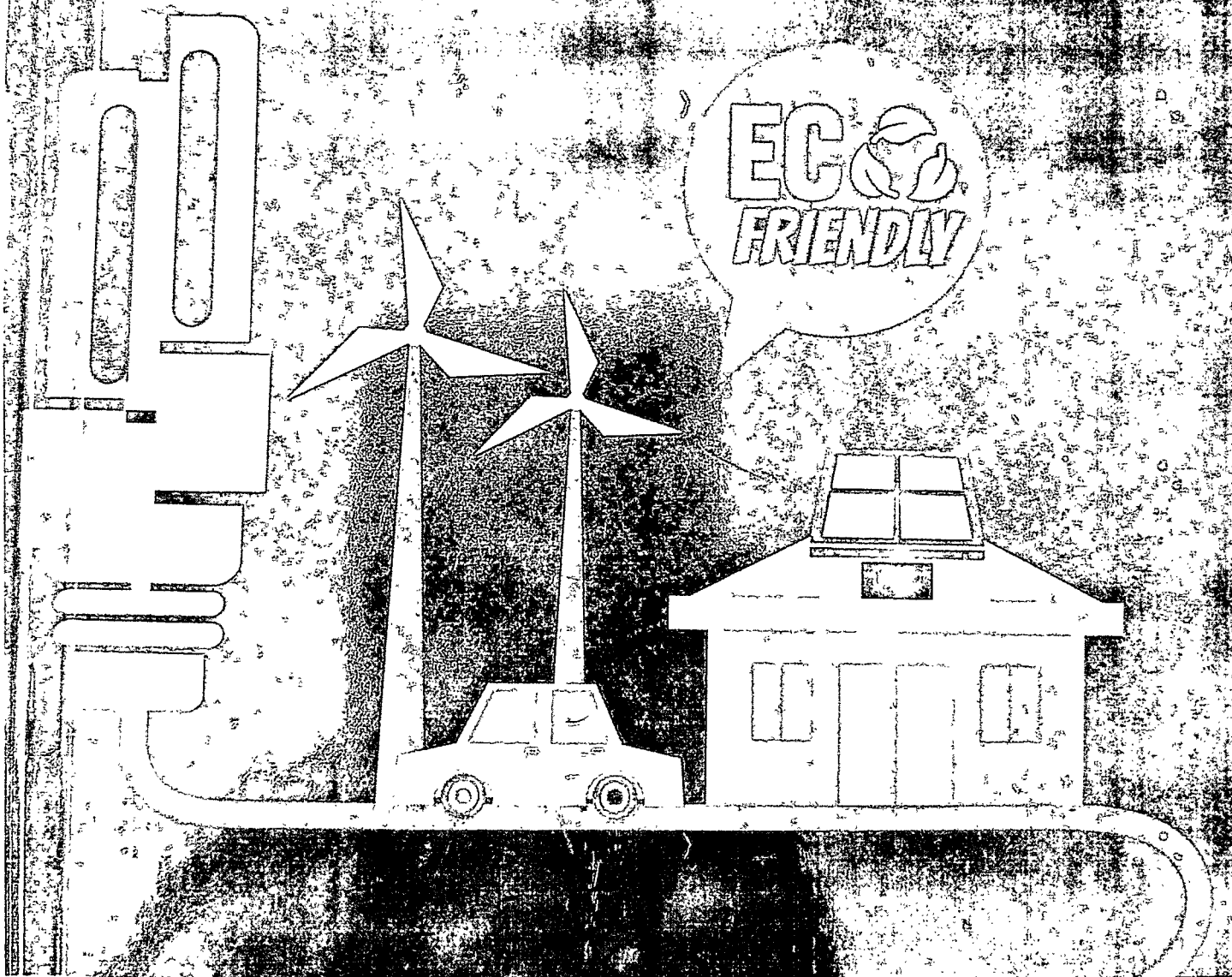


EMERGING Green Technologies *for* ENVIRONMENTAL SUSTAINABILITY



EDITORS

DR. RAJESH KUMAR | DR. INDU | DR. MONITA MOHAN

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Microbial, Plant-Based, and Green-Synthesized Dyes: Sustainable Production Strategies

**Divya Patiyal*, Saba Rana,
Zehra Husaini, Vikas Kumar**

Abstract

Dyed and pigments are essential in various industries, including textiles, food, cosmetics, printing, and advanced functional materials. Conventional synthetic dyes, while offering vibrant and durable colors, pose serious environmental and health risks due to toxic chemicals, heavy metals, and high water and energy consumption. The growing need for sustainable alternatives has led to the development of eco-friendly dyes and pigments derived from plants, microbes, minerals, and waste materials, often produced using green extraction techniques and biotechnological approaches. Sustainable dyeing technologies, including low-water systems, biodegradable mordants, and digital printing, minimize environmental impact while maintaining color quality. Despite challenges such as color consistency, fastness, scale-up, and regulatory issues, industrial adoption is increasing, supported by global brands and circular economy practices. Future trends focus on synthetic biology, nano-pigments, smart dyes, and renewable chemical frameworks to enhance sustainability. This chapter provides a comprehensive overview of sustainable dye and

Green Engineering of Bio-Derived Adhesives, Coatings, and Lubricants for Industrial Applications

**Vikas Kumar*, Saba Rana, Vipin Saini,
Ankit kumar, Divya Patiyal**

Abstract

The increasing global demand for sustainable materials has accelerated research on bio-derived adhesives, coatings, and lubricants as alternatives to petroleum-based products. These biomaterials sourced from plant oils, natural polymers, microbial biopolymers, and animal derived macromolecules provide significant environmental advantages, including biodegradability, low toxicity, renewability, and reduced carbon emissions. This chapter presents an in depth examination of the green engineering principles governing the development, fabrication, and application of bio-based adhesives, biocoatings, and biolubricants. Key themes include material sources, chemical modification strategies, functional performance, industrial applications, and emerging technologies such as nanobiocomposites, enzymatic processing, and circular bioeconomy models. The chapter also explores existing limitations, including cost, durability, and standardization, and proposes research directions that integrate biotechnology, green chemistry, and advanced surface engineering. Ultimately, this comprehensive overview highlights the potential of

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Use of Nanotechnology in Biofuel Production: Major Challenges and Future Opportunities

**Vipin Kumar Saini*, Saba Rana,
Vikas Kumar, Shalini Mishra**

Abstract

Given the current situation, where fossil fuels are steadily running out, biofuel is one of the finest substitutes for fuels derived from petroleum in the world. When fossil fuels burn, greenhouse gases are released into the atmosphere, posing serious risks to both human health and the ecosystem. Industrial biofuel production is a time-consuming process due to a number of restrictions in currently available technologies and the correspondingly higher costs. Furthermore, based on the varied methods and materials used, multiple procedures are used to convert diverse feedstocks into the intended result. In terms of selectivity, energy efficiency, and time management, nanoparticles (NPs) are among the finest ways to address the present problems with biomass usage at a lower cost. Many of these techniques have just lately gained traction, and a number of NPs, including metal, magnetic, and metal oxide, are currently being employed to improve the production of biofuel. NPs are useful biofuel additions because of their special qualities, which include their design, stability, higher surface area to

Emerging Advances in Genetic Crop Improvement for Sustainable Farming Systems

Saba Rana*, Vipin Kumar Saini, Ankit Kumar,
Divya Patiyal, Zehra Husaini

Abstract

The global agricultural landscape is confronted with major challenges such as meeting the food demands of an expanding population, coping with climate variability, and minimizing ecological damage. Genetically modified (GM) crops have emerged as a valuable tool to address these issues by improving crop tolerance, lowering production costs, and supporting sustainable farming practices. Recent developments in GM technology include enhanced resistance to pests and pathogens (such as Bt-based varieties), tolerance to herbicides, and the ability to withstand environmental stresses like drought and salinity. Furthermore, biofortification has enabled the enrichment of staple crops with vital nutrients—including vitamins, minerals, and omega-3 fatty acids—helping combat global nutritional deficiencies. From an environmental perspective, GM crops contribute to sustainability by reducing reliance on chemical inputs, promoting soil conservation through reduced tillage, and improving water-use efficiency. Economically, these crops have boosted yields, increased farm income, and strengthened food security, especially in resource-

Integrating Sustainable Agriculture and Precision Farming: Strategies for a Resilient and Eco-Friendly Future

Zehra Husaini*, Saba Rana, Divya Patiyal

Introduction

The 21st century faces multifaceted challenges in ensuring food security while maintaining environmental integrity. Global population growth, climate change, resource depletion, and biodiversity loss threaten the sustainability of conventional agricultural practices. In response, the agricultural industry is progressively adopting innovative approaches that enhance efficiency while reducing environmental impact. Notably, combining sustainable farming practices with precision agriculture technologies presents a viable route toward a more resilient and environmentally responsible future.

Sustainable agriculture emphasizes practices that meet current food and fiber needs without compromising the ability of future generations to do the same. It emphasizes ecological sustainability, financial viability, and social fairness. In contrast, precision agriculture employs advanced digital tools such as information and communication technologies (ICT), GPS, remote sensing, Internet of Things (IoT) devices, and data analytics to manage inputs more efficiently at fine spatial scales. The convergence of these approaches aims to create agricultural systems that are productive, eco-friendly, socially responsible, and economically viable^[1].

Green Synthesis of Nanomaterials for Sustainable Environmental Solutions

Shalini Mishra*, Vipin Kumar Saini, Saba Rana, and Divya Patial

Abstract

Nanotechnology is rapidly emerging as a transformative tool for addressing critical environmental challenges such as water scarcity, air and soil pollution, climate change mitigation, and the development of sustainable energy systems. Owing to their nanoscale dimensions and distinctive physicochemical properties, nanomaterials exhibit enhanced surface area, reactivity, and functional efficiency, making them highly effective in environmental remediation, pollutant detection, antimicrobial applications, catalysis, and renewable energy technologies. However, conventional physical and chemical synthesis routes often involve the use of toxic reagents, high energy consumption, and the generation of environmentally hazardous by-products, raising serious ecological and health concerns.

In this context, green synthesis has emerged as a sustainable and environmentally benign alternative for nanomaterial fabrication, utilizing natural resources such as plant extracts, microorganisms, biopolymers, and agricultural waste under mild reaction conditions. This approach is strongly aligned with the principles of green chemistry.

ECONOMIC PLANNING AND NUTRITIONAL WELL-BEING OF FAMILIES

Abstract

Household economic planning plays a crucial role in determining the nutritional well-being of families, particularly in the context of limited resources, rising food prices and changing lifestyles. This chapter examines the interrelationship between economic planning and family nutrition from a Home Science perspective, emphasizing the family as a basic economic unit where income, time, energy and skills must be efficiently managed. It explores how budgeting, meal planning, food purchasing, storage and cooking practices influence dietary quality, food security and health outcomes. The chapter highlights that income alone does not ensure good nutrition; rather, informed decision-making and effective resource management significantly enhance nutritional well-being even in low-income households. Special attention is given to the role of women in household economic and nutritional management, as well as to microeconomic theories of food choice that shape consumption behavior. By linking economic planning with nutrition, health and food security, the chapter underscores the importance of financial literacy and nutrition education in preventing malnutrition and nutrition-related disorders. The discussion offers valuable insights for students, educators and policymakers seeking to promote sustainable and healthy family living.

Keywords: Household Economic Planning, Nutritional Well-Being, Family Resource Management, Food Budgeting, Meal Planning, Women's Role in Nutrition, Food Security, Microeconomics of Food Dietary Quality, Malnutrition Prevention.

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Reimagining Commerce and Management in the Digital Era

Edited by

Ashfaq Ali

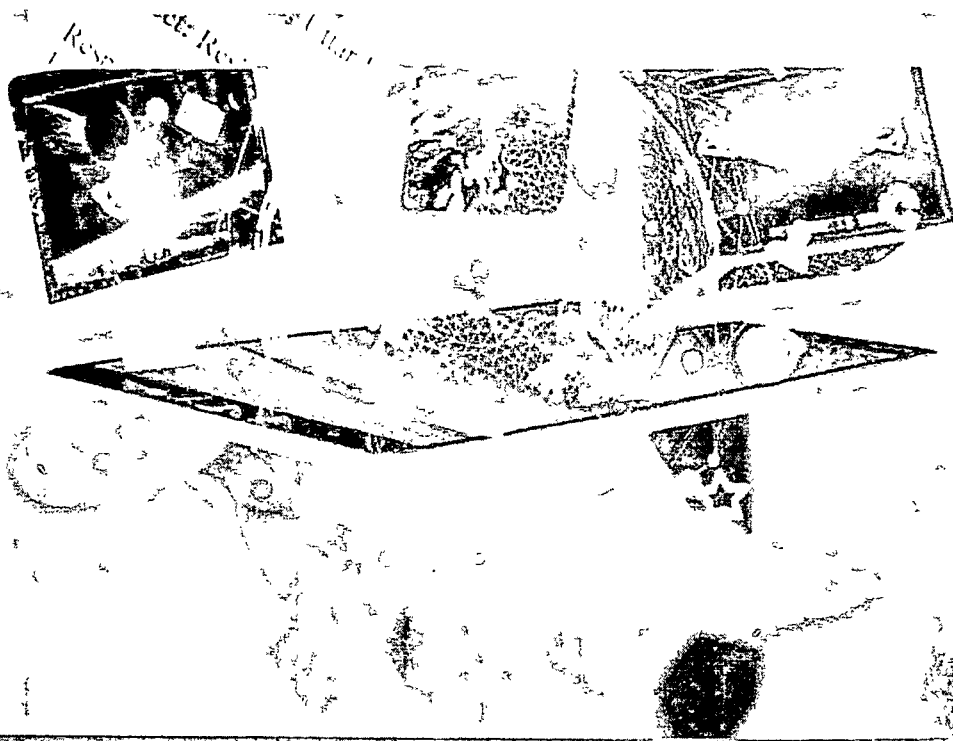
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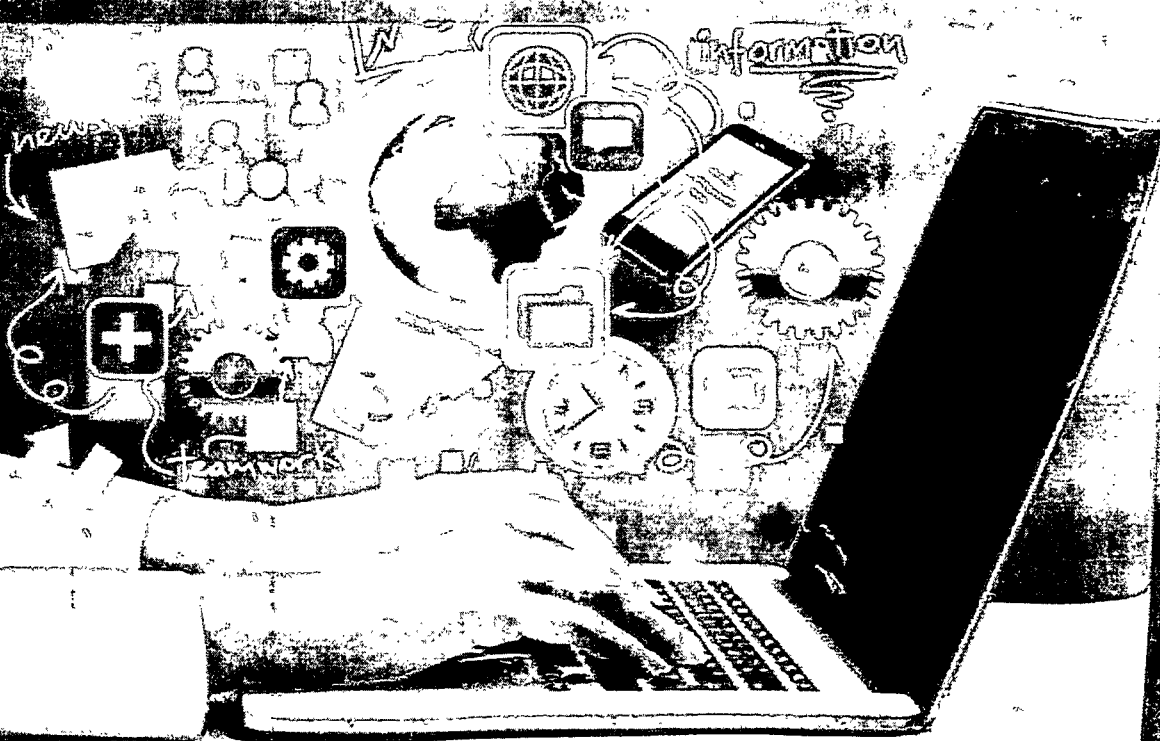


