthroughs, governmental frameworks, and market incentives in promoting the wider use of agricultural waste valorization. The report also assesses the economic viability, environmental benefits, and problems associated with expanding these waste-to-wealth efforts. Furthermore, case studies from diverse countries show effective applications of agricultural byproduct usage, underlining their potential contribution to food security, rural development, and climate change mitigation.This study intends to promote worldwide waste management and recycling solutions for sustainable development by emphasizing the practical and commercial potential of transforming agricultural waste into valuable commodities. The findings highlight the significance of a circular economy approach, in which waste materials are reincorporated into production cycles, encouraging sustainability, resource efficiency, and economic resilience.

Keywords: Agricultural by-products, enzymatic hydrolysis, value-added products, waste valorization, biofuels, bioplastics, organic fertilizers, circular economy, sustainable development, recycling strategies, bioconversion, enzymatic hydrolysis, rural development, climate change mitigation, environmental sustainability.

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Assessing the Effectiveness of Integrated Nutrient Management (INM) on Tomato Crop Productivity andSoil Fertility

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Abstract

Integrated Nutrient Management (INM) is a holistic approach that combines organic and inorganic fertilizer sources to optimize crop productivity and soil fertility. This study aimed to assesstheeffectivenessofINMontomato crop productivityandsoilfertility.Afieldexperiment was conducted using a randomized complete block design with fourtreatments: (1) control (no fertilizer), (2) inorganic fertilizer (NPK), (3) organic fertilizer (compost), and (4) integrated nutrient management (INM) combining NPK and compost. Results showed that INM significantly improved tomato crop productivity, with a 25%increase in yield compared to the control treatment. Soil fertility parameters, including organic carbon, nitrogen, phosphorus, and potassium, were also significantly improved under INM. The study demonstrated that INM can be an effective strategy for optimizing tomato crop productivity while maintaining soil fertility. The findings of this study have implicationsfor sustainable agriculture practices and can contribute to improving food security and environmental sustainability.

Keywords:Integrated Nutrient Management (INM),Tomato Crop Productivity,Soil Fertility, Sustainable Agriculture

The Role of Social Impact in Science and Technology: A Framework for Responsible Innovation

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Abstract

The role of social impact in science and technology is a critical aspect of ensuring that innovations and advancements in these fields contribute to the betterment of society. As science and technology continue to evolve and shape our world, it is essential to consider the potential social implications of these developments and to prioritize responsible innovation. Social impact refers to the effects of science and technology on individuals, communities, and society as a whole, including issues such as equity, access, and environmental sustainability. By prioritizing social impact and adopting a framework for responsible innovation, we can ensure that science and technology contribute to the betterment of society and promote a more equitable, sustainable, and just world.

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"Waste Management and Recycling Strategies For Sustainable Development"

Theme: Green Business Models in Waste Management

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Abstract

The increasing amounts of waste generated globally necessitate innovative and sustainable waste management solutions. Green business models offer a promising approach to reduce waste's environmental impact while generating economic benefits. Green business models in waste management represent an essential shift toward sustainability, focusing on reducing the environmental impact of waste while promoting resource efficiency. These models prioritize the circular economy, aiming to minimize waste generation through recycling, reusing, and repurposing materials. They also embrace innovative technologies like waste-to-energy solutions, product life extension, and eco-packaging strategies to create value while protecting natural resources. Businesses adopting green waste management models often work towards zero waste, leveraging practices such as composting, up cycling, and sustainable disposal methods to enhance their operations and contribute to environmental conservation. By integrating these models, companies not only reduce their carbon footprint but also generate new economic opportunities and improve their corporate social responsibility. The transition to green business models in waste management fosters a more sustainable and efficient approach to resource use, contributing to the global shift towards circular and low-carbon economies.Waste management is a significant environmental challenge globally. The increasing amounts of waste generated pose substantial environmental, health, and economic risks. Traditional waste management practices, such as landfilling and incineration, are unsustainable and contribute to greenhouse gas emissions, pollution, and waste of resources.Green business models in waste management focus on sustainability, reducing environmental impact, and promoting the circular economy. These models aim to manage waste in an efficient, eco-friendly way, converting waste into resources or minimizing waste generation in the first place.

Green business models not only contribute to environmental sustainability but also offer cost savings, innovation opportunities, and positive brand differentiation for companies involved in waste management.

Use of Sewage Water in Marigold Crop in Agra Region

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Abstract

Marigold (Tagetes spp.) is an important flower crop grown widely in the Agra region due to its high demand in religious and commercial purposes. The use of sewage water for irrigation is becoming a common practice due to water scarcity. This study examines the potential benefits

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and risks of using sewage water for marigold cultivation.Sewage water contains essential nutrients like nitrogen, phosphorus, and potassium, which can enhance plant growth and reduce the need for chemical fertilizers. Farmers in Agra have been using treated and untreated sewage water for irrigation, which helps in cost reduction and sustainable water management. However, there are concerns regarding heavy metal accumulation, soil contamination, and plant health. Proper treatment and monitoring of sewage water quality can help in minimizing these risks.
The study indicates that controlled use of sewage water can improve marigold yield and reduce dependency on freshwater sources. Further research is needed to evaluate its long-term impact on soil health and flower quality. Awareness programs and scientific interventions are essential to ensure safe and effective use of sewage water in floriculture.

Keywords: Marigold, Sewage Water, Agra Region, Sustainable Irrigation, Soil Health

Enhancing Sustainability Through Efficient Mustard Waste Management

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Abstract

Mustard (Brassica spp.) is a key oilseed crop, but its large-scale cultivation generates significant agricultural waste, including straw, husk, seed meal, and oil cake. Effective waste management not only mitigates environmental concerns but also transforms these byproducts into valuable resources, contributing to sustainability and economic growth. Mustard straw can be repurposed for composting, biochar production, and livestock feed, while seed meal and oil cake are rich in nutrients, making them excellent organic fertilizers, biofuel sources, and natural pesticides. Additionally, innovative applications like biodegradable packaging, bio-based plastics, and pharmaceuticals enhance the circular economy approach in mustard farming. By integrating advanced waste utilization strategies, mustard cultivation can transition towards a zero-waste model, reducing carbon footprints and improving soil health. Policy support, farmer awareness, and technological innovations are crucial to optimizing these practices. Sustainable mustard waste management not only preserves environmental resources but also fosters economic resilience, making it a vital step toward future-ready agriculture.

Keywords: Mustard waste, circular economy, biochar, organic fertilizers, sustainability, renewable energy.

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Sustainable Waste Disposal: Landfills, Incineration and Composting

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Abstract

Sustainable waste management is a critical approach in addressing the growing global waste problem and play vital role in shaping our environment. Especially the developing countries are facing major challenges for adequate and sustainable management of waste generated. The traditional methods of waste disposal *i.e.* landfills, incineration and composting; offer distant benefits as well as challenges. Landfills, traditionally the most common method, create environmental concerns due to methane emissions, leachate contamination, and land degradation. Incineration, while reducing waste volume to a greater extent, contributes to air pollution and requires significant investment in advanced technology to mitigate harmful gas emissions. Composting is a sustainable and eco-friendly approach that biologically transforms organic waste such as food scraps, yard waste and agricultural residues into valuable soil nutrients that promote sustainable agriculture. The microbial activities during composting not only reduce waste, but also restore vital nutrients to the soil, enhance its fertility and improve soil structure. The challenges and environmental impacts of landfills, incineration and composting emphasize to adopt a holistic and integrated approach for waste management. Each method plays a role in waste management, but composting stands out for its potential to support a circular economy by returning nutrients to the soil and reducing reliance on synthetic fertilizers. While landfills and incineration offer short term solutions, composting presents long term benefits in terms of improving soil health and fostering sustainable agricultural practices. Thus, it advocates the increased investment in composting programs and technology as part of a broader strategy for achieving sustainable eco-system.

Genetic Analysis of Okra's Nutritional Content and Its Implications for Human Health

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Abstract

Okra (*Abelmoschus esculentus*) is a nutrient-dense vegetable crop, providing essential vitamins, minerals, and antioxidants. To enhance okra's nutritional quality, understanding the genetic basis of its nutritional content is crucial. This study aimed to investigate the genetic variation in okra's nutritional traits and explore their implications for human health.A diverse panel of 150 okra genotypes was evaluated for nutritional traits, including vitamin C, vitamin A, potassium, and fiber content. Genome-wide association study (GWAS) and quantitative trait locus (QTL) mapping identified several genetic loci associated with these traits. Notably, a major QTL for vitamin C content was detected on chromosome 5.The study revealed significant genetic variation for all nutritional traits, indicating the potential for genetic improvement. The identified genetic loci and associated molecular markers can be used to develop breeding strategies for enhancing okra's nutritional quality. Furthermore, the findings of this study have important implications for human health, particularly in regions where okra is a staple crop.Okra is a powerhouse of valuable nutrients, nearly half of which is soluble fibre in the form of gums and pectins which help to lower serum cholesterol, reducing the risk of heart diseases. The other fraction of Okra is insoluble fibre, which helps to keep the intestinal tract healthy. Okra is also abundant with several carbohydrates, minerals and vitamins, which plays a vital role in human diet and health.

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EFFECT OF MICROBE BASED NATURAL RESOURCES ON HUMAN HEALTH AND ENVIRONMENTAL

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ABSTRACT

Nature blessed us with so many microbe based natural plant nutrient resources which can be an answer to the pollution emitted into the environment while production of chemical fertilizers. These chemical fertilizers not only damage the soil fertility, but also have toxic effects in case of humans. Consumers are avoiding food produced using chemicals and ready to buy food products with natural nutrient resources at premium price. The demand for natural sources of such compounds is increasing day by day because of awareness of its positive health benefits. It is therefore, essential to explore various natural sources of food nutrients and their use potentials. Most often, the nutrients are extracted from plant residue, but other sources such as flora and fauna are used as well. Additionally, organisms other than plants can manage the entire nutrients and thereby reducing dependence on chemical fertilizer. Furthermore, natural nutrients will not only be beneficial to the health of human beings, but it will be a boon for the conservation of soil fertility as harmful chemicals released into the environment while producing chemical fertilizer could be stopped.

. Government Policies for Effective Waste Management

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Abstract

Waste management and recycling are critical components of sustainable development, ensuring environmental protection, resource conservation, and human health. Rapid industrialization and urbanization have led to an exponential increase in waste generation, particularly in developing countries like India. To address these challenges, the Government of India has introduced various policies, including Solid Waste Management Rules (2015) and the initiatives under Ministry of Environment, Forest and Climate Change, as well as the Ministry of Urban Development. To ensure sustainable waste management, various strategies and best practices are addressed *viz*. Public Awareness and Behavioural Change, Public-Private Partnerships (PPPs), Source Segregation and Collection Efficiency, Scientific Land filling and Safe Disposal, Electronic Waste Recovery-Refurbishing-Resale etc. One of the best examples of a successful waste management strategy is Sweden's Waste-to-Energy (WTE) program. Sweden has achieved remarkable results by combining recycling, waste-to-energy, and circular economy principles. This program includes various modes of waste recycling such as dual-stream & single-stream recycling, integration of mechanical and chemical recycling, smart waste collection and AI optimization. Thus, it is suggested that educational strategies should also be employed to educate global audiences regarding hazards of wastes, need for appropriate management, and options that can be implemented.

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Social Awareness about Government Scheme for Waste Management in India

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Abstract

The waste situation in India is dire, with only about 43 million tonnes of the generated waste being collected, while a significant portion remains untreated or ends up in landfills. Recycling rates are relatively low, and the management of hazardous and biomedical waste also presents challenges. There is a need for significant improvement in waste collection, segregation, and treatment practices across the country. The biggest problem with waste in India is the inadequate waste collection infrastructure and lack of efficient sorting and recycling systems. Due to these shortcomings, valuable materials end up in landfills instead of being recycled. An effective way to improve attitudes towards waste reuse and recycling is to integrate waste management education into school curriculum and particularly teaching children about the causes and consequences of waste disposal and highlighting the importance of waste prevention, reuse and recycling. Swachh Bharat Mission for Solid Waste Management: Central assistance is provided under Swachh Bharat Mission for solid waste management including plastic waste management in urban and rural areas. Swaccha Survekshan is an annual survey of cleanliness, hygiene and sanitation in cities and towns across India. Swachhata Hi Sewa Campaign has been launched for ensuring cleanliness through the various stakeholders' engagement in the "Jan Andolan" (National Movement). Compost Banao, Compost Apnao Campaign aims to encourage people to convert their kitchen waste into compost to be used as fertilizer and to reduce the amount of waste getting to landfill sites. Project REPLAN aims to make carry bags by mixing processed and treated plastic waste with cotton fibre rags in the ratio 20:80. Waste to Wealth Portal aims to identify, develop, and deploy technologies to treat waste to generate energy, recycle materials, and extract resources of value. Waste to Energy, The Ministry of New and Renewable Energy (MNRE) launched it to convert municipal and industrial solid waste into electricity and/or heat for industrial processing. Waste to Wealth Mission is the scientific mission of the Prime Minister's Science, Technology, and Innovation Advisory Council (PMSTIAC).

Key words: social awareness, government scheme, waste management

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Role of Biotic Factors in Cotton Debris Waste Management

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Abstract

The key waste management and recycling strategies include reducing waste at its source, reusing materials, recycling, composting, adopting a circular economy model, and utilizing waste-to-energy technologies. These strategies essentially focus on 3-R principle to minimize waste generation and conserve natural resources, while mitigating the environmental impact. Among different types of wastes, the most common point where all the attention stuck is field waste of agricultural crops, and one of the most economic crops for farmers is cotton, along with challenge of its debris waste disposal. This debris is slow decomposing as well as high in volume. Among various practices of its management, the biotic factors including soil microorganisms, fungi, invertebrates and even vertebrates including cotton mice play vital role in decomposition and recycling of cotton debris with a positive percentage. Scientifically, the bacteria and fungi precisely break down cellulose fibers; churn organic matter into simpler compounds, while the invertebrates (earthworm, ants) help in physical fragmentation of debris. The rodents may also contribute via indirect ways by distributing the debris in lower horizon of soil, increasing microbial activity and aeration. Thus, the cotton waste management by microbial and biotic community would potentially promote a safe and green environment with the promotion of natural biodiversity.

