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# A Study of E-Resource Use Patterns Among Scientists of the Indian Council of Agricultural Research Institutes in Telangana

**Ammaji Rajitha[1*] and Dr.V.K. Dhanyasree[2]**

[1*]Research Scholar, Department of Library and Information Science, Central University of Tamil Nadu, Thiruvarur, Tamil Nadu, India
[2]Assistant Professor, Department of Library and Information Science, Central University of Tamil Nadu, Thiruvarur, Tamil Nadu, India
E-mail: [1]ammajirajitha810@gmail.com, [2]dhanyasree@cutn.ac.in
ORCID: [1]https://orcid.org/0000-0003-0830-3578, [2]https://orcid.org/0009-0002-8082-5266
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*Abstract* - **Electronic resources are critical for contemporary agricultural research; however, users' behavior towards access, platform satisfaction, and competence issues has not been adequately measured. The current study is an attempt to measure the adoption, awareness level, usage behavior, and satisfaction with respect to electronic resources, particularly Consortium for e-Resources in Agriculture (CeRA), among scientists from ICAR institutes located in the Telangana region. The research employs a quantitative survey research design, and empirical data have been collected from 221 Ph.D.-educated researchers (N=221, 91.7% response rate) using a structured questionnaire and analyzed via descriptive and inferential statistics ($\chi^2$ testing). The results show that electronic journals (85.1%) and online databases (81.9%) are the main formats used because of easy digital storage (93.7%) and 24/7 availability (83.3%). However, the CeRA gained 100% of users, and the level of satisfaction was high (55.6%), but according to the results of the Chi-Square test, there is a relationship between being an academic and the preference for retrieval channels ($\chi^2 = 9.842, df = 2, p = 0.007$). For example, young scientists use popular search engines (65.6%) rather than OPAC systems (0.9%). Information overload (71.9%) and lack of searching skills (41.6%) were considered operational barriers; thus, 76.5% asked for training. It can be concluded that although e-resources are extremely important, the way to use them strategically is to change the approach from managing repositories to capacity building of users through interactive workshops (70.6%) and UI/UX interface enhancements.**

*Keywords:* **Use Pattern, E-resources, CeRA, ICAR, NARS, Telangana, Digital Literacy**

## I. INTRODUCTION

Electronic publication has changed the way scholarly communication is done by enhancing the way academic journals are produced, distributed, and made available by solving problems such as the inability of individuals to subscribe to scholarly journals due to financial and infrastructural constraints. Being a collaborative body, a consortium helps individual libraries access high-quality scholarly materials as a team. The use of the consortium as a means of accessing academic journals has become a steady development since its first use in India through the establishment of FORSA and INFLIBNET by UGC and subsequently the formation of other major consortia such as UGC-Infonet, INDEST-AICTE, ERMED, and NKRC. Within this framework, CeRA has been established as a very important national platform for agricultural research through the provision of easy access to articles published by renowned publishers of scholarly journals for all NARS institutions, thus resulting in tangible improvements in research productivity and citation influence. In e-publishing through CeRA, researchers can have accessibility at any time and from anywhere, faster search with the help of advanced search facilities, and better research capabilities, whereas libraries can have lower operational burden, cost-effectiveness, effective service provision, and higher interaction with the academic fraternity. Through efforts like document delivery facility, access to global citation databases, periodic training programs, governance systems, and constant monitoring of utilization, CeRA has not only revolutionized the functioning of libraries but has also transformed India's agricultural research scenario in line with international standards of digital scholarship and knowledge sharing.

### *Problem Statement and Significance*

Despite huge expenditures on national consortia like CeRA, the problem of information literacy, successful retrieval, and optimal usage still persists in agricultural institutions. Although digital subscriptions are broadly provided, the issue is that scientists mostly use commercial search engines instead of institutional discovery tools. There are various problems that result from such practice – the most common ones being information overload, time limits, and the underutilization of professional agricultural databases. It is necessary to assess how senior scientists especially utilize these sources in order to identify problems and optimize the budget allocation on subscription budgets, and design targeted training interventions that maximize research productivity.

*Unique Contributions of the Study*

To address this gap, this study provides several key contributions to the field of library and information science in agricultural research:

- It delivers a focused empirical analysis of e-resource adoption and CeRA usage specifically across ICAR research institutes in Telangana.
- The study gathers empirical evidence from a highly qualified scientific workforce (100% Ph.D. holders, with 68.8% having over 15 years of research experience), offering specific insights into the access habits and friction points faced by experienced researchers.
- It empirically highlights the gap between high open-web search engine usage (65.6%) and low library discovery tool usage (0.9% for Web OPAC).
- It identifies clear, user-preferred training formats (such as practical workshops and hands-on demonstrations) to improve search skills and specialized database awareness.

*Hypotheses*

- $H_0$: There is no significant association between a scientist's designation and their choice of e-resource retrieval method.
- $H_1$: There is a statistically significant association between a scientist's designation and their choice of e-resource retrieval method.

The rest of this paper is organized in the following manner: Section 2 provides a literature review on digital consortia and e-resources adoption. Section 3 gives an account of the methods used for data collection and analysis. Section 4 provides an analysis of the data and the empirical results. Section 5 discusses the results, implications, and limitations of the study. Lastly, Section 6 focuses on important observations and draws out conclusions and recommendations.

## II. REVIEW OF LITERATURE

The idea and development of electronic resources in libraries have seen a major change, reflecting changes in technology as well as in the requirements of users. Libraries earlier used to depend on physical collections, but the introduction of electronic resources brought a major shift toward the digitalization of libraries. The study of the aforementioned change has helped in bringing about different digital innovations like virtual reality (VR), augmented reality (AR), digital catalogs, multimedia laboratories, and maker spaces, thus making libraries technologically sophisticated and inclusive institutions that facilitate learning, research, and cultural activities (Rahmanova, 2025).