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Dr. Ashfaq Ali
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Dr. Saurabh Mittal
Dr. M. S. Khan



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DIGITAL TRANSFORMATION AND SUSTAINABLE HOME MANAGEMENT: A COMMERCE-HOME SCIENCE INTERFACE

— Dr. Shweta Rathi

ABSTRACT

In the rapidly changing digital age, the traditional area of home management is experiencing a major shift driven by technological progress and sustainable living priorities. This paper examines the connection between digital transformation and sustainable home management, combining viewpoints from both commerce and home science. The research shows how adopting eco-friendly digital tools, energy-saving smart devices, and e-commerce platforms is changing household practices and consumption habits.

Through a multidisciplinary approach, the study examines the role of smart technologies such as IoT-enabled appliances, digital budgeting applications, and home automation systems in encouraging efficient resource use and environmentally conscious decision-making at the household level. It also explores how digital commerce has facilitated access to sustainable products and services, enabling families to align their consumption with eco-friendly values.

Based on qualitative insights and secondary data, the paper demonstrates how the convergence of digital management tools with sustainability goals is not only empowering individuals, particularly women, in home decision-making but also contributing to broader societal objectives such as reduced carbon footprints and responsible consumption. The study concludes by recommending policy support, awareness programs, and design improvements to promote the wider adoption of digital solutions for sustainable home management.

Keywords: Digital Home Management, Sustainable Living, Smart Appliances, Green Consumerism, Technology in Domestic Management



THE IMPACT OF DIGITAL TRANSFORMATION ON INDIAN STARTUPS

— Isha Arora

ABSTRACT

Digital transformation has significantly reshaped the global business landscape, with Indian startups emerging as key drivers of this revolution. This study examines the profound impact of digital transformation on Indian startups, emphasizing its role in fostering innovation, enhancing operational efficiency, and redefining business models. The research delves into current trends, challenges, and opportunities, underscoring the critical role of technology in accelerating growth within the Indian startup ecosystem. By integrating insights from case studies, this paper demonstrates how digital tools and platforms enable startups to scale rapidly, optimize processes, and deliver value to customers in competitive markets. However, it also identifies barriers such as limited resources, regulatory hurdles, and resistance to change that hinder digital adoption. To address these challenges, the study provides actionable recommendations, including strategic investments in technology, capacity building, and fostering collaborations with key stakeholders. This analysis highlights the transformative potential of digitalization in empowering Indian startups to compete globally and drive sustainable economic growth. The findings contribute to a deeper understanding of how startups can leverage digital transformation to navigate dynamic markets and achieve long-term success.

1. Introduction

The Indian startup ecosystem has experienced exponential growth over the past decade, becoming a vibrant hub of innovation and economic activity. This remarkable expansion is attributed to the convergence of an entrepreneurial spirit, supportive government policies, and rapid technological advancements. As one of the world's leading startup ecosystems, India has embraced digital transformation as a pivotal force shaping its trajectory. Digital transformation, defined by the integration of emerging technologies

CONSUMER BEHAVIOR IN THE DIGITAL AGE: ANALYZING THE SHOPPING PATTERNS OF INDIAN E-COMMERCE USERS

— Sofiya Ansari

ABSTRACT

The expansion of e-commerce in India has had a significant impact on consumer behavior, with digital platforms impacting interaction, tastes, and buying decisions. This study looks at how internet shopping is developing, what drives customer decisions, and the impact of digital marketing strategies. Using survey data and secondary research, the study provides valuable insights into the expectations, obstacles, and motivations of Indian e-commerce buyers. Keywords: India, digital marketing, ecommerce, digital transformation, online shopping, and cons.

1. Introduction

Nowadays, customers' shopping habits have been radically revolutionized by the rapid advancement of digital technology, and e-commerce usage in India is growing at an unprecedented rate. Various studies indicate that the Indian e-commerce business has grown fast over the last ten years as a result of factors such as increased internet usage, reasonable costs for various commodities, cellphones, and digital payment methods. In addition to providing convenience, this development has influenced consumers' tastes, decision-making processes, and purchasing patterns on a large scale. A variety of factors influence the modern Indian client, including competitive pricing strategies, social media influence, and specialized recommendations. Shopping patterns are constantly evolving as a result of the advent of direct-to-consumer (D2C) corporations and platforms such as Amazon and Flipkart.

Furthermore, following the COVID-19 outbreak, customers are increasingly reliant on online platforms for both necessary and non-essential purchases, hastening the shift towards digital purchasing. This study seeks to

A STUDY ON THE IMPACT OF SOCIAL MEDIA MARKETING TRENDS ON DIGITAL MARKETING

— Ruby Poswal

ABSTRACT

The growing popularity of social media has compelled marketers to consider this platform alongside traditional marketing functions. Social media primarily relies on internet or mobile phone applications and tools to share information among users. The number of social media users exceeds the population of some countries today. The impact of social media on marketing can be evaluated by comparing marketing practices before and after the rise of social media and by examining the technologies used in social media.

Keywords: Marketing before social media, the evolution of social media, social media today, web technology, the impact of social media on marketing, concerns, and criticism of social media.

Introduction

Social media marketing is the use of social media platforms and websites to promote a product or service. Although the terms e-marketing and digital marketing are still dominant in academia, social media marketing is becoming more popular for both practitioners and researchers. Most social media platforms have built in data analytics tools, which enable companies to track the progress, success, and engagement of ad campaigns. Companies address a range of stakeholders through social media marketing, including current and potential customers, current and potential employees, journalists, bloggers, and the general public. On a strategic level, social media marketing includes the management of a marketing campaign, governance, setting the scope (e.g., more active or passive use) and the establishment of a firm's desired social media "culture" and "tone." While using social media marketing, firms can allow customers and Internet users to post user-generated content (e.g., online comments, product reviews, etc.), also known as "earned media," rather than use marketer-prepared advertising copy.

THE PSYCHOLOGY OF SPACE: HOW INTERIOR DESIGN AFFECTS HUMAN BEHAVIOR

— Kajal Mavi

ABSTRACT

This research explores the intricate relationship between interior design and human behavior, delving into the psychological principles that govern our interactions with the built environment. It investigates how elements such as color, light, texture, and spatial arrangement can significantly influence our emotions, moods, and behaviors. By examining the psychological underpinnings of design choices, this study aims to demonstrate how thoughtfully designed spaces can foster well-being, enhance productivity, and cultivate positive human interactions. The research will draw upon a combination of psychological theories, empirical studies, and real-world case studies to illustrate the profound impact of interior design on human behavior. Ultimately, this exploration seeks to provide valuable insights for architects, interior designers, and individuals alike, empowering them to create spaces that not only aesthetically pleasing but also conducive to human flourishing.

Keywords: Interior design, psychology of space, human behavior, environmental psychology, well-being, productivity, design principles.

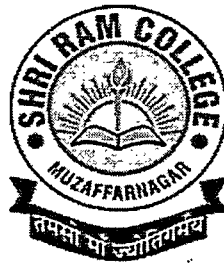
Introduction

The built environment profoundly shapes human experience. Beyond mere aesthetics, interior design exerts a powerful influence on our emotions, moods, and behaviors. This research delves into the intricate relationship between the psychology of space and human behavior, exploring how elements such as color, light, texture, and spatial arrangement can significantly impact our well-being, productivity, and social interactions.

From the moment we enter a space, our senses are bombarded with information that subconsciously influences our thoughts and actions. The colors on the walls, the quality of light, the choice of materials, and the way

Contemporary Issues in Media and Communication

Edited by
Omprakash Kushwaha



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PODCAST JOURNALISM: GROWTH AND CHALLENGES IN INDIA

— Mayank Verma

ABSTRACT

Podcast journalism has become an important and growing form of news and storytelling in India in recent years. This growth has been supported by the rapid increase in smartphone usage, easy availability of low-cost internet, and the rising popularity of on-demand audio content among audiences. Unlike traditional forms of journalism such as newspapers and television, podcast journalism allows journalists to present news and stories in a detailed, conversational, and engaging manner. Podcasts also provide space for long-form discussions, interviews, and narrative storytelling, which help audiences better understand complex social, political, and cultural issues.

This research paper examines the growth of podcast journalism in India and analyzes the major challenges faced by journalists and content creators working in this medium. The study uses a qualitative research approach and is based on the review of existing academic literature, media industry reports, and case studies of selected Indian news podcasts..

The study further suggests that podcast journalism has the potential to play a strong supportive role alongside mainstream media by promoting in-depth reporting, diverse viewpoints, and independent journalism.. With these improvements, podcast journalism can become a powerful tool for strengthening democratic communication and informed public discourse in the digital age.

Keywords: *Podcast Journalism, Digital Media, Audio Journalism, Indian Media, New Media*

Contemporary Issues In Media And Communication

An Edited Volume of Research Papers

(Volume 1)

EDITOR:

OMPRAKASH KUSHWAHA



**PUBLICATION DIVISION,
SHRI RAM GROUP OF COLLEGES,
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COMICS AS A SOCIOLOGY TEACHING TOOL: CHALLENGING PEDAGOGICAL AND INSTITUTIONAL INERTIA IN THE CLASSROOM

Omprakash Kushwaha

Abstract

This paper analyses the use of comics as a transformative teaching tool in university sociology classrooms, emphasizing their potential to challenge traditional power dynamics and institutional inertia. Focusing on visual, satirical, and narrative elements of comics such as *Chacha Chaudhary*, *Amar Chitra Katha*, and *Batman*, the paper highlights how comics foster democratic and egalitarian classroom environments? It critically examines the role of pedagogical and institutional structures in shaping teacher-student relationships and argues that comics can disrupt these hierarchies, promoting freedom, equality, and cognitive discourse. The paper also investigates how comics, through their unique blend of humor and critical resonance, encourage students to engage with complex sociological themes and challenge societal power relations. Ultimately, this paper positions comics as a powerful pedagogical tool. It redefines the classroom as a site of knowledge production and democratic dialogue.

Keywords: comics, classroom, pedagogy, democracy, freedom, institutional inertia

Introduction

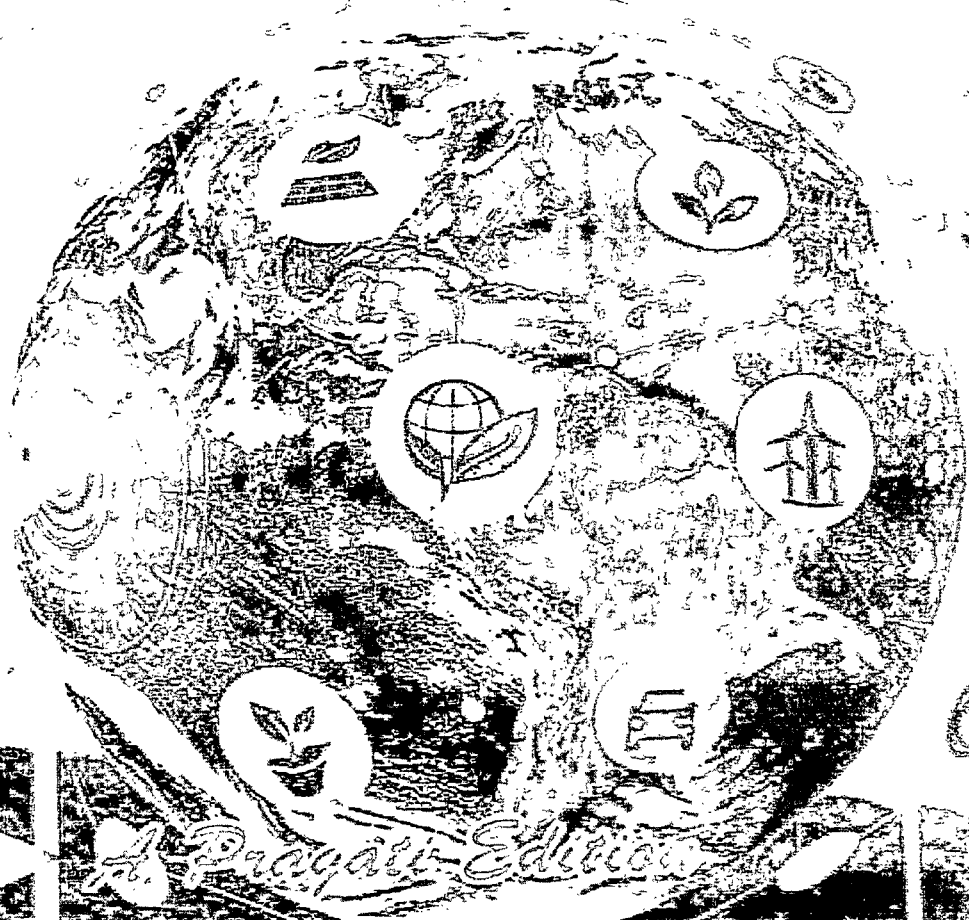
Chacha Choudhary is one of the most popular and witty comic book heroes. His sharp problem-solving mind proposes a perspective offering a transformative vision. Its popularity and new messaging style that is traditional in nature is highly appealing. Specifically the behaviour of storytelling and visual narrative that is emotional in tone forms a unique communication channel linking to Indian culture and society. To connecting the youth of 1970s, the *Chacha Chaudhary* fosters a new way of thinking through their visual narrative and storytelling. This strategy of

