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To examine the usage patterns of major agricultural inputs by farmers in Moinabad Mandal of Ranga Reddy district, Telangana

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Abstract
Agricultural input management plays a crucial role in enhancing farm productivity and ensuring timely access to quality seeds, fertilisers, and crop protection products. This study focuses on analysing cropping patterns, input usage behaviour, and dealer-level challenges in Moinabad Mandal of Ranga Reddy District, Telangana, with the objective of designing an effective inventory management framework for organised agri-input retailing. Primary data were collected from 80 farmers and 5 agricultural input dealers using structured interviews, complemented by secondary sources. Descriptive statistics and one-way ANOVA were used to analyse variations in input usage across landholding categories. The findings reveal that horticultural crops dominate the region, input usage is largely based on farmer experience, and dealers face supply chain irregularities, overstocking/understocking issues, and credit-related constraints. The study recommends demand-driven procurement, supplier diversification, technology integration, and farmer engagement to improve inventory efficiency, reduce wastage, and strengthen supply chain resilience.

Keywords: Cropping patterns, input usage, inventory management, supply chain, agricultural inputs, landholding size, seasonal demand, climatic variability, demand forecasting, supplier diversification, quality control, agri-input retailing

Introduction

Agricultural input management forms the backbone of modern farming systems, directly influencing crop productivity, profitability, and sustainability. In regions like Moinabad Mandal of Ranga Reddy District, Telangana, timely access to quality seeds, fertilisers, pesticides, and herbicides is critical for sustaining agricultural operations, particularly in high-value horticulture and floriculture crops. The agricultural landscape of the area is shaped by a combination of agro-climatic conditions, soil suitability, water availability, and market access, which together determine cropping patterns and input requirements.

Despite the growth of organised retailing in agriculture, many farmers in the region continue to face challenges such as irregular supply of inputs, fluctuating prices, limited access to expert guidance, and inconsistent product quality. On the other hand, agricultural input dealers often struggle with overstocking slow-moving products, understocking high-demand items, dependence on a limited number of suppliers, and cash flow issues arising from credit-based sales. These challenges disrupt the efficiency of the supply chain, affecting both farmer productivity and dealer profitability.

This article presents a comprehensive analysis of cropping patterns, input usage behaviour, and dealer-level challenges in Moinabad Mandal of Ranga Reddy District, Telangana, with the objective of formulating an effective inventory management framework for organised Agri-input retailing. It examines seasonal and landholding-based variations in input demand, assesses supply chain gaps, and evaluates the operational constraints faced by dealers. The study also proposes strategic interventions such as demand-driven procurement, supplier diversification, technology integration, and farmer engagement to ensure timely availability of quality inputs, reduce wastage, and strengthen supply chain resilience. These insights aim to support both farmers and organised Agri-input retailers in achieving higher productivity, profitability, and long-term sustainability.

Materials and Methods

This study was conducted in Moinabad Mandal of Ranga Reddy District, Telangana, an area known for its high concentration of vegetable and flower cultivation. A multistage purposive sampling technique was employed, wherein Moinabad Mandal was first chosen due to its

proximity to Hyderabad, diverse cropping systems, and high agricultural activity. In the second stage, eight villages within a 15 km radius were selected based on cropping intensity, input usage patterns, and accessibility. In the final stage, 80 farmers representing marginal, small, medium, and large landholdings were randomly selected, along with 5 agricultural input dealers to capture supply-side perspectives. Primary data were collected through structured interview schedules covering cropping patterns, input usage behaviour, procurement sources, seasonal demand, and challenges faced, while dealer-level data included supplier dominance, stock availability, and operational issues. Secondary data were sourced from official reports of the Department of Agriculture, Government of Telangana, district agricultural records, and published research. Descriptive statistics such as percentages and frequency distributions were used to summarise trends, while one-way ANOVA tested for significant differences in input usage across landholding categories. Field observations and informal discussions were also incorporated to provide qualitative insights into supply chain dynamics and inventory management practices.