भारत में कचरा प्रबंधन: समस्याएं और समाधान

डॉ शोभा रानी सिंह चौधरी (अंशकालिक प्रवक्ता)
हिंदी विभाग तिलक महाविद्यालय औरैया

वह अपशिष्ट पदार्थ जिसे हम अनुपयोगी ,अवांछित मानकर फेंक देते हैं ,कचरा कहलाता है। यह कचरा घरों में सब्जी फल के बेकार छिलके ,बचा हुआ बासी भोजन, कागज के बेकार टुकड़े , शीशा, प्लास्टिक, धातु, इलेक्ट्रॉनिक कचरा ,सीमेंट ,मालवा आदि के रूप में हमारे आस-पास के वातावरण में बिखरा हुआ पाया जाता है । यह कचरा हमारे पारिस्थितिक तंत्र और स्वास्थ्य को बहुत नुकसान पहुंचता है ।एक शोध के अनुसार भारत के शहरी क्षेत्र में वर्ष 2025 में प्रति व्यक्ति प्रतिदिन 0.7 किलोग्राम कचरा उत्पन्न होगा जो वर्ष 1999 की तुलना में लगभग चार से छह गुना अधिक होगा ।पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय के अनुसार भारत में वर्तमान में हर साल 62 मिलियन टन कचरा (पुनर्नवीनीकरण योग्य और गैर पुनर्नवीनीकरण योग्य दोनों)उत्पन्न होता है ,जिसकी औसत वार्षिक वृद्धि दर 4% है। ठोस अपशिष्ट प्लास्टिक अपशिष्ट और ई - कचरा मुख्य अपशिष्ट पदार्थ हैं ।पर्यावरण को संरक्षित करने, सार्वजनिक स्वास्थ्य को बनाए रखने और भविष्य की पीढ़ियों के लिए संधारणीय जीवन स्थितियों को सुनिश्चित करने के लिए प्रभावी कचरा प्रबंधन महत्वपूर्ण है ।बढ़ती वैश्विक जनसंख्या, औद्योगिक क्रांति, शहरीकरण और बड़े पैमाने पर उत्पादन ने कचरे के उत्पादन में उल्लेखनीय वृद्धि की है। कचरा प्रबंधन में अपशिष्ट पदार्थों का संग्रह, परिवहन ,निपटान और पुनर्चक्रण शामिल है।

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Waste Management and Recycling Strategies for Sustainable Development

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Abstract

Waste management plays a crucial role in achieving environmental sustainabilitybyminimizing pollution, conserving natural resources, and reducing health hazards. Inefficient waste disposal contributes to environmental degradation, climate change, and biodiversityloss. This paper explores sustainable waste management strategies, including waste reduction, recycling, composting, and energy recovery. It highlights the importance of government policies, community participation, and technological innovations in improving waste management systems. Effective waste management involves several key approaches: Waste Reduction Encouraging minimal packaging and eco-friendlymaterials Promotingreusable products(e.g, cloth bags, glass bottles) Implementing responsible consumptionhabits. Recycling & Reuse Separating recyclable materials like plastic, paper, and metal Supportingupcycling initiatives to repurpose waste into new products Establishing community recyclingprograms. Composting Organic Waste Using food and garden waste for composting Encouragingcomposting at home, farms, Reducing landfill waste by managing organic material properly. Efficient Waste Collection & Disposal Implementing smart waste bins with sensors tooptimizecollection Ensuring proper landfill management to prevent leachate contamination Investinginwaste-to-energy technologies like incineration and biogas production. Industrial & Hazardous Waste Management Encouraging eco-friendly manufacturing processesProper disposal of electronic waste (e-waste) and hazardous chemicals Enforcing regulationsfor responsible industrial waste disposal. Government Policies & Community Involvement Implementing strict environmental lawsfor waste management Encouraging public awareness campaigns on waste reduction Partneringwith businesses to promote sustainable waste practices.

To determine the impact of Boron application on growth, yield and quality of potato

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Abstract

Although it is a common issue in alkaline soils that impacts potato output and quality, gardeners frequently overlook boron (B) shortage. For this reason, we examined the effects of various boron delivery techniques and control on the yield, quality, and boron usage efficiency (BUE) of potatoes grown on alkaline soils. The data collected demonstrated that the plant recorded high values for tuber number per plant, tuber weight per plant, total tuber yield, and marketable tuber yield. In comparison to other approaches, the application of boron (2 kg ha-1) as a soil (Basal

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dosage) resulted in a considerable increase in plant height, tuber per plant, and tuber volume. It also improved the quality of the potato in terms of its vitamin C, starch, and B content.The yield of large and medium-grade tubers was greatly increased by the application of boron, while the yield of correspondingly smaller tubers decreased. Furthermore, applied B was more efficient than previous application techniques and greatly increased B uptake. Vitamin C and starch levels were highly connected with the B concentration in tubers. In terms of how well the application techniques improved potato yield and quality, they were ranked as soil dressing. Therefore, under current agro climatic circumstances, B should be applied as a basal dose at a rate of 2 kg B ha-1 for the best production of high-quality potatoes.

Treatment of sewage sludge

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Sewage Sludge is a byproduct of waste water treatment processes. It consists of organic and in organic materials, microorganisms and contaminants removed from sewage during treatment. Proper management of sewage sludge is crucial for environmental protection and public health. Typical, sewage sludge is treated with one or more of the following steps, lime stabilization, ticking, dewatering, drying, anaerobic digestion or composting and alkaline stabilization may affect contaminant strength and concentration. Depending on the processes and the contaminate in question, treatment may decrease or,in some cases increase contaminant bioavailability and solubility. Sewage sludge is a great source of nutrients like nitrogen and phosphorus that can improve soil fertility and agriculture productivity. However, sewage sludge can also contain toxic metals that constrict it's use.

Key words - organic, inorganic materials, microorganism, contaminant, toxic, public health.

Integrated Nutrient Management (INM) Practices on Growth & Yield Attributes of Wheat (*Triticum aestivum* L.)

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Abstract

Wheat (Triticum aestivum L.) plays a pivotal role in global food security, being a primary source of carbohydrates and nutrients for millions of people worldwide. However, the intensive agricultural practices necessary to meet the growing food demand have often led to soil degradation and reduced soil fertility. Integrated Nutrient Management (INM) has emerged as a sustainable approach that combines the use of organic and inorganic fertilizers, along with bio-fertilizers, to enhance crop productivity while maintaining soil health. This review critically examines recent studies on the application of INM practices in wheat cultivation, focusing on their impact on wheat growth and yield. The integration of organic

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manures, such as farmyard manure and compost, with chemical fertilizers has been shown to improve soil structure, increase microbial activity, and enhance nutrient availability. Moreover, the use of bio-fertilizers, including nitrogen-fixing bacteria and phosphate-solubilizing microorganisms, has been demonstrated to boost growth and improves plant health. The review highlights the synergistic effects of combining these different nutrient sources, leading to optimized nutrient use efficiency and increased wheat yield and quality. Challenges associated with INM practices, such as the need for precise management and potential variability in results, are also discussed. Overall, this comprehensive review underscores the importance of adopting INM practices to achieve sustainable wheat production.The dwarf varieties of wheat have great potential but require more nutrients and have posed a great threat to long-term sustainability of crop production due to exhaustive nature. Application of all the needy nutrients through chemical fertilizers have adverse effect on soil health leading to unsustainable yields (Eid *et al*., 2006) and it is the prime threat to Indian agriculture which is being more aggravated with continuous uncontrolled use of fertilizers in soils containing low organic matter The nutrient supply, the flows and the added nutrient should be managed properly in order to achieve as high yield as possible while minimizing environmental pollution (Finck, 1998).

Keywords— INM, Wheat, Growth, Yield, Organic Manure.

Waste Reduction and Sustainable Supply Chain Management

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Abstract

Waste reduction and sustainable supply chain management (SSCM) are now crucial tactics for companies looking to strike a balance between social and environmental responsibility and economic success. With an emphasis on resource efficiency, ethical sourcing, and minimizing environmental effect, SSCM incorporates sustainability concepts into supply chain operations. Green procurement, eco-friendly logistics, circular economy methods, and waste reduction techniques are important activities that improve operational effectiveness and lower carbon footprints. By maximizing material utilization, reducing manufacturing waste, and encouraging recycling and reuse, waste reduction plays a critical role in SSCM. Sustainable practices are enhanced by innovations like digital supply chain optimization, energy-efficient transportation, and biodegradable packaging. Businesses may drastically cut waste, carbon footprints, and operating expenses by using lean manufacturing, reverse logistics, and sustainable buying. The study also looks at how supply chain sustainability and transparency may be improved by technology advancements like blockchain, artificial intelligence, and the Internet of Things. Additionally, businesses are incorporating sustainability into their supply chain strategy due to legal frameworks, customer awareness, and corporate social responsibility (CSR) programs. High implementation costs, supply chain complexity, and change aversion are some of the difficulties with SSCM. On the other hand, businesses that effectively implement sustainable practices enjoy long-term resilience, cost savings, enhanced brand recognition, and regulatory compliance.

Key words : Artificial intelligence, Ecofriendly, Sustainability, Supply chain.

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Recycling strategies of waste management for sustainable development

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Abstract

Wastematerialsare discarded material after use. When we use any material, some parts of that material are not consumed. This not consumed material treated as waste material. A large consumption creates large wastes material if it is not properly managed it develop as mountain of waste materials. A large amount of industrial waste, urban waste, house hold waste material developed day by day.The world generates over billion tons of municipal solid waste annually, this is expected to increase 70 percent by 2050. The management strategies of waste material use 3R strategy as Reduce waste at source, Reuse waste materials and effective recycling of waste materials.

Food Waste Reduction and Sustainable Consumption

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Abstract

Food waste is a severe issue that has an impact on the economy, ecology, and world food supply. Every day, a significant amount of food is wasted, which increases pollution and wastes resources. Reducing food waste lowers greenhouse gas emissions and conserves energy, water, and land. By guaranteeing that edible food is used effectively rather than thrown away, it also increases food security.

Food waste may be addressed in large part through sustainable consumption. This entails purchasing only what is required, storing food appropriately, and cutting back on excess consumption. Meal planning, reusing leftovers, and selecting locally grown and seasonal vegetables are all easy ways to drastically reduce waste. Enhancing food delivery networks, cutting packaging waste, and putting waste reduction rules into place are more ways that companies and legislators may help.In addition to helping the environment, minimizing food waste improves the food system by lowering prices and increasing food accessibility. A sustainable future where food is valued and utilized responsibly may be achieved by raising awareness and promoting responsible eating practices at all levels—individual, community, and industry.

Keywords: Food waste, sustainable consumption, resource conservation, responsible food habits.

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Waste Management and Recycling Strategies for Home Material Products

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Abstract

The waste management and recycling of home material products are essential for promoting sustainability and minimizing the environmental impact of household items. Efficient waste management practices involve the segregation of waste, such as plastics, metals, glass, and textiles, to ensure proper recycling and reuse. Strategies for home material product recycling include repurposing and upcycling old furniture, textiles, and containers into functional or decorative items, thereby reducing waste and conserving resources. Additionally, adopting eco-friendly materials, such as biodegradable packaging or sustainable fabrics, helps mitigate the reliance on single-use products. Recycling programs for materials like glass, paper, and plastic ensure proper disposal and reduce landfill accumulation. Energy-efficient appliances and low-waste home designs further minimize environmental footprints. By incorporating these waste management and recycling strategies, households can effectively reduce waste, enhance the lifecycle of home materials, and contribute to a more sustainable future.

Key Word- Waste management, recycle and home product

Recycling Agricultural Waste for Organic Fertilizers and Bioenergy

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Abstract

Recycling agricultural waste produces useful byproducts like bio-energy and organic fertilizers while sustainably managing farm wastes. Large volumes of waste, such as crop leftovers, animal dung, and byproducts of food processing, are produced by the quick growth of agricultural operations. These wastes contribute to greenhouse gas emissions and environmental contamination if improperly managed. An environmentally responsible way to improve soil fertility and energy sustainability is to recycle agricultural waste through bioconversion, composting, anaerobic digestion, and the manufacture of biochar.Biogas, bioethanol, and biodiesel are renewable substitutes for fossil fuels that are produced from agricultural waste. By turning organic waste into biofuels, technologies like pyrolysis and anaerobic digestion lessen reliance on non-renewable energy sources. In the meanwhile, crop yields are increased and the requirement for synthetic fertilizers is decreased when soil nutrients are enhanced by organic fertilizers made from livestock manure and composted plant waste. By guaranteeing that waste is effectively used within the farming environment, this encourages circular agriculture.Notwithstanding its advantages, obstacles including high upfront costs, a lack of knowledge, and technological limitations prevent agricultural waste recycling from being widely used. Nonetheless, its application is being propelled by regulatory incentives, farmer training initiatives, and technological breakthroughs. Energy security, climate change mitigation, and sustainable farming may all be greatly enhanced by incorporating trash recycling into agricultural operations. This abstract highlights how recycling agricultural waste may improve agricultural production and support environmental sustainability, and it calls for more study and development to optimize its effects on a worldwide scale.

Keywords: *Biofuel, Composting, Environment, Recycling*.

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The Role of Recycling Strategies And Technologies In Physics

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ABSTRACT

Recycling strategies and technologies play a crucial role in physics by enhancing sustainability, optimizing resource utilization, and minimizing environmental impact. In areas such as materials science, nuclear physics, and electronics, innovative recycling methods help recover valuable materials, reduce waste, and improve efficiency. Advances in superconducting materials recycling, nuclear fuel reprocessing, and electronic waste (e-waste) management contribute significantly to energy conservation and cost reduction. Additionally, physics-based techniques, such as laser separation and plasma processing, enhance the effectiveness of recycling processes. This paper explores various recycling strategies and technologies in physics, their impact on sustainability, and future research directions to improve resource management.

Keywords: Recycling strategies, physics, sustainability, superconducting materials, nuclear fuel reprocessing, electronic waste, plasma processing, laser separation.

To Study the Role of Technology in Waste Management for Sustainable Development

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Effective waste management is crucial for sustainable development. As we strive to create a healthier planet, innovative technologies are playing an increasingly important role in revolutionizing how we handle waste. These advancements offer solutions to minimize environmental impact, optimize resource recovery, and promote a circular economy. This leads to fuel savings, decreased emissions, and improved efficiency. Waste-to-energy (WTE) technologies offer another promising avenue. By converting waste into usable energy, these processes reduce landfill burden and generate renewable power. This not only addresses waste disposal challenges but also contributes to a cleaner energy mix. Technology is playing a pivotal role in creating sustainable waste management practices. From smart collection systems to advanced recycling and WTE technologies, innovations are transforming how we handle waste. By embracing these advancements, we can minimize environmental impact, conserve resources, and move towards a circular economy for a more sustainable future.