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ENVIRONMENTAL SCIENCE AND SUSTAINABILITY

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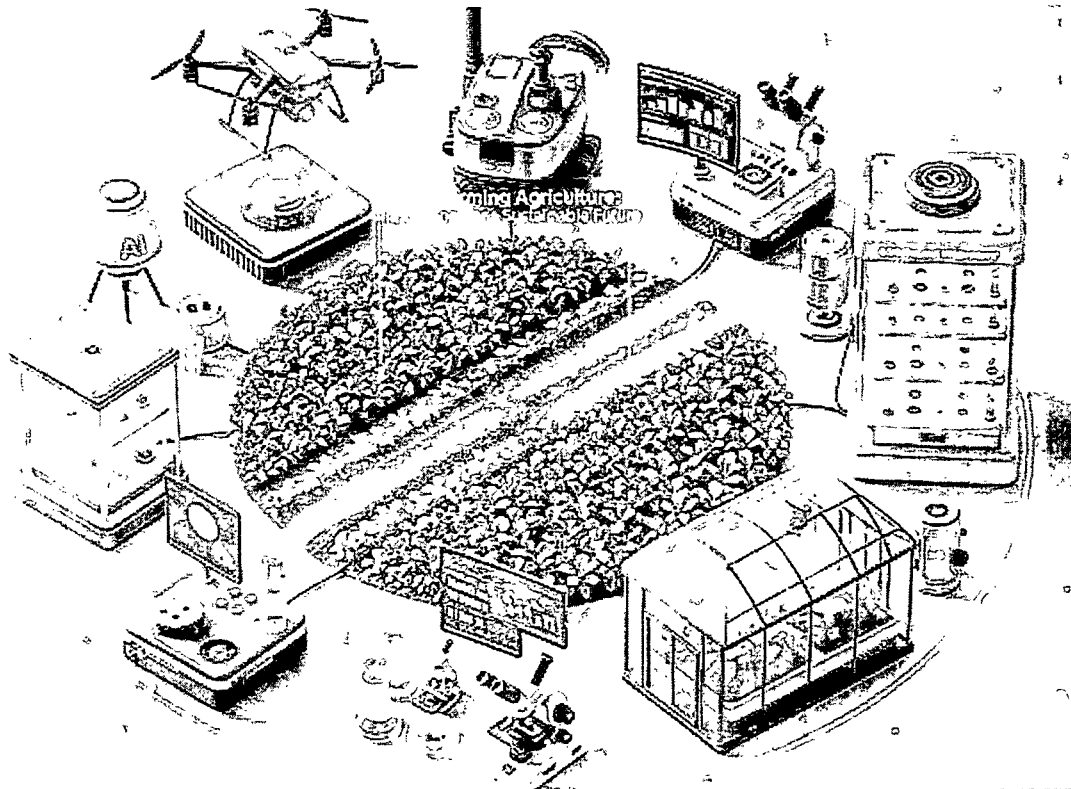
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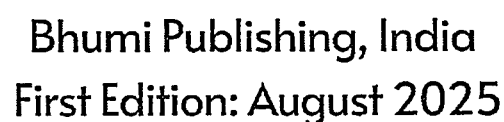
TRANSFORMING AGRICULTURE: INNOVATIONS FOR A SUSTAINABLE FUTURE



Dr. Santosh

Dr. Ratnakiran D. Wankhade

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DRONES IN AGRICULTURE

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Abstract:

Agriculture is undergoing a technological transformation with the advent of unmanned aerial vehicles (UAVs), commonly known as drones. These tools are revolutionizing the way farming operations are conducted, enabling precision agriculture through real-time data acquisition, crop monitoring, field analysis, irrigation management, and spraying operations. The integration of drones has significantly enhanced efficiency, reduced labor dependency, and increased crop productivity while promoting sustainable practices. This chapter delves into the evolution, types, components, applications, benefits, challenges, legal frameworks, and future perspectives of drone technology in agriculture. Case studies from various agricultural zones are also discussed to highlight real-world applications. The chapter provides a comprehensive view of how drones are reshaping modern agriculture, aligning it with global food security and sustainability goals.

Keywords: UAVs, Precision Agriculture, Remote Sensing, Smart Farming, Sustainable Agriculture, Aerial GIS, NDVI, Variable Rate Application.

Introduction:

The increasing global demand for food, driven by population growth, urbanization, and climate change, has necessitated a shift toward smarter agricultural practices. One of the most transformative technologies to emerge in this domain is the use of drones. Drones, or unmanned aerial vehicles (UAVs), are aircraft systems that operate without a human pilot on board and are typically controlled remotely or autonomously via GPS. Drones have found extensive application across numerous sectors, but their utility in agriculture stands out due to the tangible impact on productivity, sustainability, and cost-effectiveness. They offer a bird's-eye view of vast fields, allowing for rapid data collection and analysis. According to Zhang and Kovacs (2012), drones can significantly reduce the time and labor required for traditional agricultural monitoring techniques. The integration of drone technology into agriculture is a pivotal component of precision farming — a concept that combines data analytics, GPS, and automation to optimize

BIOFORTIFICATION: A SUSTAINABLE STRATEGY FOR COMBATING MICRONUTRIENT MALNUTRITION

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Abstract:

Micronutrient deficiencies, often referred to as hidden hunger, affect more than two billion people globally, particularly in developing countries. Biofortification is a cost-effective, sustainable, and long-term strategy aimed at increasing the density of essential vitamins and minerals in staple crops through conventional plant breeding, transgenic approaches, or agronomic practices. Unlike supplementation and food fortification, biofortification targets rural populations who rely heavily on home-grown foods. This chapter provides a comprehensive analysis of biofortification, including its conceptual framework, types, methods, crops under development, global programs, success stories, challenges, and future prospects. The integration of biofortified crops into food systems can significantly enhance nutritional security and contribute to the achievement of several Sustainable Development Goals (SDGs), particularly those focused on hunger, health, and well-being.

Keywords: Biofortification, Micronutrient Deficiency, Hidden Hunger, Genetic Engineering, Agronomic Biofortification, Sustainable Development Goals, Staple Crops, Malnutrition

Introduction:

Micronutrient malnutrition affects a substantial portion of the global population, especially in regions where diets are primarily based on calorie-rich but nutrient-poor staple foods such as rice, wheat, and maize. According to the World Health Organization (WHO), over 30% of the global population suffers from deficiencies in essential micronutrients like iron, vitamin A, and zinc (WHO, 2021). These deficiencies can lead to a wide range of health problems, including anemia, impaired cognitive development, weakened immunity, and increased mortality rates, especially among women and children. Biofortification—defined as the process of increasing the nutrient content of staple crops during plant growth rather than through post-harvest fortification—emerges as a promising and sustainable solution to address hidden hunger. The technique encompasses plant breeding, transgenic modifications, and agronomic

APICULTURE – A SUSTAINABLE APPROACH TO LIVELIHOOD AND AGRICULTURE

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Abstract:

Apiculture, or beekeeping, is an ancient and evolving practice with profound ecological, economic, and social significance. Rooted in human civilization for over 9,000 years, modern apiculture has progressed into a scientifically managed agricultural enterprise. Beyond honey production, it plays a vital role in crop pollination, biodiversity conservation, and rural employment. This chapter explores the historical development, commonly used bee species, essential equipment, and management practices involved in beekeeping. It emphasizes the economic importance of hive products such as honey, wax, and propolis, and their contribution to rural income and allied industries. The ecological benefits of apiculture, particularly in supporting sustainable agriculture and contributing to the UN Sustainable Development Goals, are discussed in detail. Challenges such as pesticide exposure, climate change, diseases, and lack of training are identified alongside innovations like smart hives and selective breeding. The current status and future prospects of apiculture in India—including its suitability for women and tribal communities—highlight its potential as a low-cost, climate-resilient livelihood strategy. Strengthened by institutional support and growing market demand, apiculture holds immense promise for enhancing food security and ecological sustainability.

Keywords: Apiculture, Beekeeping, Honeybee, Pollination, Sustainable Agriculture, Hive Products, Rural Livelihoods, Smart Hives, Climate Change.

Introduction:

Apiculture, derived from the Latin word *Apis* meaning bee, refers to the practice of maintaining bee colonies primarily for the production of honey and other hive products. With its roots dating back over 9,000 years, apiculture has evolved from wild honey collection to a sophisticated agricultural practice. In addition to honey production, beekeeping contributes significantly to pollination services, biodiversity conservation, and rural income generation (FAO, 2020). Amidst pressing challenges such as climate change, food insecurity, and

PRECISION FARMING: REVOLUTIONIZING AGRICULTURE THROUGH TECHNOLOGY-DRIVEN SOLUTIONS

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Abstract:

Precision farming, also known as site-specific crop management, represents a transformative evolution in modern agriculture through the integration of cutting-edge technologies such as GPS, GIS, remote sensing, IoT, AI, drones, and robotics. This data-driven approach enables the real-time observation, measurement, and response to intra-field variability, ensuring optimal input utilization and enhancing resource-use efficiency. As the global demand for food continues to surge amidst environmental degradation, climate change, and resource scarcity, precision farming emerges as a critical solution for sustainable intensification. This chapter comprehensively explores the principles, components, technologies, applications, and global scenarios of precision farming. It also delves into economic and environmental benefits, implementation strategies, policy frameworks, challenges, and future research directions. By promoting ecological sustainability, economic viability, and technological inclusivity, precision agriculture has the potential to revolutionize global food systems while empowering farmers with intelligent, adaptive solutions for 21st-century agriculture.

Keywords: Precision Agriculture; Site-Specific Crop Management (SSCM); Smart Farming; GPS; GIS; Remote Sensing; Internet of Things (IoT); Variable Rate Technology (VRT); Artificial Intelligence (AI); Unmanned Aerial Vehicles (UAVs); Data Analytics; Climate-Smart Agriculture.

Introduction:

Agriculture has historically been the backbone of human civilization, providing food, fiber, and fuel. From the early days of subsistence farming to the Green Revolution and beyond, agricultural innovations have continuously shaped human societies. However, contemporary agriculture is confronted with a new set of complex challenges. The global population is projected to reach nearly 10 billion by 2050, thereby increasing food demand by over 60% (FAO, 2017). At the same time, climate change is threatening agricultural productivity through

GENOMICS IN CROP IMPROVEMENT

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Abstract:

The exponential growth in global population, climate change, and increasing pressure on natural resources necessitate a paradigm shift in how crops are improved to meet global food security goals. Genomics—a comprehensive study of an organism's entire genome—has emerged as a powerful and transformative tool in modern plant breeding. It provides insights into genome structure, gene function, and complex trait architecture, significantly accelerating the breeding cycle. This chapter discusses the foundations of plant genomics, sequencing technologies, marker systems, genome-wide association studies (GWAS), genomic selection (GS), and genome editing, with special emphasis on their applications in the improvement of major crops. Furthermore, it examines the role of omics integration, challenges of practical implementation in breeding programs, and the way forward in integrating genomics for sustainable crop productivity.

Keywords: Genomics, Molecular Breeding, Genome Sequencing, Marker-Assisted Selection, Genome Editing, Genomic Selection, Plant Biotechnology, Functional Genomics, Omics Integration.

Introduction:

Crop improvement has always been a cornerstone of agricultural development. Traditional breeding practices, relying on phenotypic selection and hybridization, have historically enhanced crop productivity and stress resilience. However, such methods are often time-consuming, labor-intensive, and limited in scope when dealing with complex traits like drought resistance, yield stability, and nutrient use efficiency (Tester & Langridge, 2010). The introduction of molecular biology and genomics has transformed the landscape of crop breeding. Genomics refers to the study of the structure, function, evolution, and mapping of genomes. It allows scientists to understand gene functions and interactions at a system-wide level, significantly enhancing the precision and speed of breeding programs (Varshney *et al.*, 2014). This chapter presents an extensive review of the role of genomics in modern crop improvement, emphasizing recent advances, technologies, and applications in key food and cash crops.

LAC CULTURE: A SUSTAINABLE BIO-RESOURCE FOR LIVELIHOOD AND INDUSTRY

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Abstract:

Lac culture, the scientific cultivation of lac insects (*Kerria lacca*) on host plants for the production of natural resin, is an ancient yet economically vital agro-forestry practice. As one of the few commercially viable entomological products sourced from insects, lac serves as a base for bio-based resins, dyes, and polishes with wide applications in food, pharmaceuticals, cosmetics, electronics, and varnish industries. India, the world's largest producer and exporter of lac, supports millions of tribal and rural households engaged in lac cultivation, harvesting, and processing. This chapter delves into the intricate world of lac culture, tracing its historical development, biological foundations, cultivation practices, host plant ecology, and socio-economic implications. It also explores modern innovations, value-added lac products, pest and disease management, market potential, and policy frameworks supporting sustainable lac-based livelihoods. With global interest in renewable, biodegradable materials rising, lac culture stands at the confluence of traditional knowledge and future-ready green technologies.

Keywords: Lac Culture, *Kerria lacca*, Lac Insect, Host Plants, Lac Resin, Agroforestry, Non-Timber Forest Products (NTFPs), Sustainable Livelihood, Bio-based Polymers, Tribal Economy, Resin Insects, Natural Dyes

Introduction:

Lac is a unique, natural resin secreted by scale insects of the species *Kerria lacca*, which feed on the sap of specific host plants. Unlike synthetic resins, lac is biodegradable, non-toxic, and eco-friendly, making it an attractive raw material in a world seeking sustainable alternatives. The process of cultivating lac insects on suitable trees to harvest this resin is known as lac culture. In India, lac culture is a traditional livelihood activity, particularly among tribal communities in Jharkhand, Chhattisgarh, Madhya Pradesh, Odisha, and West Bengal. It forms part of the country's rich tradition of non-timber forest products (NTFPs) and contributes to both subsistence income and export revenue. According to the Indian Institute of Natural Resins and

REMOTE SENSING IN AGRICULTURE

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Abstract:

Remote sensing has emerged as a vital technology in modern agriculture, facilitating enhanced monitoring, management, and decision-making across diverse cropping systems. The integration of satellite, aerial, and drone-based sensors allows the observation and analysis of various agronomic variables such as crop health, soil moisture, nutrient status, and pest infestations with high spatial and temporal resolution. This chapter provides a detailed overview of remote sensing technologies, their principles, types, and applications in precision agriculture, crop monitoring, yield estimation, soil and water management, and sustainable farming. Moreover, it explores the fusion of remote sensing data with GIS, artificial intelligence (AI), and decision support systems (DSS). Case studies from different countries are provided to highlight its practical implications and socioeconomic benefits. Challenges, such as data accuracy, high costs, and policy limitations, are also discussed, along with future prospects aimed at making agriculture more resilient, productive, and sustainable.

