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BALANCING ACT: INSIGHTS INTO TELANGANA FARMERS' PERSPECTIVES ON INTENSIVE VS. SUSTAINABLE AGRICULTURE

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ABSTRACT

High-input agriculture presents several drawbacks that can adversely affect both environmental sustainability and human health. A primary concern is soil degradation, which results from the excessive use of chemical fertilizers and pesticides. These substances can deplete soil nutrients, impair crop growth, and ultimately render the land barren and unproductive. This study, therefore, aims to explore the perceptions and practices of farmers in the Kumuram Bheem Asifabad district of Telangana State, India. The research involved a sample of 382 farmers across six mandals within this district. A stratified random sampling method was utilized within a survey-descriptive research framework. Data collection incorporated a mixed-method approach, combining observational techniques, interviews with farmers, and a semi-structured interview schedule. Data analysis employed frequency distributions, percentages, and Chi-Square tests to interpret the results. The study reveals that farmers in the Backward Class (BC) social category are preponderantly represented in terms of land size and agricultural holdings, despite the region being a scheduled tribe agency area. The majority of farmers (53%) have approximately 21 years of experience in intensive farming. Furthermore, 92% of the farmers cultivate their own land. Land ownership patterns show that 42% of farmers own between 4 and 6 acres, while 30% possess between 3 and 6 acres. There is a notable correlation between land ownership—whether outright or under tenancy—and agricultural output profitability. The findings highlight the prevalence of high-input agriculture practices and their implications for soil health and farmer livelihoods in Kumuram Bheem Asifabad district. Effective strategies are needed to promote sustainable agricultural practices and mitigate the adverse effects of chemical-intensive farming on both environmental sustainability and farmer income.

Keywords: High-input agriculture, Soil Degradation, Organic and conservative farming, Agricultural practices

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Agriculture has long been a crucial livelihood source in India, with approximately 58% of the population relying on it for their sustenance (Azhagiri, 2019). According to data from the Indian Brand Equity Foundation (IBEF), the agriculture and allied sectors contributed ₹19.48 lakh crore (US $276.37 billion) to the Gross Value Added (GVA) for the fiscal year 2020 (Sarkar *et al.*, 2022). India ranks second globally in the production of wheat and rice. Despite its significant position in global agricultural statistics, the sector faces critical challenges, including climate change and the degradation of soil and natural resources (Clay, 2004; de Fraiture *et al.*, 2008; Mahajan *et al.*, 2017).

The Green Revolution significantly transformed Indian agricultural output and fundamentally altered the structure of Agro-Productive Economics (APE) (Ray and Ghose, 2014). As a result, agriculture now accounts for approximately one-fourth of all greenhouse gas (GHG) emissions, adversely affecting crop patterns (Nemecek *et al.*, 2016). While elevated levels of atmospheric carbon dioxide (CO_2) can enhance plant photosynthesis and potentially increase agricultural yields, these benefits are primarily limited to plant growth and do not address the broader environmental impacts (Bennetzen *et al.*, 2016; Tapia Granados and Carpintero, 2013).

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Standpoint on Intensive Agriculture Dynamics (IAD)

In India, agriculture serves as the primary income source for the vast majority of its population and is a critical component of the country's primary industries (Pillai and Sivathanu, 2020). During the mid-1960s, the Indian agricultural sector underwent a significant transformation from traditional practices to the High Yielding Agriculture Model (HYAM) as part of the five-year plans aimed at addressing food scarcity (Mathur *et al.*, 2006). This modern approach focused on expanding agricultural land use and incorporating advanced technologies, including the application of chemical fertilizers and pesticides (Kaur *et al.*, 2021). However, the excessive use of agrochemical fertilizers has led to soil degradation and directly contributed to climate change (Prashar and Shah, 2016). The introduction of

High Yielding Varieties' Seeds (HYVS) and specialized irrigation techniques significantly enhanced both the quantity and quality of agricultural production, ultimately achieving national self-sufficiency (Deb *et al.*, 2009). Nevertheless, the reliance on chemical inputs has also led to various environmental issues, including climate change, deforestation, irrigation challenges, greenhouse gas emissions, and soil degradation (Gupta, 2019; Hameed *et al.*, 2014). Additionally, the overuse of pesticides and chemicals poses risks to groundwater systems and adversely affects soil quality, further compromising environmental sustainability (Agrawal *et al.*, 2010).