Keywords: Sustainable Development, WTE, Renewable Power, Waste Disposal Challenges, Technology, Conserve Resources.

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Waste Management : The Microbial Edge

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Abstract

The growing challenge of waste management necessitates innovative and sustainable solutions. Microorganisms, with their diverse metabolic capabilities, play a crucial role in the decomposition and transformation of various waste materials.Microbes are essential for sustainable waste management. They drive decomposition in composting, producing nutrient-rich compost. In anaerobic digestion, microbes create biogas (renewable energy) and digestate (fertilizer). Bioremediation uses microbes to clean up pollutants, while wastewater treatment relies on microbes to remove contaminants. This abstract highlights the significance of microbial processes in waste management, emphasizing their potential to mitigate environmental pollution, recover valuable resources, and promote a circular economy.

Key words: Waste Management, Sustainable solutions, Decomposition, Transformation, Aerobic Digestion, Digestate , Bioremediation, Renewable Energy, Contaminants.

WASTE MANAGEMENT AND RECYCLING STRATEGIES FOR SUSTAINABLE DEVELOPMENT

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Abstract

Waste management refers to the activities and actions that handle waste materials. It includes collection, transportation, processing, and disposal of waste. Waste prevention, recycling, reuse, and recovery are important waste management strategies that eases the burden of landfills, conserves natural resources, and saves energy. This helps utilize resources more effectively and sustainably.

SOLID WASTE- solid waste are any disposed materials that have resulted from industries, commercial uses, agricultural, house hold activities . The collection, treatment and disposed of this solid waste in a proper Manner is called solid waste management.

Non municipal solid waste-construction waste, automobile bodies, mining waste, agricultural waste, municipal sludges.

Methods of solid waste Management / Treatment-of solid waste

(A)Solid waste collection- solid waste collectionon daily basis by the municipal corporations where the waste are disposal site then transported to the disposal site. (B)Separation → it is manual sorting of solid Waste before disposing.eg- sorting out the dry solid waste from wet solid waste sorting out the dry solid waste from the wet solid wastes or Sorting out between biodegradable wastes(vegetables, fruits peels, paper, cotton wooden things decompose by microorganisms) andnon biodegradable waste (plastic bags, toys, plastic bottles, metals, rubber, glass)can not decompose by microorganisms.

Sanitary land fill- Trash is transported to huge areas of land that dug deep the garbage is spread our and once land is full it topped with layers of soil, sand and gravel.

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Effect of Integrated Nutrient Management on Growth and quality in Clusterbean - Barley cropping sequence.

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ABSTRACT

Traditionally legumes are considered as important component of cropping system by virtue of its ability to enrich soil nitrogen and added organic matter. The effect of legume on succeeding crop invariably depends on nature of crop, fertilization and soil type. A field investigation was carried out for three consecutive years during *kharif* and *rabi* seasons at agriculture farm of R.B.S College, Bichpuri, Agra. The present investigation comprised of ten treatments replicated thrice and statistically tested using randomized block design. The treatments consisted of 100, 75 and 50 % recommended dose of fertilizer for both crop with and without FYM and $ZnSO_4$. It was hypothesized that reduction in recommended dose coupled with FYM and $ZnSO_4$ in marginal sandy loam soil could sustain the yield of cropping sequence. The results showed that this integrated approach of nutrient management has significantly enhanced the growth and quality of clusterbean and barley crops. The results showed that the growth parameter viz. plant height, number of pods per plant, number of seed per pod, 1000 seed weight of clusterbean was recorded significantly highest by application of 75 % recommended dose along with 5 t FYM ha^{-1} and $ZnSO_4$ @ 20 kg ha^{-1} while it was at par with 100% recommended dose of fertilizer without FYM. Similarly, in barley crop plant height, number of tillers per plant, spike per plant was maximum in same treatment followed by 100% recommended dose without FYM. The protein content in clusterbean (27.4%) and barley (15.1%) likewise, the gum content (26.6%) in clusterbean and starch content (3.52%) in barley was significantly highest in treatment receiving 75 % recommended dose along with 5 t FYM ha^{-1} and $ZnSO_4$ @ 20 kg ha^{-1} which was statistically at par with 100% recommended dose of fertilizer. It is concluded that integrated use of chemical and organic fertilizer could save 25 per cent of fertilizer without compromising the quality of the produce in both clusterbean and barley crops.

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Influence of Zinc Nutrition on Yield, Uptake and Soil Properties in Clusterbean-Barley Cropping Sequence Grown on Alluvial Soil of Agra District

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ABSTRACT

A field investigation was carried out for three consecutive years during *kharif* and *rabi* seasons at agriculture farm of R.B.S college, Bichpuri Agra. The present investigation comprised of ten treatments replicated thrice and statistically tested using randomized block design. The treatments consisted of 100, 75 and 50 % recommended dose of fertilizer for both crop with and without FYM and $ZnSO_4$. The results exhibited that application of 75 % recommended dose along with 5 t FYM ha^{-1} and $ZnSO_4$ @ 20 kg ha^{-1} recorded highest seed yield (11.60 q ha^{-1}) and stover yield (20.50 q ha^{-1}) in clusterbean and 43.7 and 66.9 q ha^{-1} of grain and straw yield respectively of barley crop. The application of FYM 2 5 t ha^{-1} along $ZnSO_4$ 20 kg ha^{-1} substantially increased the nutrient uptake in both the crops. The combination treatment of 75% recommended dose + FYM @ 5 t ha-1 + $ZnSO_4$ @ 20 kg ha^{-1} recorded significantly highest nitrogen, phosphorus, potassium and zinc uptake (50.4, 7.5, 67.2 kg ha^{-1} and 41.3 g ha^{-1} respectively) in clusterbean and in barley nitrogen (180 kg ha^{-1}), phosphorus (22.3 kg ha^{-1}), potassium (197 kg ha^{-1}) and zinc (297 g ha^{-1}) uptake. The soil properties after completion of three years revealed that inclusion of legume has considerably contributed to availability of nutrients. The application of organic manures indicated slight increase in organic carbon content while the available nitrogen, phosphorus, potassium and zinc was significantly highest in treatment receiving 75 % recommended dose along with 5 t FYM ha^{-1} and $ZnSO_4$ @ 20 kg ha^{-1} over all the other treatments while at par with 100 % recommended dose. Thus adopting proper cropping system, use of organic manures, especially farmyard manure and balanced use of nitrogen and phosphorus in combination, may enhance the status of soil and productivity of both clusterbean and barley crop in Agra *i.e.* semi-arid region of south-western Uttar Pradesh. The findings indicated that besides increase in yields of both crop the integrated nutrient management approach has also resulted in improved soil fertility.

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Mathematical Modelling on waste management

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Abstract

Mathematical modelling for waste management when focusing on recycling strategies for sustainable development, using mathematical equations. Also, model can be formed by mathematical algorithms to simulate and optimize waste collection, sorting, processing, and recycling operation. Aim of the mathematical modelling is aiming to minimize environmental impact while maximizing resource recovery and economic efficiency.

Key words: - Mathematical Modelling, Wast management

Integration of Artificial Intelligence in Vertical Farming: Enhancing Sustainable Agricultural Practices

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Abstract

Vertical farming, a modern agricultural innovation, offers a solution to challenges like limited arable land, water scarcity, and the need for consistent food production in urban areas. Integrating Artificial Intelligence (AI) into vertical farming systems enhances efficiency, productivity, and sustainability. AI-driven technologies enable real-time monitoring and control of critical parameters, including light, temperature, humidity, and nutrient levels. Machine learning algorithms optimize resource allocation, predict plant growth patterns, and identify potential crop diseases, thereby reducing waste and improving crop quality. Furthermore, AI facilitates data-driven decision-making, supporting scalability and profitability. This integration not only revolutionizes urban agriculture but also aligns with global goals for sustainable development by minimizing environmental impact. Future research should focus on addressing challenges in data management, affordability, and interoperability to maximize the potential of AI in vertical farming.

Keywords: Vertical Farming, Artificial Intelligence, Smart Agriculture, Machine Learning, Sustainable Development, Urban Farming, Resource Optimization, Crop Monitoring, Data-Driven Agriculture, Precision Farming.

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Harnessing Artificial Intelligence for Sustainable Agrochemical Usage in Agriculture

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Abstract

Sustainable agricultural practices necessitate optimizing agrochemical usage to balance crop productivity with environmental conservation. Artificial Intelligence (AI) is emerging as a transformative tool to achieve this equilibrium by enabling precision application, reducing waste, and minimizing ecological impacts. AI-powered systems leverage machine learning, computer vision, and predictive analytics to monitor field conditions, identify crop-specific needs, and recommend optimal doses of fertilizers, pesticides, and herbicides. Innovations such as automated drones, IoT-connected sensors, and AI-driven decision-support systems enable real-time monitoring and site-specific agrochemical application. These technologies significantly reduce overuse and runoff, addressing concerns of soil degradation and water pollution while enhancing crop health and yield. This paper examines the role of AI in fostering sustainable agrochemical practices, highlighting advancements, practical applications, and challenges. It underscores the potential of AI-driven innovations to revolutionize agrochemical management, contributing to resilient and environmentally friendly agricultural systems.

Keywords: Artificial Intelligence, Sustainable Agriculture, Agrochemical Optimization, Precision Farming, Environmental Conservation, Machine Learning, IoT, Crop Management, Smart Agriculture

Revolutionizing Agriculture: The Role of Artificial Intelligence and IoT in Smart Farming

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Abstract

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) in agriculture is revolutionizing traditional farming practices, ushering in an era of smart agriculture aimed at enhancing productivity, sustainability, and efficiency. AI-driven algorithms, combined with IoT-enabled sensors and devices, facilitate real-time data collection, monitoring, and analysis, enabling precision farming and data-driven decision-making. These technologies optimize resource utilization—such as water, fertilizers, and pesticides—while minimizing waste and environmental impacts. IoT-based systems foster connectivity and automation in farming operations, enabling remote monitoring and control of processes. Notable innovations include

predictive analytics for weather forecasting, pest and disease identification, yield estimation, and soil health monitoring. Moreover, AI and IoT mitigate challenges like labor shortages and climate variability through automation and adaptive management strategies. This paper explores the transformative potential of AI and IoT in agriculture, presenting case studies, technological advancements, and their implications for both smallholder and large-scale farming systems. The study emphasizes the need for cost-effective and scalable solutions to ensure equitable access to these technologies, thereby contributing to global food security and sustainable agricultural development.

Keywords: Agriculture, Artificial Intelligence, Internet of Things, precision farming, weather forecasting.

Ecological Risk Management and Sustainable Earth E – Waste Risk Management

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Abstract

Electronic waste, as known as e-waste, is generated when any electronic and electrical equipment becomes unfit for the intended use or if it has crossed it's expiry date. Consumers are the key to better e-waste management of India. Initiative such as extended Producer Responsibility, design for environment (3RS) Reduce, Reuse, Recycle technology Platform for linking the market facilitating the circular economy aim to encourage consumers to correctly dispose the e-waste, with an Increased reuse and recycling rates, and also adopt sustainable consumers habits. Electronic waste is one of the fastest- growing pollution problem worldwide given the presence. If, a variety of toxic substances which can contaminate the environment and threaten human health, if disposal protocols are not meticulously managed. This paper presents an overview of

Waste Management Initiatives of Indian Government for Sustainable Development

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Abstract

The government of India has launched a number of important programs for encouraging sustainable waste management to cut down on pollution in the environment and to ensure a circular economy. One of the most prominent programs is the Swachh Bharat Mission (SBM), which was launched in 2014. The mission targets sanitation and solid waste management in urban and rural India. It lays emphasis on segregation of waste at the source, encouraging cleanliness, and spreading awareness regarding the proper disposal of waste. In order to combat plastic pollution, Plastic Waste Management Rules (2016) were implemented, which made reduction, recycling, and disposal of plastic waste compulsory. The government has also banned

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single-use plastics and implemented Extended Producer Responsibility (EPR), under which the producers are held responsible for collecting back and recycling plastic products.
Another key initiative is the National Clean Energy Fund (NCEF), which finances waste-to-energy projects that utilize non-recyclable waste to produce renewable energy, lessening the reliance on landfills and assisting in the mitigation of the increasing waste problem. The E-Waste (Management) Rules (2016) also seek to address the increasing problem of electronic waste by promoting safe recycling and disposal. Efforts at the state level also reinforce national actions, with states such as Maharashtra and Uttarakhand leading the charge in curtailing plastic use and encouraging waste management. The National Action Plan for Waste to Energy aims to exploit waste as an asset by making it biofuel or electricity. Additionally, the Swachh Bharat Urban program emphasizes improvement in collection, processing, and recycling of wastes in cities.
By these integrated efforts, the Indian government wants to enhance not just waste management but also achieve sustainable development, minimize environmental pollution, and ensure a cleaner, healthier future for India.

Sustainable agriculture waste management in agriculture

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Abstract

Agriculture waste management is crucial for sustainable farming and environmental protection. Various forms of waste, including crop residues, animal manure, pesticide Containers and food processing by –products, pose challenges if not managed properly. Effective waste management practices, such as composting, bio gas production, recycling, and precision farming, help in minimizing environmental pollution, enhancing soil fertility, and improving farm productivity. Sustainable approaches like vermicomposting, biochar production and integrated waste management system can convert waste into valuable resources. This paper discusses the importance of agriculture waste management various techniques used , and their impact on environmental and economic sustainability.

Key words: Agriculture waste , Composting , Biogas production, recycling, vermicomposting, Biochar, sustainable farming , Crop residus etc.

