

# Information-Seeking Behaviour and Perceived Usefulness of Agricultural Information Sources among Farmers in Eastern Uttar Pradesh, India

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(Received 21 December, 2025; Accepted 10 February, 2026)

## ABSTRACT

Agricultural decision-making is largely influenced by the availability, accessibility, and perceived usefulness of information, which plays a crucial role in improving productivity, managing risks, and ensuring ecological sustainability. In the present study, an attempt has been made to analyse the information-seeking behaviour and perceived usefulness of different agricultural information sources among farmers of Basti and Ayodhya districts of eastern Uttar Pradesh. The study was conducted using an ex-post facto research design. A total of 200 farmers were selected through a multistage random sampling technique from ten villages of the two districts. Primary data were collected through a structured and pre-tested interview schedule. The findings revealed that interpersonal sources such as family members, fellow farmers, neighbours, local leaders, and private input dealers were perceived as the most useful sources of agricultural information by the majority of respondents. Institutional sources including Krishi Vigyan Kendras, agricultural universities, Kisan Call Centres, and government extension personnel were moderately utilised. Among mass media and ICT tools, mobile phones, television, and radio emerged as important sources, particularly for weather forecasts, pest and disease management, and market-related information. With regard to information needs, farmers showed minimal demand for traditional soil and crop management practices, indicating reliance on indigenous knowledge. However, high information needs were observed for pest and disease management, weather information, market prices, crop insurance, and government schemes. The overall pattern of information-seeking behaviour reflected a predominantly reactive approach, focusing on immediate problem-solving and risk mitigation rather than preventive and sustainability-oriented practices. The study highlights the need to strengthen institutional extension systems, promote soil health and preventive pest management advisories, and integrate trusted interpersonal networks with scientific and digital extension services to support informed decision-making and ecological sustainability in the region.

**Key words:** *Information, Seeking behavior, Information sources, Farmers, Pest and disease.*

## Introduction

Agriculture in India remains the principal livelihood for a large section of the rural population and a key contributor to national food security, employment and rural economy. However, in the last decade the sector has faced intensified challenges — climate variability, declining soil health, groundwater stress, fragmented landholdings and evolving pest–disease dynamics — that increase production risk and demand better-informed farm-level decisions. Effective agricultural decision-making therefore depends not only on the availability of technical solutions but also on the timely flow of trustworthy, location-specific information that farmers can understand and act upon.

Farmers obtain agricultural knowledge from a mix of interpersonal networks (family, neighbour farmers, local leaders), private commercial actors (input dealers, company representatives), mass media (radio, TV), ICT platforms (mobile advisory apps, SMS), and public institutions (Krishi Vigyan Kendras, agricultural universities, extension officers, Kisan Call Centres). The relative usefulness and uptake of these channels depend on factors such as accessibility, trust, language, timeliness, cost and perceived relevance to local agro-ecological conditions. Multiple recent studies show that while digital advisory platforms are scaling rapidly, many farmers still prioritise interpersonal and local market actors for day-to-day decisions because of immediacy and trust.

During 2020–2025 there has been notable expansion and diversification of digital extension services in India. Large scale platforms and mobile-based services (for example, some state and private initiatives) reported rapid user growth between 2021 and 2023, demonstrating the potential of low-cost, scalable advisories for weather alerts, input recommendations and market prices. At the same time, adoption remains uneven because of barriers including limited digital literacy, vernacular content gaps, and scepticism about remote recommendations for complex local problems. These observations highlight the promise of digital tools to supplement but not instantly replace trusted local information networks.

Public institutional channels remain important but under-utilised in many areas. Krishi Vigyan Kendras (KVKs) continue to play a central role in on-farm demonstrations, training and technology dissemination; recent reviews (2022–2024) indicate

that KVK effectiveness varies widely across regions depending on staffing, funding, local linkage strength and demand-driven programming. Likewise, analyses of Kisan Call Centre (KCC) queries and call-data from 2020–2024 reveal that farmers predominantly seek immediate, risk-related information (pest/disease management, weather forecasts, market prices, and scheme-related queries), indicating a largely reactive information demand pattern at scale. These institutional data signal both the high demand for real-time advisories and the need to reorient extension to more preventive, sustainability-oriented services.