To mitigate pollution and conserve resources for future generations, organic farming has been emphasized as a key element of sustainable development (Pasupuleti *et al.*, 2022). A decline in organic carbon (OC) levels in topsoil over time can adversely affect crop yields. To ensure optimal productivity, it is crucial to maintain a minimum of 12 to 18% organic content in the topsoil (Peón *et al.*, 2017). The extensive use of pesticides and other chemicals can deplete soil nutrients and lead to water pollution through soil erosion (van Beusekom, 2018). This phenomenon, known as eutrophication, occurs when water bodies become enriched with dissolved nutrients, primarily phosphates and nitrates, resulting in excessive growth of aquatic plants and algae (Sinha *et al.*, 2017). Eutrophication can have detrimental effects on ecosystems, including reduced oxygen levels, shifts in species composition, and increased frequency of harmful algal blooms (Khan and Mohammad, 2014). Human activities such as agricultural runoff, sewage discharge, and urbanization are major contributors to eutrophication. Therefore, implementing appropriate soil management practices is essential for enhancing soil organic matter, including carbon and other nutrients, and controlling nutrient movement through erosion, whether caused by natural or anthropogenic processes (Scotti *et al.*, 2015; Ekholm and Lehtoranta, 2012).

The sensitivity of ecosystems to high-input agriculture can be managed if appropriate strategies and plans are effectively implemented. However, several indicators suggest that high-input agriculture may significantly adversely affect both the environment and human health (Pagiola, 1995). Farmers have reported experiencing land degradation as a consequence of these practices, which has led to reduced crop yields over time. In response, there has been a tendency among farmers to use excessive pesticides to boost production. Unfortunately, this approach often exacerbates the problem, leading to further environmental and health issues. Therefore, adopting conservative farming practices is essential for achieving sustainability and mitigating the negative impacts of high-input agriculture (Touré *et al.*, 2020).

Analysis of Climate Change and Environment.

Numerous studies and policies have explored various hypotheses regarding climate change and environmentally friendly practices. However, in practice, high-input agriculture has prioritized increasing output per acre through the use of highly effective synthetic fertilizers and chemicals. This approach focuses on achieving immediate crop yields to meet farmers' expectations and market demands, driven by economic incentives and the need to feed a growing population (Ali & Gupta, 2012; Glover *et al.*, 2007). Consequently, the pressure to boost crop production is indirectly linked to rising population demands. On the other hand, current agricultural policies tend to address these concerns through approaches that often favour high-input methods over conservation practices. This trend is unlikely to promote environmental sustainability or stabilize climate change effectively. Agricultural policies should instead emphasize conservative practices tailored to the needs of diverse regions. In particular, preserving intact forest areas is crucial, as they are threatened by agricultural expansion both now and in the future (Lele and Goswami, 2020). Expanding and implementing specific sustainable measures in these areas could benefit the environment and help stabilize climate change (Ramankutty and Rhemtulla, 2012). Understanding the impact of human population growth on land use requires precise geographical and physical data, which remains insufficient (Meyer and Turner, 1992).

Factors Affecting High-Input Agriculture Adoption

High-input agricultural practices have gained prominence among farmers in the study region for several compelling reasons, primarily driven by economic considerations and operational efficiency. The adoption of synthetic chemicals and modern machinery is increasingly favoured as these methods offer enhanced crop production capabilities.

A crucial factor influencing this shift is the escalation in labour costs and the growing scarcity of available labour. The significant rise in labour charges has rendered manual labour less economically viable compared to the use of synthetic chemicals. Additionally, the limited availability of labour further incentivizes farmers to embrace high-input practices. Mechanization, by reducing reliance on human labour, facilitates more efficient agricultural operations.

Efficiency in weed management is another pivotal consideration. Traditionally, manual weed removal for one acre of land requires 2 to 3 days of labour, incurring

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costs of approximately 1,000 to 1,500 rupees per acre. Herbicides, however, present a more efficient alternative by substantially reducing both time and labour costs associated with weed control. This efficiency allows farmers to allocate their resources more effectively.

Moreover, there has been a notable shift away from traditional livestock rearing practices, with many farmers now depending exclusively on machinery for land preparation. The recognition of time-saving benefits during tilling and harvesting has led to a prioritization of mechanization over traditional manual labour. Thus, the adoption of high-input agricultural practices is influenced by a combination of economic factors, labour dynamics, and the imperative for efficient weed management.