The development of electronic sources has been associated not only with the enhancement of their content but also with the improvement of accessibility and usability. It has been shown that the problems of huge amounts of information, heterogeneous formats of data storage, and the absence of unified systems for management of electronic documents pose a serious problem in the scientific and educational sphere (Serikbayeva et al., 2021). This information illustrates the complexity of working with electronic resources. In the same way, it should be noted that the role of libraries in creating the modern information environment is significant and illustrated by the problems of digital systematization of resources and the influence of big data on the work of libraries (Athiya, 2022). The role of the library has shifted from simple custody of resources to dissemination of knowledge and digital literacy in society. Recent technological advancements also stimulated the development of electronic resources, as described, showing trends in the development and implementation of ICT to enhance library services (Jasim & Hantoush, 2023).

The effect of electronic sources on library services includes users' involvement and their satisfaction. It is proven that the use of experiential marketing methods may enhance user satisfaction and interest in electronic resources, particularly when there are difficult periods like the COVID-19 pandemic (Fatmawati, 2021). Moreover, due to changes in electronic sources, there is a need to reconsider staff and the skills of library professionals. It is evident from research that the majority of libraries do not have systems librarians, which could affect the proper administration of electronic resources and technological innovation (Singh & Nyaichyai, 2023).

The emergence of smart libraries is an example of continuous evolution of electronic resources where user cultivation and integration are considered. The study focuses on methods of cultivating users in smart libraries. It stresses the significance of differentiated users, resource integration, and quality of education to make users more involved in using electronic resources (Dong et al., 2022). The significance of access to technology and digital literacy as key determinants of health and healthcare outcomes was stressed by research; it can be stated that the same principles relate to agricultural research and education (Shaw, 2023). Access to technology and electronic resources is an essential prerequisite to getting full advantage from digital initiatives. This case shows how the use of advanced IT systems such as EDI improves the channels of communication and ensures transparency (Murtezaj, 2024). This example stresses the possibilities of electronic resource systems for improving the efficiency of administration and interaction with stakeholders, which is important for ICAR to disseminate research and knowledge effectively.

The significance of organizational support and infrastructure for evidence-based practice in relation to the study suggests that it is essential to have supportive leadership and the availability of resources in implementing a digital strategy (Sebire et al., 2025). In regard to ICAR, creating an enabling

environment, including infrastructure and leadership, is important in encouraging access to electronic resources. In addition, it is established from the study that institutional repositories and open science infrastructure are significant in disseminating knowledge (Kulyk & Gladyševa, 2025). This is in line with ICAR's possible involvement in building digital repositories to promote access to the results of agricultural research outputs at both domestic and international levels.

The idea of Digital CeRA (Consortium of E-Resources in Agriculture) has received a lot of attention in different contexts, especially in agricultural and research settings (Mendhe & Dhandore, 2014). As per the study, the use of consortium-based digital information sources, in particular CeRA, has been successfully incorporated into the academic curriculum of Kerala Agricultural University. As many as 82% of postgraduate and PhD students were aware of CeRA, and these students gained knowledge on how to access digital information through curriculum-based courses such as library and information services and research methodology. It clearly shows that digital consortia such as CeRA have played an important part in improving the research skills of students.

As per the study, the scientists working in select institutes for plantation crops research in South India extensively use the electronic resources offered by CeRA, signifying a high level of engagement with the consortium (Madhu, 2018; Prajapati et al., 2022). Likewise, the study mentions that about 69.56% of scientists working in South Indian institutes of plantation research make use of CeRA for their research purposes, underlining the significance of CeRA as a large database for agricultural research literature and specialized areas like tropical horticulture and sugarcane research (Tyagi, 2011).

Research examines the more comprehensive perspective of the use of CeRA from the point of view of different institutions undertaking research into access and use of resources at different institutes and universities (Kumar, 2023). The study highlights that digital resources are an essential part of any research activity, with the patterns of access being in line with the requirements of users. Supporting this, the study explains the role of CeRA in improving access, use, and impact in the Indian agricultural research system, highlighting user behavior, satisfaction level, and the impact of the consortium on research output (Sharma & Kashyap, 2025).

Other information about user participation comes from a study that looks at the National Rice Research Institute (NRRI) (Nagaraju & Sujatha, 2019). The results show that CeRA works as a catalyst and helps to improve awareness and use of electronic materials, thus reinforcing research, education, and extension services. Likewise, the study examines the use of online materials by teachers at Punjab Agriculture University, Ludhiana, highlighting the change in scholars' reading preferences due to CeRA that has made more scholarly articles and research material available (Motebennur, 2012).

The role of Institutional Libraries in managing and marketing CeRA is addressed in the study, which stresses the rise in the use of CeRA owing to enhanced library services, thanks to ICAR (Thangjom, 2023). It suggests that library activities and awareness campaigns have a very strong impact on the use rate of CeRA. Furthermore, the study assesses the perception and usage behavior of research scholars at Indira Gandhi Krishi Vishwavidyalaya, showing a strong link between attitude and usage rates.

*Scope of the study*

The scope of the present study is confined to examining the use pattern, accessibility, and satisfaction level of electronic resources, with special reference to the Consortium for e-Resources in Agriculture (CeRA), among scientists working in ICAR institutes in Telangana. The study covers aspects such as library visits, purposes of e-resource use, access locations and methods, awareness of agricultural databases, satisfaction with available e-resources, problems faced, and training needs.

*Objectives of the Study*

The specific objectives of the study are

- To examine the availability of electronic resources in ICAR institute libraries in Telangana.
- To study the adoption of electronic resources by ICAR scientists.
- To know the basic purpose of access to E-resources by ICAR scientists
- To identify the primary access locations and main access methods used by scientists for retrieving electronic resources.
- To know the preferred types of electronic resources by ICAR scientists
- To assess the level of awareness among scientists regarding online databases related to agriculture.
- To analyze the level of satisfaction of scientists with the available electronic resources.
- To identify the problems faced by scientists while accessing multiple electronic resources.
- To examine the training methods preferred for enhancing awareness and effective use of electronic resources.