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"सतत अपशिष्ट प्रबंधन का पर्यावरण संरक्षण में महत्व"

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सतत अपशिष्ट प्रबंधन पर्यावरण संरक्षण की दिशा में एक महत्वपूर्ण कदम है। यह प्रक्रिया अपशिष्टों के प्रभावी और जिम्मेदार तरीके से प्रबंधन को सुनिश्चित करती है, जिससे प्राकृतिक संसाधनों की बचत होती है और प्रदूषण कम होता है। वर्तमान समय में, अपशिष्टों की बढ़ती मात्रा और उनका सही तरीके से प्रबंधन न होने के कारण पर्यावरण पर गंभीर असर पड़ रहा है। कूड़ा-कचरा, प्लास्टिक, इलेक्ट्रॉनिक अपशिष्ट, जैविक और औद्योगिक अपशिष्टों का सही तरीके से निस्तारण न होने से मिट्टी, जल और वायु में प्रदूषण फैलता है, जिससे जैव विविधता और पारिस्थितिकी तंत्र पर प्रतिकूल प्रभाव पड़ता है।

सतत अपशिष्ट प्रबंधन में अपशिष्टों का पुनर्चक्रण (recycling), पुनः उपयोग (reuse), और पुनर्नवीनीकरण (composting) जैसी विधियों को प्राथमिकता दी जाती है। यह न केवल कच्चे माल की आवश्यकता को कम करता है, बल्कि ऊर्जा की बचत भी करता है और जलवायु परिवर्तन के प्रभावों को भी नियंत्रित करता है। इसके अलावा, सतत प्रबंधन से समाज में पर्यावरणीय जागरूकता बढ़ती है, और यह समुदायों को एकत्रित होकर पर्यावरण के संरक्षण के लिए कार्य करने की प्रेरणा देता है।
इस प्रक्रिया से लेंडफिल्स को भी कम किया जा सकता है, और अपशिष्टों का निस्तारण अधिक प्रभावी और सुरक्षित तरीके से किया जा सकता है। इसके अलावा, स्थिरता और सामाजिक जिम्मेदारी के दृष्टिकोण से यह भविष्य की पीढ़ियों के लिए एक साफ और स्वस्थ पर्यावरण सुनिश्चित करता है। इसलिए, सतत अपशिष्ट प्रबंधन पर्यावरण संरक्षण की दिशा में अनिवार्य कदम है।

Paddy crop waste management for sustainable agriculture

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Abstract

Paddy crop waste management is a critical component of sustainable agriculture, addressing environmental, economic, and social challenges in rice cultivation. The disposal of paddy residues, such as rice straw and husk, has traditionally been through burning, leading to air pollution and the release of greenhouse gases. Sustainable alternatives, however, offer promising solutions to reduce these harmful impacts. Techniques such as mulching, composting, biochar production, biogas generation, and using residues as animal fodder or fuel, provide effective means of managing paddy waste. These methods not only reduce waste and enhance soil health but also contribute to resource efficiency, increase farm productivity, and mitigate climate change. This paper explores various paddy crop waste management strategies, highlighting their environmental benefits and economic viability for smallholder and commercial rice farmers. By adopting these practices, the agricultural sector can move towards a more sustainable, circular economy, promoting long term agricultural resilience and environmental stewardship.

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Waste Management : The Microbial Edge

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ABSTRACT

The growing challenge of waste management necessitates innovative and sustainable solutions. Microorganisms, with their diverse metabolic capabilities, play a crucial role in the decomposition and transformation of various waste materials.Microbes are essential for sustainable waste management. They drive decomposition in composting, producing nutrient-rich compost. In anaerobic digestion, microbes create biogas (renewable energy) and digestate (fertilizer). Bioremediation uses microbes to clean up pollutants, while wastewater treatment relies on microbes to remove contaminants. This abstract highlights the significance of microbial processes in waste management, emphasizing their potential to mitigate environmental pollution, recover valuable resources, and promote a circular economy.

Key words: Waste Management, Sustainable solutions, Decomposition, Transformation, AerobicDigestion, Digestate , Bioremediation, Renewable Energy, Contaminants.

Stability analysis for yield and its contributing traits in Wheat Crop (Triticumaestivum L.)

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Abstract

The stability of 10 parents (K68, DL784-3, K9107, K8027, C306, K7903, GW373, K123, HP1633 and K 9644) and their 45 Fis and 45 F_2s of wheat were studied for days to 75% flowering, number of ear bearing tillers, plant height, spike length/plant, number of grains/spike, grain weight/spike, days to maturity and grain yield/plant at three diverse locations, viz., Crop Research Farm, Nawabganj (Kanpur), Mauranipur (Jhansi) and Etawah, of C.S.A. University of Agriculture and Technology, Kanpur (U.P.), India. The model proposed by Eberhart and Russell (1966) was utilized to estimate stability parameters and genotype x environment interaction for different genotypes with respect to different characters. The stability analysis revealed that the variances due to genotypes, environments, genotypes x environments interaction including environments (linear) were highly significant for all the characters, indicating significant variability among the genotypes and significant involvement of environments with different genotypes. The non-linear component (pooled deviation) was also highly significant for all the attributes, exhibiting considerable genetic diversity in yield and its contributing traits. Among parents, K 9107 was found to be higher yielder and stable across environments. The crosses namely, K 68 x K 9107, K 68 x K 7903, K 68 x HP 1633, DL 784-3 x K 9107, DL 784-3 x K 9644, K 9107 x K 9644, K 8027 x C 306, K 8027 x K 9644, C 306 x K 9644 and GW 373 x K 9644 were identified as stable yielder across environments in addition to higher yield in both the generations. These parents and crosses may be utilized in hybridization and further breeding programmes for high yiedevelopinglding stable varieties.

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"Discourses of Sustainable Development in English Literature"

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Abstract

Sustainable development, a critical global issue, has found its way into various disciplines, including English literature, where it is increasingly explored through both contemporary and classic works. In literature, the discourses of sustainable development are often intertwined with themes of environmental conservation, social equity, and economic sustainability. Authors address the interconnectedness between humans and the environment, critiquing the exploitation of natural resources and the long-term consequences of such actions. Through literature, readers are challenged to question the ethics of progress, the tension between industrialization and nature, and the implications of an unsustainable future.The representation of sustainability in English literature takes multiple forms: from dystopian futures, where environmental degradation has led to societal collapse, to utopian visions that emphasize harmonious relationships between human development and nature. Writers like Rachel Carson, in *Silent Spring*, paved the way for environmental discourse in literature, while contemporary authors such as Amitav Ghosh and Margaret Atwood continue to engage with sustainability through the lens of climate change, resource depletion, and biodiversity loss. These texts provide critical insights into the social, political, and economic forces that drive unsustainable practices.Moreover, the literary examination of sustainability often intersects with issues of social justice, highlighting how marginalized communities are disproportionately affected by environmental destruction. The integration of sustainable development within English literature serves as both a reflection of societal anxieties and a call for collective action. Through narrative and poetry, literature not only raises awareness but also advocates for responsible stewardship of the earth, urging readers to rethink the ways in which they interact with the natural world.
In conclusion, the discourses of sustainable development in English literature challenge the dominant paradigms of growth and development, offering an alternative vision of a more balanced and ethical future where human progress does not come at the cost of the planet's well-being.

Sustainable agriculture waste management in agriculture

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Abstract

Waste management in agriculture involves recycling, composting, Biogas production ,and proper disposal of hazardous materials . Organic waste like manure and crop residues can be composted Or used for biogas ,reducing pollution and enhancing soil fertility. Plastics and chemical waste should be recycled or safely discarded to prevent environmental harm. Precision farming minimizes waste by optimizing inputs like fertilizers and pesticides. Effective waste management promotes sustainability, Reduces costs, and improves agriculture productivity while protecting natural resources.

Key words: sustainable agriculture ,recycling ,energy , bioenergy, compost, Bioplastics

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Differential expression of antioxidant genes (CAT and APX) and metallothioneins protein in cadmium and lead stressed *Moringa oleifera* Lam.

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Abstract

Heavy metal contamination is the major problem spreading worldwide as nonbiodegradable pollutant. The toxicity of metals creates major threat for primary and secondary consumer in environment and reaches to the top level consumers in the ecosystem through food chain.

Therefore, the present study was performed to explore cadmium and lead induced metallothionein protein and antioxidant gene expression in *Moringa oleifera* leaves. Metallothioneins are nonezymatic cysteine rich low molecular weight (3-20) proteins which work in Cd and Pb homeostasis and detoxification. *M. oleifera* seedlings were treated with different concentrations (1 mM, 2 mM, 3 mM and 5 mM) of $CdCl_2$ and $Pb(NO_3)_2$ and kept under controlled photoperiod in green house. The expression of catalase and ascorbate peroxidase defence genes and metallothioneins polypeptides were investigated using SDS-PAGE gel electrophoresis and real time polymerase chain reaction at 10, 20, 30 and 40 days of stress period. The plants showed survivability upto 5 mM Cd and Pb concentrations and accumulated the maximum Cd and Pb content into roots than shoots and leaves at 5 mM Cd and Pb. Elevated level of metallothioniens polypeptides with increasing metal concentration (1 mM < 2 mM < 3 mM < 5 mM) was reported in treated leaves. The maximum metallothioneins content 95.99 µmol $g^{-1} \times 10^{-3}$ and 93.55 µmol $g^{-1} \times 10^{-3}$ at 30 days was highly prominent to assess the effects of 5 mM Cd and Pb. Among all concentrations the significant highest transcript level of CAT and APX 1.087 and 0.953 fold in leaves and 2.278 and 1.486 fold in roots at 40 days was measured to reduce free radicals and scavenging ions produced by 5 mM $CdCl_2$ while the expression 2.321 and 1.899 fold in leaves and 1.059 and 0.907 fold in roots against 5 mM Pb was also significantly elevated in *M. oleifera*.

Keywords: *M. oleifera,* phytoremediation, heavymetals, catalse.

Solid Waste Management with the help of Vermicomposting and its Application in Crop Management

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Abstract

Management of Solid waste has become one of the biggest problem that we are facing today. Vermicomposting is the better option to tackle with this problem. Vermicomposting is the process of conversion of organic wastes by earthworms to valuable humus like material which is used as a natural soil conditioner. Vermicomposting is environment friendly and cost effective technique for solid waste management. Vermicomposting is an eco-friendly waste management technique that utilizes earthworms to break down organic waste into nutrients-rich compost. Vermicompost is much better than chemical

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fertilizer because it is not associated with any kind of risk. Earthworms are potentially important creatures that are capable of transforming garbage into gold. *Eiseniafetida,*is the most commonly used species of earthworms for Vermicomposting. Vermicomposting is a mesophilic process and should be maintained up to 32 c with the moisture content of 60-80%. Earthworms breakdown organic matter and leave behind castings that are an exceptionally valuable fertilizers. Vermicomposting has many applications in crop improvement such as pathogen destruction, water holding capacity of soil, improved crop growth and yield, improved soil physical, chemical and biological properties and production of plant growth regulators.

Key words- Vermicomposting, *Eiseniafetida,* Solid waste, Earthworm, Waste Management.

Social Entrepreneurship in Recycling and Waste Reduction

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Abstract

Socialentrepreneurshipin recycling and waste reductionplaysacriticalrole in addressing environmentalchallenges while promotingsocialequity and economicdevelopment. This modelof entrepreneurship focuses oncreating sustainable solutions thatnot onlyreducewaste butalsoengage communities in environmentallyconscious practices.Social entrepreneurs in this field leverageinnovative technologies, business models, andpartnershipsto enhance recycling processes, minimizelandfill waste, and promotecircular economies. Additionally, they empowermarginalizedcommunitiesthrough job creation, education, and the development ofgreenskills.Socialentrepreneurs in the recycling and wastereductionsector employcreative solutions to tackle waste-relatedproblems, suchasdevelopingclosed-loop production systems, designing waste-to-wealthinitiatives, and implementingcommunity-based recycling programs. These initiativesnot onlycontribute to environmental sustainability butalsogenerateeconomic benefits, create jobs, and promotesocial inclusion.The synergybetweenenvironmentalgoalsand socialimpact makesthis sector a promisingavenuefor tacklingpressingglobal issues likeclimate changeand resource depletion.This abstract explores thekeycomponents of social entrepreneurship inwaste reduction, its potentialtocreate socialvalue, and the ongoingchallenges faced by social enterprises in therecycling industry. Throughcollaboration and systemicinnovation, socialentrepreneurshipinrecyclingcan contribute to a moresustainable, inclusive, and economically flexiblefuture.

Keywords:- entrepreneurship, innovation, sustainable, recycling, waste reduction

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Banana Waste management for sustainable development of horticulture

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Abstract

Banana cultivation generates significant organic waste, including peels, stems, leaves, and rejected fruits, which, if not managed properly, can contribute to environmental pollution. This research explores sustainable banana waste management strategies to enhance agricultural productivity and environmental sustainability. Key methods include composting, vermicomposting, biochar production, and biogas generation, which help recycle nutrients, improve soil health, and reduce greenhouse gas emissions. Additionally, banana waste can be utilized in biofertilizers and animal feed, promoting circular economy principles. The study highlights the economic and ecological benefits of integrating banana waste into sustainable farming systems, ultimately contributing to improved soil fertility, reduced synthetic fertilizer dependency and enhanced farmer livelihoods. The findings emphasize the need for innovative policies and farmer education to implement effective waste management practices, ensuring a more resilient and sustainable agricultural sector.

Keywords: Banana waste, sustainable agriculture, composting, biochar, , organic farming.

Advance Techniques in Waste `Management Strategies for Sustainable Development

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Abstract

Effective waste management and recycling strategies are crucial components of sustainable development, addressing both environmental degradation and resource scarcity. As global waste generation accelerates due to population growth, urbanization, and industrialization, the need for comprehensive waste management practices has become increasingly urgent. This paper explores the role of waste management and recycling in achieving sustainability goals, emphasizing the importance of reducing, reusing, and recycling materials to minimize the environmental footprint. The study highlights various waste management strategies, such as waste segregation, composting, landfill diversion, and the development of circular economies, which aim to maximize resource recovery and minimize waste disposal. Additionally, the integration of advanced technologies, such as waste-to-energy systems, smart waste management, and automated sorting, is examined for their potential to enhance efficiency and reduce waste. The role of policies, regulations, and public awareness campaigns in promoting sustainable waste practices is also discussed. Furthermore, the paper evaluates the environmental, economic, and social impacts of waste management practices, illustrating their potential to create green jobs, reduce carbon emissions, and preserve natural resources. The challenges of implementing these strategies, such as lack of infrastructure, inadequate waste collection systems, and insufficient financial investments, are also explored. Finally, recommendations are provided for enhancing waste management and recycling practices globally, including the promotion of global cooperation, technological innovation, and community engagement to foster a culture of sustainability.