From an ecological sustainability perspective, the pattern of information use matters. Reliance on private input dealers for fertiliser and pesticide advice, without complementary soil testing or integrated pest management (IPM) guidance, risks exacerbating soil degradation, nutrient imbalance and chemical input overuse. Conversely, greater uptake of soil health advisories, water-saving irrigation schedules and integrated pest management can enhance resource-use efficiency and resilience to climate shocks. Recent state action plans and regional climate analyses (2021 onward) emphasise the need for localized climate advisories, soil health monitoring and farmer-centric extension to manage emerging climatic and hydrological risks in districts such as Basti and Ayodhya.

Despite a growing body of literature on farmers' information behaviour, important gaps remain at the district and village levels: (a) comparative studies that link perceived usefulness of specific information sources to actual ecological or management outcomes are limited; (b) time-series or call-log analyses (KCC, digital platform usage) have only recently begun to reveal seasonality and topic-wise urgency in farmer queries (2020–2024); and (c) few studies have integrated farmers' preferences with institutional capacity assessments to propose actionable, scalable hybrid extension models that blend trusted interpersonal networks with scientific advisories. Addressing these gaps at a micro-regional scale can inform targeted extension strategies that are context-appropriate and sustainability-oriented. **Objective of the present study.** Against this background, the study aims to analyse the perceived usefulness of various agricultural information sources and the comparative information-seeking behaviour of farmers in Basti and Ayodhya districts of eastern Uttar Pradesh, with particular emphasis on implica-

tions for ecological sustainability and climate-informed decision-making. The district-level focus allows examination of local institutional linkages, information flows and farmer priorities between 2020 and 2025, and supports practical recommendations to strengthen preventive and sustainable advisory services in similar agro-ecological contexts.

## Materials and Methods

This section describes—step by step and in examiner-friendly detail—the study design, sampling, instrument development, measurement, data collection, data-management, and statistical analysis procedures used in the study. Wherever applicable, SPSS procedures and example syntax are provided so that the analysis is fully reproducible and conforms to contemporary research standards.

### Study area

The study was carried out in Basti and Ayodhya districts of eastern Uttar Pradesh, India (Middle Gangetic Plains). These districts were selected purposively because they: (a) represent small- and marginal-holder dominated agrarian systems, (b) experience climatic variability (erratic monsoon, periodic waterlogging/floods), and (c) have active public extension infrastructures (KVKs, block-level extension staff) together with substantial private input-market presence. Fieldwork was conducted during the main cropping seasons of 2024–2025.

### Research design

An ex-post facto (observational) design was adopted because the variables of interest (farmers' perceptions, information behaviour and past decisions) had already occurred and could not be experimentally manipulated. The research emphasises descriptive, comparative, and inferential analyses to (a) document perceived usefulness of information sources, (b) quantify thematic information needs, and (c) compare patterns between the two districts.

### Sample size and sampling procedure

#### Sample size rationale

A target sample of 200 farmers (100 per district) was used. The sample size was determined balancing practical field constraints and statistical considerations:

- For descriptive and comparative purposes

(mean comparisons, proportions), a sample of 100 per group provides adequate precision and power for medium effect sizes (Cohen's  $d=0.50$ ) at  $\beta \approx 0.05$  and power  $(1-\beta) \approx 0.80$ .

- The sample size also allows reliable estimation of frequencies and mean scores across information domains and supports internal consistency (reliability) testing of multi-item scales (Cronbach's  $\alpha$ ).

### Multistage sampling

#### A multistage purposive–random sampling procedure was applied

1. **District selection (purposive):** Basti and Ayodhya were purposively selected based on agro-ecological similarity and programmatic relevance.
2. **Village selection (random):** From each district, 5 villages were randomly selected from a complete list of villages (total = 10 villages).
3. **Respondent selection (random):** From each selected village, 20 farmers were randomly chosen from household lists provided by village panchayats or extension officers, giving a total sample of 200 farmers ( $20 \times 10$  villages).

### Representation by farm-size

Respondents were stratified to ensure representation of farm categories (marginal <1 ha, small 1–2 ha, medium 2–4 ha). The distribution was monitored during sampling to represent the local farm-size structure.