Keywords: Remote Sensing, Precision Agriculture, Satellite Imagery, NDVI, Drones, Crop Monitoring, GIS, Sustainable Farming, Spatial Analysis, Multispectral Data.

Introduction:

Agriculture, the cornerstone of human civilization, has evolved significantly with the advent of modern technology. One of the most transformative tools reshaping agriculture in recent decades is remote sensing—the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites. In agricultural contexts, remote sensing allows for the real-time monitoring of vast tracts of farmland, enabling timely decisions regarding crop health, water usage, soil fertility, pest outbreaks, and yield prediction. The traditional methods of field monitoring are labor-intensive, time-consuming, and often limited in spatial and temporal coverage. By contrast, remote sensing provides comprehensive spatial data at various scales and resolutions, facilitating more efficient and sustainable agricultural practices.

PRECISION BREEDING: TRANSFORMING CROP IMPROVEMENT FOR THE FUTURE

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Abstract:

Precision breeding is a rapidly evolving paradigm in modern agriculture that combines genomic technologies, bioinformatics, phenomics, and advanced breeding techniques to enhance the speed, accuracy, and efficiency of crop and livestock improvement. It represents a shift from phenotype-based selection to targeted genetic manipulation guided by molecular and computational tools. Unlike traditional breeding, which relies on random gene shuffling and selection over multiple generations, precision breeding leverages genomic selection, marker-assisted breeding, genome editing technologies like CRISPR-Cas9, and high-throughput phenotyping to precisely modify or select for desirable traits. This approach not only accelerates varietal development but also enables the design of crops with improved yield, stress tolerance, nutrient efficiency, and resilience to climate change. This chapter explores the principles, tools, applications, challenges, and future prospects of precision breeding, focusing on its critical role in ensuring global food and nutritional security.

Keywords: Precision Breeding, Marker-Assisted Selection, Genomic Selection, CRISPR, Genome Editing, High-Throughput Phenotyping, Crop Improvement, Genomics, Bioinformatics, Plant Breeding, Trait Discovery, Smart Agriculture.

Introduction to Precision Breeding:

Precision breeding refers to the suite of modern breeding techniques that enable targeted modification, selection, or engineering of traits in plants and animals. This approach is grounded in genetic knowledge, advanced biotechnology, and data-driven tools that allow breeders to make informed decisions based on genomic and phenotypic information (Tester & Langridge, 2010). Unlike conventional breeding, which often takes over a decade to release a new variety, precision breeding dramatically shortens the breeding cycle and enhances predictability. The increasing pressure on agriculture from population growth, climate change, soil degradation, and emerging pests and diseases necessitates innovative approaches that are efficient, accurate, and

**SERICULTURE: A COMPREHENSIVE TREATISE ON THE SCIENCE,
PRACTICE, AND PROSPECTS OF SILK FARMING**

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Abstract:

Sericulture, the practice of rearing silkworms for silk production, is a unique agro-based industry that integrates agriculture, biology, and textile technology. It plays a significant role in rural development by offering sustainable income, especially to women and marginalized communities. This chapter presents an exhaustive overview of sericulture, encompassing its historical evolution, biological foundation, types of silkworms and silk, mulberry cultivation, silkworm rearing practices, post-cocoon processing, and modern biotechnological advancements. It highlights the environmental and economic importance of silk farming, India's position in the global silk market, and challenges such as pest outbreaks and climate variability. Government initiatives, women's empowerment, education, and innovative research are also discussed, demonstrating sericulture's potential as a tool for socio-economic transformation and ecological sustainability. With increasing demand for eco-friendly and natural fibers, sericulture is poised to play a vital role in sustainable development and rural industrialization.

Keywords: Sericulture, Mulberry Cultivation, Silk Reeling, Cocoon Production, Post-Cocoon Technology, Silk Industry, Sustainable Agriculture, Rural Employment, Biotechnological Innovations, Non-Mulberry Silk, Silkworm Rearing, Silk Marketing, India Silk Export.

Introduction:

Sericulture is the art and science of rearing silkworms for the production of raw silk; a natural protein fiber composed mainly of fibroin and sericin. This activity has both scientific significance and socio-economic relevance, offering employment, especially in rural and semi-rural areas. Silk has been known for centuries as the "queen of textiles" due to its luster, softness, and elegance. The sericulture industry involves various interdisciplinary aspects including entomology, botany, microbiology, biotechnology, and agricultural sciences (Jolly, 1987). Sericulture is typically divided into two main activities: **Pre-cocoon sector:** Includes mulberry cultivation and silkworm rearing and **Post-cocoon sector:** Comprises cocoon harvesting, silk

ROBOTICS IN AGRICULTURE

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Abstract:

The integration of robotics in agriculture is transforming the landscape of modern farming by introducing automation, precision, and data-driven management. With global food demand rising due to population growth and environmental constraints, robotic technologies offer a sustainable solution to improve efficiency and resilience in agricultural systems. This chapter explores the historical evolution of agricultural robotics, their technical components, classifications, and multifaceted applications across crop, livestock, and aquaculture sectors. Emphasis is placed on the synergy between robotics and precision agriculture, along with case studies of commercially deployed systems. Socio-economic and environmental implications are thoroughly examined, including labor dynamics, cost-benefit considerations, and ecological benefits. The chapter also addresses policy and ethical concerns, technical barriers, and future directions such as AI-enhanced autonomy, swarm robotics, and Robotics-as-a-Service (RaaS). Overall, robotics stands poised to revolutionize agriculture by fostering productivity, sustainability, and equity in food systems.

Keywords: Agricultural Robotics, Precision Agriculture, Autonomous Systems, Smart Farming, Machine Vision, AI in Agriculture, Farm Automation, Sustainability, Labor Transformation, Robotics-as-a-Service (RaaS).

Introduction:

Agriculture is undergoing a profound transformation, driven by advancements in digital technologies, artificial intelligence (AI), and robotics. With the global population projected to reach 9.7 billion by 2050, the demand for food is expected to increase by 70% (FAO, 2017). Traditional agricultural practices, reliant on manual labor and seasonal inputs, are increasingly unable to meet this rising demand sustainably. Labor shortages, climate variability, soil degradation, and the need for environmental stewardship further complicate this scenario. In response, agricultural stakeholders are turning to innovative technologies—particularly

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INDIGENOUS LIVESTOCK MANAGEMENT FOR ENHANCING SOIL FERTILITY AND FARM PROFITABILITY IN ORGANIC AGRICULTURE

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Abstract:

Indigenous livestock management has long played a pivotal role in traditional farming systems, especially within organic agriculture, where sustainability, ecological balance, and resource efficiency are prioritized. This chapter explores the significance of integrating indigenous livestock into organic farming frameworks, emphasizing their multifaceted contributions to soil fertility enhancement and economic viability. Indigenous breeds, adapted to local climates and stress conditions, offer unique advantages such as disease resistance, low input needs, and compatibility with region-specific agroecological practices. Their dung and urine serve as vital raw materials for organic bio-inputs like compost, Panchagavya, Jeevamrut, and vermicompost, enriching soil health and microbial activity. Furthermore, the chapter discusses how incorporating livestock into mixed and integrated farming systems not only improves soil organic carbon and nutrient recycling but also provides diversified income sources through dairy, manure-based products, and biogas. While the benefits are substantial, the chapter also addresses challenges including breed conservation, institutional support, and market access. By drawing on both traditional wisdom and scientific validation, the chapter presents a holistic framework for harnessing indigenous livestock to promote sustainable soil fertility management and improve farm profitability within organic and climate-resilient agricultural paradigms.

Introduction:

The challenges posed by modern agriculture—including soil degradation, declining productivity, and climate vulnerability—have triggered a global reevaluation of farming systems. Among the most promising alternatives is the integration of indigenous livestock management within organic and sustainable agriculture. Traditional livestock systems, which have co-evolved with local ecosystems and communities over centuries, offer ecologically balanced solutions that modern, high-input systems often overlook.

In many parts of the world, especially in India and other developing nations, indigenous livestock breeds have formed the backbone of rural livelihoods and food systems. These animals—such as Gir, Sahiwal, Malnad Gidda (cattle); Murrah (buffalo); Jamunapari (goat); and

CLIMATE-RESILIENT AGRICULTURAL PRACTICES FOR RISK MITIGATION IN ORGANIC FARMING

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Abstract:

Climate change has emerged as a major threat to global food security, posing significant risks to agricultural productivity and rural livelihoods. Extreme weather events, unpredictable rainfall patterns, rising temperatures, and increasing pest pressures challenge conventional farming systems, especially in developing regions. Organic farming, with its emphasis on ecological balance, soil health, and biodiversity, offers a robust framework for building resilience in agriculture. This chapter explores the concept and principles of climate-resilient agriculture (CRA), focusing on its integration within organic farming systems. It provides an in-depth examination of adaptive strategies, indigenous practices, technological innovations, and policy frameworks that collectively mitigate climate risks while promoting sustainable food systems. The chapter also includes case studies, challenges, and future directions, making it an essential reference for researchers, practitioners, and policymakers.

1. Introduction:

The global agricultural sector is increasingly affected by climate change, which manifests in rising temperatures, erratic precipitation patterns, frequent droughts, floods, and a rise in pest and disease outbreaks. These climate-related disturbances jeopardize the stability and productivity of agricultural systems, particularly those that are resource-poor or dependent on natural rainfall. According to the Intergovernmental Panel on Climate Change (IPCC), agricultural productivity could decline by up to 30% in many parts of the world by 2050 due to climate-induced stresses.

In response to this growing threat, the concept of climate-resilient agriculture (CRA) has emerged as a vital component of sustainable development. CRA refers to a holistic approach that enables farming systems to anticipate, absorb, adapt to, and recover from climate shocks and stresses. It includes adaptive capacity building, livelihood diversification, risk management, and ecological restoration.

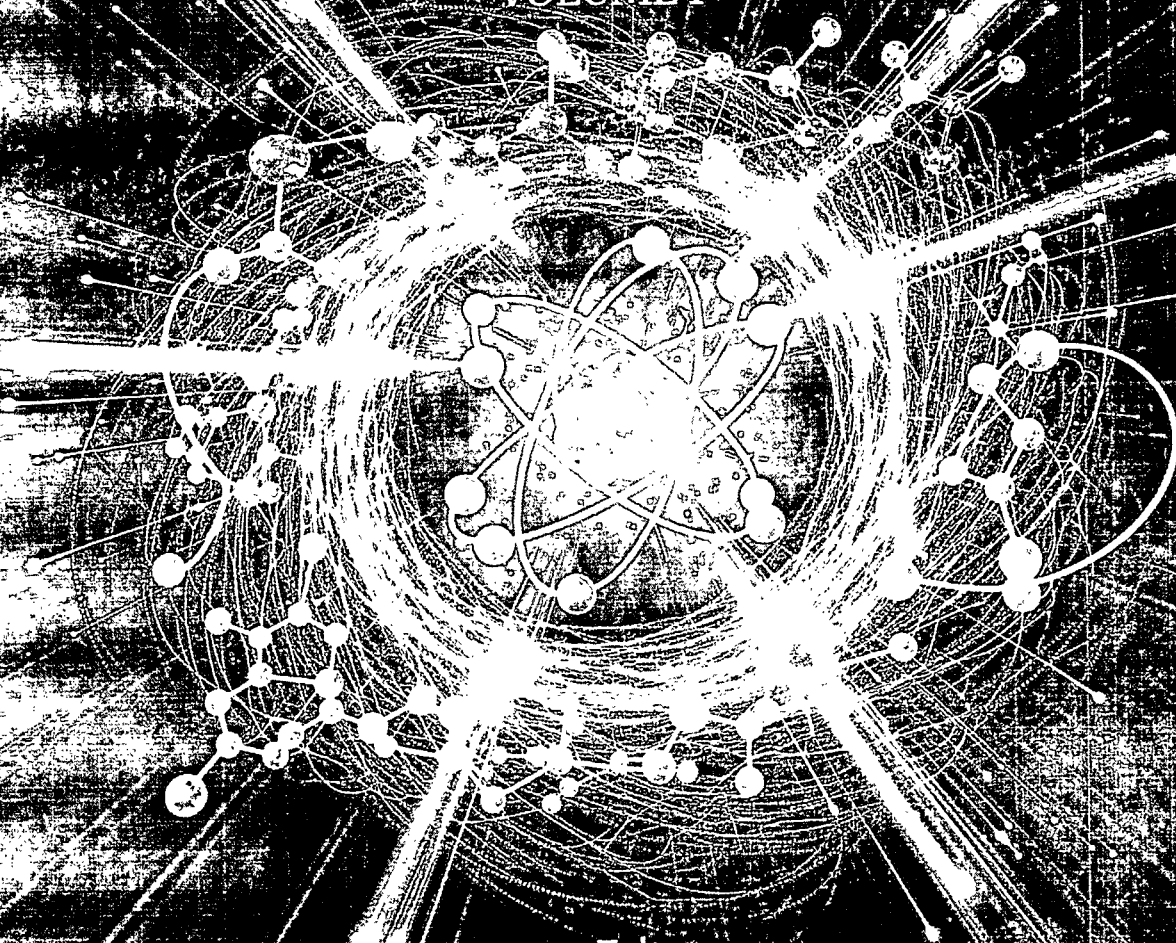
Concurrently, organic farming presents itself as a powerful ally in the pursuit of resilience. Unlike conventional agriculture, which often relies heavily on external chemical inputs and monocultures, organic systems emphasize the health of ecosystems and the

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Matter & Motion

EXPLORATIONS IN PHYSICAL AND CHEMICAL SCIENCE

VOLUME I



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APPLYING THE 12 PRINCIPLES OF GREEN CHEMISTRY TO NANOPARTICLE PRODUCTION

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Abstract:

Nanotechnology has emerged as a transformative field across industries, from medicine and energy to agriculture and environmental remediation. However, conventional nanoparticle synthesis methods often involve toxic chemicals, high energy consumption, and environmentally hazardous by-products. This chapter explores how the 12 Principles of Green Chemistry, proposed by Paul Anastas and John Warner, can be strategically applied to nanoparticle production. The integration of green chemistry in nanoparticle synthesis fosters environmentally benign, cost-effective, and sustainable practices, essential for the future of materials science and industrial innovation.

