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# An Overview of Recent Agricultural Research Advances and Trends

[1]Dr. Alpana Joshi, [2]Dr. Saurabh Tyagi, [3]Dr. Shivani
[1,2,3] Shobhit Institute of Engineering and Technology (Deemed to be University), Meerut
Email id- [1]alpana.joshi@shobhituniversity.ac.in , [2]saurabh.tyagi@shobhituniversity.ac.in,
[3]shivani@shobhituniversity.ac.in

***ABSTRACT:*** ***These advances coupled with the rise in urbanization are significant factors for the evolution of agricultural research. Recent developments in the field of Agricultural Research comprises of Eco-Agro-tourism, Big Data, Climate Smart Agriculture, Subsequent Promotional Linkages, Integrated Agriculture, etc. These developments are significant not only from the study context but also from the policy point of view towards the aim of doubling farmers' income by 2022. In today's' age technology plays a very significant role in enabling farmers to take up entrepreneurial initiatives and Agro-based businesses. Recent study has also talked about integrating Agriculture technology with the Information technology for increasing the agricultural production. Traditional farming method need to be replaced with the contemporary farming techniques as Integrated Farming System, Vertical Farming, or forward Backward integration, etc. With the rise in population and limited resource availability, research connected to Urban Agriculture is being highlighted which encourages the urban people to opt for organic agriculture for healthy and safe products. In summary, it can be said that along with coping with the main problems such as climate change, increasing farmers' income and feeding the billions, above-described developments in agricultural research are regarded as ray of hope for preserving Indian agriculture.***

***KEYWORDS:*** ***Advanced Marketing Linkages, Big Data Analytics, Climate Smart Agriculture, Eco-Agro-Tourism.***

## 1. INTRODUCTION

Agriculture is India's most significant sector in terms of the number of people who rely on it. Despite the fact that agriculture currently accounts for just 14% of GDP, it remains the primary source of income for the vast majority of the rural people. As a result, fast agricultural expansion is essential for the development of the rural economy. Inclusionary growth will result from the sustainable development of the rural sector. With linked agricultural operations in mind, the government is developing different sector-specific agricultural programs. Glimpse may be addressed with the 2018 Union Budget and the agricultural measures mentioned. The Ministry of Agriculture of the Government of India's National Agricultural Policy targets for agricultural growth of 4% per year by 2017, with a route defined by three key factors: technology, globalization, as well as markets. Future agricultural studies and researches must therefore address two interrelated challenges: improving agricultural productivity and profitability to keep up with demand while also guaranteeing long-term production sustainability. The first problem is addressed by the National Agricultural Research System (NARS). The technical foundation for expanding agricultural output and the green revolution was the development of short-duration, high-yielding cultivars, irrigation, and extensive use of fertilizers and other Agro-chemicals. The micro or farm economics, which controlled the use of inputs such as land, cultivar, labor, equipment, and pesticides balanced against crop yield profits, and the macroeconomics, which provided improved access to inputs and markets, were essential to the adoption of green revolution technology. Agriculture is no longer confined to only farmers and consumers; it now includes a wide range of stakeholders, all of whom contribute to job creation. Agriculture is regarded as a ray

of hope to solve and overcome many problems like as urbanization, technological diffusion, food security, and safety in order to improve the economy. As a result, the current agricultural trend has been concentrated on organic and vertical farming, not only to address rising environmental concerns but also to meet the food needs of a growing global population[1].

Farmers have just begun to utilize DSR (Direct Seed Rate) technology, which has resulted in water conservation and environmental improvement. Excessive chemical fertilizer and pesticide usage in agriculture may have negative consequences on food and the environment. In contrast to chemical-based agriculture, organic farming is seen as a feasible option. Various projects are underway in this approach, and some farmers are switching to natural farming as well. These changes are being made in order to address environmental concerns and ensure long-term viability. The International Forum representing Organic Agriculture Movements (IFOAM) and the Research Institute for Organic Agriculture (FiBL) have released their newest report on the World of Organic Agriculture 2018. India has surpassed Mexico and Uganda as the world's biggest nation in terms of organic producers. According to research statistics, there were 8,35,000 organic agricultural producers in India in 2016. This figure is even greater than the total number of organic commodities producers in the other two countries on the list: Mexico has 2,10,000 and Uganda has 2,10,252. In another perspective, current initiatives such as agritourism and integrated farming with the inclusion of related agricultural activities may be viewed as ways to increase, motivate, and improve farmer incomes. While staying in villages, tourists will get the opportunity to learn a lot about communities, forests, eating traditions, and farming. The government is making preparations for visitors' accommodation and safety in rural regions. Farmers will benefit from this decision. Because they will be providing lodging and food, their revenue will rise. Tourists will have a completely different experience. The government is creating agendas for promoting agritourism in order to boost tourism and make it a source of income for rural regions[2].