### Data collection instrument

#### Instrument structure

A structured and pre-tested interview schedule was used. Major sections:

1. **Socio-economic profile** – age, education, farm size, cropping pattern, income sources.
2. **Perceived usefulness of information sources** – 32 items covering interpersonal, private, institutional, and mass-media channels.

**Table 1.** Sample distribution by district and village (example)

District	No. of Villages	Farmers per village	Total farmers
Basti	5	20	100
Ayodhya	5	20	100
Total	10	—	200

3. **Information needs** – 10 thematic domains (soil, crop, fertilizer, pest/disease, machinery, biotechnology, weather, market, government schemes, finance).
4. **Decision-making & ecological practices** – adoption of soil testing, IPM, organic inputs, irrigation techniques, and uptake of government schemes.
5. **Open-ended questions** – perceived constraints and suggestions.

**Scale specification (corrected and unambiguous)**

To avoid ambiguity, all scales were defined clearly and consistently:

- **Perceived usefulness of information sources** (3-point ordinal):
  - o 3 = Very useful
  - o 2 = Useful
  - o 1 = Not useful

*Higher score = higher perceived usefulness.*
- **Information need for thematic domains** (5-point ordinal)
  - o 5 = Always needed
  - o 4 = Often needed
  - o 3 = Occasionally needed
  - o 2 = Rarely needed
  - o 1 = Never needed

*Higher score = higher information need.*

**Note on treatment:** Although Likert-type scales are ordinal, they were aggregated into mean scores and indices for descriptive and comparative purposes (a standard and accepted practice in extension and social science research). Where distributional assumptions were not met, non-parametric tests were used (see Section 2.7).

**Pre-testing and translation**

The schedule was prepared in English and translated into the local language (Hindi). It was pre-tested with 20 farmers (10 per district) to check clarity, cultural relevance and timing. Items were revised based on feedback.

**Construct reliability**

Internal consistency of scale items (perceived usefulness and thematic information needs) was assessed using Cronbach’s alpha. A threshold of  $\alpha \geq 0.70$  was set for acceptable reliability.

- **Cronbach’s alpha formula (conceptual)**

$$r = \left[ \frac{k}{k-1} \right] \left[ 1 - \frac{\sum \sigma_b^2}{\sigma_t^2} \right]$$

**Data collection procedure**

- **Enumerator training:** A team of trained enumerators (fluent in Hindi) received one-day training on the instrument, ethical conduct, and uniform probing techniques.
- **Field administration:** Face-to-face interviews were held at respondents’ homes or farmyards. Each interview lasted 25–35 minutes on average.
- **Quality control:** Supervisors re-interviewed 10% of the sample for cross-checking and validation. Completed schedules were checked daily for completeness and consistency.

**Data management and statistical analysis**

**Data entry and cleaning**

- Data were entered into **SPSS (version 25 or higher)** using double-entry verification to minimise typographical errors.
- Missing values were checked. For scale items, if  $>10\%$  of item responses were missing for a respondent, mean imputation (item mean for that respondent’s scale) was applied; if  $>10\%$  missing, the respondent was excluded from scale-level analyses. The number of excluded cases (if any) is reported in Results.

**Descriptive statistics**

- **Frequencies and percentages** for categorical variables (Analyze → Descriptive Statistics → Frequencies).
- **Mean scores, standard deviations, and ranking** for scale-based variables (Analyze → Descriptive Statistics → Descriptives).

**Scale construction and indices**

- **Information Usefulness Index (IUI):** Mean of 32 perceived-usefulness items (range 1–3). Higher IUI = greater reliance on external information.
- **Information Need Index (INI):** Mean of 10 thematic need-scores (range 1–5). Higher INI =

**Table 2.** Reliability of major scales (example)

Scale	No. of items (K)	Cronbach’s $\alpha$
Perceived usefulness (all channels)	32	0.82
Information needs (10 thematic areas)	10	0.79

*The actual  $\alpha$  values are reported in Results after computation.*

stronger demand for information.