1. Introduction:

Nanoparticles possess unique physical and chemical properties due to their nanoscale size (1–100 nm), which enables diverse applications. Despite their potential, traditional synthesis techniques often neglect environmental and health safety. Green chemistry offers a robust framework for rethinking nanoparticle production to align with principles of sustainability. This chapter dissects each of the 12 principles and illustrates their relevance and application to nanoparticle synthesis and functionalization.

2. Overview of the 12 Principles of Green Chemistry

The 12 Principles are:

1. Prevention
2. Atom Economy
3. Less Hazardous Chemical Syntheses
4. Designing Safer Chemicals
5. Safer Solvents and Auxiliaries
6. Design for Energy Efficiency
7. Use of Renewable Feedstocks
8. Reduce Derivatives

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**Life Science:
A Renaissance
Approach**

Editors:

Ms. Pinal Darji

Dr. Aparna M. Yadav

Dr. Bipinchandra Kalbande

Dr. Dinesh D. Wanule



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FACILITATE TO DAIRY FARM THROUGH VENTILATION FOR HEAT STRESS REDUCTION

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Introduction:

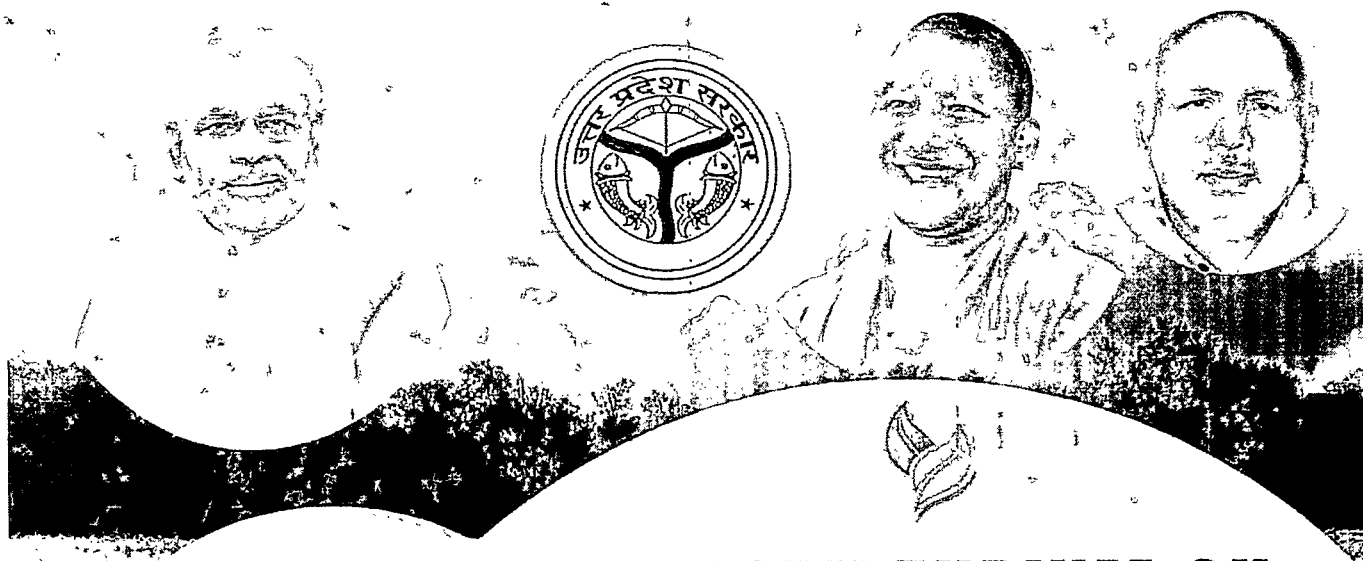
Efficient ventilation is a critical component of dairy farm management, directly impacting animal health, productivity, and overall farm hygiene. Proper airflow helps regulate temperature, humidity, and gas concentrations within housing facilities, creating a comfortable environment for dairy cattle and reducing the risk of respiratory diseases and other health issues. Ventilation is a critical component of dairy farm management that ensures a healthy and comfortable environment for dairy cattle [5]. Proper ventilation involves the circulation of fresh air within the housing facilities to remove excess moisture, heat, odor, dust, and harmful gases, such as ammonia and carbon dioxide.

Effective ventilation helps maintain optimal temperature and humidity levels, reducing stress and promoting better health, feed intake, and milk production in dairy animals [7]. It also minimizes the risk of respiratory diseases and other health problems associated with poor air quality.

In dairy farm design, ventilation systems can be natural, mechanical, or a combination of both, tailored to the specific climatic conditions and housing structures. Implementing appropriate ventilation strategies is essential for improving animal welfare, productivity, and overall farm sustainability.

Importance of Ventilation in Dairy Housing Ventilation in dairy housing is essential for maintaining a healthy, comfortable, and productive environment for dairy cows [9]. Its importance includes:

- **Maintaining Air Quality:** Proper ventilation reduces the buildup of harmful gases such as ammonia, carbon dioxide, and methane, which can cause respiratory issues and discomfort.
- **Temperature Regulation:** Adequate airflow helps control indoor temperatures, preventing heat stress during hot weather and maintaining comfort year-round.
- **Moisture Control:** Ventilation reduces humidity levels, preventing the growth of mold and bacteria, which can lead to infections and udder health problems.
- **Odor Management:** Good airflow minimizes unpleasant odors, improving the well-being of both animals and farm workers.



COMPENDIUM ON “RURAL YOUTH SKILL DEVELOPMENT PROGRAM” UNDER ATMA YOJANA YEAR 2025-26

PRESENTED BY

- Mr. Pramod Sirohi (Deputy Director Agriculture, Muzaffarnagar)
- Dr. Ashok Kumar (Director, Shri Ram College, Muzaffarnagar)
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Chapter- 1

Cultivation of Floriculture

(Dr. Riya Jakhwal, Mr. Sachin Kumar Sahu and Dr. Mohd Nayeem Ali)

Department of Agriculture, Shri Ram College, Muzaffarnagar)

1. Introduction

Floriculture, a major branch of horticulture, involves the cultivation, management and marketing of flowering and ornamental plants. It includes a wide range of activities such as the production of cut flowers, loose flowers, potted plants, foliage plants, bedding plants, and value-added products like garlands, bouquets and floral decorations. Over the past decades, floriculture has evolved from a traditional activity into a commercially profitable agribusiness due to increasing domestic demand and export opportunities. India's diverse agro-climatic conditions, availability of labour and expanding market infrastructure offer immense potential for the commercial cultivation of ornamental crops.

2. Importance of Floriculture

Floriculture plays a vital role in increasing farm income, generating employment and promoting entrepreneurship in rural and peri-urban areas. Its importance can be highlighted as follows:

2.1 Economic Importance

- High returns per unit area compared to many field crops.

IMPORTANCE OF MILLETS FOR HUMAN HEALTH

Dr. Mohd Nayeem Ali, Anjali Jakhar, Mr. Sachin Kumar Sahu and Mr. Suraj Singh

Department of Agriculture, Shri Ram College, Muzaffarnagar

Introduction

Milletts are a group of small-seeded, hardy cereals that have been cultivated for thousands of years across Africa and Asia. In India, millets have traditionally been a staple food in rural communities due to their adaptability to harsh climates and minimal input requirements. Common millets include sorghum (jowar), pearl millet (bajra), finger millet (ragi) and minor millets like foxtail millet, little millet, barnyard millet, kodo millet, and proso millet. In recent years, with rising concerns around lifestyle diseases, poor dietary diversity, and climate change, millets have regained global attention. Their outstanding nutritional profile and therapeutic potential make them valuable for human health.

Nutritional Composition of Millets

Millets are often referred to as “nutri-cereals” because they contain higher levels of nutrients compared to major cereals such as rice and wheat. Their composition includes:

Rich in Dietary Fiber- Millets contain both soluble and insoluble fiber, supporting proper digestion, preventing constipation, and promoting satiety.

Chapter- 3

Useful Weeds

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Department of Agriculture, Shri Ram College, Muzaffarnagar

Abstract

Weeds are generally regarded as undesirable plants that compete with crops for nutrients, water, and space. However, many weeds possess significant ecological, medicinal, nutritional, and economic value. These “useful weeds” play important roles in soil improvement, biodiversity enhancement, pest management, and rural livelihoods. This article examines major categories, benefits, and applications of useful weeds, highlighting their potential role in sustainable agriculture.

Introduction

In conventional agriculture, weeds are labelled as unwanted competitors that reduce crop yields. As a result, efforts are directed toward their eradication through mechanical, cultural, or chemical means. Nevertheless, many species classified as weeds hold considerable importance for ecosystems and humans. These plants often possess strong adaptability, rich phytochemical diversity, and ecological resilience, making them valuable sources of medicine, food, fodder, and soil nutrients.

Chapter 4

Polyhouse: Uses and Their Benefits

Author: Dr. Parveen Malik and Dr. Anjali Jakhar

Department of Agriculture, Shri Ram College, Muzaffarnagar

Abstract: Polyhouse technology is an advanced method of protected cultivation that allows for the controlled growth of crops under a partially or fully enclosed environment using polyethylene-covered structures. It provides favorable conditions for year-round production, higher yield, and improved quality. This chapter discusses the types, structure, uses, and benefits of polyhouses, highlighting their role in sustainable and profitable agriculture.

Keywords: Polyhouse, Protected cultivation, Greenhouse technology, Controlled environment, Crop productivity

1. Introduction: Polyhouse cultivation is a modern approach to farming where crops are grown inside a structure covered with a transparent or translucent material like polyethylene film. It helps in maintaining optimal temperature, humidity, and light intensity for plant growth. This technology is particularly useful in regions with extreme climatic conditions, enabling farmers to grow high-value crops throughout the year.

2. Structure and Design of a Polyhouse: A polyhouse consists of a frame (made of GI pipes or steel) covered with UV-stabilized polyethylene film. The design and size depend on climatic conditions, crop type, and the level of automation.

Components of a Polyhouse:

a) **Frame:** Galvanized steel or aluminum structure for support.

b) **Covering material:** UV-stabilized polyethylene sheet (200 microns).

Chapter 5

Processing of Plantation Crops

Author: Dr. Parveen Malik, Dr. Anjali Jakhar and Dr. Riya Jakhwal

Department of Agriculture, Shri Ram College, Muzaffarnagar

Abstract: The Plantation crops such as tea, coffee, cocoa, coconut, and rubber are important commercial crops cultivated in tropical and subtropical regions. The processing of these crops adds significant value, improves marketability, and ensures longer shelf life. This chapter discusses the major steps, techniques, and importance of processing plantation crops along with examples of commonly used methods and products.

Keywords: Plantation crops, processing, fermentation, curing, drying, value addition

1. Introduction: Plantation crops are perennial commercial crops grown extensively in tropical regions for industrial and export purposes. Major plantation crops include tea, coffee, cocoa, rubber, coconut, and oil palm. Processing plays a crucial role in enhancing the quality, flavor, and economic value of these crops. Each crop requires specific postharvest techniques such as fermentation, drying, curing, roasting, or extraction to produce marketable products.

2. Importance of Processing:

- a) Enhances flavor, aroma, and quality of produce.
- b) Reduces perishability and increases shelf life.
- c) Improves market value and facilitates export.

Chapter 6

PMFME (Pradhan Mantri Formalisation of Micro Food Processing Enterprises) Scheme

Author: Dr. Parveen Malik, Dr. Mohd Nayeem Ali, and Dr. Umara Rahmani

Department of Agriculture, Shri Ram College, Muzaffarnagar

Abstract: The Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) Scheme is an initiative of the Government of India launched under the Ministry of Food Processing Industries (MoFPI) to support unorganized micro-food processing enterprises. It aims to enhance the competitiveness of individual and group enterprises through financial, technical, and infrastructural support. This chapter provides an overview of the scheme's objectives, components, implementation process, and its role in promoting entrepreneurship and value addition in the food processing sector.

Keywords: PMFME, Micro Food Processing, Value Addition, Entrepreneurship, Food Industry, Self-reliant India

1. Introduction: India's food processing sector plays a crucial role in linking farmers to consumers and reducing post-harvest losses. However, nearly 70% of micro-enterprises in this sector operate in the unorganized segment, lacking access to credit, technology, and markets. To address these challenges, the PMFME Scheme was launched in June 2020 as part of the Atmanirbhar Bharat Abhiyan. The scheme adopts a 'One District One Product (ODOP)' approach and emphasizes capacity building, formalization, and value addition in micro food units.

Chapter 7

Food Nutrients and Hygiene

Dr. Umara Rahmani, Dr. Praveen Malik, Mr. Sachin Kumar Sahu and Dr. Mohd Nayeem

Ali, Department of Agriculture, Shri Ram College, Muzaffarnagar

1. Introduction:

Food is fundamental for human survival, growth, and development. A healthy diet provides essential nutrients that the body requires for energy, repair, immunity, and overall well-being. Alongside nutrition, food hygiene plays a critical role in safeguarding health by preventing contamination, spoilage, and diseases. The World Health Organization (WHO) emphasizes that millions of cases of food-borne illnesses occur annually due to poor hygiene and unsafe food practices. Therefore, understanding food nutrients and maintaining hygiene is essential for improving the quality of life.

2. Concept and Classification of Nutrients:

Nutrients are chemical substances obtained from food that perform vital functions in the human body. They are broadly classified into:

A. Macronutrients:

Needed in large quantities:

- a) Carbohydrates
- b) Proteins
- c) Fats
- d) Water

B. Micronutrients

Needed in smaller quantities: Vitamins and Minerals

Chapter-8

Importance of Horticulture

Dr. Aksheya Kumar, Dr. Ratna Kiran D Wankhede, Mr. Sachin Kumar Sahu and Dr.

Anjali Jakhar

Department of Agriculture, Shri Ram College, Muzaffarnagar

1. Introduction

Horticulture is a vital branch of agriculture that deals with the cultivation of fruits, vegetables, flowers, ornamental plants, spices, plantation crops, and medicinal plants. Derived from the Latin words *hortus* (garden) and *cultura* (cultivation), horticulture focuses on intensive crop production with high economic returns. Over the past few decades, horticulture has emerged as a major contributor to nutritional security, employment generation, export earnings, and environmental sustainability. According to the Food and Agriculture Organization (FAO, 2022), horticulture contributes significantly to global food diversity and enhances dietary quality through nutrient-rich crops.