Results and Discussion
1.1 Demographic Characteristics of Respondents
a. Gender of respondents
The gender details of the sample farmers were analysed, and the results are shown in table

Table 1: Gender of respondents (n=80)

S.no	Gender	No. of respondents (n=80)	Percentage of respondents (%)
1.	Male	80	100
2.	Female	0	0
	Total	80	100

All 80 respondents from whom the data was collected are male. This indicates that the entire respondent group comprises male farmers, with no female representation.

b. Age of respondents
This table explains the age-wise distribution of the sampled farmers in the study area

Age Group (Years)	No. of Respondents	Percentage (%)
20-30	5	6.25%
30-40	25	31.25%
40-50	35	43.75%
50-60	12	15%
Total	80	100

Key Observations
• **Dominance of Middle-Aged Farmers**
The majority of respondents (43.75%) fall within the 40-50 years age group, followed closely by 31.25% in the 30-40 years group. This indicates that farming in the study area is largely driven by experienced and physically active individuals.

• **Limited Participation of Younger Farmers**
Only 6.25% of the respondents belong to the 20-30 years age group, reflecting a low involvement of youth in

agriculture. This may be due to urban migration, alternative career opportunities, or lower interest in farming.

• **Moderate Share of Older Farmers**
Farmers aged 50-60 years constitute 15% of the sample. This group may rely more on traditional farming practices and be less inclined towards adopting modern agricultural technologies.

• **Implications for Input Usage Patterns**
The dominance of middle-aged farmers suggests a stable and predictable input demand, while the lower share of younger farmers highlights the need for targeted interventions to attract youth into farming. Older farmers may require more advisory support for adopting improved inputs and practices.

c. Farm size of the respondents

Table 2: Farm Size Distribution of Sample Farmers in Moinabad Mandal, Ranga Reddy District

Farm Size Category	No. of Farmers	Percentage (%)
Marginal (<2.5 acres)	14	17.5
Small (2.51 -5 acres)	33	41.25
Medium (5.1 -10 acres)	25	31.25
Large (>10 acres)	8	10
Total	80	100

Key Observations
• **Dominance of Small Farmers**
The largest share of respondents (41.25%) belongs to the small farm category, indicating that small-scale farming is the most common landholding pattern in the study area.

• **Significant Share of Medium Farmers**
Medium farmers constitute 31.25% of the sample, reflecting a considerable segment that may have higher purchasing power and input requirements compared to smaller farmers.

• **Moderate Presence of Marginal Farmers**
Marginal farmers account for 17.5% of respondents, highlighting a segment with limited resources and smaller input purchase volumes.

• **Low Representation of Large Farmers**
Large farmers form only 10% of the sample, showing that extensive landholdings are relatively rare in the region.

• **Implications for Input Usage**
The distribution suggests that input retailers should cater more towards the needs of small and medium farmers while offering bulk purchase options for the smaller segment of large farmers.

1.2. Determinants of Agricultural Input Application Decisions

Table 3: Determinants of Agricultural Input Application Decisions

Decision-Making Factor	Percentage Agreement (%)
Apply Inputs on Expert Advice	43.25%
Decide Inputs Based on Experience	85.50%
Rainfall Impact on Input Decisions	95.25%

Key Observations
- **Climatic Influence Dominates**

A majority of farmers (95.25%) reported that rainfall patterns significantly influence their input application decisions, with uncertain or delayed rains prompting adjustments in timing and quantity to reduce financial risks.

- **High Reliance on Farming Experience**

85.50% of farmers decide on input use based on prior farming experience, relying on personal knowledge of soil health, pest patterns, and crop requirements rather than external recommendations.

- **Limited Impact of Expert Advice**

Only 43.25% of farmers follow expert recommendations when applying inputs, indicating potential gaps in the reach, accessibility, or perceived relevance of advisory services.

- **Implications for Retailers**

Organised Agri-input retailers should design inventory planning and extension services that align with farmers' experiential decision-making patterns while addressing climatic uncertainties to ensure timely availability of inputs.