### Inferential statistics and checks

The following inferential analyses were planned and executed as appropriate:

**1. Normality checks:** Shapiro–Wilk test for continuous indices (Analyze → Descriptive Statistics → Explore) and inspection of skewness/kurtosis. If normality assumption held, parametric tests were used; otherwise, non-parametric alternatives were adopted.

- o SPSS: Analyze → Descriptive Statistics → Explore → Plots: Normality plots with tests.

### District-wise comparisons

- o **Independent-samples t-test** to compare mean indices (IUI, INI) between Basti and Ayodhya when normality is satisfied.
- ◆ SPSS syntax (example):
  - o T-TEST GROUPS=district(1 2)
  - o /MISSING=ANALYSIS
  - o /VARIABLES=IUI INI
  - o /STATISTICS=DESCRIPTIVES.

**Mann–Whitney U test** (non-parametric equivalent) when normality not satisfied.

SPSS: Analyze → Nonparametric Tests → Legacy Dialogs → 2 Independent Samples.

### Association tests for categorical variables

- o **Chi-square test** to assess association between categorical variables (e.g., primary source type vs farm-size).
- ◆ SPSS: Analyze → Descriptive Statistics → Crosstabs → Statistics: Chi-square.
- o If expected cell counts <5, Fisher’s exact test or Monte Carlo correction was used.

### ANOVA/Kruskal–Wallis

- o **One-way ANOVA** to compare mean indices across more than two groups (e.g., farm-size categories) when assumptions hold. Post-hoc tests (Tukey) used for pairwise comparisons.
- o **Kruskal–Wallis** used if non-normal.

### Correlation analysis

- o **Spearman’s rho** (preferred) between ordinal/scale variables such as IUI and INI, or IUI and ecological practice adoption score.
- o SPSS: Analyze → Correlate → Bivariate (select Spearman).

### 6. Factor analysis / dimension reduction (optional

#### but recommended)

- o **Exploratory Factor Analysis (EFA)** on perceived-usefulness items to identify latent dimensions (e.g., interpersonal, institutional, mass-media).
- o Procedure: Analyze → Dimension Reduction → Factor → Extraction method: Principal Axis Factoring / PCA; rotation: Varimax.
- o Criteria: Eigenvalue >1, scree-plot, and interpretability.
- o KMO and Bartlett’s test used to confirm sample adequacy.

#### Reliability analysis

- o **Cronbach’s alpha** calculated for scales (Analyze → Scale → Reliability Analysis).
- o SPSS output used to identify problematic items (item-total correlation) and improve  $\alpha$  by removing items if justified.

#### Regression analysis (optional for inferential insight)

- o **Binary logistic regression** to model adoption of a preventive ecological practice (e.g., soil testing: yes/no) using predictors such as IUI, INI, education, farm-size, and district.
- o SPSS: Analyze → Regression → Binary Logistic.

#### Significance threshold and effect size

- **Significance level:**  $\alpha = 0.05$ .
- **Effect sizes** reported where relevant: Cohen’s  $d$  for t-tests,  $\chi^2$  or partial  $\chi^2$  for ANOVA, and odds ratios for logistic regression.

#### Graphical presentation

- **Bar charts** for mean scores by domain (SPSS: Graphs → Chart Builder → Bar).
- **Clustered bar charts** for district-wise comparisons.
- **Factor loadings** and **scree plots** for factor analysis.
- **Boxplots** to show distribution of indices by farm-size or district (Graphs → Boxplot). All figures include appropriate labels, legends, and figure captions.

#### Ethical considerations

- **Consent:** Informed verbal consent was obtained from all respondents after explaining the purpose of the study.

- **Confidentiality:** Data were anonymised; no personal identifiers were retained in the analysis files.
- **Voluntary participation:** Respondents could refuse or withdraw at any time without consequence.
- **Institutional review:** The study followed institutional ethical norms; if required by the target journal, formal ethics clearance was to be sought and documented.

**Limitations and mitigation**

- **Cross-sectional design** limits causal inference; analyses focus on associations and comparisons.
- **Self-reported data** can produce recall or social desirability bias; mitigation included careful questionnaire wording, interviewer training, and spot re-checks.
- **Scale treatment:** Likert-type responses were analysed using means for indexing; where distributional assumptions were uncertain, non-parametric tests were used.