Keywords: Waste management, recycling, sustainable development, circular economy, resource recovery, waste-to-energy, environmental sustainability, public awareness.

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Coconut crop waste management for sustainable agriculture

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Abstract

Coconut crop waste management is an essential component for promoting sustainable agriculture, particularly in regions where coconut farming is prevalent. With a substantial amount of waste produced from coconut trees, including husks, shells, leaves, and trunks, there is a growing need to find innovative and eco-friendly solutions to reduce environmental impact and enhance the productivity of agricultural systems. Effective management of coconut crop waste involves recycling and repurposing these by-products into value-added products such as compost, biofuels, biodegradable packaging, and organic fertilizers. This approach not only helps in waste reduction but also contributes to soil health, water retention, and improved crop yield. Furthermore, integrating coconut waste management with sustainable agricultural practices can foster economic opportunities for local communities by creating jobs in waste processing and product development. By advancing research and implementing practical strategies for coconut crop waste management, agriculture can become more sustainable, contributing to the overall health of ecosystems and enhancing food security.

Incineration of Organic Radioactive Waste in Microbiology

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Abstract: The management of organic radioactive waste in microbiology laboratories is critical for environmental safety and regulatory compliance. Incineration is an effective method for disposing of low-level radioactive waste (LLW) containing biological materials, contaminated lab supplies, and organic solvents. This process involves hightemperature combustion (850–1,100°C) to break down organic compounds while minimizing waste volume and sterilizing hazardous microbial materials. Advanced filtration systems, such as HEPA filters and scrubbers, are essential to prevent the release of radioactive particles into the atmosphere. Despite its advantages, incineration poses challenges, including the need for strict emission control, handling of residual ash, and ensuring compliance with radiation safety regulations. Proper selection of based types and adherence to regulatory guidelines are crucial for safe and efficient waste disposal. This review explores the principles, benefits and limitations of incineration in microbiology related radioactive waste management , highlighting its role in sustainable laboratory practices.

Key word:-Radioactive waste management, Incineration, Organic radioactive waste, Low level radioactive waste (LLW), Microbiology laboratory waste, Waste volume reduction, Biological waste sterilization, Hazardous waste treatment

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Waste Management and Recycling Strategies for Sustainable Development in Suburban Areas

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Abstract

In a world grappling with escalating waste production, effective waste management and recycling strategies are imperative for sustainable development. Modern societies generate diverse types of waste, including municipal, industrial, hazardous, and electronic waste. These contribute to environmental degradation, health hazards, and resource depletion. Sustainable waste management aims to minimize the negative impacts of waste through innovative and environmentally friendly practices. Key strategies include the implementation of the circular economy, which emphasizes the reduction, reuse, and recycling of materials. By transforming waste into resources, the circular economy minimizes landfill use and conserves natural resources. Additionally, waste-to-energy (WTE) technologies convert waste materials into usable energy, providing a dual benefit of waste reduction and energy production. Policy frameworks and regulations play a crucial role in enforcing sustainable waste management practices. Governments and local authorities must implement stringent waste management policies, encourage public participation, and promote awareness campaigns. Furthermore, advancements in technology, such as smart waste management systems and AI driven sorting, are enhancing efficiency and effectiveness in waste handling and recycling. Community involvement and corporate responsibility are essential in achieving sustainable waste management goals. Educational programs and initiatives that foster a culture of responsible consumption and waste segregation at the source are vital. Corporate entities must also adopt green practices, invest in sustainable packaging, and adhere to extended producer responsibility (EPR) principles. Ultimately, sustainable waste management and recycling strategies are indispensable in achieving a sustainable future. They ensure environmental protection, resource conservation, and improved quality of life.

Keywords: Waste Management, Recycling, Sustainable Development, Circular Economy, Waste-to-Energy, Policy Frameworks, Technological Advancements, Community Involvement, Corporate Responsibility.

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Phytoremediation of cadmium toxicity by Brassica

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ABSTRACT

Phytoremediation is a relatively new cost effective and environmental friendly technology that offers clear advantages over traditional methods for site cleanup and intoxication. This green technology can be applied to remediate the polluted soils without creating any destructive effect of soil structure. Members of brassicace family especially *Brassica* spp: are well-known hyperaccumulators of heavy metals with possible utilization in phytoremediation technologies. The ability of *Brassicas* to bioaccumulate heavy matals can be used to reduce the labal of contaminants in the soil (Phytoremediation) and thus to cleanup and prepare soil for cultivation.

Key words: Phytoremmediation, Plants, *Brassica*, Heavy metals, Substances,

Smart Waste Management: Innovations and Technologies

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ABSTRACT

Smart waste management (SWM) technologies and innovations discuss how new technologies can improve waste management processes and environmental sustainability. India generates approximately 65 million tons of garbage every year. The main challenge is to manage this waste. Conventional systems are not efficient to manage this much amount of waste. SWM technologies can include smart garbage bins made with Ultrasonic sensors (smart bins), Global Positioning System (GPS-based systems), and Internet of Things (IoT) technology, can help reduce pollution, waste generation & can help make waste management more accountable and transparent. The ultrasonic sensor detects the level of garbage in the dustbin and notifies the garbage collection authorities when the dustbin is full. The mobile applications sends SMS and email notifications using If This Then That (IFTTT) and Thing Speak the online digital automation platforms where the authorities can see the status of the dustbin and an optimized shortest route to be followed by the garbage collector truck for garbage collection and disposal. The proposed system is economical, practical, easy to use, and requires minimal human interaction.

Key words: waste management, Conventional systems, SWM technologies, smart bins, GPS-based systems, IoT technology, Ultrasonic sensors.

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Effect of Irrigation Schedule and Integrated Nutrient Management on Potato Crop

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Potato (*Solanum tuberosum L.*) is a crucial staple crop worldwide, and its yield is significantly influenced by irrigation and nutrient management practices. This study examines the impact of different irrigation schedules and integrated nutrient management (INM) strategies on the growth, yield, and quality of potatoes. A field experiment was conducted to evaluate various irrigation levels based on critical growth stages and soil moisture content, coupled with different nutrient management approaches that integrated organic and inorganic fertilizers.The results indicated that an optimized irrigation schedule, ensuring adequate water availability during tuber initiation and bulking stages, significantly improved tuber yield and quality. Excessive irrigation led to nutrient leaching and reduced water use efficiency, while water stress negatively affected plant growth and tuber development. The integration of organic manure (e.g., farmyard manure, vermicompost) with chemical fertilizers enhanced soil fertility, microbial activity, and nutrient uptake, resulting in improved plant vigor and higher yields compared to sole chemical fertilizer application. Furthermore, the combined application of balanced nitrogen (N), phosphorus (P), potassium (K), and micronutrients under well-regulated irrigation showed a synergistic effect, promoting better crop establishment and higher tuber dry matter content. The most effective treatment was a moderate irrigation schedule (based on 80% field capacity) with INM involving 50% recommended NPK from chemical fertilizers and 50% from organic sources. This combination maximized productivity while improving soil health and sustainability.

Keywords: Potato, Irrigation Schedule, Integrated Nutrient Management, Yield, Water Use Efficiency, Soil Fertility

Effect of integrated nutrient management on Oats(*Avena* sativa L) crop in semi arid region of Agra

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The Oat (*Avena sativa*L) is the important rarecereal cropand their nutritive and digestive property is very high.Oats crop grown in most of dry area and low fertility area in India. The fulfillment of demand of food grain for the next century of our country is depending upon increasing the oats production. The present experiment was conducted during*Rabi;*2022-2023 at research farm of the Department of Agricultural Chemistry and Soil Science R.B.S. College,Bichpuri, Agra. To study the effect of integrated nutrient management on oats crop in semiaridregionof Agra. The integrated use of inorganic and organic sources of nutrient tested N40+P20+K15kg/ha+FYM5t/ha replicated thrice in Randomized Block Design.The results clearly indicated that the integrated use of fertilizer and organic manure had significant and positive effect on growth character, yield attributes and yield of oats crop can be achieved by balance use of nutrient to the crop. The quality parameter of the crop in respect of protein content and utilization of nutrients (content and uptake) were increase significantly with conjoint use of FYM and N, P and K fertilizer (N80+P40+K30kg/ha+FYM5t/ha).The post harvest soil properties i.e.available NPKS and Zn content were also improved by the combined use of NPK fertilizerandFYM as compared to initial values.

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Physiological and Agronomic Responses of Tomato (Solanum lycopersicum) Under Heat Stress: Implications for Climate Resilience and Yield Performance

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Abstract

Climate change-induced heat stress poses a significant threat to agricultural productivity, particularly in heat-sensitive crops like tomato (Solanum lycopersicum). This study evaluates the phenotypic and agronomic responses of tomato plants to varying heat stress conditions, specifically focusing on key physiological traits such as photosynthetic efficiency, chlorophyll content, membrane stability, and pollen viability. The research further explores the impact of heat stress on fruit set, plant height, stem diameter, leaf number, days to flowering, and fruit yield. Tomato plants exposed to elevated temperatures exhibited a decline in photosynthetic efficiency, chlorophyll content, and membrane stability, while pollen viability and fruit set were adversely affected under high heat conditions. Agronomic traits such as plant height, stem diameter, and fruit yield were also significantly reduced under heat stress. The study highlights the variability in stress tolerance among genotypes, indicating potential avenues for selecting heat-tolerant cultivars. The findings underscore the importance of developing strategies to mitigate the impacts of heat stress on tomato production, thereby contributing to food security and climate resilience in future agricultural sy

Waste Management of Fruits and Vegetables

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ABSTRACT

Fruits and vegetables account for the larger portion of that waste about 30% of the fruit and vegetables grown in India get wasted annually while, fruits and vegetables are among the most wasted food items , accounting for around 45% of all food waste globally. Reasons of waste are production exceed deformed, premature harvesting, strict quality standards of processing and marketing, poor post harvest handling and storage infrastructure, chemical abuse for selflife extension of produce, lack of processing facilities, wide range of processed products,etc. Waste items must be gathered,tranported, processed, dispossed of or recycled and monitered. The pre- treatement, processing, transportation, collection and ultimate residue abatment are all included in a standered waste management. Store the culled fruits and vegetables on site in a pile or bermed area for a limited time, return fruit and vegetable waste to the field on which it was grown, feed fruit and vegetable waste to livestock and give the fruit and vegetable culles to local food banks. In order to decrease the quantity of material with society, waste management aims to provide hygienic living conditions.

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Effect of Foliar Application of NAA, GA3 and Zinc Sulphate on Fruit Drop, Growth and Yield of Ber (*Zizyphus mauritiana Lamk.*) cv. Banarasi Karaka

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ABSTRACT

The present investigation was undertaken on the field experiment was escort to assess the effect of foliar application of NAA, GA_3 and Zinc Sulphate on fruit drop, growth and yield of ber *(Zizyphus mauritiana Lamk.)* cv. Banarasi Karaka, the research work was conducted at horticulture orchard at Janta College Bakewar, Etawah department of horticulture on fifteen years old uniform trees of ber. The experiment was conducted in randomized block design with ten treatments comprising of each three levels of NAA @ 10, 20 and 30 ppm, GA_3 @ 20, 30 and 40 ppm and Zinc Sulphate @ 0.2, 0.4 and 0.6 % and control (water spray), respectively. Spray was done in month of November at the time of fruit setting stage. The results clearly showed that the foliar spray of $ZnSO_4$ @ 0.6% proved most effective in recording maximum initial fruit setting (166), fruit retention (14.89%) and minimum fruit drop (85.11%). The spray of GA_3 at 20 ppm resulted in maximum fruit length (4.46 cm), fruit width (2.79 cm), fruit volume (15.40 cc), fruit weight (18.68 g) and weight of fruit pulp (16.64 g). It was also observed that the foliar spray of ZnSO4 @ 0.6% was proved to be most effective in recording maximum fruit yield per tree (56.22 kg). Whereas, the control was recorded the lowest percentage on fruit set, fruit retention (%), fruit drop (%), length of fruit (cm), width of fruit (cm), fruit volume (cc), fruit weight (g), weight of fruit pulp (g), yield (kg/tree).

Keywords: Ber, NAA, GA3, ZnSO4, Fruit

Genetic Variability, Heritability, and Genetic Advance for Quantitative Traits in Indian Mustard (Brassica juncea L. Czern. & Coss.)

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Abstract

Indian mustard (Brassica juncea L. Czern & Coss) is a key oilseed crop in India, playing a crucial role in meeting the country's edible oil demand. It is a natural amphidiploid (2n=36), originating from B. rapa (2n=20) and B. nigra (2n=16), and is widely known as rai or raya. Among Brassica oilseeds, it occupies a significant share of cultivated land. Recognizing its agricultural and economic importance, the present study was conducted during the Rabi season of 2023 at the Agricultural Research Farm, Janta Mahavidyalaya, Ajitmal, Auraiya (U.P.). The research aimed to evaluate genetic variability, heritability, and genetic advance in Brassica spp. for effective crop improvement. The experiment involved twelve parental lines, 20 single crosses, and 10 three-way crosses to estimate variance components and identify traits with high breeding potential. The results revealed considerable genetic variability among genotypes. Seed yield per plant exhibited the highest phenotypic (31.45%) and genotypic coefficient of

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variation (15.53%), indicating substantial genetic diversity. Primary branches per plant had a high genetic advance as a percentage of the mean (19.74%), suggesting strong potential for selection-based improvement. Similarly, siliqua per plant (20.74%) exhibited high genetic advance, making it a promising selection criterion for yield enhancement. Heritability estimates varied across traits, with moderate to high values for plant height (66.5%), seed yield per plant (54.3%), and siliqua per plant (68.3%). High heritability and genetic advance in yield-related traits suggest the predominance of additive gene action, favouring direct selection. In contrast, days to flowering and maturity showed lower genetic advance, indicating the influence of nonadditive gene action and environmental factors. These findings provide valuable insights for plant breeders, enabling the development of high-yielding, genetically improved Indian

Nanotechnology Revolution: Transforming Medicine, Electronics, and Sustainability

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Abstract

Nanotechnology has revolutionized multiple scientific and industrial fields, leading to significant breakthroughs in medicine, electronics, materials science and environmental sustainability. The ability to engineer materials at the nanoscale has opened new frontiers for innovation, enhancing performance, efficiency and functionality across various applications.In healthcare, nanoparticles have transformed drug delivery by enabling targeted therapies that improve treatment efficacy while reducing side effects. They also play a crucial role in early disease detection, advanced imaging techniques and regenerative medicine, offering promising solutions for conditions that were previously difficult to treat. In electronics, nanoscale transistors, quantum dots, and other nanostructures have driven miniaturization, improved computing power, and enhanced energy efficiency, pushing the boundaries of modern technology.Advanced nanomaterials, such as graphene, carbon nanotubes and nanocomposites, exhibit exceptional mechanical, electrical, and thermal properties, making them valuable for next-generation materials in aerospace, construction and consumer products. Additionally, nanotechnology contributes to environmental sustainability through innovative applications in water purification, air filtration, pollution control and renewable energy.