In today's world, technology plays a critical role in enabling farmers to start their own businesses and work in agro-based sectors. Recent study has also discussed the benefits of integrating agriculture with information technology to improve agricultural production. Growers are increasingly using smart agricultural practices. Smart Farming is a new trend that stresses the use of ICT in the hyperphysical farm management cycle. This is encapsulated by the Big Data phenomena, which refers to enormous amounts of data of various types that may be collected, analyzed, and utilized for decision-making. India could consider developing a systematic data collection system that may provide new value-adding possibilities. In example, the increasing adoption of mobile technology among rural populations may enable farmers in these regions to increase productivity by making decisions based on improved data derived from Big Data[3].

*1.1.Eco-Agri-tourism:*

Eco-Agri-tourism is a relatively new idea in the Indian tourist sector, and it usually takes place on farms in communities. It provides a pleasant respite from the stresses of everyday life in a tranquil rural setting. It allows you to unwind and rejuvenate in a natural setting surrounded by breathtaking scenery. The act of visiting a functioning farm or other agricultural, horticulture, or agri-business operation for the goal of pleasure, education, or active participation in the farm's or operation's operations is known as agritourism. Due to rising migration from rural regions, the population of urban areas is growing. The lives of city dwellers are confined to their houses, workplaces,

televisions, clubs, videogames, fast food, and cell phones, among other things. Urban residents also want to experience the rural lifestyle and are interested in learning more about agriculture. How crops are grown, ploughing experience, cow milking, and exposure to related agricultural activities such as poultry, fisheries, forestry, beekeeping, organic farming, terrace gardening, horticulture, and floriculture are all desirable. Agri-Tourism, which encompasses farmer, village, and agricultural, is an excellent way to fulfill the curiosity of the urban people. The Eco Agritourism idea brings city dwellers closer to nature and rural activities, where they may participate, be entertained, and enjoy the benefits of tourism[4]. Agri-tourism takes use of rural culture as a tourist draw. It offers prospective revenue and job possibilities in rural regions, thus increasing the rural population's standard of living. The most common reason for involving farmers in agritourism is the desire for supplementary income, or the major challenges in the agritourism economy were dealing with visitors, marketing agritourism business, and many agritourism operators lack the help and support, knowledge, or skills required, according to Morarueta l's studies on motivations as well as challenges for entrepreneurs in Agritourism. Agritourism also serves as a channel for farmers to engage in direct marketing to end customers, thus boosting the farmers' part of the consumer's rupee. Agritourism also offers educational possibilities for urban students by exposing them to a variety of agriculture-related businesses[5].

*1.2.Food security and big data analytics:*

By 2050, predicted population growth and urbanization rates will have a significant effect on global food security. The consequences are multi-sectoral, affecting infrastructure, healthcare, and technology as well as food. At the same time, rising food demand and changing food security requirements are pushing resource innovation. The world is becoming increasingly interconnected, resulting in enormous data, which may be used to drive decision-making that can change the farm-to-consumer value chain. Throughout their supply chain, agribusinesses are subject to a slew of laws and customer demands. Each of the many contact points throughout the agri-value chain has important information that may assist companies in making the most of their resources, increasing transparency in their operations, and protecting customers. Big Data has the ability to provide value at every touchpoint, from choosing the appropriate agri-inputs to monitoring soil moisture, watching market prices, managing irrigations, determining the best-selling point, and obtaining the best price. In a nation like India, with 638,000 villages and 130 million farmers speaking approximately 800 languages, 140 million hectares of cultivable land under 127 Agro-climatic zones capable of sustaining 3,000 distinct crops and one million variations, the difficulties and possibilities of data are enormous. Recent advancements in Big Data or advanced analytics capabilities, as well as agri-robotics such as aerial photography, sensors, and smart local weather predictions, have the potential to change the agri-scape and increase global agricultural production in the next decades. Satellite photography has the capability of capturing pictures of farmer fields with a resolution of 1 m x 1 m (20–25 pixels), which is increasing with the advancement of technology. These pictures may capture a variety of data points, such as Leaf Area Index, plant height, canopy, and other factors that indicate crop vigour and can therefore be used to correctly predict farm output[6].

