Literature Survey

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| **S. No** | **Title**  *(Name of the journal, author and publication details)* | **Methodology**  *(Provide a Summary of key studies and their findings)* | **Identification of gaps and limitations.**  *(Identify the limitations of the Research Paper)* |
| 1 | A Systematic Review on Monitoring and Advanced Control Strategies in Smart Agriculture  Authors: Syeda Iqra Hassan, Muhammad Mansoor Alam, Usman Illahi, Mohammed A. Al Ghamdi, Sultan H. Almotiri, Mazliham Mohd Su’ud | * The study systematically reviews advanced control strategies in smart agriculture, including IoT, AI, imaging techniques (e.g., multispectral, hyperspectral cameras), drones, and machine learning. * It emphasizes the importance of automation to address challenges like plant diseases, irrigation management, and nutrient optimization. * Highlights AI-based approaches like CNNs and Random Forests for crop monitoring, disease detection, and yield prediction. | * Limited Geographic Application: Most studies focus on specific regions, with little exploration of diverse agricultural contexts or developing countries. * Scalability Concerns: High costs and technical complexities make scalability and adoption by small-scale farmers challenging. * Technology Integration Issues: Difficulty in harmonizing various technologies like IoT, AI, and drones for seamless operations in real-world scenarios. |
| 2 | Integrating Artificial Intelligence and Internet of Things (IoT) for Enhanced Crop Monitoring and Management in Precision Agriculture  Authors: Kushagra Sharma, Shiv Kumar Shivandu | * The paper explores the integration of AI and IoT technologies to enhance precision agriculture, emphasizing their role in crop monitoring and management. * It highlights advancements in technologies such as high-throughput phenotyping, remote sensing, spectral imaging, and agricultural robotics. * Wireless sensor networks (WSNs) and georeferencing technologies (e.g., GPS, DGPS) are identified as critical for precise, real-time data collection in monitoring soil health and crop growth. * The integration of advanced communication technologies like 5G is emphasized for improving connectivity in precision agriculture. | * Scalability Issues: The high cost of implementation limits adoption among small and medium-sized farmers. * Technological Integration Challenges: Difficulty in harmonizing IoT devices, AI models, and other precision agriculture tools in real-world scenarios. * Limited Dataset Diversity: A lack of diverse, localized datasets for different geographical conditions restricts the effectiveness of the solutions. * Connectivity Constraints: Dependence on reliable broadband connectivity, which remains inaccessible in many rural areas, hampers widespread adoption. |
| 3 | Camera-Based Plant Growth Monitoring for Automated Plant Cultivation with Controlled Environment Agriculture  Authors: Tony Chen, Huiming Yin | * The paper introduces a camera-based system for plant growth monitoring in controlled environment agriculture (CEA) using Building-Integrated Photovoltaic-Thermal (BIPVT) greenhouses. * Cameras capture plant images for real-time monitoring of growth rate and structure, with noise correction and length measurement algorithms (based on BFS). * It evaluates a 3D growth monitoring system using voxel carving, enabling more precise measurements compared to traditional 2D approaches. | * Hardware Dependency: Relies heavily on camera placement and resolution, which can lead to errors due to camera noise or blind spots, especially in large-scale operations. * Plant Geometry Considerations: Current methods focus on length measurements, which may not fully capture other growth parameters like area or volumetric growth. * Scalability Challenges: The setup requires multiple cameras and calibration, which might not be feasible for larger agricultural setups. |
| 4 | Applications of Internet of Things (IoT) in Agriculture: The Need and Implementation  Authors: Abhineet Anand, Raj Gaurang Tiwari, Naresh Kumar Trivedi, Deden Witarsyah, Vinay Gautam, Alok Misra | * The study examines the integration of IoT in agriculture, focusing on its role in enhancing efficiency, automation, and sustainability. * Highlights the potential of IoT to enable real-time monitoring through interconnected devices, including sensors for soil quality, weather conditions, and crop growth. * Demonstrates the application of IoT in precision farming, greenhouse monitoring, and disease detection with real-world examples of IoT frameworks in agriculture. | * High Initial Cost: The substantial investment required for IoT devices limits adoption, particularly for small-scale farmers. * Connectivity Challenges: Dependence on reliable internet connectivity is a significant barrier, especially in rural and remote areas. * Security Concerns: Identifies vulnerabilities in IoT networks and data security as critical challenges for widespread adoption. |
| 5 | IoT-Enabled Smart Agriculture: Architecture, Applications, and Challenges  Authors: Vu Khanh Quy, Nguyen Van Hau, Dang Van Anh, Nguyen Minh Quy, Nguyen Tien Ban, Stefania Lanza, Giovanni Randazzo, Anselme Muzirafuti | * This paper provides a comprehensive survey of IoT applications in agriculture, focusing on architecture, communication technologies, and data storage solutions. * It highlights the integration of wireless sensor networks (WSN), cloud computing, and big data analytics into IoT-enabled agriculture for enhanced productivity and efficiency. * Presents a detailed analysis of IoT components like sensor nodes, communication protocols (LoRa, SigFox, Bluetooth), and cloud-based big data platforms for smart farming. * It identifies trends in smart agriculture, emphasizing precision farming, traceability systems, and greenhouse optimization using IoT. | * Economic Constraints: High initialization and operating costs for IoT systems restrict adoption among small-scale farmers. * Connectivity Challenges: Dependence on reliable broadband infrastructure, which is often unavailable in rural and remote areas. * Data Security and Privacy: Concerns about the misuse of sensitive farming data by service providers, with insufficient regulations in place. * Interoperability Issues: Lack of standardization across IoT devices and platforms complicates integration and scalability. * Environmental Reliability: IoT devices deployed in harsh environments are prone to failures due to extreme weather conditions. |