Keywords : nanotechnology, nanomaterial, drug delivery, electronics, environmental sustainability

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Sustainable Health Care Waste Management and Strategies for Environmental and Public Health Protection

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Abstract

Effective health care waste management is crucial for protecting public health and minimizing environmental hazards. The increasing volume of biomedical and pharmaceutical waste, coupled with the risk of antimicrobial resistance (AMR), underscores the urgent need for sustainable waste disposal strategies. This international workshop on *Health Care Waste Management* aims to bring together experts, researchers, healthcare professionals, and policymakers to discuss innovative approaches and best practices for managing health care waste responsibly.Key topics will include waste segregation, treatment technologies, hazardous waste disposal, and the role of regulatory frameworks in ensuring compliance. Special emphasis will be given to the environmental impact of pharmaceutical and hospital waste, its contribution to AMR, and sustainable recycling solutions. Discussions will also explore cost-effective and eco-friendly disposal methods, as well as the role of digital innovations in waste tracking and management.Through keynote addresses, technical sessions, and panel discussions, participants will gain insights into evidence-based waste management strategies and collaborative solutions. The workshop aims to foster interdisciplinary cooperation and develop actionable policies for a cleaner and safer healthcare environment.

Keywords: Health Care Waste, Biomedical Waste Management, Pharmaceutical Waste Disposal, Environmental Sustainability, Antimicrobial Resistance, Waste Treatment Technologies

Smart Waste Solutions: Innovate, Recycle, Sustain

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Global waste generation is rising at an alarming rate due to rapid urbanization, industrial growth, and increased consumerism. Traditional waste disposal methods such as landfilling and incineration contribute to environmental degradation, pollution, and resource depletion. Smart Waste Management Solutions: Innovate, Recycle, Sustain offers a modern, technology-driven approach to tackling these challenges by integrating IoT, AI, and data analytics into waste management systems.Smart bins equipped with sensors can monitor waste levels in real-time, optimizing collection routes and reducing operational costs. AI-powered sorting machines enhance recycling efficiency by accurately separating different types of waste, minimizing contamination, and maximizing resource recovery. Blockchain technology enables transparent waste tracking, ensuring accountability and promoting a circular economy where waste is repurposed into valuable materials. Additionally, waste-to-energy technologies convert

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non-recyclable waste into renewable energy, reducing landfill dependency and lowering carbon footprints.Beyond technology, sustainable waste management also requires public participation, government regulations, and corporate responsibility. Awareness campaigns, policy incentives, and extended producer responsibility (EPR) frameworks encourage industries and individuals to adopt responsible waste disposal habits. Implementing smart solutions in waste management not only reduces pollution and conserves resources but also creates economic opportunities in the green sector.This abstract explores the latest advancements in smart waste management, emphasizing the importance of innovation, recycling, and sustainable practices in shaping a cleaner and more resource-efficient future. With the right combination of technology, policy, and community engagement, smart waste solutions can revolutionize the way we handle waste, paving the way for a more sustainable and eco-friendlier world.

Keyword: Waste management, Reusable materials, Minimizing landfill.

Role of agricultural waste recycling for sustainable agricultural development through INM

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Abstract

Integrated Nutrient Management (INM) involves combining various organic and inorganic sources of plant nutrients in an integrated manner, aiming to enhance agricultural productivity, promote soil health, and mitigate environmental concerns. INM is a vital component of modern agricultural practices, addressing challenges such as declining factor productivity, escalating input costs, soil degradation, and ecological issues. By fostering a harmonious balance between chemical fertilizers and organic sources, INM contributes to sustainable agricultural systems, making it a cornerstone of environmentally conscious farming. At its core, INM seeks to strike an equilibrium between crop productivity and ecological well-being. It emphasizes the integration of inorganic like chemical fertilizers, and organic sources like FYM (Farm Yard Manure), Pig Manure, Poultry Manure, Goat/Sheep Manure, City Compost, vermicompost, Sewage Sludge, Press Mud, Green Manure, Crop Residues, biofertilizer like PSB, Rhizobium, Azotobacter Azospirillum, blue-green algae, mycorrhiza and other natural sources to achieve optimal nutrient balance. By minimizing the excessive use of chemical fertilizers, INM offers a pathway to environmental sustainability. This approach embodies the ethos of good agricultural practices, nurturing soil health, sustaining agricultural output, and enhancing the resilience of farming communities. The adoption of Integrated Nutrient Management (INM) practices underscores the indispensable role of external nutrient supply in maintaining and enhancing crop productivity. Beyond sustaining yields, it is evident that meticulous nutrient management fosters a multifaceted improvement in soil properties, spanning chemical, physical, and biological aspects. INM's balanced and integrated approach contributes significantly to elevating soil quality. In essence, nutrient management stands as the pivotal key to a sustainable future for agriculture, bridging the nexus between crop yield and soil vitality.

Keywords: INM, organic, inorganic, soil fertility.

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To assess the optimum dose of Phosphorus and Potassium for obtaining good yield of Mustard (Brassica juncea L.)

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Abstract

A field experiment was conducted during winter season of 2023-24 under factorial Randomized Block Design at Agricultural Research farm of Janta mahavidyalaya Ajitmal Auriaya to find out the optimum dose of phosphorus and potassium for obtaining good yield of Mustard. In this experiment Phosphatic and Potassic fertilizers were used at different levels to assess the effect of different combinations of Phosphorus and Potassium. Phosphorus and Potassium were applied in the form of monocalcium superphosphate and muriate of Potash (each at the rate of 30, 60, 90 kg P_2O_5 & K_2O/ha.) respectively. In addition, a uniform dose of urea at the rate of 80 kg N/ha.was also applied. The yield and its attributes were recorded at the time of harvesting. The various yields attributes such as number of pods/plant, number of seeds/pod, seed yield and oil yield were found significantly higher with treatment T_2. It was apparent from present investigation that the effect of Phosphorus as well as in combination with Potassium (60 kg P_2O_5/ha & 60 kg K_2O/ha) were found significant for obtaining good yield of Mustard. The increase in seed yield was due to increase in number of pods/plant and seeds/pod.

Keywords: Mustard, Phosphorus and potassium level

Strategies for Recycling and Waste Management in Etawah District: A Study

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Abstract

An important concern for the environment and public health is waste management. The present recycling and garbage management practices in the Etawah district of Uttar Pradesh, India, are examined in this study. It looks into the difficulties encountered, possible fixes, and tactics to make the district's waste management system more sustainable and efficient. The study highlights legal framework, public awareness, and infrastructural shortcomings and offers doable suggestions to enhance waste management procedures. Resource conservation, environmental integrity, and public health all depend on efficient waste management. Rapid urbanization and population growth have increased trash creation in emerging areas like Etawah district, making the use of sustainable waste management techniques necessary. This essay examines the district's present procedures, difficulties, and opportunities. In order to guarantee sustainable trash

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management, this report examines the district's present procedures, difficulties, and possible alternatives Goals

- Evaluate the Etawah district's present trash management procedures. Determine the difficulties and potential areas for development.
- Make suggestions for improved recycling and trash management techniques.

2. Etawah District's Present Waste Management Procedures

Municipal administrations are the main source of rubbish collection and disposal in the Etawah district. Informal garbage collectors, however, are also very important. The district's inadequate recycling and trash segregation facilities cause systemic inefficiencies.

2.1 Collection of Waste

Door-to-door services and community bins are used to collect the majority of waste from residential and business areas. Waste is not well separated at the source, though.

2.2 Disposal of Waste

The gathered waste is frequently taken to landfills, which are not scientifically managed and pose a risk to public health and the environment.

2.3 The Role of the Informal Sector

Although they operate in hazardous and uncontrolled environments, informal garbage pickers make a substantial contribution to recycling by gathering recyclables from waste dumps.

3. Waste Management Difficulties

1. **Lack of Public Awareness**: A large number of locals do not understand the significance of appropriate disposal and trash segregation.
2. **Inadequate Infrastructure:** The district does not have enough facilities for recycling, composting, or trash segregation.
3. **Policy Gaps:** Tighter enforcement of waste management laws is required.
4. **Limited Funding**: The construction and upkeep of waste management infrastructure are hampered by a lack of funding.
5. **Risks to Health and Safety**: Unofficial garbage collectors operate in dangerous
6. **Health and Safety Risks**: Without proper safety precautions, informal waste collectors operate in dangerous environments.

4. Suggested Recycling and Waste Management Techniques

4.1 **Education and Community Involvement**

To educate locals about recycling, composting, and garbage segregation, public awareness programs had to be started. Raising awareness can be greatly aided by community organizations and schools. Consistent campaigns and workshops can support the promotion of sustainable behaviors.

4.2 **Infrastructure Development: Create community-level waste segregation facilities.**

• Create facilities for organic waste composting.
• Install recycling facilities for metal, paper, and plastic.
• To turn non-recyclable garbage into energy, invest in waste-to-energy facilities.

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4.3 **PPPs, or public-private partnerships**

Involving the commercial sector can aid in attracting funding and technological know-how to enhance waste management procedures. Private businesses can help with effective landfill management, recycling technology, and contemporary garbage collection methods.

4.4 **Regulation and Policy**

• Require garbage to be separated at the source.
• Apply penalties for inappropriate disposal of garbage.
• Offer rewards to homes and companies who handle their waste in an environmentally friendly manner.
• To guarantee adherence to waste management regulations, regulatory control should be strengthened.

4.5 **The Informal Sector's Integration**

Recycling rates and working conditions can both be improved by formalizing the employment of informal waste collectors. They should be given safety gear and training courses. To increase the effectiveness of waste collection, the local government might work with workers in the unorganized sector.

5. Case Study: Successful Waste Management Models

Successful waste management practices from other regions, such as Indore's zero-waste initiatives, can serve as a blueprint for Etawah district. Indore's model emphasizes strict waste segregation, efficient collection systems, and community participation. The city's waste-to-compost initiatives and its partnerships with private companies have significantly improved its waste management practices.

6. Conclusion

The waste management challenges in Etawah district can be addressed through a combination of community engagement, improved infrastructure, public-private partnerships, regulatory reforms, and digital innovation. By formalizing the role of the informal sector and adopting successful practices from other regions, Etawah can move towards a more sustainable and efficient waste management system. With concerted efforts from all stakeholders, the district can enhance its waste management practices to protect public health and the environment.

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The role of technology in enhancing recycling efficiency

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Abstract

The integration of technology into recycling processes has significantly improved efficiency, sustainability, and cost-effectiveness in waste management. This research explores the transformative role of advanced technologies—such as artificial intelligence (AI), the Internet of Things (IoT), robotics, and blockchain—in optimizing recycling systems. AI-driven sorting mechanisms, enabled by machine learning and computer vision, enhance material classification accuracy, reducing contamination and increasing the recyclability of waste. IoT-based smart bins and real-time monitoring systems improve waste collection logistics, minimizing operational inefficiencies. Robotics further streamline recycling operations by automating labor-intensive tasks, such as waste segregation and material recovery, thereby reducing human error and processing time. Additionally, blockchain technology facilitates transparent and traceable recycling supply chains, ensuring accountability and promoting circular economy practices. Moreover, data analytics and cloud computing enable predictive maintenance of recycling machinery, optimizing operational uptime and reducing energy consumption. Innovations in chemical and enzymatic recycling break down complex materials that were previously non-recyclable, thereby expanding the scope of recyclable products. Case studies from various countries demonstrate how smart recycling infrastructures have led to increased recovery rates, reduced landfill dependency, and economic benefits. Despite these advancements, challenges remain, including high initial investment costs, technological integration barriers, and regulatory constraints. Addressing these challenges requires collaborative efforts from governments, industries, and researchers to develop cost-effective and scalable solutions. This paper provides a comprehensive analysis of emerging technological trends in recycling, assessing their impact on sustainability, economic feasibility, and environmental conservation. By leveraging technological innovations, recycling systems can transition towards more efficient, automated, and intelligent frameworks, contributing to global sustainability goals. Future research should focus on enhancing interoperability among recycling technologies, reducing implementation costs, and developing policies that encourage the widespread adoption of smart waste management solutions.

Keywords: *Technology, Artificial Intelligence, Recycling efficiency, Sustainability, Waste Management*

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The role of water recycling in sustainable development

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Abstract

In a world where vital resources are progressivelylacking in quantity, nations cannot lead to the unnecessary loss or misuse of valuable resources . After we use water in our homes and other places, it is washed away, and takes many useful resources with it. Wastewater has different types of minerals, nutrients and carbon so it must be recycled to provide fresh water , energy and fertilizer. Many countries and metropolitan cities have already developedadvanced and complicated wastewater treatment plants that effectively recycleminerals and bioenergyand reproduce"fresh water". But more than 75% of all wastewater still currently flows into natural ecosystems like rivers, ponds, seaetc. and polluting the environment and taking valuable minerals, nutrients and other recyclable materials with it. There is important role of water recycling in sustainable development

Zero-Waste Agricultural Models: Best Practices for Reducing, Reusing, and Recycling

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Abstract

The agricultural sector plays a pivotal role in the global economy, yet it also contributes heavily to environmental degradation by producing excessive waste. In response, zero-waste farming models are developing as a promising alternative to reduce waste while increasing resource efficiency. Zero-waste farming seeks to stop the loop on agricultural output by reducing, reusing, and recycling waste materials, so transforming them into valuable resources. This abstract investigates the most effective techniques and tactics for establishing zero-waste models in agriculture, emphasizing their potential to promote sustainability and reduce environmental footprint. Best practices in zero-waste agriculture include eliminating waste at its source by optimizing resource utilization throughout the farming process.Precision agriculture, integrated pest management, and crop rotation are techniques that reduce the demand for chemical inputs while also reducing extra biomass. Furthermore, the use of regenerative farming strategies like cover cropping and agroforestry improves soil health, promotes biodiversity, and decreases waste via natural recycling mechanisms. Reusing agricultural waste is another key component of zero-waste farming. Crop leftovers, livestock manure, and food industry waste can be recycled into organic fertilizers, animal feed, and even bioproducts such as bioplastics and biochar. Composting and vermiculture are low-cost, environmentally friendly options for recycling organic waste, improving soil quality, and minimizing reliance on synthetic inputs. Recycling agricultural waste using energy recovery technologies,Such as anaerobic digestion and bioenergy production, farmers have great opportunity to generate renewable energy while managing trash. These devices can convert agricultural leftovers into

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biogas, which can be used to cook, heat, or generate electricity, so improving rural energy security and lowering greenhouse gas emissions. However, the successful adoption of zero-waste farming models necessitates overcoming obstacles such as high initial investment costs, a lack of infrastructure, and limited awareness of waste management procedures. Governments, industry stakeholders, and research institutions must work together to promote innovation, expand access to green technologies, and build favourable policy frameworks that foster zero-waste projects in agriculture. To summarize, implementing zero-waste agricultural models provides a holistic approach to sustainable farming, transforming trash into a valuable resource and encouraging environmental, economic and social benefits. By adopting best practices for reducing, reusing, and recycling agricultural waste, the sector can make a significant contribution to reaching global sustainability goals while also cultivating resilient and resource-efficient farming systems.