*1.3.Agriculture that is climate savvy:*

Climatic-smart agriculture may be described as a strategy for reforming and reorienting agricultural growth in light of changing climate conditions (Lipper et al. 2014). Climate smart agriculture is defined by the FAO (Food and Agricultural Organization) as "agriculture that sustainably increases productivity, improves resilience (adaptation), reduces or removes GHGs (mitigation) where possible, as well as enhances achievement of national food security and development goals." Climate Smart Agriculture, according to the FAO, aims to achieve three goals: boosting productivity and incomes in a sustainable manner, adapting to climate change, and decreasing greenhouse gas emissions wherever feasible. The majority of Indians live in rural regions, and agriculture is their primary source of income. Many impacts of climate change have been documented, such as temperature rises, increasing sea levels, severe weather occurrences, and so on. All of factors put agriculture, food production, and water resources at danger. As a result, resilience is a major issue. One of the major causes of greenhouse gas emissions is agriculture. Agriculture now accounts for 19-29 percent of global greenhouse gas emissions, according to a World Bank report. If nothing is done, that proportion may rise as other industries decrease their emissions. Researchers have devised a variety of methods and technology aimed at improving agricultural output stability in the face of seasonal fluctuations. Farmers must embrace such resilient methods and technology in a thoughtful manner. Resource efficiency, agriculture's long-term viability and growth, and environmental and social protections all become more important[7].

*1.4.DSR technique (direct seeded rice):*

The quest for alternative crop setups that may improve water productivity is sparked by increasing water shortages and labor costs in rice. DSR is a feasible method for decreasing wasteful water flows. DSR is the method of starting a rice crop from seeds planted directly in the field rather than transferring seedlings from a nursery to the main field. Dhillon and Romana (2016) stated that DSR has the potential to improve water use efficiency, reduce other losses, as well as significantly reduce methane production by generating aerobic conditions, and also that DSR saved Rs. 5250 per hectare in labor, irrigations by 40%, and realized an additional yield of 2.61 percent financial reporting for Rs. 3298. According to Prasad et al. (2014), using Direct Seeded Rice (DSR) technology saved up to 25% in water, 27% in energy (Diesel), 35-40 man days/ha, improved fertilizer use efficiency due to fertilizer placement in the root zone, early maturity of crops by 7-10 days helps in timely sowing of crop growth, and reduced methane emissions[8].

*1.5.Models of marketing that are unique:*

Agribusiness models include a wide variety of product and service delivery choices, and are divided into one-stop shops, also known as Rural Business Hubs (RBHs), procurement-led or input-driven models, and ICT and FPO-related agribusiness models. Understanding markets and creating strategies to access them properly is a process for new entrants. Model development is a never-ending cycle of learning and invention that catalyzes both backward and forward connections with farmers. To begin with eRBH, SFAC (Small Farmers Agribusiness Consortium) has created an integrated database of 5 lakh farmers spread over 250 FPOs to match demand and supply for inputs. The impoverished may and should benefit from markets. Empirical studies indicate that aggregating business ideas among small-holder farmers in Africa has led in a 50 percent to 100 percent increase in farmer income. In Africa, there are parastatal models where the

government organizes cash crop supply chains, such as the Ghana Cocoa Board or the Kenya Tea Development Board, which are the most integrated[9].