From previous studies in the literature, it has been shown that there is an increasing trend towards the use of digital repositories for storing information by researchers, but at the same time there has been a consistent problem of inadequate skills of users in making search queries. The results from this study confirm this trend, where although there is a widespread use of digital repositories like CeRA among agricultural researchers, there is a very high dependence on general search engines as compared to discovery systems.

This demonstrates the need for the availability of digital resources not to guarantee effective use, which supports the need for organizations to move beyond mere provision of infrastructure towards training users on literacy.

## III. METHODOLOGY

### *3.1. Research Design*

The research will use a quantitative research methodology involving a descriptive research design through cross-sectional survey methodology. The choice of a quantitative research methodology was due to the need for objectivity in the measurement, aggregation, and statistical analysis of frequency of use, awareness level, and satisfaction in order to detect precise patterns of adoption behaviors of e-resources without any form of researcher bias.

### *3.2. Research Framework*

The study population consisted of all the active agricultural scientists from seven ICAR institutions based in the state of Telangana. In order to conduct a total population or census study, it was necessary to involve the entire scientific community in all three categories of scientists: senior scientists and principal scientists. Of the 241 structured questionnaires issued, a response rate of 91.7% was obtained through 221 responses. The data set contains 221 entries of survey data from which 100% hold a Ph.D. degree, and 68.8% have more than 15 years of experience in research. Data collection ensured inclusion of data from different operational areas to provide proper statistical representation.

In order to systematically assess the use of e-resources, four main constructs have been operationalized for which appropriate variables have been used in the questionnaire. Categorical variables measuring the frequency of library visits, places from where one uses the library most (department/home/library), and means used to access the library (search engine/Web OPAC). Nominal and ordinal variables indicating the format of e-resources and objectives of using those. Dichotomous and multiple response variables measuring familiarity with fourteen databases and constraints faced while using them (e.g., information overload, time constraints, skill constraints). Ordinal variables measured through a 5-point Likert scale (Very dissatisfied – 1 to Very satisfied – 5) measuring satisfaction level in six main areas: search facility, full text availability, user interface, coverage, mobile availability, and journal access.

To satisfy the structural assumptions of the Chi-Square test of independence (ensuring expected cell frequencies $E_{ij} \geq 5$), detailed retrieval channels from table VII were collapsed into a binary categorical variable for fig. 2 and inferential testing. Specifically, the formal institutional channels Library Web ($n = 12$), OPAC ($n = 2$), CeRA Direct Portal ($n = 58$), and Publisher Platforms ($n = 4$) were pooled into the unified category "Library Portal / OPAC" ($n = 76$), while General Search Engines ($n = 145$) remained as the primary informal retrieval channel.

The raw data from the survey were analyzed through systematic coding, cleaning, and tabulation using the Microsoft Excel spreadsheet program. Descriptive and inferential statistical analysis was conducted using SPSS (Statistical Package for the Social Sciences). Absolute frequency, percentage, mean, and standard deviation calculations were done to assess the satisfaction and usage trends among the respondent population.

*Conceptual Framework*

Fig. 1 presents the conceptual framework of the study by demonstrating the connection between the input factors, research methodology, empirical findings, and strategic outcomes of the entire process. The framework points out the importance of such factors as institutional context, user characteristics, availability of e-resources, and support as input factors. All these factors are subjected to research processes, which yield empirical data on matters of utilization, preference, user satisfaction, barriers, and training needs. Such empirical findings will assist in increasing the utilization of e-resources, upgrading users' skills, improving library services, conducting research, and evidence-based decision-making within institutions.