Keywords:Zero-waste agriculture, waste reduction, recycling, sustainable farming, resource efficiency, regenerative agriculture, biogas, composting, circular economy.

Sustainable Fertilizer Alternatives from Agricultural Waste for Soil Rejuvenation

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Abstract

The extensive use of chemical fertilizers in modern agriculture has resulted in soil degradation, biodiversity loss, and environmental contamination. Sustainable fertilizer options obtained from agricultural waste provide an environmentally responsible solution to these issues while also encouraging soil renewal. This study looks at various organic fertilizers made from agricultural waste, such as compost, biochar, green manure, and vermicompost, and highlights their benefits for improving soil fertility, increasing microbial activity, and lowering dependency on synthetic inputs. The study also investigates novel methods for turning garbage into nutrient-rich fertilizers using anaerobic digestion and fermentation. Furthermore, policy frameworks and incentives for using sustainable fertilizers play an important role in promoting these practices.By showcasing field research and case studies,this work intends to illustrate the feasibility and benefits of using agricultural waste as a sustainable fertilizer option, while also contributing to a circular economy and supporting environmentally sound agricultural practices.

Keywords: Sustainable fertilizers, sustainable agriculture, agricultural waste, soil rejuvenation, composting, biochar, green manure, vermicompost, anaerobic digestion, circular economy.

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Public-Private Partnerships for Effective Waste Management

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Abstract

Public-Private Partnerships (PPPs) are crucial to improving the efficiency and sustainability of waste management systems. PPPs improve garbage collection, disposal, and recycling operations through leveraging the strengths of public institutions and private firms. This research investigates the importance of public-private partnerships in waste management, focusing on their role in infrastructure development, technological innovation, and resource optimization. PPPs enable municipalities to overcome budget restrictions and administrative inefficiencies by using private sector experience, investments, and operational effectiveness. Collaborations of this nature frequently offer advanced waste processing technology, smart waste management systems, and efficient logistical frameworks. Furthermore, PPPs contribute to community participation and awareness programs that promote sustainable waste management practices. This study conveys successful examples of PPP-driven waste management projects from various countries, proving their impact on trash reduction, circular economy integration, and environmental sustainability. However, issues like as policy inconsistencies, financial risks, and stakeholder cooperation necessitate organized regulatory frameworks and strategic planning. Governments and private enterprises may build resilient, cost-effective, and environmentally friendly waste management systems by strengthening public-private partnerships. This study finishes with recommendations for policymakers, corporations, and urban planners to improve public-private partnership frameworks for long-term waste management efficiency.

Keywords: Public-Private Partnerships, policy frameworks, circular economy, waste management, sustainability, infrastructure development, technological innovation, stakeholder collaboration.

Smart Waste Management: Role of AI and IoT in Waste Collection

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Abstract

Effective waste management is critical to environmental sustainability and urban hygiene. The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) into waste collection systems has transformed traditional waste management procedures, increasing efficiency, lowering operational costs, and encouraging ecological balance. This study investigates the use of AI and IoT in smart trash management, focusing on real-time monitoring, route optimization, and predictive analytics. AI-powered analytics enable intelligent decision-making by studying waste generation patterns, optimizing collection schedules, and forecasting future waste accumulation. IoT-enabled smart bins with sensors provide real-time data on waste levels, preventing overflows and assuring timely collection. Furthermore, automated garbage sorting with AI improves recycling efficiency, contributing to a circular economy.The study

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describes successful AI and IoT implementations in waste collection across multiple cities, demonstrating their usefulness in lowering landfill dependency and increasing sustainability. It also addresses issues including data security, high implementation costs, and the need for policy frameworks to support smart waste management programs. Municipalities and waste management authorities may use AI and IoT to improve garbage collection methods, cut carbon footprints, and create smarter, cleaner cities. This study finishes with recommendations for legislators, technologists, and urban planners to improve waste collection systems by leveraging AI and IoT breakthroughs.

Keywords: Internet of Things, Artificial Intelligence, Smart waste management, waste collection, real-time monitoring, route optimization, predictive analytics, sustainability, circular economy.

Studies on foliar application of micronutrients and GA_3 on yield and quality of ber (*Zizyphus mauritiana* Lamk.) fruits cv. Gola.

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ABSTRACT

The present investigation entitled **"**Studies on foliar application of micronutrients and GA_3 on yield and quality of ber (*Zizyphus mauritiana* Lamk.) fruits cv. Gola**"** was carried out during the year 2019-20. The studies comprised two sets of experiments, first experiment conducted at Main Experiment Station, and second experiments was conducted at ambient temperature in P.G. Laboratory of the Department of Horticulture. The collected data were analyzed using RBD design for first experiment, and Factorial CRD design for second experiment with four replications. Under first experiment effect of $ZnSO_4$, borax and GA_3 on the yield and quality of ber fruits was studied and it was found that highest Fruit set, fruit retention, fruit yield, fruit weight, seed pulp ratio, moisture per cent, TSS, ascorbic acid, reducing sugars, non-reducing sugar, total sugars content and organoleptic score and lowest acidity content was recorded with foliar application of $ZnSO_4$ 0.5% + borax 0.5% + $GA_3$100ppm. Under second sets of experiment effect of foliar application of micronutrients and GA_3 on shelf-life of ber fruits was studies and found that the TSS, reducing sugars, non-reducing sugar and total sugars content increased with storage period up till 9^{th} days of storage period thereafter content was started to decreased till end of the experiment whereas acidity and ascorbic acid content decreased continuously with storage periods in all the treatments including control. There was no PLW and decay loss up to the 3^{rd} day in all the treatments thereafter both increased with storage periods to end of the observations. The ber fruits can be stored with acceptable quality up to 9^{th} days with two foliar application of $ZnSO_4$ 0.5% + borax 0.5% + $GA_3$100ppm done just before flowering and after fruit setting.

Keywords: yield and quality of ber (*Zizyphus mauritiana* Lamk.), borax and GA_3, micronutrients.

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Best utilization of horticultural waste for sustainable development

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Abstract

The use of horticultural waste for soil amendment is limited in developing countries. Competition between fuel and feed is the major cause for the insufficient application of waste on cropland. The aims of this study were therefore (i) to investigate variation in horticultural waste allocation between groups of farmers with different livelihood strategies and link this allocation with the nutrient balances of their production systems, (ii) to identify farm characteristics that influence utilisation of horticultural waste for soil amendment, and (iii) to assess demand for urban/rural waste compost. A total of 100 farmers were selected randomly and interviewed using standardised semi-structured questionnaires. Four groups of farmers, namely (i) vegetable producers, (ii) ornamental-plant growers, (iii) fruit producers and (iv) farmers practising mixed farming were identified using categorical principal component and two-step cluster analyses. Vegetable producer farmers produced the largest quantity of horticultural waste, but they allocated 80% of manure to fuel and 85% of crop residues to feed. Only <10% of manure and crop residues were applied on soils. Farmers also sold manure and crop residues, and this generated 5–10% of their annual income. Vegetable and ornamental-plant growers allocated over 40% of manure and crop residues to soil amendment. Hence, nutrient balances were less negative in vegetable production systems. Education, farm size, land tenure and access to extension services were the variables that impeded allocation of horticultural waste to soil amendment. Replacement of fuel and feed through sustainable means is a viable option for soil fertility management. Urban waste compost should also be used as alternative option for soil amendment. Our results showed variation in compost demand between farmers. Education, landownership, experience with compost and access to extension services explained variation in compost demand.

Role of Vermicomposting in Urban Gardening and Waste Management for a Sustainable Environment

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Abstract

Vermicomposting has emerged as a sustainable solution for urban waste management and environmental conservation. It not only reduces organic waste but also enhances soil fertility, making it a crucial component in urban gardening. This paper explores the role of vermicomposting in waste recycling, its effectiveness in managing biodegradable waste, and its contribution to sustainable urban agriculture. Additionally, statistical data from the past five years is analyzed to demonstrate the impact of vermicomposting on waste reduction, soil health, and economic viability. The findings suggest that integrating vermicomposting into urban waste management strategies can significantly reduce landfill dependency, lower carbon emissions, and promote eco-friendly gardening practices.

Keywords: Vermicomposting, Urban Gardening, Waste Management, Soil Fertility, Sustainable Agriculture.

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EFFECT OF POTASSIUM LEVELS ON PRODUCTIVITY AND PROFITABILITY OF WHEAT VARIETIES

Shiv Shankar Assistant Professor, Department of Agronomy, R.B.S. College, Bichpuri, Agra–283105, U.P. **Abstract**

A field experiment was conducted during Rabi season of 2022-23 at Agricultural Research Farm, Department of Agronomy, R.B.S. College, Bichpuri, Agra (U.P.) the investigation entitled 'Effect of potassium levels on productivity and profitability of wheat (Triticum aestivum L.) varieties'. The experiment was laid out in a factorial randomized block design with three replications, treatment consisted of three wheat varieties (HD2967, DBW187 and RAJ3765) and four potassium levels (0, 20, 40, and 60 kg K2O ha-1). The results indicated that the wheat variety DBW187 demonstrated significantly enhanced yield attributes such as no. of spikes meter-2 (391.45), no. of spike-lets spike-1 (9.86), no. of grains spike-1 (41.61), and test weight (39.49 g.) compared to HD2967 and RAJ3765. The highest grain yield (59.13 q ha-1), biological yield (147.05 q ha-1) and net returns (Rs.78848.93 ha1) and benefit-cost ratio (2.45) were recorded with the application of 60 kg K2O ha-1 and the variety DBW187.

Keywords : Economic, potassium levels, varieties, and yieldompost demand beside cash.

Sustainable Waste Management Through Black Soldier Fly (BSF) Culture: A Bioeconomic Approach

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Abstract

The increasing generation of organic waste poses significant environmental and economic challenges. Traditional waste management methods, such as landfilling and incineration, contribute to pollution and resource depletion. In this context, Black Soldier Fly (BSF) (Hermetiaillucens) culture has emerged as an innovative and sustainable solution for organic waste management. BSF larvae efficiently convert various organic wastes, including agricultural residues, food waste, and manure, into high-value biomass, including protein-rich insect feed and organic fertilizer. This process not only reduces waste accumulation but also supports circular economy principles by promoting resource recovery.

The bioeconomic potential of BSF culture is substantial, as it provides cost-effective alternatives for animal feed production and soil enrichment while minimizing environmental impact. Additionally, BSF farming requires minimal resources, emits lower greenhouse gases compared to conventional waste processing methods, and offers an eco-friendly alternative to fishmeal and soybean-based feeds.

This seminar explores the biological efficiency, economic feasibility, and environmental benefits of BSF-based waste management systems. By integrating BSF culture into existing waste management frameworks, we can move towards a more sustainable, resilient, and resource-efficient future.

Keywords: Black Soldier Fly (BSF), Organic Waste Management,Waste Vaporization, Environmental Sustainability.

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Role of Plants in Waste Management and Recycling Strategies

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Abstract

Plants play a significant role in sustainable waste management and recycling, offering natural solutions for pollution control and resource recovery. This paper explores various plant-based strategies, including phytoremediation, composting, biofiltration, and the production of biodegradable materials, highlighting their importance in managing waste and promoting environmental sustainability. Waste generation has increased due to rapid industrialization and urbanization, leading to environmental pollution. Conventional waste management methods often have limitations, making plant-based solutions a viable and eco-friendly alternative. Certain plants, such as water hyacinths*Eichhornia crassipes, Typha latifolia, Ocimum bacilicum, Azolla pinnata*and sunflowers, have the ability to absorb heavy metals and pollutants from soil and water. Phytoremediation helps in detoxifying contaminated environments, while biofiltration using plant roots aids in wastewater treatment. Plants like vetiver grass*Vetiveria zizanioides* effectively remove toxins from industrial waste, while algae-based systems treat wastewater efficiently. Urban green spaces also help in managing organic waste through community composting programs. Plants contribute to organic waste recycling through composting, converting biodegradable waste into nutrient-rich fertilizers. Additionally, plant-derived materials like bioplastics and natural fibers reduce reliance on synthetic, non-biodegradable products, promoting a circular economy.Utilizing plants in waste management not only reduces pollution but also supports ecological balance. Integrating plant-based recycling strategies into modern waste management systems is essential for a sustainable future.

Food Waste Reduction and Sustainable Consumption

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Abstract

Food waste is a severe issue that has an impact on the economy, ecology, and world food supply. Every day, a significant amount of food is wasted, which increases pollution and wastes resources. Reducing food waste lowers greenhouse gas emissions and conserves energy, water, and land. By guaranteeing that edible food is used effectively rather than thrown away, it also increases food security. Food waste may be addressed in large part through sustainable consumption. This entails purchasing only what is required, storing food appropriately, and cutting back on excess consumption. Meal planning, reusing leftovers, and selecting locally grown and seasonal vegetables are all easy ways to drastically reduce waste. Enhancing food delivery networks, cutting packaging waste, and putting waste reduction rules into place are more ways that companies and legislators may help. In addition to helping the environment, minimizing food waste improves the food system by lowering prices and increasing food accessibility. A sustainable future where food is valued and utilized responsibly may be achieved by raising awareness and promoting responsible eating practices at all levels—individual, community, and industry.