**Reproducibility and data availability**

- All raw and coded datasets, along with SPSS syntax files and codebooks, were archived and can be made available on request to the corresponding author, subject to confidentiality restrictions.

**Results**

The results of the study are presented under thematic sub-sections to describe the perceived usefulness of agricultural information sources and the information-seeking behaviour of farmers in Basti and Ayodhya districts of eastern Uttar Pradesh.

**Perceived Usefulness of Agricultural Information Sources**

Farmers relied on a wide range of information sources, including interpersonal, private, institutional, and mass media channels. The perceived usefulness of these sources was assessed using mean score analysis and ranking.

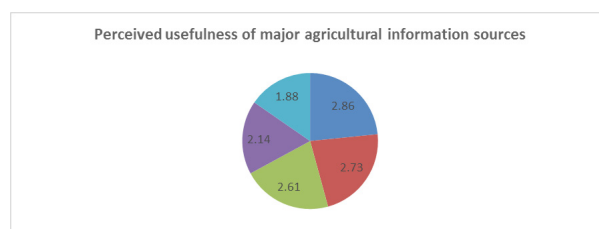
**Interpersonal and Private Information Sources**

Interpersonal sources such as family members, neighbouring farmers, and fellow villagers were rated as the most useful sources of agricultural information in both districts. The mean usefulness score for interpersonal sources was highest among

all categories. Similarly, private input dealers and company representatives were perceived as highly useful by the majority of respondents.

**Table 1.** Perceived usefulness of major agricultural information sources

Information source category	Mean score	Rank
Interpersonal sources	2.86	I
Private input dealers	2.73	II
Mobile-based advisories	2.61	III
Institutional sources	2.14	IV
Print media	1.88	V



The results indicate a strong dependence on formal and market-based sources for day-to-day agricultural decision-making.

**Institutional Information Sources**

Institutional sources such as KrishiVigyanKendras, agricultural universities, Kisan Call Centres, and government extension personnel were moderately utilised. While a section of farmers reported these sources as useful, their overall mean scores were considerably lower than interpersonal and private sources. District-wise comparison revealed slightly higher utilisation of institutional sources in Basti compared to Ayodhya; however, the difference was not statistically significant at the 5 per cent level ( $p > 0.05$ ).

**Mass Media and ICT-Based Sources**

Among mass media and ICT tools, mobile phones emerged as the most useful source of information, particularly for weather forecasts, pest alerts, and market prices. Television and radio were also reported as useful, whereas newspapers and farm magazines were least utilized.

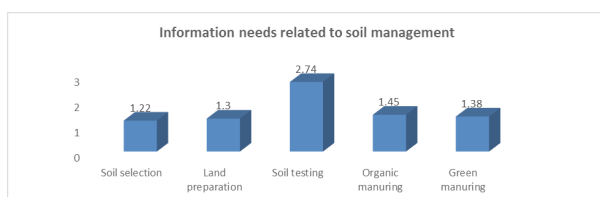
**Information Needs Related to Soil and Land Management**

Information needs related to soil selection and land preparation were reported as minimal by the majority of respondents, with most farmers indicating that

such information was “rarely” or “never” needed. However, moderate information need was observed for soil testing, with a proportion of farmers reporting occasional or frequent requirement.

**Table 2.** Information needs related to soil management

Soil-related practice	Mean score
Soil selection	1.22
Land preparation	1.30
Soil testing	2.74
Organic manuring	1.45
Green manuring	1.38



### Information Needs for Crop Production Practices

Farmers reported low information needs for routine crop production practices such as nursery management, weeding, irrigation scheduling, and harvesting. Moderate information need was observed for crop selection, intercropping, and improved crop production techniques.

This pattern suggests reliance on traditional knowledge for routine operations, with selective interest in improved practices.

### Information Needs for Seed and Fertilizer Management

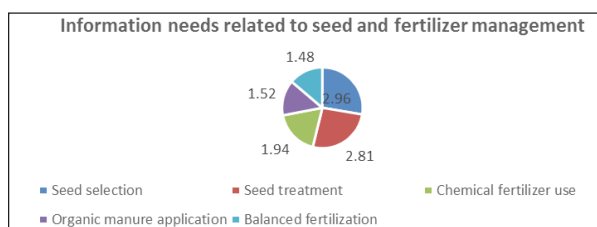
Information related to seed selection and seed treatment showed moderate demand among farmers. In contrast, information needs for fertilizer application, balanced nutrient management, and organic inputs were reported as low.

