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Assessing the barriers to adoption of modern agricultural technologies among maize farmers in Chhattisgarh

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Abstract
The research was carried out in the Nagri block of Dhamtari district within the Chhattisgarh state. Given the critical role of technology in agricultural progress, numerous extension services are actively involved in promoting innovative agricultural technologies among farmers. Considerable resources are allocated for various extension activities, including field days and demonstrations, and some services may even undergo substantial reorganization, such as the implementation of the training and visit (T&V) system. However, there is a significant gap when it comes to reserving resources for monitoring the outcomes of these extension initiatives and conducting analyses to comprehend why some recommendations or extension techniques are more successful than others. For farmers who have not yet adopted these technologies, it's important to explore whether they encounter drawbacks with the new practices and improved technologies. Is the new practice too distant from the farmers' existing knowledge base, or has the extension methodology been ineffective in introducing these farmers to the new techniques? There are multiple compelling reasons to invest in studying the adoption of agricultural technology.

Keywords: Adoption barriers, agricultural technology, maize farmers, technology gap

Introduction
Maize, scientifically known as Zea mays, is classified as one of the prominent coarse grains and holds a significant place in the dietary landscape of India (Dwivedi *et al*., 2019) [2]. The primary form of maize consumption in India is in the shape of corn. Maize cultivation is prevalent in diverse geographical regions, spanning from the plains to hilly areas at altitudes of approximately 2700 meters. Notably, India witnesses extensive maize cultivation, with key production areas including Bihar, Andhra Pradesh, Rajasthan, Karnataka, and Uttar Pradesh (Sharma *et al*., 2018) [7]. On a global scale, maize is cultivated prolifically in countries such as Brazil, China, the United States, and Mexico (USDA Foreign Agricultural Service, 2021) [9].

Maize is a crop rich in nutritional content, characterized by its high calorie count. This nutritional aspect is crucial for maintaining good health and sustaining daily metabolic functions (Bressani *et al*., 2002) [1]. Furthermore, maize is recognized as a valuable source of essential vitamins, including Vitamin A, B, and E, as well as an array of minerals (Yadav and Choudhary, 2017) [10]. It comprises proteins, fats, and carbohydrates, making it a well-rounded food source. The presence of ample dietary fiber in maize is instrumental in preventing and alleviating digestive disorders, such as piles, constipation, and colorectal cancer (Dwivedi *et al*., 2019) [2]. Additionally, maize contains antioxidants, which serve as anti-carcinogenic agents and contribute to addressing mental health conditions, including Alzheimer's disease.

Given the nutritional significance of maize, there exists a compelling need to expand its production. However, the scope for increasing cultivated land under maize production is limited, as unused land is dwindling, and available land may be of marginal quality or unsuitable for maize cultivation. Hence, the focus shifts towards enhancing maize yields on the existing cultivated land, which is crucial for meeting the escalating demand for maize (Sharma *et al*., 2018) [7]. Achieving this objective necessitates the implementation of various remedial measures. Augmented productivity forms a pivotal facet of a thriving agricultural sector, and this entails the adoption of improved post-harvest management practices (Ministry of Agriculture and Farmers Welfare, Government of India, 2021) [9]. Effective handling and processing are indispensable to ensure that a substantial quantity of high-quality maize products reaches consumers.

Regrettably, even in scenarios where crop yields are high, producers often experience income losses due to inadequate post-harvest management practices (FAO, 2015) [3].

In light of the aforementioned considerations, this research endeavors to investigate the constraints responsible for the existing technological gap in maize cultivation within the Nagri block of Dhamtari district, Chhattisgarh. This inquiry aims to shed light on the challenges and barriers hindering the adoption of modern agricultural technologies and practices among maize farmers, and seeks to offer insights into potential strategies for bridging this technological divide, thereby enhancing maize production and the well-being of the farming community

Materials and Methodology

The research was carried out in the Nagri block of the Dhamtari district, situated within the Chhattisgarh state, India. The Dhamtari district encompasses four distinct developmental blocks, namely Dhamtari, Kurud, Nagri, and Magarlod. It is geographically bordered by Raipur district to the North, Dhamtari district and Bastar to the South, parts of the Orissa state to the East, and Durg and Dhamtari districts to the West. The study primarily involves the analysis and interpretation of data collected from a sample of 120 maize growers in the region, focusing on the technological gap in maize production. Data collection was conducted using a pre-tested structured interview schedule. The analysis of the collected data involved the calculation of percentages, mean values, and the application of rank order methods to draw meaningful insights and conclusions.