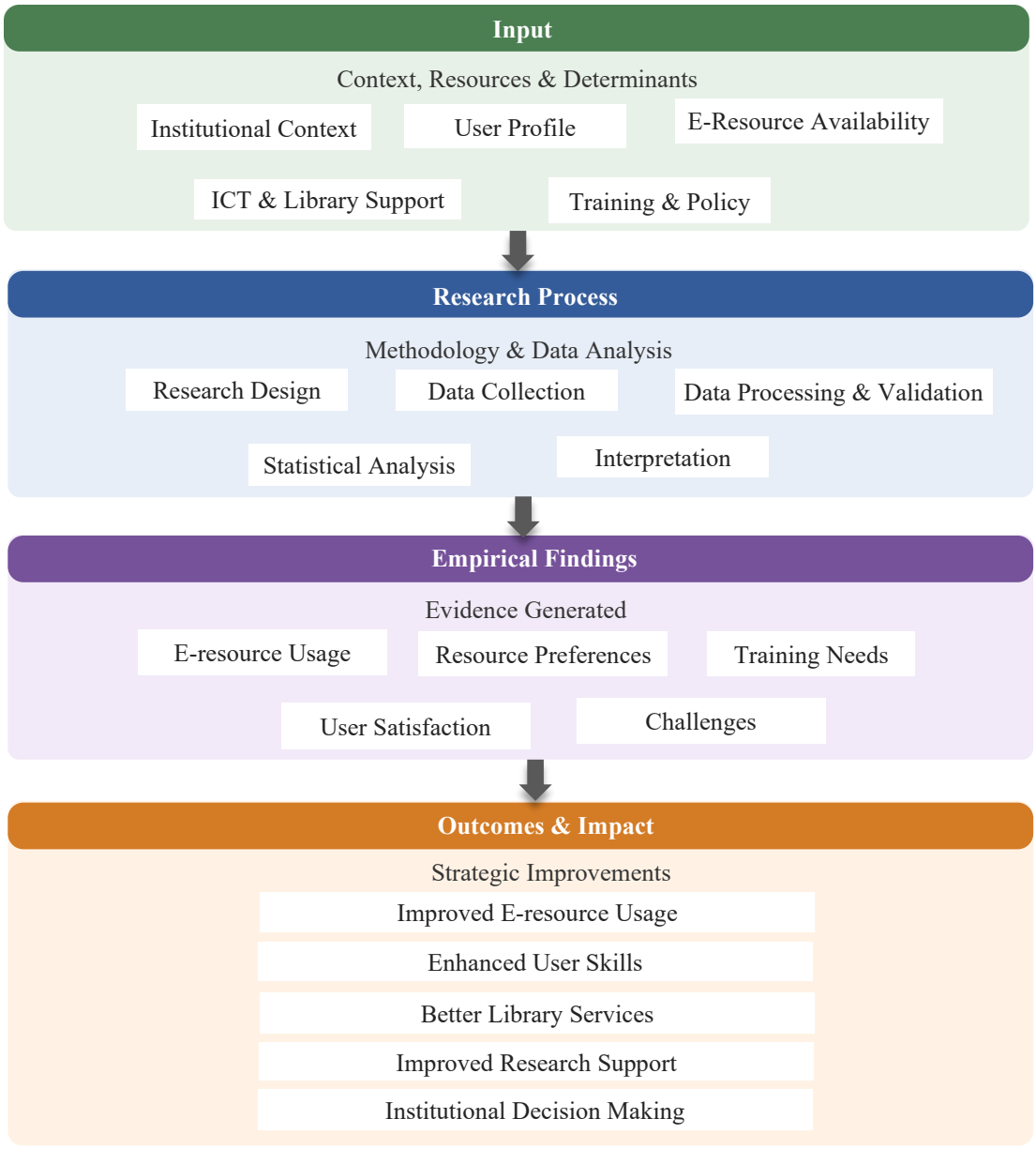



Fig. 1 Conceptual Framework for Assessing E-resource Utilization and Institutional Outcomes

## IV. Analysis

Data analysis is the last phase in the whole research process by means of which data accumulated throughout the research endeavor is analyzed and converted into a valuable outcome; it is an important bridge between valid data and concrete outcomes, and hence the information collected needs to be judiciously analyzed for a productive result.

### *4.1. Demographic Profile*

Table I offers basic information about the demographic profile of the respondents. There was a total of 221 scientists, of which 75.10% were males and 24.90% were females, showing that there is male domination in the scientific community in the ICAR institutions in Telangana. From the age profile of the respondents, the majority (60.20%) of them were in the 50-59 years age category. This means that the survey involves experienced individuals who may occupy the higher cadre positions. From the social background of the respondents, 52.90% were from rural backgrounds and 47.10% from urban backgrounds, showing that the respondents come from different social backgrounds. All the respondents have Ph.D. degree qualifications. The majority of them are principal scientists (60.20%), scientists (20.40%), and senior scientists (19.50%). More than 68.80% of the respondents have experience of more than 15 years, which confirms once again that the sample consists of established professionals. This demographic makeup implies that the results of this study are affected by highly qualified and experienced people.

TABLE I DEMOGRAPHIC PROFILE OF RESPONDENTS

| Sl. No | Demographic Profile | | Respondents | Percentage |
|---|---|---|---|---|
| 1. | Gender | Male | 166 | 75.10% |
| | | Female | 55 | 24.90% |
| 2. | Age Group | 30-39 | 36 | 16.30% |
| | | 40-49 | 52 | 23.50% |
| | | 50-59 | 133 | 60.20% |
| 3. | Social Background | Rural | 117 | 52.90% |
| | | Urban | 104 | 47.10% |
| 4. | Educational Background | Ph.D. | 221 | 100.00% |
| 5. | Current Designation | Scientist | 45 | 20.40% |
| | | Senior Scientist | 43 | 19.50% |
| | | Principal Scientist | 133 | 60.20% |
| 6. | Total Experience | 1-5 Years | 1 | 0.50% |
| | | 6-10 Years | 40 | 18.10% |
| | | 11-15 Years | 28 | 12.70% |
| | | More than 15 Years | 152 | 68.80% |

### *4.2. Frequency of Library Visits*

The frequency of visits to a library serves as an Indicator of library usage and the level of research/scholarly activities by researchers of an institution, and indicates the dependency that library patrons place on library facilities, services, tools, and professional information assistance for scholarly research.

TABLE II FREQUENCY OF LIBRARY VISITS

| Visit Frequency | Respondents (N=221) | Percentage (%) |
|---|---|---|
| Daily | 65 | 29.4 |
| Weekly | 58 | 26.2 |
| Fortnightly | 29 | 13.1 |
| Monthly | 15 | 6.8 |
| Occasionally | 5 | 2.3 |
| Not at all | 49 | 22.2 |

Table II shows the frequency of library visits among the respondents. 65 respondents (29.4%) visited the library daily, followed by 58 respondents (26.2%) who visited weekly. This shows that a substantial portion of respondents are frequent users of the library.

Furthermore, 29 respondents (13.1%) reported visiting the library fortnightly, while 15 respondents (6.8%) visited the library monthly. Only 5 respondents (2.3%) reported visiting the library occasionally. A noticeable number of respondents (22.2%) reported not visiting the library at all. The results from table II emphasize the need for more efforts from the part of the ICAR libraries to attract users.

### *4.3. Availability of Various Types of E-Resources in ICAR Libraries*

The availability of diverse electronic resources in ICAR libraries is regarded by the respondents as a critical enabler of academic and research excellence.