| 6 | "Perceptions of High-Tech Controlled Environment Agriculture among Local Food Consumers: Using Interviews to Explore Sense-Making and Connections to Good Food"  Authors: Garrett M. Broad, Wythe Marschall, Maya Ezzeddine | * The study investigates consumer perceptions of high-tech Controlled Environment Agriculture (CEA) systems through structured interviews with local food consumers in New York City. * It examines how CEA fits into consumer conceptualizations of "good food," focusing on values such as sustainability, naturalness, and local food production. * Findings show that while respondents appreciate the potential sustainability and efficiency of CEA systems, concerns about energy use, affordability, and the "unnaturalness" of the technology persist. * The research emphasizes the importance of bridging the gap between consumer expectations of "good food" and CEA’s technological innovations to gain wider acceptance. | * Limited Sample Diversity: The study focuses on a niche demographic of local food consumers in New York City, which may not represent broader consumer perceptions or rural perspectives. * Knowledge Gaps: Participants demonstrated limited understanding of CEA technologies, leading to reliance on initial impressions and preconceived notions. * Perceived Unnaturalness: Concerns about the lack of soil and artificial conditions in CEA systems challenge consumer acceptance, especially among "good food" advocates. * Focus on Urban Context: The research largely neglects the implications of CEA systems for rural or global agricultural settings, limiting its broader applicability. |
| 7 | "Smart Controlled Environment Agriculture Methods: A Holistic Review"  Authors: S. Ragaveena, A. Shirly Edward, U. Surendran | * The paper provides an extensive review of controlled environment agriculture (CEA) techniques such as hydroponics, aeroponics, aquaponics, and bioponics, emphasizing their advantages over traditional farming practices. * Highlights the integration of IoT, artificial intelligence (AI), and machine learning (ML) technologies for smart farming, focusing on real-time monitoring and nutrient management. * Discusses the role of advanced sensors (e.g., pH, EC, dissolved oxygen, and light intensity sensors) and IoT frameworks in automating CEA systems. * Explores the significance of hydroponics as a sustainable farming technique, reducing water usage and eliminating soil-related challenges. * Presents case studies showcasing the efficiency of AI and IoT in optimizing crop yield, nutrient delivery, and environmental monitoring. | * High Cost of Implementation: The initial investment required for IoT-enabled CEA systems is substantial, limiting accessibility for small-scale farmers. * Data Gaps and Localization: Lack of diverse, region-specific datasets for optimizing nutrient solutions and environmental parameters in different geographies. * Limited Crop Range: Focuses predominantly on specific crop types (e.g., leafy vegetables) with limited insights into broader crop diversity. * Environmental Variability: Limited ability to adapt systems to extreme climatic conditions, which could hinder scalability in various regions. |
| 8 | Smart Planter: A Controlled Environment Agriculture System Prioritizing Usability for Urban Home Owner Authors: Kawai Teoh, Sokchoo Ng | * Designed Smart Planter, an IoT-enabled agriculture solution for city house owners * Gathered environmental data from sensors using Arduino and Raspberry Pi * stored information in Google Sheets using an API as a cloud solution * Set temperature and illumination for the environment supporting plant development. * tested the approach over several repetitions using lettuce seedlings * gathered five-minute interval environmental data including temperature, humidity, pH, light). | * Restricted testing time: The research period could not have enough 1-2 batches of lettuce produced for a longitudinal analysis. * Lack of long-term data: Not enough time to gather adequate data for developing a correct decision model * Typical LEDs utilized might not offer ideal wavelengths for plant development. * Lacked specific sensors to track PPFD/PAR light and nutrition levels (PPM). * Small sample size: limited generalizability to other plants by testing just lettuce * No comparative study: Not compared performance with other CEA systems or conventional growth techniques. |
| 9 | Environmental Science and Pollution Research  Authors: Arindam Niyogi, Priyanka Sarkar, Soumyadeb Bhattacharyya, Souvik Pal, Subhankar Mukherjee | * Forms of biomass and techniques of characterisation * Thermochemical, biochemical, physicochemical conversion methods (thermochemical, biochemical) * Uses in environmental impact reducing, agricultural residue management, and bioenergy generation * Biosensors' contribution to maximize biomass use * Geographic dispersion and availability of biomass sources | * forms of biomass and methods of characterization * Methods of thermochemical, biochemical, physicochemical conversion (thermochemical, biochemical) * Applications in agricultural residue management, environmental impact mitigating, and bioenergy production * The role of biosensors to maximize biomass utilization * Geographic spread and accessibility of biomass sources |
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