Results and Discussions

Through a comprehensive review of research reports and findings published in research journals, it becomes evident that the farming practices employed by agricultural practitioners differ to some extent from the guidelines and recommendations put forth by scientific experts for achieving optimal maize production. While agricultural universities and research institutes in India have diligently generated substantial research on maize production technology, a notable disparity exists in the extent to which this technology is adopted by the intended beneficiaries. This persistent gap reflects the difference between the recommended technologies and their actual adoption by the end-users of this agricultural technology.

Factors responsible for existing technological gap in maize cultivation

The data pertaining to the constraints in the technological gap within maize production, as perceived by maize growers, is detailed in Table 1. The data reveals that a significant majority of maize growers face several constraints. These include a lack of laborers (89.17%), insufficient knowledge about insects and diseases and their control measures (87.50%), limited awareness of recommended fertilizer dosages (85.83%), a scarcity of appropriate technology (84.17%), higher labor charges (78.33%), elevated costs of inputs such as seeds, fertilizers, and chemicals (77.50%), a dearth of training programs on maize production technology (73.33%), inadequate knowledge about chemicals and their recommended dosages (72.50%), infrequent contact with Rural Agricultural Extension Officers (RAEOs) in villages (61.67%), a lack of financial resources to purchase agricultural inputs (59.17%), the absence of timely technological information (58.33%), high interest rates on loans (55.83%), the absence of on-farm demonstrations (54.17%), delays in obtaining seeds, fertilizers, and chemicals (50.00%), limited awareness of improved maize varieties (49.17%), a shortage of agricultural literature (45.00%), a lack of a consistent and accessible market (44.17%), inadequate knowledge about seed treatment (42.50%), and a lack of awareness regarding actual market prices (36.67%). These findings align with those of Patel (2007) [5] and Kumar *et al*. (2008) [4].

The average technological gap in various components of maize production technology among maize producers is summarized in Table 1. Notably, the average technological gap varies across different components of maize production technology. This observation is consistent with the findings of Singh (2007) [8], Patel (2007) [5], Kumar *et al*. (2008) [4], and Patel *et al*. (2011) [6].

Table 1: Factors Responsible for Existing Technological gap in Maize Cultivation

N=120

S. No.	Constraints Statements	Frequency	Percentage	Rank
1.	Lack of knowledge of improved varieties.	59	49.17	XV
2.	Lack of knowledge about seed treatment.	51	42.50	XVIII
3.	Lack of knowledge about insects and diseases and their control measures.	105	87.50	II
4.	Lack of knowledge about recommended doses of fertilizers.	103	85.83	III
5.	Lack of knowledge about chemicals and their recommended dozes.	87	72.50	VIII
6.	Lack of appropriate technology.	101	84.17	IV
7.	Lack of knowledge of actual market prize.	44	36.67	XIX
8.	Lack of appropriate and regular market.	53	44.17	XVII
9.	Non-availability of agricultural literature.	54	45.00	XVI
10.	Non-availability of seeds, fertilizers and chemicals at the proper time.	60	50.00	XIV
11.	Lack of demonstration on farmer's field.	65	54.17	XIII
12.	Higher rate of interest on loan.	67	55.83	XII
13.	Non-availability of technological information.	70	58.33	XI
14.	Lack of money to purchase agricultural inputs.	71	59.17	X
15.	Lack of regular contact of RAEOs in villages.	74	61.67	IX
16.	Lack of training programmes on maize production technology.	88	73.33	VII
17.	High cost of inputs like seeds, fertilizers, chemicals etc.	93	77.50	VI
18.	Higher charges of laborers.	94	78.33	V
19.	Lack of laborers	107	89.17	I

Summery and Conclusions

The findings underscore a predominant challenge in maize cultivation, where a significant proportion of maize growers grapple with the technology gap primarily due to a lack of adequate knowledge. To bridge this gap and empower farmers, a set of strategic measures can be implemented. Firstly, there is a crucial need to disseminate technical knowledge about new agricultural technologies to farmers, ensuring they are well-informed and capable of adopting innovative practices. Furthermore, it is essential to facilitate the effective communication of the benefits of government schemes and support programs directly to farmers, enabling them to leverage these resources optimally. Additionally, fostering regular interactions through periodic meetings with Rural Agricultural Extension Officers (RAEOs) and subject matter specialists can offer farmers a valuable platform for knowledge exchange and support. Streamlining the loaning process to make it more accessible to farmers is pivotal, as it can alleviate financial constraints. Organizing training programs through Krishi Vigyan Kendras (KVKs) and conducting on-farm demonstrations in collaboration with the agriculture department are instrumental in building farmers' capacity and confidence in embracing modern maize production techniques. By implementing these measures, we can not only address the current technology gap but also empower maize growers to improve their crop yields and livelihoods, contributing to the overall development of the agricultural sector.

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