TABLE III AVAILABILITY OF VARIOUS TYPES OF E-RESOURCES IN ICAR LIBRARIES

| Type of E-Resource | Respondents (N=221) | Percentage (%) |
|---|---|---|
| E-Books | 165 | 74.7 |
| E-Journals | 207 | 93.7 |
| E-Archives / Digital Archives Audio- Visual Archives | 139 | 62.9 |
| Digital Repositories / Data Repositories / Digital Libraries | 172 | 77.8 |
| Databases (Online/CD-ROM) | 183 | 82.8 |
| Multimedia Contents | 130 | 58.8 |
| Electronic/Online Reference (Encyclopaedia/Dictionaries) | 170 | 76.9 |
| Open Access Resources | 174 | 78.7 |
| Online Learning Platforms | 153 | 69.2 |
| Theses and Dissertations | 178 | 80.5 |
| Patent/Standards Databases | 111 | 50.2 |
| Online Newspapers/ E-Magazines | 157 | 71 |
| Government Publications | 166 | 75.1 |

Table III indicates a high level of awareness among scientists regarding the availability of various electronic resources in ICAR libraries. Among the different types of e-resources, e-journals recorded the highest level of awareness, with 207 (93.7%) scientists acknowledging their availability. This reflects the prominent role of e-journals in research and scholarly communication within ICAR institutions.

The availability of online/CD-ROM databases is reported by 183 (82.8%) respondents, followed by theses and dissertations with 178 (80.5%) respondents. Awareness regarding the availability of open access resources was observed among 174 (78.7%) scientists, while 172 (77.8%) respondents were aware of the availability of digital/data repositories and digital libraries.

The study further reveals considerable awareness about the availability of electronic reference sources such as online encyclopedias and dictionaries, acknowledged by 170 (76.9%) scientists. Government publications and e-books were also well recognized, with 166 (75.1%) and 165 (74.7%) respondents reporting their availability, respectively. This indicates that ICAR libraries effectively provide and promote a variety of academic and reference-oriented e-resources.

The availability of online newspapers and e-magazines was reported by 157 (71.0%) scientists, while 153 (69.2%) respondents reported the availability of online learning platforms. The availability of e-archives and audio-visual

resources was reported by 139 (62.9%) scientists, and multimedia content was reported by 130 (58.8%).

In general, the results clearly indicate that the scientists working in ICAR institutes have good knowledge about the availability of various types of e-resources in libraries, especially research-oriented e-resources, which are very important for research, teaching, and academic purposes.

### *4.4. Preference and Adoption of E-Resources for Research Purposes*

The reasons that might lead to preference and adoption of electronic resources may be varied depending on different categories of users. At ICAR libraries, the same reasons act as a guiding tool for enhancement of the digital services by ensuring resources match researchers' expectations, and helping them become indispensable partners in achieving excellence in academics and agricultural innovation**.**

TABLE IV THE REASONS FOR PREFERENCE AND ADOPTION OF E-RESOURCES FOR RESEARCH PURPOSES

| Reason for Preference | Respondents (N=221) | Percentage (%) |
|---|---|---|
| Facilitate remote access | 160 | 72.4 |
| Provides timely access | 146 | 66.1 |
| Support searching capabilities | 144 | 65.2 |
| Contains multimedia information (e.g., Audio, Video, DVD, etc.) | 131 | 59.3 |
| Can be saved digitally | 207 | 93.7 |
| Availability of up-to-date information | 144 | 65.2 |
| Minimizing the consumables (e.g., Paper, printouts) | 146 | 66.1 |
| Non-availability of print/ hard copies of books and journals in the library | 125 | 56.6 |
| Anywhere and anytime access | 184 | 83.3 |

Table IV indicates the reasons for respondents' preference and adoption of e-resources for research purposes. The most important reason for the use of e-resources among 221 respondents is the possibility of storing information in digital format, as reported by 207 respondents (93.7%). It is then followed by whenever and anywhere access, reported by 184 respondents (83.3%). It highlights the versatility and convenience provided by e-resources.

Moreover, 160 respondents (72.4%) like using e-resources because they provide remote access facilities. Another 146 respondents (66.1%) have reported timely access to information and reducing the consumption of consumables like paper and printouts as important factors. Searching features and up-to-date information are the reasons mentioned by 144 respondents (65.2%). It shows how efficient and relevant the electronic resources are.

Additionally, 131 respondents (59.3%) like to use e-resources for multimedia information content. There are 125 respondents (56.6%) who have reported non-availability of print or hard copies of books and magazines in the library as the reason for adopting e-resources. These results show that the important factors that influence the choice of e-resources among respondents are convenience, accessibility, and digital storage capacities are the primary factors influencing the preference and adoption of e-resources among respondents.

### *4.5. Basic Purposes for Which Respondents Access E-Resources*

Identifying the main reasons respondents use e-resources will enable us to create reactive, efficient, and participatory e-resource access; help academic libraries support the academic agenda; make informed investments; and strengthen knowledge-driven decision-making in agricultural research, education, and extension

TABLE V BASIC PURPOSES FOR WHICH RESPONDENTS ACCESS E-RESOURCES

| Purpose of Access | Respondents (N=221) | Percentage (%) |
|---|---|---|
| To enhance knowledge | 184 | 83.3 |
| In the realm of academics | 128 | 57.9 |
| For research work | 143 | 64.7 |
| To know the latest information | 128 | 57.9 |
| Acquire knowledge about global happenings | 136 | 61.5 |
| In the context of education and fostering new ideas | 104 | 47.1 |
| Addressing daily challenges in the workplace | 65 | 29.4 |

Table V shows that out of 221 respondents, 184 (83.3%) used e-resources to increase their knowledge which reflects the importance of learning and continuous intellectual improvement, 143 (64.7%) of the respondents used e-resources for doing research work showing the crucial role of e-resources in scholarly activities, 136 (61.5%) of the respondents used e-resources to get knowledge about what happens in the world, which is an indication of the significance of e-resources in being aware of international affairs, 128 (57.9%) of the respondents used e-resources for academic purpose and 128 (57.9%) used e-resources to be aware of the latest information showing equal significance of both of these purposes, while 104 (47.1%) used e-resources for educational purpose and for generating new ideas, and 65 (29.4%) of the respondents used e-resources for tackling day-to-day problems at work.