2. Scope of Horticulture

Horticulture comprises several specialized branches:

2.1 Pomology

The science and practice of fruit cultivation. Fruits such as mango, banana, apple, and citrus are important for nutrition and trade (Kumar & Sharma, 2021).

Chapter-9

Basics of Animal Husbandry

Dr. Jitendra Gupta, CVO, Muzaffarnagar and

Dr. Mohd Nayeem Ali, and Mr. Sachin Kumar Sahu Department of Agriculture, Shri

Ram College, Muzaffarnagar

1. Introduction

Animal husbandry is one of the oldest practices associated with human civilization. It involves the management, breeding, and care of domestic animals to obtain useful products such as milk, meat, eggs, wool, draught power, manure, and hides. In agricultural societies, animal husbandry plays a crucial role in providing nutrition, income, and livelihood security. The discipline integrates scientific knowledge of animal breeding, feeding, health care, housing, and management to enhance productivity and welfare of livestock.

In India, animal husbandry is a core component of the rural economy. According to recent data, nearly two-thirds of farmers depend on livestock as a supplementary source of income, and women play a major role in daily animal management operations. Thus, understanding the basics of animal husbandry is essential for students, extension workers, and farmers.

2. Importance of Animal Husbandry:

Animal husbandry plays a vital role in the socio-economic development of rural communities. Its importance can be viewed in several dimensions:

2.1 Food Security

Chapter-10

PROCESSING OF PLANTATION CROPS

Mr. Sachin Kumar sahu, Dr. Santosh, Dr. Mohd Nayeem Ali and Dr. Anjali Jakhar

Department of Agriculture, Shri Ram College, Muzaffarnagar and

Mr Gaurav Kumar (DHI Horticulture Department), Department of Agriculture, Shri Ram
College, Muzaffarnagar

1. Introduction

Plantation crops constitute a diverse group of commercial crops grown extensively in tropical and subtropical regions. These include tea, coffee, rubber, coconut, arecanut, cashew, cocoa, oil palm, and spices such as cardamom and black pepper. Processing of plantation crops is a crucial step that converts raw agricultural produce into consumable or industrial-grade products. Effective processing enhances shelf life, adds value, improves marketability, and ensures better income for farmers. This chapter explains the major processing methods applied to important plantation crops, their technological requirements, and quality standards.

2. Processing of Major Plantation Crops

2.1 Tea Processing

Tea processing involves a series of operations carried out to convert tender tea leaves into various marketable forms. The major types of tea include **black tea**, **green tea**, **oolong tea**, and **white tea**, each produced through specific processing treatments.

2.1.1 Black Tea Processing

Chapter- 11

Identification of Polyhouse Plants

Mr Sachin Kumar Sahu and Dr. Anjali Jakhar, Department of Agriculture, Shri Ram
College, Muzaffarnagar

1. Introduction

Agriculture in the 21st century is continuously evolving with technological interventions aimed at increasing productivity, efficiency, and sustainability. One such innovation is the **polyhouse**, a protected cultivation structure made of polyethylene material that creates a controlled microenvironment for plants. Visiting a polyhouse provides students, farmers, and researchers with firsthand experience of modern cultivation practices that differ significantly from open-field agriculture.

This chapter presents a detailed experiential account of a polyhouse visit, explaining its components, functioning, benefits, challenges, and the learning outcomes from the field visit.

2. Objectives of the Polyhouse Visit

The major aims of visiting a polyhouse include:

1. **Understanding the concept of protected cultivation** and how it differs from traditional farming.
2. **Observing the structural components** such as cladding materials, ventilation systems, irrigation layout, and internal design.

Chapter: 12

Natural Farming

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College, Muzaffarnagar

Natural Farming – Principles, Practices and Prospects

1. Introduction

Natural farming has emerged as a sustainable, eco-friendly alternative to input-intensive conventional agriculture. It promotes farming in harmony with nature, minimizing external interventions and encouraging the natural processes that sustain soil fertility, crop growth, and ecological balance. Globally recognized through the philosophies of Sir Albert Howard, Masanobu Fukuoka, and more recently the Zero Budget Natural Farming (ZBNF) model in India, natural farming is considered a promising pathway for climate-resilient and low-cost agriculture.

Natural farming minimizes human interference and rejects synthetic inputs such as chemical fertilizers, pesticides, herbicides, and genetically modified seeds. Instead, it emphasizes soil biological activity, natural nutrient cycles, and the use of locally available materials. It is especially relevant for small and marginal farmers in India who face high input costs and declining soil health. With increasing environmental concerns, natural farming is also aligned with sustainable development goals, making it an important strategy for future farming systems.

2. Concept and Philosophy of Natural Farming

Chapter 13

Fisheries Methods and Marketing

Dr. Anita, Assistant Director, Fisheries Department, Muzaffarnagar

Dr. Mohd Nayeem Ali and Mr Sachin Kumar Sahu, Department of Agriculture, Shri Ram
College, Muzaffarnagar

Introduction

Fisheries play a vital role in global food security, livelihoods, and economic development. Efficient methods of fishing and effective marketing strategies are essential to sustain fish populations and maximize economic benefits. Fisheries methods and marketing are vital components of the global fishing industry, contributing significantly to food security, employment, and economic development.

Fisheries Methods: Fisheries methods encompass the diverse techniques used to catch fish and other aquatic organisms. These methods can be broadly categorized into traditional and modern practices. Traditional methods include hand collection, net fishing, and trapping, often practiced by small-scale or subsistence fishers. Modern methods involve advanced technologies such as trawling, purse seining, longlining, and the use of mechanized vessels, which enable large-scale commercial fishing. Sustainable fisheries management emphasizes responsible practices like selective fishing gear, quotas, and seasonal closures to prevent overfishing and protect marine ecosystems.

Chapter - 14

चारा संरक्षण की तकनीकियाँ

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भारत संसार में सर्वाधिक पशुओं वाला देश है। सन 2012 के पशु गणना के हिसाब से भारत में इनकी संख्या लगभग 512 करोड़ है। यहाँ संसार के कुल भैंसों की संख्या का 56.7%, पशुओं की संख्या 12.4% तथा छोटे पशुओं (भेंड़, बकरी) की संख्या 20.4% पायी जाती है। जैसा कि यह ज्ञात है कि पशु उत्पाद में लगभग 60-70% लागत सिर्फ उनके चारा एवं दाना पर लगता है। इस लागत को कम करने के लिए चारे की उपलब्धता बढ़ाना तथा कम लागत वाली भोज्य पदार्थों को उपलब्ध कराना जिससे कि पशु उत्पाद किसानों के लिए पशुपालन एक लाभकारी व्यवसाय सिद्ध हो। चारा उत्पादन एवं इसकी उपयोगिता फसल पद्धति, जलवायु, किसानों की आर्थिक एवं सामाजिक स्थिति, पशुओं के प्रकार एवं उनके लिए उपलब्ध भोजन आदि पर निर्भर करती है। पशुओं को खिलाने हेतु हम मुख्यतः तीन स्रोतों पर निर्भर रहते हैं: (1) चारे की खेती द्वारा (2) फसलों के अवशेषों द्वारा (3) वन वृक्षों के कोमल पत्तों एवं तनों को खिलाना, स्थायी चारागाह एवं प्राकृतिक चारे की भूमि का उपयोग करना आदि। वर्तमान में देश में हरे चारे की कुल कमी 35.6%, शुष्क चारे की कमी 10.9% आंकी गयी है। तत्काल आंकलन करने पर यह कमी क्रमशः शुष्क चारा (10%), दानेदार भोजन (33%) तथा हरा चारा (35%) पाई जाती है। जबकि यह कमी वर्ष 2020 तक क्रमशः 11%, 35% तथा 45% तक आंकी गयी है जो कि हमारे लिए एक चुनौती पूर्ण कार्य है। हरा चारा उत्पादन के तत्पश्चात भारत के पंजाब राज्य में दुग्ध उत्पादन में अति वृद्धि पाई गयी है। अतः इसी प्रकार से भारत के अन्य गाँवों में भी संगठित संरचना, उचित निति तथा तकनीकी सहयोग से अविलम्ब चारे का विकास किया जा सकता है। इसका दूसरा पहलू चारा संरक्षण (साईलेज/हे/बेल/फीड ब्लॉक आदि) है, जो कि पंजाब व हरियाणा जैसे राज्यों में भी इस तरफ अधिक ध्यान नहीं दिया गया है। अतः चारे की अधिकता के समय इसे उपयुक्त तरीके से संरक्षित करके उसके बाद चारे की कमी या अनुपलब्धता के समय मुख्य रूप से मध्य नवम्बर से मध्य दिसम्बर तक तथा मध्य मई से मध्य जून तक संरक्षित चारे को खिलाया जा सकता है।

चारा संरक्षण की आवश्यकता:

Chapter - 15

डेयरी पशुओं के रहने लिए आवास और आश्रय की आवश्यकता

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डेयरी पशुओं के लिए आवास और आश्रय का मुख्य उद्देश्य पशुओं के बेहतर विकास, बेहतर प्रजनन और उत्पादन प्रदर्श के लिये अनुकूल वातावरण प्रदान करना। डेयरी पशुओं के आवास की योजना और डिजाइन बनाते समय पशुओं के बेहतर स्वास्थ्य और आरामदायक के साथ साथ श्रमिकों का डेयरी फार्म के विभिन्न कार्यों जैसे पशुओं की खिलाई पिलाई, पशु व फार्म की सफाई और स्वच्छ दूध उत्पादन आदी में आर्थिक रूप से उपयोग हो सके। पशुओं के बेहतर कल्याण के लिये पशु आवास की योजना बनाते समय निम्नलिखित बिंदुओं पर ध्यान देना चाहिये।

- सभी पशुओं के रहने लिये स्थान पर्याप्त होना चाहिये।
- जल निकास की सुविधा होनी चाहिये।
- पशुओं के आवास में रौशनी, हवा, प्रभावी तापमान और अद्रुता होनी चाहिये।
- पशुओं के घर में स्थान का निर्धारण पशुओं की आयु, श्रेणी तथा संख्या के आधार पर होना चाहिये।
- पशु घर में पशु संख्या 35-40 सही मानी जाती है। तथा 50-60 से ऊपर नहीं होना चाहिये।
- जब पशुओं को समूह में खिलाया जाता है तो उनके स्थान पर्याप्त होना चाहिये।
- पशुओं को ऐसे जगह बाँधे की उनका दूध आसानी से निकाला जा सके। स्वच्छ, सुख तथा स्वास्थ्यकर परिस्थिति होने से बीमारी नहीं फैलती है। ऐसे में दूध उत्तम श्रेणी का होगा।

पशु आवास के लिये स्थान का चुनाव:

- स्थान सुख तथा सामान्य स्थान से ऊँचा होना चाहिये।
- पानी जमा होने वाला स्थान ठीक नहीं है अतः पानी निकास पूर्ण रूप से होना चाहिये।
- पशुशाला से मल-मुत्र आसानी से खेत तक ले जाया जाएँ अतः जमीन ढालू होनी चाहिये।

थनेला रोग में अयन में सूजन हो जाती है जिससे दूध के रंग और स्थिरता में परिवर्तन हो जाता है। आमतौर पर अछि तरह से रख रखाव नहीं करने से थनेला बीमारी होती है। यह दूध की मात्रा काम कर देता है, वसा, एस एन एफ, लैक्टोज और कैसिन प्रोटीन की मात्रा में परिवर्तन कर देता है।

थनेला रोग को निम्न रूप में वर्गीकृत किया जाता है

(अ) सब क्लीनिकल मैस्टाइटिस: इस स्थिति में पशु संक्रमित होता है, पर लक्षण दिखाई नहीं देते हैं, हालांकि अच्छा खिलाने के बाद भी दुग्ध उत्पादन धीरे-धीरे गिरता चला जाता है।

(ब) एक्यूट मैस्टाइटिस : इस स्थिति में पशु के अयन में सूजन आ जाती है, कभी कभी दूध के साथ रक्त का थक्का भी निकलता है, अयन गर्म महसूस होता है, पशु के शरीर का तापमान बढ़ जाता है अंत में खाना पीना बंद कर देता है !

(स) क्रोनिक मैस्टाइटिस :- यहां अयन से दूध की बजाय पानी या दही जैसा दूध, गन्दी बदबू, गंभीर सूजन, जीवाणु संक्रमण हो जाता है, पशु अवसाद का शिकार हो जाता है व अयन में कड़ापन / फाइब्रोसिस हो जाता है !

उपचार:-

पशु के इस रोग से प्रभावित होने पर तुरंत पशु चिकित्सक से संपर्क करना चाहिए ! प्रभावित थन/ अयन में इंद्रा मेमरी एंटीबायोटिक ट्यूब के साथ उपचार करना चाहिए। सूजन हुए थन / अयन (लोटी) में धीरे-धीरे Healanant क्रीम/ mastilep जेल से मालिश की जा सकती है। होम्योपैथिक दवाइया जैसे g masti व g fibro नामक दवाई 5 ml, 5-5 मिनट के अंतराल में दिन में तीन बार पिलाने से अच्छे परिणाम मिल सकते हैं ! Mammidium पाउडर 50 ग्राम व त tri सोडियम साइट्रेट 50 ग्राम (जो की दूध की pH को नियंत्रित करता है) नाल से पिलाना चाहिए।

रोकथाम:-

पशु का दूध निकालने से पहले दूधिये को अपने हाथ अच्छी तरह साफ़ पानी व साबुन से धोने चाहिए व पशु के अयन को अच्छी तरह साफ़ पानी से धोकर तोलिये से पूछना चाहिए। दूध निकालते समय पहली दो तीन धार निचे निकाल / फेंक देनी चाहिए ! दूध निकालने के बाद पशु को आधे घण्टे तक निचे नहीं बैठने देना चाहिए क्योंकि आधे घण्टे तक थन का मुह खुला रहता है व संक्रमण थन के अंदर प्रवेश कर सकता है !

इस प्रकार हम आसान उपाय करके पशु को थनेला रोग से बचा सकते हैं !