Keywords: Food waste, sustainable consumption, resource conservation, responsible food habits.

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STUDY OF AZADIRACHTA INDICA LEAVES IN BLOOD OF ALBINO RATS

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ABSTRACT

A plant is said to be medicinal when at least one part possesses therapeutic properties. What about medicinal plants for several years, now the fad for natural therapies has thrust these plants into the limelight. It is greatly to the credit of the people of India that they were acquainted with a far larger number of medicinal plants. Azadirachta Indica A juss (neem), an indigenous tree of indopakistan subcontinent belongs to the family maliaceae and is widely distributed in Asia, Africa & other tropical parts of the world. Almost every part of the tree has found applications in indigenous medicine for the treatment of a variety of human ailments (Kirtikar & Basu, 1965) Mostpart of the plant are used mainly bark, root, young fruits, seed, flowers, leaves, gum and toddy.Neem tree having many medicinal properties. This is used in leprosy, intestinal worms, piles and urinary diseases. Narayanan et al 1993 reported heemoglobin & glucose chanals in rats with treatment of neem ot.

Keywords: Possesses therapeutic properties, indopakistan subcontinent, Heemoglobin & glucose chanals,

Organic Farming

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Abstract

Organic farming is a modern and a sustainable form of agriculture that provides consumers fresh natural farm products. Organic farming works in synchronization with nature rather than against it. This objective is achieved by using techniques to improve crop yields without harming the natural environment as well as the people who live and work in it. Organic agriculture offers an exclu-sive amalgamation of environment-friendly practices, which require low external inputs, thereby contributing to increased food availability. Organic farming has a very positive influence especially on birds, insects, weeds, wildlife, and soil flora and fauna. Conventional farming is capital intensive, which requires more manu-factured inputs and energy as compared to knowledge and labor-intensive organic farming. Organic agriculture uses energy more competently than conventional agri-culture. As compared to conventional agriculture, organic farming produces cost-effective food products, free of synthetic fertilizers and pesticides. It also provides employment opportunities and economic benefits to local communities.

Keywords: Synchronization with nature rather, Organic agriculture, organic farming, cost-effective food products

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Sustainable Agriculture Practices

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Abstract

Sustainable agriculture is the practice of farming in a way that satisfies current demands of society for food and textiles without compromising the ability of present or future generations to meet their own needs. It might be created on knowledge of ecosystem services. There are numerous ways to improve of agriculture sustainability. Flexible business procedures and farming techniques are crucial when developing agriculture within sustainable food systems. A large portion of anthropogenic greenhouse gas emissions are attributed to food systems, which have a significant impact on climate change, water scarcity, water pollution, land degradation, deforestation, and other processes. Agriculture both influences and is impacted by environmental changes at the same time. Sustainable agriculture refers to farming practices that protect the environment while permitting for the production of crops or livestock without causing harm to people or the environment. It involves protecting against negative effects on the farm of employees, residents, the environment, water, biodiversity, upward resources, and soil. Crop rotation, mixed farming, multiple cropping, and permaculture are examples of sustainable agriculture practices.

Keywords: Sustainable agriculture, Flexible business, emissions, environmental changes.

Polycyclic aromatic hydrocarbons (PAHs) Waste management by bacterial strains and environment sustainable

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Abstract

PAHs pollution is well reported to cause serious problems to water and soil ecosystem. PAHs are typical petroleum contaminants that are extensively present in the environment and Hydrocarbon contamination from petrochemical sector activities, oil exploration, and chemical factory wastes is currently one of today's biggest environmental issues. These PAHs are releases from natural (volcano eruption, forest fire) and anthropogenic activity (coal tar distillation, dye, drugs and paint manufacturing), these are highly toxic to plant growth and human health. These are cause dangerous toxicity such as carcinonegic, taratogenic, mutagenicity, immunogenicity in humans ; so I have already worked on biodegradation method by isolated bacterial strain and I was found staphylococcus aureus LOP-9 bacterial strain and this bacterial strain was isolated from aromatic hydrocarbon contaminated sites by different screening methods at higher concentration of PAH and different conditions and degradation activity checked by HPLC ,degraded metabolites were identified by GCMS techniques. Thus LOP-9 bacterial strain can be used for cleanup of waste hydrocarbons and these methods are very cost effective, eco-friendly and sustainable development.

Keywords: PAHs pollution, soil ecosystem, bacterial strain, GCMS techniques.

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A study of the role of unorganised sector workers in waste management

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Abstract

Waste management is an important aspect of urban development and environmental protection in which the role of workers in the informal sector is extremely crucial. This study analyses the role of waste pickers, recycling workers and waste segregators employed in the informal sector. These workers contribute to the processes of collection, sorting and recycling of solid waste, making the waste management system more effective.

The study pointed out that these workers play a vital role in maintaining environmental sustainability and cleanliness, but they face social and economic inequalities. They are deprived of stable income, health protection and social recognition due to being informally employed.

This research highlights the status of unorganized workers in waste management, their challenges and possible measures to improve their living standards. It also highlights the role of policy-making, government schemes, non-governmental organizations and community-based initiatives.

Key Words: Waste management, development and environmental protection, waste pickers, waste segregators.

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Effective waste management strategies and potential policy for sustainable farming

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Abstract

Agricultural waste management plays vital role in sustainable agriculture, affecting environmental health, growth, and resource. This paper examines the different categories of agricultural waste, their effects on ecosystems, and innovative approaches for recycling and repurposing waste materials. It particularly focuses on composting, the generation of energy, and the use of biopolymers as sustainable alternatives. Additionally, the paper addresses the obstacles encountered in establishing effective waste management practices and potential policy measures to enhance these efforts. The findings indicate that blending modern technology with traditional methods can greatly improve the utilization of agricultural waste, aiding both environmental preservation and economic sustainability.

Keywords: Agricultural waste, sustainability, composting, bioenergy, biopolymers, waste management

Introduction

Agriculture plays a pivotal role in global food security but also generates substantial amounts of waste, including crop residues, livestock manure, and food processing by-products. Several studies have highlighted the importance of effective waste management strategies in sustainable farming. According to Smith et al. (2020), integrating composting techniques with precision agriculture significantly improves soil fertility while reducing environmental degradation. Similarly, Jones and Brown (2019) emphasize the role of bioenergy production from agricultural residues in achieving a circular economy. Patel et al. (2021) suggests that policy interventions, such as subsidies for bio-composting and anaerobic digestion technologies, can enhance waste management practices among smallholder farmers. Kumar et al (2020) proposed a new work of production of bio gas from agriculture waste. Additionally; Singh and Verma (2022) argue that a combination of traditional and modern waste recycling techniques can optimize resource efficiency. Recent advancements in biodegradable polymer production from agricultural waste have also been explored by Garcia et al. (2023), indicating promising applications in sustainable packaging solutions. Despite these insights, gaps remain in the large-scale implementation of waste management strategies, particularly in developing regions. The lack of financial incentives, inadequate infrastructure, and limited awareness among farmers are major barriers that require targeted policy solutions. Sharma, R., & Gupta, N. (2019) discuss the concept of Regulatory Framework for Agricultural Waste Management. Carbon Sequestration through Biochar for Agricultural Waste Utilization was proposed by Wilson, T., et al. (2022).in recent era the concept of Public-Private Partnerships in Agricultural Waste Management was discussed by Lopez, F., & Martinez, D. (2023).This paper aims to explore sustainable agricultural waste management strategies that can mitigate these issues while enhancing productivity and environmental health.

Agriculture Waste: There are specially four types of Agriculture waste, which are discussed as under diagrammatic representation-

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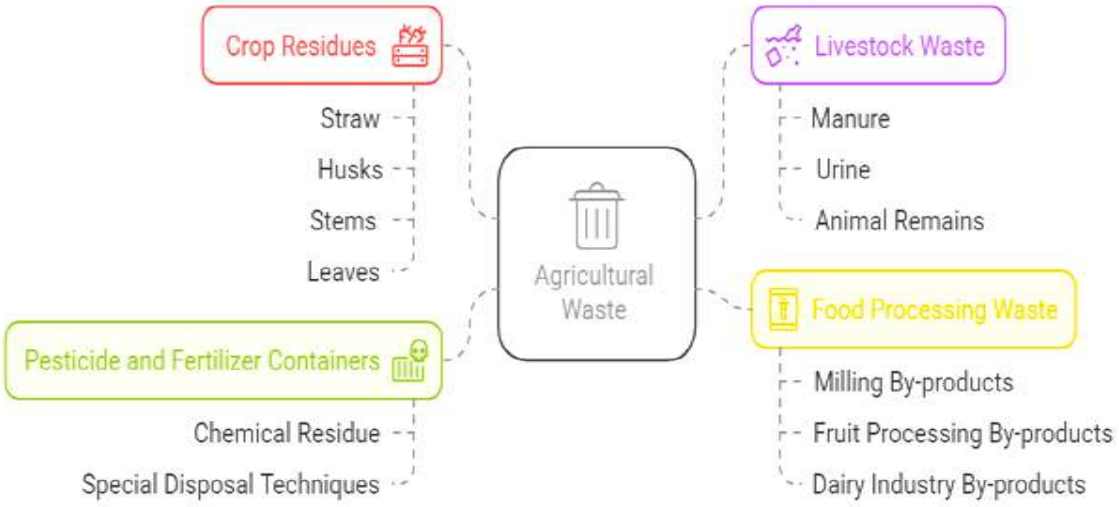
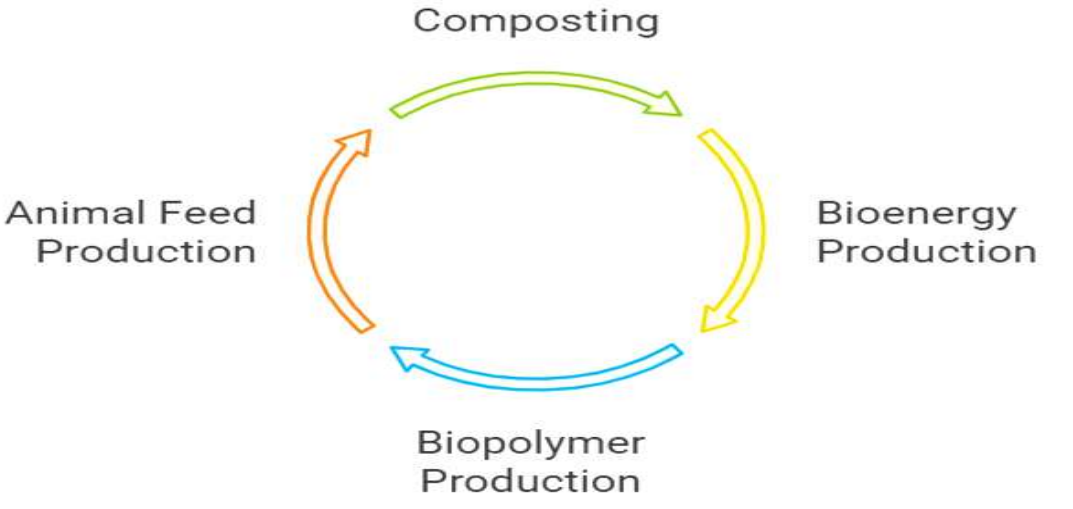


Agriculture waste management: In present context if we adopt the systematic waste management cycle as shown in the diagram excellent results will be obtained in form of soil health, renewable energy, biodegradable plastics, soil enrichment and nutritional livestock feed for sustainable agriculture waste management.



Systematic processAgriculture waste management

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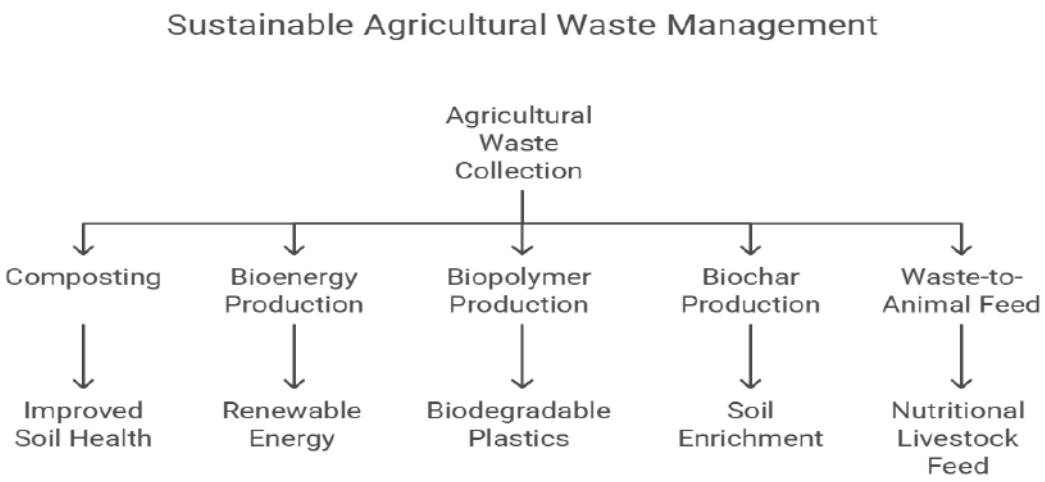

Conclusion

Agricultural waste, when handled properly, can become a valuable asset instead of a challenge. Incorporating such as compost, bioenergy generation, and advanced biopolymer technologies offers a promising route toward sustainability. To ensure effective waste management that benefits both the environment and the agricultural industry economically, collaboration among governments, businesses, and researchers is essential.

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About the Workshop

The International One-Day Workshop on "Waste Management and Recycling Strategies for Sustainable Development" aims to explore innovative waste management and recycling techniques that contribute to a sustainable future. This Workshop will bring together experts, researchers, policymakers, and industry professionals to discuss effective strategies for reducing waste, improving recycling processes, and promoting environmental sustainability.Key topics will include sustainable waste management, advanced recycling technologies, government policies, corporate sustainability initiatives, and community participation in waste reduction.This Workshop serves as a platform for knowledge exchange, fostering new ideas and collaborations to address global environmental challenges.

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