The main motivation behind the usage of e-resources is their utility in gaining knowledge and doing research, with educational and information purposes coming next. The statistics provide evidence of a balanced approach towards

the usage of e-resources covering learning, research, professional use, and international awareness. It proves the need for constant improvement of e-resources to meet multiple objectives of ICAR participants.

### *4.6. Primary Locations Used by Respondents for Accessing Electronic Resources*

The main places where users access electronic information serve as a basis for obtaining essential information about the performance of infrastructure, behavior of users, and gaps in services. This information is important for ICAR libraries, as it allows developing the strategy of digital access that will satisfy the needs of users in the agricultural research ecosystem.

TABLE VI PRIMARY LOCATIONS USED BY RESPONDENTS FOR ACCESSING ELECTRONIC RESOURCES

| Access Location | Respondents (N=221) | Percentage (%) |
|---|---|---|
| Department / Office | 96 | 43.4 |
| Library / Departmental Library | 39 | 17.6 |
| Computer Lab / Computer Center | 17 | 7.7 |
| Home | 51 | 23.1 |
| ARIS (Agricultural Research Information System) Center | 12 | 5.4 |
| Other | 6 | 2.7 |

Table VI indicates the primary locations used by participants for accessing electronic resources. However, among the respondents, 96 (43.4%) accessed the electronic resources through their department or office premises, which is the most popular means of accessing e-resources. After that came accessing the resources at their homes, which was done by 51 (23.1%) respondents.

Further, 39 (17.6%) accessed the electronic resources through the library or the departmental library, whereas 17 (7.7%) accessed these resources through the computer lab or computer center. In addition to this, access through the ARIS Center was done by 12 (5.4%) respondents. There were also a few respondents (6, 2.7%) who accessed the electronic resources from other places.

### *4.7. Primary Access Methods Used by Respondents for Accessing Electronic Resources*

Understanding the primary access methods used by respondents is critical to improving the efficiency, accessibility, and impact of e-resource services. For ICAR institutions, this knowledge helps align digital strategies with actual user behavior, ensuring that researchers, students, and faculty can seamlessly engage with digital content wherever there, whenever need it.

TABLE VII PRIMARY ACCESS METHODS USED FOR ACCESSING ELECTRONIC RESOURCES

| S.No | Access Method | Respondents | Percentage (%) |
|---|---|---|---|
| 1. | Internet / Search Engines | 145 | 65.6 |
| 2. | OPAC / Web OPAC | 2 | 0.9 |
| 3. | Library Website / Institutional Website | 12 | 5.4 |
| 4. | E-Databases / CD-ROM Databases | 51 | 23.1 |
| 5. | Other | 11 | 5.0 |

Table VII represents the main access methods adopted by respondents to access electronic information. Of the total number of respondents, most respondents (65.6%) accessed electronic resources through the internet or search engines, and this represents the highest proportion of respondents in terms of access methods. Other access methods are access through e-databases or CD-ROM databases, which were adopted by 51 respondents (23.1%).

As can be seen from table VII, a very small number of respondents accessed the electronic resources through the library website or institution website (5.4%), while 5.0% of respondents accessed the electronic resources through another access method. The least-used access method was access through OPAC or Web OPAC, which was accessed by only 2 respondents (0.9%).

The results show that most respondents utilize internet searching tools rather than the library systems for accessing electronic resources, which indicates the need for more knowledge and training in using the library access tools such as OPAC and the library website.

### *4.8. Preferred Types of Electronic Resources*

Knowing the preferred types of electronic resources is central to user-focused, responsive digital library management. It ensures that ICAR libraries invest in the right formats, support research and education effectively, and create inclusive, high-impact digital knowledge environments for scientists, students, and extension professionals alike.

TABLE VIII PREFERRED TYPES OF ELECTRONIC RESOURCES

| Type of Electronic Resource | Respondents (N=221) | Percentage (%) |
|---|---|---|
| Online Databases | 181 | 81.9 |
| CD-ROM Databases | 19 | 8.6 |
| Electronic Journals (Full text /Abstracts) | 188 | 85.1 |
| Electronic Books | 53 | 24.0 |
| E-Theses & Dissertations | 145 | 65.6 |
| E-Newspapers | 122 | 55.2 |
| Institutional Repositories | 148 | 67.0 |
| Online Reference Books | 148 | 67.0 |
| Other | 19 | 8.6 |

Table VIII provides the preferred electronic sources of information amongst the respondents. The highest preference was found to be for electronic journals, preferred by 188 respondents (85.1%), followed by online databases, preferred by 181 respondents (81.9%). It indicates the high requirement for research and scholarly sources of information.

Furthermore, institutional repositories and online reference books were both preferred by 148 respondents (67%), while e-theses and dissertations were preferred by 145 respondents (65.6%). This denotes that academic and gray literature is used in large quantities. Also, e-newspapers were preferred by 122 respondents (55.2%), which means relevance of current awareness.

In comparison, electronic books were preferred by a smaller number of respondents (24%), while CD-ROM databases and other electronic sources were preferred by 19 respondents each (8.6%).