मिल्क फीवर (हाइपो कैल्समिया)

Chapter – 17

स्वच्छ दूध उत्पादन प्रेक्टिसिज

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दूध एक भोज्य पदार्थ है जिसका संरक्षण अत्यंत सावधानी से करने की आवश्यकता है इसलिए इसे उत्पादन, भंडारण एवं परिवहन के दौरान अत्याधिक देखभाल की आवश्यकता पड़ती है। उच्च गुणवत्ता युक्त दुग्ध उत्पादन हेतु पशुओं को साफ-सुथरे पर्यावरण में रखना चाहिए और गुणवत्ता वाला चारा खिलाना चाइये। यदि स्वच्छ दुग्ध उत्पादन न हो तो अधिक दूध देने वाली गाय रखने एवं बढ़िया चारा खिलाना निरर्थक हो सकता है। दूध की गुणवत्ता अच्छी होने से दुग्ध-पदार्थों की गुणवत्ता भी बहुत अच्छी होगी। यदि स्वच्छ दुग्ध उत्पादन हेतु कुछ मूलभूत बातों पर ध्यान दिया जाए तो दूध की गुणवत्ता कम होने एवं इसे नष्ट होने से बचाया जा सकता है। स्वच्छ दूध उत्पादन प्रेक्टिसिज के मुख्य चरण नीमिन लिखित है जिनको इस्तेमाल से स्वच्छ दूध उत्पादन कर ज्यादा लाभ अर्जित किया जा सकता है।

दूध निकालने का स्थान

पशु को साफ आवास में रखे जो की खुला और हवादार हो और पानी का निकास रखता हो। दूध देने वाले पशुओं की साफ-सफाई, स्वास्थ्य देखभाल तथा शेड व ग्वाले की व्यक्तिगत सफाई के साथ-साथ दूध उत्पादन में प्रयुक्त बर्तनों की सफाई आदि स्वच्छ दुग्ध उत्पादन सुनिश्चित करती है। पशु आवास में चुने का इस्तेमाल करते रहना चाइये जिस से पशु स्वस्थ रहता है। पशुओं की खोर में भी चुने का लैप करे। चुने के चाटनेसे पशु की कैल्शियम की कमी पूरी हो जाति है।

दुग्ध दोहन

- दुग्ध दोहन की प्रक्रिया शांत वातावरण में करने से ज्यादा दूध मिलता है। इसलिये दोहन आराम से पूरा दूध उतारने के बाद ही शुरू करे। पशुओं के स्तनों से पूरा दूध निकालना चाहिए, अन्यथा बचे हुए दूध में संक्रमण फैलता है और थनैला रोग हो सकता है। इस रोग से संक्रमित होने की जानकारी हेतु दूध को जाँचते रहना चाहिए तथा संक्रमण होने पर पशुओं का उपचार करना चाहिए।
- दूध निकालने के लिए पूर्ण हाथ का उपयोग करना ठीक रहता है परन्तु अंगूठे के पृष्ठ भाग द्वारा थन पर अनावश्यक दबाव बनाना उचित नहीं है। ऐसा करने से पशुओं के थनों में घाव तथा थनैला रोग होने की

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भैंसों में रिपिट ब्रीडिंग व बाँझपन की समस्या व उनका प्रबंधन

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हमारा देश एक कृषि प्रधान देश रहा है जिसमें पशुधन आज एक व्यवसाय की तरह उभर रहा है। आज हमारे देश में भैंसों की संख्या 105.3 मिलियन है जो कि विश्व की कुल भैंसों की संख्या से 50 प्रतिशत से भी अधिक है। इनसे होने वाला दुग्ध उत्पादन हमारे देश के कुल दुग्ध उत्पादन (120 मिलियन लीटर) का 53 प्रतिशत है। हमारे देश में भैंसों की कइ नस्ले पायी जाती हैं जिनमें मुराह, भदावरी, जाफराबादी, सुरती, मेहसाना, नागपुरी आदि हैं जिनमें “हरियाणा की शान” कही जाने वाली मुराह भैंस सर्वोत्तम मानी जाती है। इससे यह स्पष्ट हो जाता है कि भैंसें हमारी पशुधन और कृषि व्यवस्था का एक महत्वपूर्ण अंग है। अतः इनकी उत्पादकता प्रभावित करने वाले कारक जैसे प्रजनन समस्याएँ अति महत्वपूर्ण और ध्यान देने योग्य बन जाती हैं। इस कड़ी में रिपिट ब्रीडिंग औ बाँझपन की समस्या अत्यंत प्रमुख है।

गाय व भैंस में रिपिट ब्रीडिंग बहुत ही निराश करने वाली स्थिति है। गाय व भैंसों में रिपिट ब्रीडिंग कमशः 5.5 से 3.3 और 6 से 30 प्रतिशत तक पायी जाती है। रिपिट ब्रीडिंग के मुख्य कारण निम्न है :-

1. **निषेचन का असफल हो जाना** जो कि युग्मक ट्रांसपोर्ट में विसंगति, अण्डाशय से अण्डा निकलने में असामान्य और अण्डाशय से अण्डनली में अण्डा आने या युग्मको में विसंगति के कारण हो सकता है।
2. **भ्रुण की मृत्यु** – गुणसूत्रों में असमानता पोषण में कमी, उच्च पर्यावरणीय तापमान, हार्मोन्स की असमानता या विपरित गर्भाशय का सूजन और संक्रमण। रिपिट ब्रीडिंग की अवस्था के लिए निम्नलिखित कारण उत्तरदायी हैं :-

कारक	घटना	
	गाय	भैंस
हार्मोन्स का बदलाव	28 [±] 42:	25 [±] 80:
जननांगों का संक्रमण	18 [±] 03:	25 [±] 80:

Chapter - 14

सरकारी प्रायोजित कार्यक्रम

श्री सचिन कुमार साहू और डॉ. मो नईम अली

कृषि विभाग, श्री राम कॉलेज, मुजफ्फरनगर

क्र सं	कार्यक्रम का नाम	कार्यान्वयन एजेंसी	उद्देश्य	सब्सिडी प्रमात्रा
1.	कृषि विपणन के लिए एकीकृत योजना	विपणन और निरीक्षण निदेशालय	कटाई के बाद नुकसान को कम करना, कृषि उपज की गुणवत्ता और मार्केटिंग में सुधार सुनिश्चित करना, कृषि उत्पादों का पर्याप्त भंडारण, ग्रेडिंग, मानकीकरण, गुणवत्ता नियंत्रित करना, संकट बिक्री रोकना, NWRS के अंतर्गत प्लेजफाईनैन्सिंग एवं मार्केटिंग क्रेडिट हेतु गुंजाइश उत्पन्न करना	मानक लागत का 25% से 33.33% तक
2.	जेएनएनएसएम के अन्तर्गत सोलर पीवी लाइटिंग प्रणाली हेतु पुंजी सब्सिडी योजना	नवीन एवं नवीकरणीय ऊर्जा मंत्रालय, भारत सरकार	ग्रामीण क्षेत्रों में ऊर्जा की जरूरतें पूरी करने के लिये एलईडी आधारित सौर ऊर्जा प्रोत्साहित करना	40 - Wp तक के सिस्टम हेतु रु.160 प्रति Wp -40 Wp से अधिक व 300 Wp तक के सिस्टम हेतु रु.100 प्रति Wp

Chapter - 15

दूध व दूध से बने उत्पादों में प्राकृतिक जड़ी-बूटियों का प्रयोग

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हमारा देश प्राचीन काल से ही कृषि प्रदान देश कहलाता है। यहां की 80 प्रतिशत जनसंख्या कृषि पर निर्भर करती है। भारत में पहले से ही जड़ी-बूटियों का सेवन होता चला आ रहा है जिसके बारे में कुछ ग्रंथों व वेदों में भी लिखा हुआ है इसलिये हमारे देश में बीमारियाँ कम होती थी और मनुष्य तथा जानवर स्वस्थ रहते थे। परंतु अब ऐसा नहीं है क्योंकि हम लोगों ने अपना भारीतय खाना-पीना छोड़कर विदेशों की तरफ चलने लगे हैं जिसमें जड़ी-बूटियों का प्रयोग नहीं होता है। हमको अगर बीमारियों से बचना है तो अपने देशी खाने पर वापस आना होगा। आप लोग जितने भी घर में दूध से उत्पाद बनाते हैं या दूध पीते हैं आपको उत्पाद या दूध के साथ-साथ दूसरे फायदे भी मिलेंगे आप उन दुग्ध उत्पादों में जड़ी-बूटियों के बूरा या पाउडर का इस्तेमाल करें जिससे बीमारियाँ कम होंगी।

1. जैसे हम अपने घर में चाय पीते हैं तो चाय में अदरक, इलायची, अजवायन, लौंग आदि का प्रयोग भी करें। यह बहुत सी बीमारियों में काम आता है।
2. दूध में शक्कर गुड़, शक्कर और अजवायन आदि के साथ लें।
3. हर्बल घी बनाने के लिये आप जब घी पकाते हों तो उसमें कुछ जड़ी-बूटियाँ भी साथ-साथ पकाएं उससे घी की क्वालिटी भी बढ़ेगी तथा आपकी बीमारियाँ कम होंगी। इसे हम अर्जुन छाल, मोरिंगा पत्ती, लहसुन आदि का प्रयोग कर सकते हैं।
4. हर्बल आईसक्रीम कुल्फी बनाने के लिये उसमें हम अदरक, चुकन्दर का जूस या कुछ जड़ी-बूटियाँ जैसे अनार दाना, सल्मप .. दूसरी कोई भी जड़ी-बूटी के पाउडर मिक्स कर सकते हैं। ध्यान रखें कि पाउडर अधिक से अधिक 2-3 प्रतिशत से ऊपर ना हो और कड़वाहट भी न हो।
5. हर्बल मोगहट व लस्सी बनाने के लिये उसमें पहले हम दूध में 1 प्रतिशत हर्बल जूस मिक्स करके देंगे। बाद में उसमें जामन लगाकर जमने के लिये रख देते हैं।

Chapter - 16

अत्यधिक गर्मी का पशु उत्पादन पर प्रभाव व बचाव के सुझाव

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ग्रीष्म ऋतु में जब वातावरण का तापमान सामान्य से अधिक हो जाता है तो पशु प्रजातियों में गर्मी के द्वारा उत्पन्न तनाव से उनकी शरीर वृद्धि एवं दुग्ध उत्पादन एवं प्रजनन क्षमता में गिरावट होने लगती है। जिसके कारण पशुपालकों को आर्थिक नुकसान होता है। इसके साथ ही साथ पशु की दैहिक क्रियाओं के घटने व बढ़ने से पशु असामान्य महसूस करने लगता है। जिसके कारण पशु की पुनर्उत्पादन क्षमता मादा जननांगों में अण्डाणुओं की कमी एवं अण्डाणु परिपक्वता एवं अण्डाणुओं का पूर्ण विकसित न होना एवं भ्रूण का विकास न होना तथा नर पशुओं में वीर्य उत्पादन व गुणवत्ता घटने लगती है। इसलिए उचित आवास तथा खान पान में परिवर्तन कर पशुओं को अधिक गर्मी से हाने वाले विपरीत प्रभाव से बचाया जा सकता है। पशु को अधिक गर्मी से बचाकर निम्नलिखित लाभ हो सकते हैं।

- 1 पशु की चारा व दाना खाने की क्षमता बढ़ती है।
- 2 पशु की दुग्ध उत्पादन क्षमता बढ़ती है।
- 3 मादा पशु समय से गर्मी में आती है।
- 4 मादा पशु की गर्भधारण क्षमता बढ़ जाती है।
- 5 मादा पशु बार वृ बार ऋतुमयी नहीं होती।
- 6 मादा में भ्रूणीय मृत्यु दर में कमी आती है।
- 7 पशु व्यवहार सामान्य रहता है।
- 8 नर पशु की वीर्य उत्पादन क्षमता बढ़ती है।
- 9 नर पशु में शुक्राणु की संख्या में वृद्धि होती है।
- 10 नर व मादा औसत दिनों में ही परिपक्व होते हैं।

पशु	तापमान (डिग्री फ़ारनहाइट)	नाडी गति (प्रति मिनट)	श्वसन गति (प्रति मिनट)
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Chapter - 17

दुधारू पशुओं के लिये आहार

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पशुपालन व डेरी उद्योग का हमारे देश की अर्थव्यवस्था में महत्वपूर्ण स्थान है, यह बताना आवश्यक है कि देश की 60-70 प्रतिशत जनसंख्या की आजीविका इस उद्योग पर निर्भर करती है। पशु आहार विशेषकर हरे चारे व अनाज आदि की कमी इस क्षेत्र में एक विकट समस्या है। और एक बात करना आवश्यक है कि इस देश की जनसंख्या तो सघन है ही इसका साथ-साथ पशु संख्या का दबाव भी अधिक है परंतु उनकी उत्पादन क्षमता अन्य देशों की तुलना में बहुत कम है। समुचित आहार की कमी के चलते पशु अपनी क्षमता के अनुरूप उत्पादन नहीं कर पाते हैं। यदि राजस्थान की बात करें तो सरकारी आंकड़ों के अनुसार पश्चिमी राजस्थान के 10 में से 4 जिले बाड़मेर, बीकानेर, जोधपुर व नागौर में तो अन्य स्थानों की तुलना 60-99 प्रतिशत तक तथा अन्य 5 जिलों में 20-59 प्रतिशत तक कम वर्षा दर्ज की जाती है, जिसके कारण सूखे के आसार हो जाते हैं। अतः पशुओं के लिये आहार की अनुपलब्धता स्वाभाविक है। राजस्थान की पशु गणना 2007 के अनुसार 56.66 मिलियन पशु (20 प्रतिशत गायें व 58 प्रतिशत भेड़, बकरी), इतनी बड़ी संख्या के लिये आहार आपूर्ति एक चुनौति है।

संतुलित आहार अर्थात् पशुओं के समुचित स्वास्थ्य व उत्पादन हेतु उनके आहार में सभी पोषक तत्व उचित मात्रा में उपलब्ध होने चाहिये, जो विभिन्न खाद्य पदार्थों द्वारा प्राप्त कराए जा सकते हैं। प्रकृति ने रोमन्थी पशुओं को विशेष प्रकार का पाचन तंत्र प्रदान किया है जिसमें उनके पेट की क्षमता बहुत अधिक है, जो उनके भारी भार का लगभग 16-20 प्रतिशत होता है। उनके पेट के मनुष्य की तुलना में चार भाग होते हैं। जिसमें उनका पहला भाग रुमन कहलाता है। उसमें लाखों बैक्टीरिया व प्रोटोजोआ होने के कारण वे रोये युक्त पदार्थ जैसा कि भूसा, हे तथा अन्य कृषि उत्पत्ता आदि (जो अन्य पशु नहीं खा पाते) खा कर भी स्वस्थ व उत्पादकता बनाए रख सकते हैं। अर्थात् घासफूस खा कर उसे अमूल्य रूप यानि दूध में परिवर्तित कर सकते हैं। ये बैक्टीरिया प्रोटोजोआ इतने सूक्ष्म होते हैं कि उन्हें सूक्ष्मदर्शी यंत्र द्वारा ही देखा जा सकता है।