This paper aims to examine farmers' perceptions of high-input agriculture. Although farmers are generally skilled and adhere to established practices, recent shifts in agricultural methodologies have had significant environmental and climatic impacts due to the excessive use of synthetic chemicals (Gomiero *et al.*, 2011). In the study region, farmers traditionally cultivate cotton in dry lands and paddy in wet lands, with a heavy reliance on synthetic fertilizers to maximize crop yields. Historically, manual labour and traditional tools were used for soil preparation and weed control. However, the recent trend towards mechanization and the adoption of synthetic chemicals, such as herbicides, has become predominant in weed management (Mesnage *et al.*, 2021). These changes, while aimed at increasing efficiency and productivity, have led to unintended consequences. Excessive tillage disrupts the natural and biological properties of the soil (Busari *et al.*, 2015), and overuse of herbicides can negatively impact beneficial soil microorganisms (Meena *et al.*, 2020). Despite these challenges, effective crop production can still be achieved through the careful and judicious use of mechanical tools.

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To address these issues, it is essential for farmers to receive comprehensive training and guidance from qualified authorities. Implementing effective strategies is crucial to mitigating the adverse impacts of high-input agriculture on ecosystem sensitivity (Adedibu, 2023). Evidence suggests that high-input agricultural practices may have detrimental effects on both ecosystems and human health (Alengebawy *et al.*, 2021), highlighting the need to consider these impacts when developing policies.

The study further emphasizes the importance of facilitating knowledge exchange among practitioners, policymakers, and other stakeholders. Farmers should be provided with training focused on sustainable practices, including techniques for minimizing fertilizer use and conserving soil and water resources (Pretty, 2007). Incorporating farmers' perspectives into policy decisions is vital for fostering sustainable agricultural practices and ensuring long-term environmental and health benefits.

MATERIALS AND METHODS

The current study aims to explore farmers' perceptions and practices concerning high-input agriculture and to assess their knowledge regarding the use of chemical fertilizers, soil and water conservation, and effective farmland management techniques. Additionally, the study provides a detailed examination of farmers' perspectives on the benefits and drawbacks of intensive agricultural practices. To achieve these objectives, the research employed a survey-descriptive design. The focus was on rural villages within the Kumuram Bheem Asifabad district of Telangana State, India. Specifically, the study encompassed six of the district's fifteen *mandals*: Asifabad, Bejjur, Chinthala Manepalli, Kaghaznagar, Kowthala, and Rebenna. A stratified random sampling technique was used to create a representative sample, resulting in the selection of 382 farmers. These participants were registered under the Telangana State agriculture financial benefits program, known as the '*Rythu Bandhu Scheme*' (RBS), which provides financial support to registered farmers in the state.

Data collection involved a mixed-method approach. Qualitative data were gathered through direct observation and semi-structured interviews with farmers. The interview schedule was designed to delve into farmers' perceptions and practices related to high-input agriculture. The insights gained were meticulously recorded and entered into Microsoft Excel for initial organization.

For statistical analysis, the coded data were exported to IBM-SPSS. Frequencies, percentages, and Chi-Square tests were conducted to analyze the data, providing a comprehensive examination of the factors influencing high-input agricultural practices in the study region.

RESULTS AND DISCUSSION

The study examines four major social categories, focusing on groups of individuals with shared characteristics such as age, gender, ethnicity, or socioeconomic status. Specifically, the research targets six *mandals* within the Kumuram Bheem Asifabad district. The participant sample comprises 382 farmers distributed across these categories: 29.8% (114) from the Backward Class (BC), 29.8% (114) from the Scheduled Tribes (ST), 20.2% (77) from the General Category (GC), and 20.2% (77) from the Scheduled Caste (SC) (Table 1). The Kumuram Bheem Asifabad district is characterized by a higher prevalence of

Backward Classes and Scheduled Tribes and has been designated as a tribal agency area. Notably, farmers from the Backward Class (BC) category are distinguished by significant landholdings and substantial agricultural operations.

Table 1. Frequency distribution of community status of the participating farmers

Community Status		N	Per cent
Social Status	General Category (others)	77	20.2
	Backwards Caste	114	29.8
	Schedule Caste	77	20.2
	Schedule Tribes	114	29.8
	Total	382	100.0

Regarding age distribution, 62% of the surveyed farmers fall within the 41-to-50-year age range. This is followed by 16% of respondents who are 51 years or older, 15% in the 31-to-40-year age range, and 7% in the 21-to-30-year age range (Table 2). In terms of agricultural experience, 53% of the farmers have the most experience with high-input agriculture, averaging 21 years of practice. This is followed by 22% of farmers who have between 11 and 20 years of experience. A smaller proportion of farmers, 13%, have less than 5 years of experience, while 12% have between 6 and 10 years of experience in the field.