### *4.9. Awareness of Online Databases related to Agriculture*

Awareness about online databases related to agriculture is not only technical but also strategic for the ICAR organization. It enhances the way of accessing, evaluating, and utilizing agricultural knowledge. Ultimately, it improves research, teaching, and innovations at the field level. So, promotion of awareness about online databases of agriculture is crucial for building a digitally empowered agricultural research community**.**

TABLE IX AWARENESS OF ONLINE DATABASES RELATED TO AGRICULTURE

| Online Database | Respondents (N=221) | Percentage (%) |
|---|---|---|
| AGRICOLA (Agriculture Online Access) | 127 | 57.5 |
| CAB Abstracts (Commonwealth Agricultural Bureaux) | 78 | 35.3 |
| AgEcon Search | 97 | 43.9 |
| AGRIS | 132 | 59.7 |
| Food Science and Technology Abstracts (FSTA) | 100 | 45.2 |
| PubMed (for agriculture-related research) | 138 | 62.4 |
| Web of Science (includes Agricultural Sciences) | 118 | 53.4 |
| Scopus (includes Agricultural Sciences) | 148 | 67 |
| Agronomy Abstracts | 64 | 29 |
| e-Krishi Shiksha | 96 | 43.4 |
| ProQuest Agricultural & Environmental Science Database | 86 | 38.9 |
| FAO Corporate Document Repository | 101 | 45.7 |
| BIOSIS Previews (includes Agricultural Biology) | 105 | 47.5 |
| SciFinder (for Agricultural Chemistry Research) | 87 | 39.4 |

Table IX shows the level of awareness of online databases related to agriculture among the respondents. Among the 221 respondents, the highest level of awareness was observed for Scopus, with 148 respondents (67%), followed by PubMed, which was known to 138 respondents (62.4%). Awareness of AGRIS was reported by 132 respondents (59.7%), while AGRICOLA was known to 127 respondents (57.5%).

Web of Science, which includes agricultural sciences, was known to 118 respondents (53.4%), followed by BIOSIS Previews, reported by 105 respondents (47.5%), and the FAO Corporate Document Repository, known to 101 respondents (45.7%). Awareness of Food Science and Technology Abstracts (FSTA) was reported by 100 respondents (45.2%), while AgEcon Search and e-Krishi Shiksha were known to 97 respondents (43.9%) and 96 respondents (43.4%), respectively.

Further, ProQuest Agricultural and Environmental Sciences Database was known to 86 respondents (38.9%), SciFinder to 87 respondents (39.4%), and CAB Abstracts to 78 respondents (35.3%). The least awareness was observed for Agriculture Abstracts, reported by 64 respondents (29%). The findings reveal that respondents show higher awareness of multidisciplinary and widely used databases, whereas awareness of specialized agricultural databases is comparatively lower.

### *4.10. Satisfaction with the Range and Quality of Available E-Resources*

Satisfaction with the range and quality of e-resources is more than just a user opinion—it is a strategic performance metric for library services. In ICAR libraries, it ensures that digital knowledge resources are relevant, accessible, and impactful in advancing agricultural education and research. Continuous assessment and improvement based on satisfaction feedback is key to maintaining high engagement and value delivery in a rapidly evolving information landscape.

TABLE X SATISFACTION WITH THE RANGE AND QUALITY OF AVAILABLE E-RESOURCES

| Level of Satisfaction | Respondents | Percentage (%) |
|---|---|---|
| Very Satisfied | 52 | 23.5 |
| Satisfied | 71 | 32.1 |
| Neutral | 49 | 22.2 |
| Dissatisfied | 30 | 13.6 |
| Very Dissatisfied | 19 | 8.6 |

Table X shows the level of satisfaction of respondents with the range and quality of available e-resources. Among the respondents, 71 (32.1%) reported being satisfied, followed by 52 respondents (23.5%) who were very satisfied with the available e-resources. Together, this shows that more than half of the respondents expressed a positive level of satisfaction with the range and quality of e- resources available in ICAR institutions

However, 49 respondents (22.2%) expressed a neutral opinion, indicating neither satisfaction nor dissatisfaction. On the other hand, 30 respondents (13.6%) reported being

dissatisfied, while 19 respondents (8.6%) were very dissatisfied with the available e-resources. The findings reveal that although most respondents are satisfied with the e-resources provided by the library, a considerable proportion expressed neutral or negative attitudes, suggesting the need for improvement in the range, quality, or relevance of available e-resources

### *4.11. Problems Faced by Respondents While Accessing Multiple E-Resources*

Documentation and analysis of problems faced during access to various e-resources is of utmost importance for enhancing digital library services. This results in improved user experience, infrastructural development, and formulation of digital strategies. For ICAR institutions, such insights are vital to ensuring that e-resources fulfill their role in supporting cutting-edge agricultural research and education.

TABLE XI PROBLEMS FACED WHILE ACCESSING MULTIPLE E-RESOURCES

| Problem Faced | Respondents (N=221) | Percentage (%) |
|---|---|---|
| Overload of information on the Internet | 159 | 71.9 |
| Inadequate training in the use of electronic resources | 87 | 39.4 |
| Lack of understanding of the search approach | 92 | 41.6 |
| There is a time limit for using e-resources | 125 | 56.6 |
| Downloading information from the Internet takes a long time | 16 | 7.2 |
| Inability to use OPAC due to lack of knowledge | 8 | 3.6 |
| Lack of ICT skill | 29 | 13.1 |
| Limited collections of e-resources | 42 | 19 |
| Lack of trained library staff who can help the users | 24 | 10.9 |
| Lack of awareness of the existence of numerous electronic databases | 68 | 30.8 |
| Hardware infrastructure is insufficient | 17 | 7.7 |
| Difficult to read on screen | 39 | 17.6 |
| Low bandwidth | 3 | 1.4 |
| Power Failure | 8 | 3.6 |
| Other | 6 | 2.7 |

Table XI on problems encountered while accessing multiple e-resources reveals that among the 221 respondents, 159 (71.9%) reported facing an overload of information on the Internet, 125 respondents (56.6%) highlighted the constraint of a time limit for using e- resources, possibly due to session expiry, institutional access time restrictions, or licensing boundaries, 92 respondents (41.6%) stated a lack of understanding of the search approach, 87 respondents (39.4%) reported inadequate training in the use of electronic resources, 68 respondents (30.8%) lacked awareness of the existence of multiple electronic databases, 42 respondents (19%) found the collections of e-resources limited, and 39 respondents (17.6%) expressed discomfort due to difficulty reading on screen, Other issues included lack of ICT skills (13.1%), insufficient hardware infrastructure (7.7%), long download times (7.2%), and low bandwidth (1.4%).