Chapter - 18

संरक्षण की तकनीकें

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भारत संसार में सर्वाधिक पशुओं वाला देश है। सन 2012 के पशु गणना के हिसाब से भारत में इनकी संख्या लगभग 512 करोड़ है। यहाँ संसार के कुल भैंसों की संख्या का 56.7%, पशुओं की संख्या 12.4% तथा छोटे पशुओं (भैंड़, बकरी) की संख्या 20.4% पायी जाती है। जैसा कि यह ज्ञात है कि पशु उत्पाद में लगभग 60-70% लागत सिर्फ उनके चारा एवं दाना पर लगता है। इस लागत को कम करने के लिए चारे की उपलब्धता बढ़ाना तथा कम लागत वाली भोज्य पदार्थों को उपलब्ध कराना जिससे कि पशु उत्पाद किसानों के लिए पशुपालन एक लाभकारी व्यवसाय सिद्ध हो। चारा उत्पादन एवं इसकी उपयोगिता फसल पद्धति, जलवायु, किसानों की आर्थिक एवं सामाजिक स्थिति, पशुओं के प्रकार एवं उनके लिए उपलब्ध भोजन आदि पर निर्भर करती है। पशुओं को खिलाने हेतु हम मुख्यतः तीन स्रोतों पर निर्भर रहते हैं: (1) चारे की खेती द्वारा (2) फसलों के अवशेषों द्वारा (3) वन वृक्षों के कोमल पत्तों एवं तनों को खिलाना, स्थायी चारागाह एवं प्राकृतिक चारे की भूमि का उपयोग करना आदि। वर्तमान में देश में हरे चारे की कुल कमी 35.6%, शुष्क चारे की कमी 10.9% आंकी गयी है। तत्काल आंकलन करने पर यह कमी क्रमशः शुष्क चारा (10%), दानेदार भोजन (33%) तथा हरा चारा (35%) पाई जाती है। जबकि यह कमी वर्ष 2020 तक क्रमशः 11%, 35% तथा 45% तक आंकी गयी है जो कि हमारे लिए एक चुनौती पूर्ण कार्य है। हरा चारा उत्पादन के तत्पश्चात भारत के पंजाब राज्य में दुग्ध उत्पादन में अति वृद्धि पाई गयी है। अतः इसी प्रकार से भारत के अन्य गाँवों में भी संगठित संरचना, उचित निति तथा तकनीकी सहयोग से अविलम्ब चारे का विकास किया जा सकता है। इसका दूसरा पहलू चारा संरक्षण (साईलेज/हे/बेल/फीड ब्लाक आदि) है, जो कि पंजाब व हरियाणा जैसे राज्यों में भी इस तरफ अधिक ध्यान नहीं दिया गया है। अतः चारे की अधिकता के समय इसे उपयुक्त तरीके से संरक्षित करके उसके बाद चारे की कमी या अनुपलब्धता के समय मुख्य रूप से मध्य नवम्बर से मध्य दिसम्बर तक तथा मध्य मई से मध्य जून तक संरक्षित चारे को खिलाया जा सकता है।

चारा संरक्षण की आवश्यकता:

- आशा के अनुरूप चारे में पोषक तत्वों की कम से कम हानि पर संरक्षित करना।
- वर्तमान की चारे की उपलब्धता को भविष्य के लिए समायोजित करना।
- आसानी से चारे को एक स्थान से दूसरे स्थान तक ले जाना।

Chapter - 19

डेयरी पशुओं में कृत्रिम गर्भाधान

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कृत्रिम गर्भाधान वो विधि है जिसमें नर पशु से प्राप्त वीर्य मादा पशु के जननपथ में उपकरणों द्वारा निक्षेपित किया जाता है। प्राकृतिक गर्भाधान में साँड़/ भैंसा अपने वीर्य को अपने शिश्न के द्वारा सीधे मादा की योनि के अग्र भाग में स्खलित करता है परन्तु कृत्रिम गर्भाधान में कृत्रिम योनि द्वारा वीर्य एकत्रित किया जाता है तथा वीर्य के गुणों के मूल्यांकन (Evaluation), तनुकरण (Dilution), हिमीकरण (Freezing) एवं गलाने/पिघलाने (Thawing) के बाद उपकरणों द्वारा मादा जनन पथ में निक्षेपित किया जाता है। पशु की उत्पादन एवं पुनरुत्पादन क्षमता को बढ़ाने के लिए विकसित की गयी तकनीकों में ये तकनीक आज तक की सबसे महत्वपूर्ण, सफल और व्यापक तकनीक है।

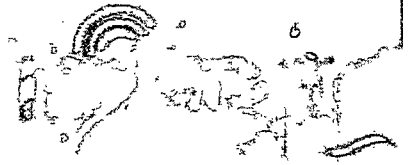
राष्ट्रीय डेयरी अनुसन्धान संस्थान, करनाल ने कृत्रिम गर्भाधान के द्वारा करण फ्रीज एवं करण स्विस नामक संकर नस्ल की गायों को विकसित किया है जो आज इस संस्थान के उच्च दुग्ध उत्पादन में महत्वपूर्ण भूमिका निभा रही है। थारपारकर गाय में होल्स्टीन फ्रीजन नस्ल के साँड़ का वीर्य निक्षेपित कर करण फ्रीज विकसित की गयी तथा साहीवाल गाय में ब्राउन स्विस नस्ल के साँड़ का वीर्य निक्षेपित कर करण स्विस विकसित की गयी। आज विश्व के विभिन्न देशों से उत्पादन की दृष्टि से श्रेष्ठ नस्लों के साँड़ का वीर्य लाकर कृत्रिम गर्भाधान की तकनीक का उपयोग कर संकर नस्ल के पशुओं को विकसित किया जा रहा है जो देशी पशुओं की तुलना में दुग्ध उत्पादन की दृष्टि से श्रेष्ठ है।

कृत्रिम गर्भाधान के लाभ

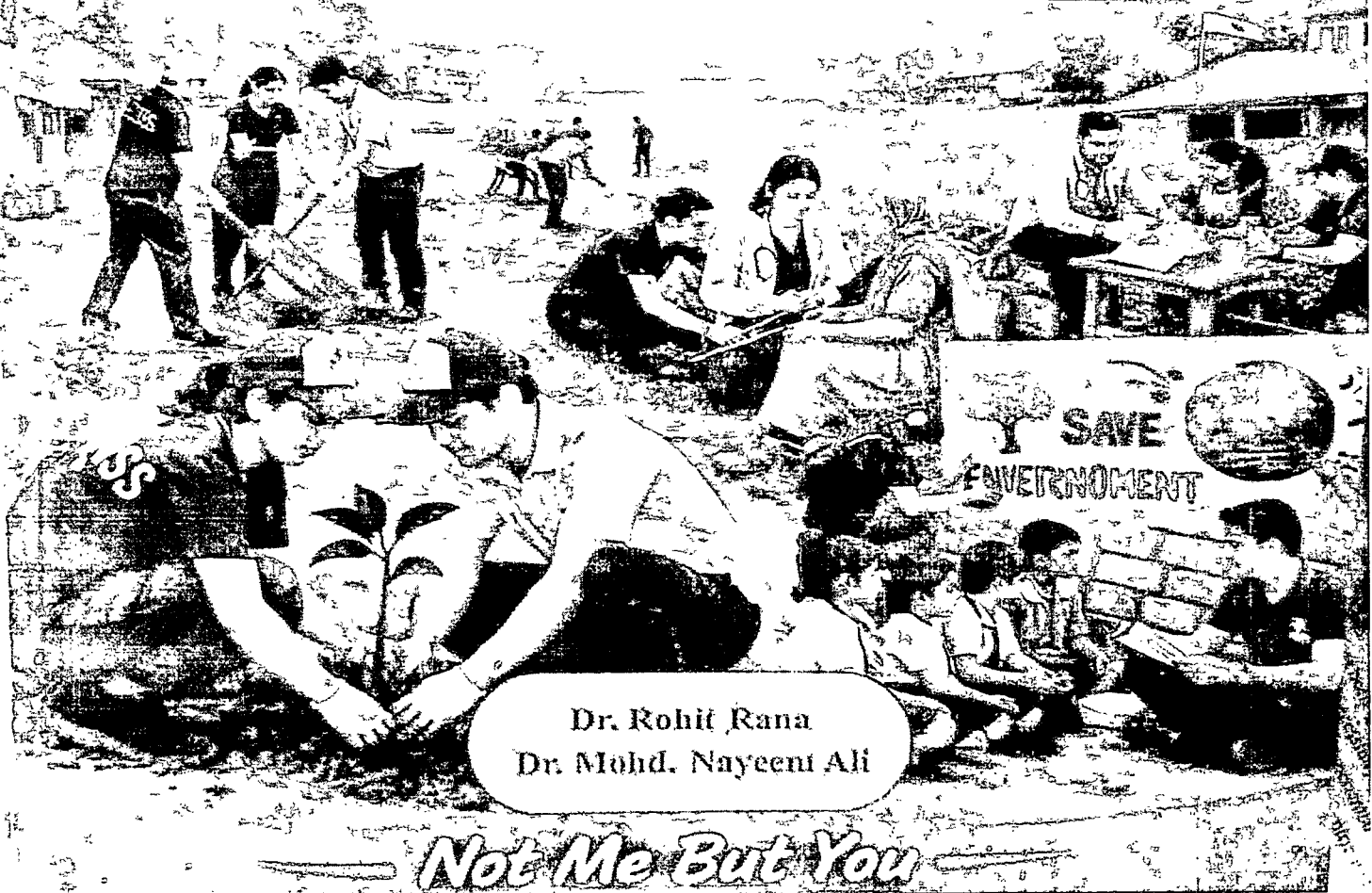
- कृत्रिम गर्भाधान द्वारा उच्च कोटि के साँड़ों का अधिकतम उपयोग करके दुधारू पशुओं की दुग्ध उत्पादन क्षमता को बढ़ाया जा सकता है। इस तकनीक का उपयोग करके प्राकृतिक गर्भाधान की तुलना में बहुत अधिक बछड़े प्राप्त किये जा सकते हैं।
- पशुओं के कुछ ऐसे रोग हैं जो नर पशु के शिश्न द्वारा प्राकृतिक गर्भाधान से फैलते हैं। इन रोगों में ट्राइकोमोनिएसिस, केम्पाइलोबैक्टेरियोसिस, लेप्टोस्पाइरोसिस प्रमुख हैं। जननांगों के इन रोगों की रोकथाम में कृत्रिम गर्भाधान की विशेष भूमिका है।
- उच्च आनुवंशिक गुणों वाले साँड़ के हिमीकृत वीर्य को संरक्षित करके रखा जा सकता है तथा साँड़ के मरने के बाद भी कृत्रिम गर्भाधान के द्वारा प्रयोग किया जा सकता है।

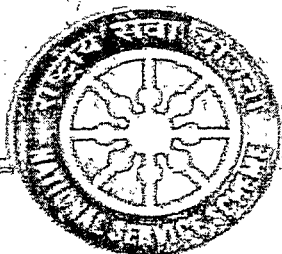
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Practical Manual (NSS-I)





NSS MANUAL



Dr. Rohit Rana is an Assistant Professor of English at the Department of English, affiliated with Mahatma Jyoti Bapu Institute of Education, Patna. He holds a B.A. and M.A. in English and a Ph.D. degree in English literature. With over eight years of experience in teaching and research, he has published several research papers in national and international journals.

Dr. Rana has been working as a Programme Officer of the NSS unit since its inception. During this period, he has successfully conducted two special seven-day night camps, one in 2018 and another in 2020. He is also an experienced learner, Dr. Rana has been a member of various committees and has oriented activities, he has contributed significantly to student development and growth through his various responsibilities.

Dr. Rana is a recipient of several national and international awards and has published several research papers in books and journals. Additionally, he serves as a member of the NSS unit and has been a member of the NSS unit since its inception. He has delivered several invited talks at various seminars and conferences and has also given radio talks on All India Radio, Patna. Dr. Rana has been engaged in various social service activities and has benefited farmers by promoting Integrated Pest Management (IPM) techniques. He has also been involved in various other social service activities and has a patent design for an insect trapping device.



Dr. Mohd. Naveem Ali holds an M.Sc. and Ph.D. in Plant Pathology and is currently working as the Head, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences, Baramulla. He is a dedicated academician with strong leadership skills. He has published 35 research papers in international journals and has presented 15 research papers and 25 book chapters at various national and international conferences. He has also published two books and has been a member of several professional bodies.

He has authored two books, two manuals, and over a dozen research papers. He has received five awards from reputed professors of various universities. He has also been a member of several academic committees and has been a member of the NSS unit since its inception. He has also been a member of the NSS unit since its inception. He has also been a member of the NSS unit since its inception. He has also been a member of the NSS unit since its inception.

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NSS MANUAL



Mr. Ankit Kumar is an educator, social worker, and academic mentor with extensive experience in youth development and community engagement through the National Service Scheme (NSS). He served as a Programme Officer of NSS from 2017 to 2023, during which he successfully organized and supervised numerous community service activities, special camps, awareness programs, environmental conservation drives, health campaigns, cleanliness initiatives, and rural development projects. Throughout his tenure as Programme Officer, Mr. Ankit actively guided student volunteers in developing leadership qualities, social responsibility, teamwork, and a spirit of selfless service. His dedication to community welfare and nation-building has contributed significantly to the holistic development of young volunteers. As an educator, he strongly believes that education should extend beyond classrooms and empower students to become responsible citizens. Drawing upon his practical experience in NSS activities and field work, he has prepared this book to provide students with a comprehensive understanding of NSS objectives, practical activities, community engagement, and social service practices. This book is intended to serve as a useful guide for NSS volunteers, students, teachers, and Programme Officers who are committed to the ideals of service, leadership, and community development.



Dr. Mohd. Nayem Ali : M.Sc., Ph.D. in Dairy Technology
Currently, he is working as Head, Faculty of Agriculture, Shri Ram College, Muzaffarnagar. Dr. Ali has published 35 research papers, 15 papers and abstracts published in Proceedings, 20 book chapters, 1 book, 2 manuals, 10 leaflets. He has received 5 awards from reputed societies. He has been member of Editorial Board in many Journals. Organized many International & National Conferences and Seminars, Workshop, Farmer Camp and Cultural Activity during last 10 years.

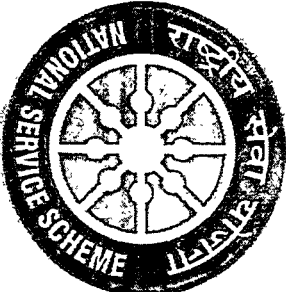
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Dr. Ankit Kumar

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Dr. Mohd. Nayem Ali

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