**Table 3.** Information needs related to seed and fertilizer management

Practice	Mean score
Seed selection	2.96
Seed treatment	2.81
Chemical fertilizer use	1.94
Organic manure application	1.52
Balanced fertilization	1.48

### Information Needs for Pest and Disease Management

Pest and disease management emerged as one of the

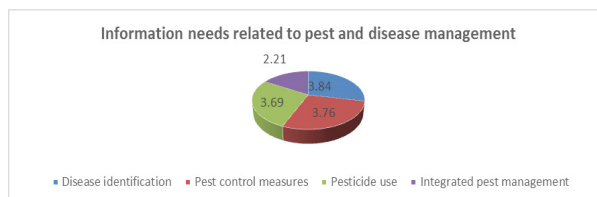


most critical information domains. A substantial proportion of farmers reported “always” or “often” needing information on disease identification, pesticide use, and control measures.

Mean scores for pest and disease-related information needs were significantly higher compared to most other thematic areas.

**Table 4.** Information needs related to pest and disease management

Practice	Mean score
Disease identification	3.84
Pest control measures	3.76
Pesticide use	3.69
Integrated pest management	2.21



### Information Needs for Advanced Agricultural Technologies

Farmers showed relatively high interest in information related to improved varieties and emerging technologies such as biotechnology. However, information needs for greenhouse cultivation, drip irrigation, and sprinkler systems were reported as low.

This indicates awareness of advanced technologies but limited practical adoption under existing resource constraints.

### Information Needs for Weather, Market, and Government Schemes

Weather-related information was universally demanded by farmers in both districts. All respondents reported frequent or constant need for timely weather forecasts.

Market-related information, particularly current market prices and selling points, also recorded high mean scores. In contrast, information on long-term

market trends and export opportunities was reported as minimal.

Information regarding government schemes and crop insurance showed the highest mean scores across all thematic areas.

### District-wise Comparison of Overall Information Needs

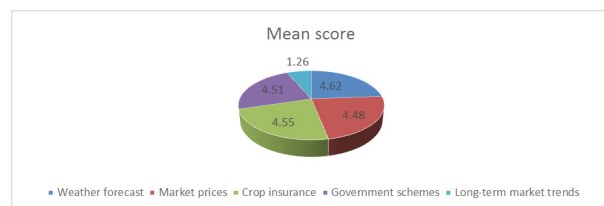
Independent sample t-test analysis revealed no significant difference between Basti and Ayodhya districts in overall information need index ( $p > 0.05$ ). However, Ayodhya farmers showed marginally higher mean scores for pest management and market-related information.

### Dominance of Interpersonal and Private Information Sources

The results clearly indicate that interpersonal networks and private input dealers dominate farmers' information environment. Family members, neighbouring farmers, and fellow villagers were perceived as the most useful information sources, followed closely by private input dealers. Similar trends have been reported in recent studies from different regions of India, which highlight trust, ease of access, and immediate feedback as major reasons for farmers' preference for informal and market-based sources over institutional channels.

**Table 5.** Information needs for weather, market, and government schemes

Information domain	Mean score
Weather forecast	4.62
Market prices	4.48
Crop insurance	4.55
Government schemes	4.51
Long-term market trends	1.26



While these sources play an important role in rapid information dissemination, excessive dependence on private input dealers raises concerns regarding biased advisories, particularly in relation to fertilizer and pesticide use. Recent extension literature (2021–2024) cautions that commercial adviso-

ries often prioritise input sales rather than resource-conserving or ecologically sound practices. The present findings reinforce the need for closer monitoring and integration of private actors into regulated, sustainability-oriented extension frameworks.