Table 2. Frequency distribution of age and experience of the farmers

Age (Years)	N	Per cent	Experience (Years)	N	Per cent
21 - 30	27	7	<5	50	13
31 - 40	57	15	6 - 10	46	12
41 - 50	237	62	11 - 21	84	22
> 51	61	16	>21	202	53
Total	382	100.0	Total	382	100.0

According to the survey findings, a significant majority of farmers, specifically 92%, own their own farmland, while only 8% are involved in sharecropping arrangements (Table 3). The distribution of owned farmland among farmers shows that 42% cultivate between 4 and 6 acres, with another 30% owning between 3 and 4 acres. Additionally, 20% of farmers possess between 7 and 10 acres, and only 8% own more than 11 acres of land. In contrast, among sharecroppers, 57% lease less than 3 acres of farmland, reflecting the prevalence of smaller land holdings in these arrangements. About 33% of sharecroppers lease land ranging from 4 to 6 acres, while a small minority, 2%, lease between 7 and 10 acres. Interestingly, 8% of sharecroppers lease more than 11 acres of land. Farmers generally cited cost-effectiveness as a key factor influencing their leasing decisions, noting that leasing larger plots of land tended to be more expensive per acre compared to their expected production yields.

Table 3. Frequency distribution of type of farmer and land-owning

Farmer Type	N	Per cent	Land in acres		N	Per cent
Own Land	351	92	*Wet*	Dry	115	30
			3	6		
Shared Cropper	31	8	4	6	160	42
			7	10	76	20
	0	11	31	8		
		Total- 382		100		

Regarding the annual income of sharecroppers, the Chi-Square test reveals a significant association between landholding patterns and income generation. The Chi-Square value is 7.080 ($p \le 0.000$, df: 3), indicating a significant relationship. Similar results were observed in a subsequent Chi-Square test for the status of landholding and income among sharecroppers, which yielded $\chi^2 = 37.712$ ($p \le 0.05$, df: 9). Furthermore, it was found that the profit margins for sharecroppers are generally higher compared to those for farmers who own their land. This suggests a strong association between the type of landholding—whether owned or leased—and the profitability of agricultural production.

Data on high-input agriculture—defined as practices that increase profitability without compromising soil fertility—reveal varied perceptions among farmers. Approximately 40% of farmers believe that while high-input methods initially boost productivity, the land eventually loses its natural fertility. While, 38% assert that high-input agriculture enhances productivity without negatively impacting soil fertility (Table 4). Only 2% of farmers maintain that high-input methods improve both productivity and soil fertility. In evaluating farmers' understanding of high-input agriculture, 49% recognized it as involving the excessive use of chemicals, machinery, and labour. On the other hand, 24% were unfamiliar with the concept. Upon receiving further explanation, many of these farmers realized that some neighbors had been employing high-input practices for years and were motivated to adopt similar methods to enhance productivity. Additionally, 13% of farmers characterized high-input agriculture solely as involving excessive labor input. Only 10% of farmers described high-input agriculture as involving the excessive use of chemical fertilizers, while at least 4% acknowledged the significant use of machinery in agricultural practices.

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Table 4. Perspective and knowledge of farmers on high input and sustainable practices

Statement	N	%
Yes, productivity increases, but soil fertility loses by time	153	40
Yes, productivity increases without compromising soil fertility	7	2
Some increase in productivity, but a significant loss of soil fertility	46	12
Intensive farming may improve production, but it does not enhance soil fertility	145	38%
Intensive farming improves production and increases soil fertility rates	30	8%
Chemical, Machinery and Labour	187	49%
Excessive Labour Input	50	13%
Excessive Machinery	15	4%
Using only chemicals	38	10%
Chemical fertilizers do not result in high yields	191	50%
Chemical fertilizers result in high yields.	160	42%
Undecided	30	8%
High input-such as chemicals, labour, and machinery-increases production. (Agree)	218	57%
High input-such as chemicals, labour, and machinery-increases production. (Disagree)	57	15%
Unsure about high input	107	28%
Green manure increase production	206	54%
Poultry manure increase production	95	25%
Cattle manure increases production	80	21%
Lower cost and higher profits	164	43%
High-input agriculture yields maximum production.	122	32%
Neighbours' motivation	42	11%
Willing to practice non-chemical, if supported by Govt	309	81%
Not Interested in sustainable practice	72	19%
For sustainable practice need experts support	283	74%