*1.6.e-NAM (Electronic Naming System):*

The National Agriculture Market (NAM) is a pan-India electronic trading platform that connects the current APMC mandis to form a single national agricultural commodities market. All APMC-related information and services are available via the NAM Portal, which acts as a single point of contact. This comprises, among other things, commodity arrivals and prices, buy and sell trade offers, and the ability to react to trade offers. While material flow (agricultural product) continues to be facilitated by mandis, an online market lowers transaction costs and asymmetry of information. Agriculture marketing is managed by the states in accordance with their agri-marketing laws, which split the state into numerous market regions, each of which is controlled by a distinct Agricultural Produce Marketing Committee (APMC) that has its own set of marketing rules (including fees). This market fragmentation, even within the State, obstructs the free flow of agricultural commodities from one market area to another, and multiple handling of agricultural produce and multiple levels of mandi charges end up raising prices for consumers without providing a corresponding benefit to farmers.

*1.7.System of integrated agriculture*

Food security, livelihood security, water conservation, natural resource conservation, and environmental preservation have all been significant topics of discussion in recent years throughout the globe. The primary emphasis for encouraging rational resource use and environmental preservation without hindering economic progress is sustainable development. Sustainability, food security, poverty reduction, and farmer security are all goals of the Integrated Farming System method. Within the broader idea of agriculture, the Integrated Farming System (IFS) occupies a unique position. Nothing goes to waste in an Integrated Farming System; the waste from one system becomes the input for another. For example, cow manure combined with crop residues and agricultural waste may be transformed into nutrient-rich vermi-compost. Crop production, animal husbandry, poultry, fisheries, forestry, horticulture, piggery, and other agricultural businesses should be integrated and mixed wisely to produce farming success (TNAU). Over the limited revenue from self-standing businesses, the adoption of numerous farm operations in an integrated way may guarantee a significant income production to maintain the livelihood of farmers[10].

## 2. DISCUSSION

Agriculture is India's most significant sector in terms of the number of people who rely on it. Despite the fact that agriculture currently accounts for just 14% of GDP, it remains the primary source of income for the vast majority of the rural people. As a result, fast agricultural expansion is essential for the development of the rural economy. Inclusionary growth will result from the sustainable development of the rural sector. With linked agricultural operations in mind, the government is developing different sector-specific agricultural programs. Since the advent of the Green Revolution in the 1960s, India's agriculture has seen rapid change. The direction and development of agricultural research are influenced by advances in science and technology, as well as growing population and urbanization. India's foodgrain output increased more than fivefold

from 50 million tons in 1950 to over 277.5 thousand tonnes in 2017-18. Farming System, Vertical Farming, or Forward Farming are all terms for the same thing. Integration with the past, etc. With the increase in population and limited resource availability, urban agricultural research is being emphasized, encouraging urban residents to choose organic agriculture for healthy and safe goods. Customers are willing to pay more on quality products as per capita income rises, encouraging backward linkages to farmers to adopt best practices at the level of production. To reduce environmental issues, researchers are focusing on Climate Smart Agricultural Techniques like DSR (Direct Seeded Rice), which reduces water usage by 50 to 60 percent while also reducing methane gas emissions to a considerable degree, allowing farmers to earn more carbon offsets. In conclusion, coupled with addressing major issues such as climate change, improving farmer income, or feeding the billions, the above-mentioned advances in agricultural research may be seen as a ray of hope for the future of Indian agriculture.

## 3. CONCLUSION

Since the advent of the Green Revolution in the 1960s, India's agriculture has seen rapid change. The direction and development of agricultural research are influenced by advances in science and technology, as well as growing population and urbanization. India's food grain output increased more than fivefold from 50 million tons in 1950 to over 277.5 million tons in 2017-18. Combining agricultural technology with information technology is critical to the agriculture sector's improvement. India is projected to have achieved the lofty objective of doubling agricultural revenue. Recent developments in agricultural research, such as agri-farm-tourism, Big data analytics, integrated farming, as well as advanced marketing models, are seen as rays of hope for sustaining Indian agriculture, in addition to coping with major issues such as climate change, boosting farmers' income, as well as feeding the billions. In order to introduce new dimensions to Indian agriculture as well as sustain for future difficulties, there is a critical need for coordinated amalgamation of different stakeholders such as producers, consumers, or public-private partnerships.

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