### Moderate Utilisation of Institutional Sources

Institutional sources such as Krishi Vigyan Kendras, agricultural universities, and Kisan Call Centres were found to be moderately utilised. This pattern aligns with recent evaluations of public extension systems, which suggest that although institutional advisory services have expanded in coverage, their reach and perceived usefulness at the farmer level remain inconsistent. Constraints such as limited field-level interaction, delayed response, and lack of location-specific recommendations have been cited as major barriers.

The absence of a statistically significant difference between districts indicates that institutional utilisation challenges are systemic rather than location-specific. Strengthening field demonstrations, improving responsiveness, and aligning advisories with farmers' immediate needs could enhance the credibility and effectiveness of these sources.

### Growing Importance of ICT and Mobile-Based Advisories

Among mass media and ICT tools, mobile phones emerged as a key source of agricultural information, particularly for weather forecasts, pest alerts, and market prices. This finding is consistent with national-level data from 2020 onwards, which show rapid growth in mobile-based agricultural advisory services. However, the study also indicates that ICT tools largely complement rather than replace traditional information channels. The selective use of ICTs suggests that farmers primarily seek time-sensitive and risk-related information through digital platforms, while relying on interpersonal sources for operational decisions. This hybrid information behaviour underscores the need for integrated extension models that combine digital advisories with local human intermediaries.

### Reactive Nature of Farmers' Information Needs

One of the most important findings of the study is the predominance of reactive information-seeking behaviour. High information needs for pest and disease management, weather forecasts, market prices, crop insurance, and government schemes indicate

that farmers primarily seek information when faced with immediate risks or uncertainties. Similar reactive patterns have been documented in recent analyses of Kisan Call Centre data and mobile advisory queries across India.

In contrast, preventive and sustainability-oriented practices such as soil testing, balanced fertilisation, organic manuring, green manuring, and integrated pest management received relatively low attention. This imbalance suggests that farmers' information behaviour is driven more by short-term problem solving than by long-term resource management.

### **Implications for Soil Health and Ecological Sustainability**

Low information demand for soil health management practices has serious implications for ecological sustainability. Recent national assessments (2021–2024) have highlighted declining soil organic carbon and nutrient imbalances as major threats to agricultural productivity. The limited interest in soil testing and organic inputs observed in the present study indicates a critical knowledge–practice gap.

Similarly, although pest and disease information demand was high, the low emphasis on integrated pest management reflects continued reliance on chemical control measures. Such practices may lead to pesticide resistance, ecological imbalance, and environmental contamination if not guided by scientific advisories.

### **Technology Awareness versus Adoption Constraints**

Farmers expressed relatively high interest in improved varieties and emerging technologies, including biotechnology, indicating awareness and curiosity about technological advancements. However, low information demand for greenhouse cultivation and modern irrigation systems suggests adoption constraints related to cost, scale, and perceived suitability for smallholder conditions. This finding is consistent with recent studies that emphasise the need for context-specific and economically viable technological solutions.

### **Extension and Policy Implications**

The findings collectively suggest that strengthening ecological sustainability in agriculture requires a strategic shift in extension approaches. Trusted interpersonal networks should be leveraged as con-

duits for scientific and sustainability-focused messages. Institutional extension systems must move beyond generic advisories and adopt need-based, location-specific, and preventive communication strategies. Digital platforms should be integrated with on-ground extension efforts to deliver timely yet contextually grounded information.

Overall, the discussion highlights that improving farmers' information behaviour is not merely a matter of increasing information supply, but of aligning advisory systems with farmers' trust structures, risk perceptions, and ecological realities.

### **Conclusion**

The present study examined the information-seeking behavior and perceived usefulness of agricultural information sources among farmers of the Basti and Ayodhya districts of eastern Uttar Pradesh, with particular reference to ecological sustainability and risk-oriented decision-making. The findings indicate that farmers predominantly depend on interpersonal networks and private input dealers for agricultural information, owing to their accessibility and immediate relevance, while formal institutional sources play a comparatively limited role. Among mass media and ICT tools, mobile-based advisories have emerged as significant channels, especially for time-sensitive information related to weather conditions, pest and disease incidence, and market prices. The study further reveals that farmers' information-seeking behavior is largely reactive in nature, with high demand for information aimed at short-term risk mitigation and income security. In contrast, limited attention to soil health management, balanced fertilization, water conservation, and integrated pest management reflects a weaker orientation towards sustainability. The moderate utilization of institutional extension services and the absence of marked district-wise differences suggest systemic constraints related to accessibility, timeliness, and local relevance, underscoring the need for strengthening grassroots-level extension mechanisms.