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Regarding farmers' experiences with high-input agriculture, 50% of respondents contended that the exclusive use of chemical fertilizers would not lead to high yields. In contrast, 42% believed that chemical fertilizers alone would result in a substantial harvest, while the remaining 8% were uncertain. Additionally, there is a prevalent belief among farmers that combining chemical fertilizers with organic amendments—such as green manure, poultry manure, and cattle manure—can enhance soil fertility and productivity. Specifically, 54% of farmers utilize a combination of chemical fertilizers and green manure, 25% use chemical fertilizers in conjunction with poultry manure, and 21% combine chemical fertilizers with cattle manure. This approach is thought to preserve soil fertility while boosting yield per unit of input.

Alongside the economic aspects of high-input agriculture, 57% of farmers agreed that such practices enhance economic stability, whereas 15% disagreed. However, 28% of farmers remain uncertain about which farming methods most effectively contribute to economic stability. In terms of motivation, 43% of farmers reported that high-input agriculture is less costly and yields greater profits. In contrast, 32% believed that high-input agriculture provides higher production levels compared to organic farming practices. The remaining 17% of farmers maintained a neutral stance on the issue.

A significant majority of farmers, 81%, express a willingness to adopt agriculture practices that rely exclusively on natural manures and avoid chemical fertilizers. In contrast, 11% of farmers indicated that their interest in such practices would be contingent upon observing their neighbors' successful outcomes, while 8% remain disinterested in these methods. This increasing interest in non-chemical fertilizers, such as natural manures, and in practices that combine minimal chemical use with substantial natural manure, reflects a growing trend in rural areas. However, among the 11% who are hesitant and the 8% who are uninterested, several concerns are evident. These farmers argue that without chemical inputs, achieving high production levels is challenging, and they perceive chemical fertilizers as less costly compared to natural manures. Additionally, there is a strong belief among these

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farmers that organic farming does not yield sufficient profits.

Finally, 74% of farmers indicated that they would need external assistance from organizations experienced in sustainable, organic, or other conservative farming practices to effectively implement these methods. On the other hand, 19% of farmers expressed a lack of interest in seeking outside help, and 7% remained neutral or had no opinion on the need for support or training.

Most farmers possess substantial experience with high-input agriculture; however, their awareness of its impact, particularly concerning soil fertility degradation and climate change, remains incomplete (Tesfahunegn *et al.*, 2016). Typically, farmers are motivated to adopt new practices by observing the success of their neighbours (Noy and Jabbour, 2020) and may choose to implement similar methods if they find them profitable or based on their personal experiences. To address this gap in knowledge and practice, it is crucial to provide farmers with comprehensive expert training on sustainable agricultural practices (Šūmane *et al.*, 2018). This training should focus on reducing the reliance on synthetic chemicals and increasing the use of natural or organic fertilizers. Adequate training will empower farmers to effectively adopt and implement sustainable farming techniques, thereby enhancing their ability to manage soil health and adapt to changing climatic conditions.

The central focus of this study is to emphasize the necessity for farmers to gain a thorough understanding of the benefits and limitations associated with intensive farming, particularly in relation to soil degradation. Policymakers should facilitate this transition by promoting organic farming practices. Organic farming not only safeguards environmental health but also enhances consumer well-being and contributes positively to overall health and ecological sustainability (Siddique *et al*., 2014). Although organic farming might not be immediately profitable, it has the potential to yield greater long-term profitability while preserving soil fertility. Furthermore, conservation farming presents an alternative approach that helps protect soil from degradation. To implement effective conservation farming, farmers must employ suitable soil and pest management techniques tailored to regional and local conditions (Hashemi *et al.*, 2009). This may include adopting a balanced use of chemical and natural fertilizers to optimize production while conserving natural resources. By integrating these practices, farmers can achieve sustainable agricultural outcomes that benefit both the environment and their economic stability.