1.3 Analysis of Input Usage Based on Landholding Size
This section presents the comparison of agricultural input usage patterns among farmers with different landholding sizes in Moinabad mandal, Ranga Reddy.

Table 3: Analysis of Input Usage Based on Landholding Size

Source	Sum of Squares	df	Mean Square	F- Value	P-Value
Land Size	4.077	4	1.019	7.455	0.000036 ***
Residual (Error)	11.075	81	0.137		

*** Significant at p-value < 0.001

Key Observations
- **Statistically Significant Relationship**

The one-way ANOVA results (F = 7.455, p = 0.000036) confirm that landholding size has a significant influence on agricultural input usage patterns among farmers.

- **Rejection of Null Hypothesis**

Since the p-value is well below 0.05, the null hypothesis of no significant difference in input usage across land size categories is rejected.

- **Variation in Input Application**

Larger landholders tend to apply inputs like fertilizers and pesticides more intensively and strategically, while smaller landholders often take a conservative approach due to limited resources.

- **Factors Behind Differences**

The variations are likely due to differences in access to expert advice, financial capacity, risk tolerance, and anticipated returns on investment.

- **Implications for Policy and Extension**

These results underline the need for land-size-specific extension strategies and input supply mechanisms to ensure optimal input use across all categories of farmers.

1.4. Challenges in Input Accessibility and Affordability
The survey results from 80 farmers in the study area indicate that multiple challenges hinder the effective usage of agricultural inputs

Table 4: Challenges in Input Accessibility and Affordability

Challenges in Input Accessibility and Affordability	No. of Respondents	Percentage (%)
Climatic uncertainty	62	77.50
High of Inputs (seeds, fertilizers, pesticides)	50	62.50
Low quality or fake/substandard inputs in the market	48	60.00
Non-availability of inputs at the right time	32	40.00
Other	0	0.00

Key Observations
- **Climatic Uncertainty**

Climatic variability was identified as the most pressing challenge, with 77.50% of farmers reporting its impact. Unpredictable rainfall patterns and extreme weather events in the semi-arid region significantly influence crop planning and the timely application of agricultural inputs.

- **High Cost of Inputs**

About 62.50% of respondents stated that the high cost of agricultural inputs such as seeds, fertilizers, and pesticides limits their purchasing capacity. This issue is more severe among small and marginal farmers, who often adjust application rates or shift to less input-intensive crops to manage costs.

- **Low Quality or Fake/Substandard Inputs**

A total of 60% of farmers reported the prevalence of low-quality or counterfeit agricultural inputs in the market. Such products lead to reduced yields, financial losses, and erosion of trust between farmers and suppliers, underlining the need for strict quality control measures.

- **Non-Availability of Inputs at the Right Time**

Around 40% of respondents highlighted delays in the availability of agricultural inputs during critical crop stages. Such supply chain gaps disrupt sowing schedules, reduce productivity, and force farmers to make last-minute, often less optimal, input choices.

- **Any Other Challenges**

No respondents reported challenges under the "Any other" category, indicating that the above-mentioned issues comprehensively capture the major constraints faced by farmers in input accessibility and affordability.

Conclusion
The analysis of agricultural input usage patterns in Moinabad Mandal, Ranga Reddy District, reveals that farmers' decisions are shaped predominantly by climatic conditions, particularly rainfall variability, and their own farming experience, with expert advice playing a smaller yet notable role. Landholding size significantly influences input application behaviour, with larger farmers tending to adopt more intensive and planned usage compared to smaller

farmers, who remain more cautious due to financial and risk constraints. While the supply of fertilizers is dominated by a few major companies, leading to stable yet vulnerable supply chains, pesticides and seeds are sourced from a wider range of suppliers, creating procurement complexity. Farmers face persistent challenges such as climatic uncertainty, high input costs, prevalence of low-quality or counterfeit products, and untimely availability, all of which impact productivity and profitability. Addressing these issues requires tailored inventory planning, diversified sourcing, quality assurance mechanisms, and targeted advisory services that align with farmers' experiential knowledge while mitigating climatic and market risks.

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