### **Acknowledgement**

The authors are highly thankful to Hon'ble Chancellor and Vice Chancellor, Integral University, Lucknow to provide necessary facilities for this study and Dean and Head, Department of Agriculture, IAST, for their continuous support and en-

couragement. Authors also acknowledge R&D cell, Integral University for providing Manuscript Communication Number (MCN No. IU/R&D/2026-MCN0004251).

**Conflict of Interest-** None

## References

- Aker, J.C. 2021. Information from markets near and far: Mobile phones and agricultural markets in developing countries. *American Economic Journal: Applied Economics*. 13(3): 1-28.
- Chand, R. and Singh, J. 2022. Digital transformation of Indian agriculture: Pathways and policy imperatives. *Indian Journal of Agricultural Economics*. 77(2): 159-176.
- Food and Agriculture Organization (FAO), 2021. *The state of the world's land and water resources for food and agriculture*. FAO, Rome.
- Government of India, 2021. *Soil health management under climate change: Status and challenges*. Ministry of Agriculture and Farmers' Welfare, New Delhi.
- Government of India, 2023. *Annual report 2022-23*. Department of Agriculture & Farmers Welfare, Ministry of Agriculture and Farmers' Welfare, New Delhi.
- ICAR-ATARI, 2022. *Impact assessment of Krishi Vigyan Kendras on technology adoption and farm income*. Indian Council of Agricultural Research, New Delhi.
- Kaur, M. and Kaur, R. 2020. Farmers' access to agricultural information sources and its influence on technology adoption. *Journal of Agricultural Extension Management*. 21(2): 23-34.
- Kumar, R., Singh, A. and Patel, D. 2023. Information seeking behaviour of farmers in relation to climate-smart agricultural practices. *Indian Journal of Extension Education*. 59(1): 44-50.
- Meena, M.S., Singh, K.M. and Swanson, B.E. 2021. Pluralistic agricultural extension system in India: Innovations and constraints. *Agricultural Extension Review*, 33(4): 10-17.
- Ministry of Agriculture and Farmers' Welfare, 2020. *Evaluation study of Kisan Call Centres*. Government of India, New Delhi.
- Mittal, S. and Mehar, M. 2022. Digital advisory services and farmers' decision-making in Indian agriculture. *Agricultural Economics Research Review*. 35(1): 1-12.
- NITI Aayog, 2021. *Climate Change and Indian Agriculture: Adaptation Strategies*. Government of India, New Delhi.
- Raghuvanshi, R. and Ansari, M.A. 2020. Information sources utilisation behaviour of farmers in eastern Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development*. 15(3): 201-206.
- Singh, K., Meena, M.S. and Jha, A. 2024. ICT-enabled extension services and their effectiveness in small-holder farming systems. *Indian Journal of Agricultural Sciences*. 94(2): 123-129.
- Singh, R. and Sharma, P. 2021. Farmers' perception of institutional extension services in India. *Journal of Extension Systems*. 37(2): 45-56.
- Shailendra Kumar Singh, Sunil Kumar, Sachin Pratap Tomar, Anand Singh, Saba Siddiqui and Mohd. Haris Siddiqui, 2025. Empirical Analysis of ICT Adoption on Agronomic Practices and Farm Income: Evidence from Sugarcane Farmers in Sitapur, Uttar Pradesh. *Ecology Environment and Conservation*. 31: 520-524.
- Sachin Pratap Tomar, P. Smriti Rao, Shailendra Kumar Singh, Shishir Kant Singh, Khalid Habib, Saba Siddiqui, Mohammed Haris Siddiqui and Ambreesh Singh Yadav, 2025. A Review - Effect of Halophilic Microbes on Soil Health and Crop Productivity in Salt-Affected Soils. *Ecology Environment and Conservation*. 31: 410-418.
- World Bank, 2022. *Digital Agriculture and Rural Transformation in South Asia*. World Bank, Washington, DC.