Farmers need to be fully aware of both the advantages and drawbacks of high-input agriculture, especially its impact on soil health. Policymakers should support the transition towards more natural farming methods, such as organic farming (Youngberg and DeMuth, 2013). Organic farming not only benefits the environment but also enhances food quality and supports better health. While it may not offer immediate financial returns, it can be more profitable in the long run while maintaining soil health. An alternative approach is conservation farming, which focuses on protecting soil from degradation (Doaei *et al.*, 2020). To implement this effectively, farmers should adopt soil and pest management practices suited to their specific regional conditions, which helps conserve natural resources. Additionally, integrating a combination of chemical and natural fertilizers can optimize productivity and improve crop yields while still supporting sustainable farming practices.

The government is instrumental in advancing sustainable agricultural practices that harmonize ecological health with economic empowerment in farming communities (Yurui *et al.*, 2021). To accomplish this, several critical strategies should be evaluated and implemented.

First and foremost, the implementation of knowledge-based practices is essential. It is crucial to equip farmers with an understanding of how excessive use of chemical inputs affects soil fertility and environmental health (Duru *et al.*, 2015). Awareness campaigns and targeted training programs can play a significant role in educating farmers about sustainable agricultural methods and the long-term repercussions of chemical-intensive farming. Secondly, a transition from chemical to natural inputs is imperative. Instead of subsidizing chemical fertilizers, the government should focus on supporting the use of green manure and other organic materials. Promoting practices such as the application of livestock manure can enhance soil health and diminish reliance on synthetic chemicals (Rahman and Zhang, 2018). Thirdly, it is crucial to minimize the use of chemicals in agriculture (Mitra *et al.*, 2021). Farmers should be encouraged to actively reduce their reliance on excessive chemical inputs by adopting natural alternatives, such as compost and organic matter. These organic and natural farming practices not only promote plant growth but also help regulate soil temperature (Walia and Kler, 2005). Furthermore, they provide a balanced approach to soil nutrition while mitigating environmental harm (Selim, 2020).

Efficient management of crop residue and organic waste is crucial for enhancing agricultural productivity (Nwite, 2017). Proper handling of crop residues is particularly important, as these residues play a vital role in reducing soil erosion caused by wind and water and increasing the organic carbon content in the soil (Ningthoujam *et al.*, 2019). Farmers should adopt practices that avoid the burning or wastage of these residues, as they contribute significantly to soil organic matter and improve soil structure (Horrigan *et al.*, 2002). Furthermore, integrating conservation farming principles is vital. Techniques such as intercropping, crop rotation, minimum tillage, and cover cropping play a crucial role in protecting soil from erosion, enhancing biodiversity, and improving overall sustainability (Brar *et al.*, 2015). Lastly, effective collaboration and robust policy implementation are essential. Government agencies, NGOs, and various stakeholders must work in concert to develop and enforce policies that empower farmers. Active participation by local bodies is crucial in shaping these initiatives to ensure their relevance and effectiveness. By embracing these principles, we can advance protective and sustainable agricultural practices that benefit both current and future generations.

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CONCLUSION

In conclusion, India's longstanding prominence in agriculture highlights its vital role, especially for rural communities whose livelihoods are deeply intertwined with this sector. Nevertheless, the sector is confronted with significant challenges arising from climate change and the ongoing depletion of natural resources. While intensive farming practices have initially increased productivity, they have also intensified problems such as greenhouse gas emissions, soil degradation, and excessive fertilizer use, thereby jeopardizing the sustainability of agricultural practices and the overall health of the environment. To address these challenges, India must transition toward more sustainable agricultural practices, support innovative farming techniques, and implement effective policies. Emphasizing conservation, reducing dependence on chemical inputs, and fostering collaboration among stakeholders are essential steps to protect India's agricultural heritage and ensure its resilience for future generations.

This study, conducted in the Kumuram Bheem Asifabad district, explored farmers' experiences with high-input agriculture and revealed significant insights. For instance, 40% of farmers observed that high-input methods increase productivity but gradually reduce soil fertility, while 27% believed that these methods enhance production without affecting soil quality. The study also highlighted that 81% of farmers recognize the need for professional training to better understand and implement sustainable and organic farming practices. Policymakers and relevant institutions should focus on understanding how farmers utilize agricultural resources and incorporate their perspectives into policy development. Providing farmers with adequate training on sustainable practices and the impacts of excessive high-input agriculture will enable them to achieve their productivity goals while preserving environmental health.

Authors' contribution

Conceptualization of research work and designing of experiments (SK, RSB); Execution of field/lab experiments and data collection (SK, RSB); Analysis of data and interpretation (SK, RSB); Preparation of manuscript (SK, RSB)

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