The findings highlight that information overload, search and access limitations, and lack of training or awareness are the most prominent barriers to effective use of multiple e-resources. These observations highlight the significance of making investments in terms of user training, resource awareness campaigns, infrastructure improvements, and efficient discovery tools, all of which need to ensure that the digital resources will actually benefit the academic/research community in ICAR institutions.

### *4.12. Need for Training Programs on the Use of E-Resources*

Training programs could do an excellent job in supporting digital learning, research, and equal access to information. For ICAR institutions and their counterparts, systematic and practical training programs will help users to make use of the potential offered by e-resources, reinforcing academic and professional success.

TABLE XII NEED FOR TRAINING PROGRAMS ON THE USE OF E-RESOURCES

| Training Requirement | Respondents | Percentage (%) |
|---|---|---|
| Yes | 169 | 76.5 |
| No | 52 | 23.5 |

Table XII clearly shows that out of the total of 221 respondents, a vast majority (76.5%) mentioned that needed training programs on the usage of electronic resources, suggesting the clear need for training from the side of the library end.

### *4.13. Preferred Training Methods for Enhancing Awareness of E-Resources*

The identification and application of training methods that are suitable to use for developing consciousness and skills in handling electronic resources is essential for making the most out of these materials. Learning about user preferences helps ensure the effectiveness of such training.

TABLE XIII PREFERRED TRAINING METHODS FOR ENHANCING AWARENESS OF E-RESOURCES

| Training Method | Respondents (N=221) | Percentage (%) |
|---|---|---|
| Presentations | 120 | 54.3 |
| Hands-on Demonstrations | 132 | 59.7 |
| Online Tutorials | 90 | 40.7 |
| Workshops | 156 | 70.6 |
| Audio – Visual Aids | 93 | 42.1 |
| Other | 28 | 12.7 |

Table XIII on the preferred training methods for enhancing awareness of e-resources reveals that among the 221 respondents, 156 respondents (70.6%) preferred workshops, 132 respondents (59.7%) favored a hands-on demonstration, 120 respondents (54.3%) selected presentations, 93 respondents (42.1%) showed interest in audio-visual aids, 90 respondents (40.7%) preferred online tutorials, A smaller portion, 28 respondents (12.7%), mentioned other methods.

The results indicate that the respondents would rather use interactive, practical, and diverse approaches to improve their awareness and skills in handling electronic resources. Considering that more than 70% preferred workshop sessions and close to 60% hands-on demonstrations, institutions such as ICAR should concentrate on in-person, interactive learning sessions. Combined with multimedia presentations and online tutorials, this approach will ensure broader accessibility and sustained impact.

### *4.14. Usage of the Consortium for E-resources in Agriculture (CeRA)*

The Consortium for e-Resources in Agriculture (CeRA) is an important electronic resource that helps in agricultural education, research, and innovations through provision of access to many national and international journals and databases of good quality. Usage of CeRA helps researchers, professors, and students get the latest peer-reviewed information that is critical for enhancing the quality of research work and outputs. By making use of CeRA in an effective way, it is possible to cut down the financial burden on individual institutions and make available the e-resources equally in different regions. The effective usage of CeRA will facilitate knowledge sharing and interdisciplinary research and thus play a crucial part in agricultural research and development.

TABLE XIV USAGE OF THE CONSORTIUM FOR E-RESOURCES IN AGRICULTURE (CeRA)

| Usage Status | Respondents | Percentage (%) |
|---|---|---|
| Yes | 221 | 100 |
| No | 0 | 0 |

Table XIV shows that all the respondents reported using the Consortium for e-Resources in Agriculture (CeRA).

This consistent answer shows complete adoption of CeRA by the respondents. It is evident that CeRA has assumed great importance in agricultural research and information retrieval, thereby making it a crucial component of all academic/ research work at ICAR institutions, where all people have equal access to scholarly journals, e-books, and databases irrespective of their designation and geographical location.

### *4.15. Satisfaction with CeRA Features*

Through its various features, the Consortium for e-Resources in Agriculture (CeRA) provides valuable online information services for the agricultural research community. CeRA is the first national consortium that provides unrestricted access to research literature, and it is vital to the advancement of research, education, as well as the practice of informed decisions in the agricultural sciences.

TABLE XV SATISFACTION WITH CERA FEATURES

| CeRA Features | Satisfaction Levels | | | | | | |
|---|---|---|---|---|---|---|---|
| | Very Dissatisfied | Dissatisfied | Neutral | Satisfied | Very Satisfied | Mean | SD |
| Search mechanism of CeRA | 5 (2.26%) | 8 (3.62%) | 67 (30.32%) | 54 (24.43%) | 87 (39.37%) | 3.950 | 1.023 |
| Full-text download facility | 7 (3.17%) | 7 (3.17%) | 76 (34.39%) | 53 (23.98%) | 78 (35.29%) | 3.851 | 1.045 |
| User-friendly interface | 9 (4.07%) | 7 (3.17%) | 85 (38.46%) | 43 (19.46%) | 77 (34.84%) | 3.778 | 1.087 |
| Multi-disciplinary coverage | 4 (1.81%) | 12 (5.43%) | 68 (30.77%) | 50 (22.62%) | 87 (39.37%) | 3.923 | 1.039 |
| Mobile access | 9 (4.07%) | 6 (2.71%) | 60 (27.15%) | 45 (20.36%) | 101 (45.70%) | 4.009 | 1.100 |
| Access to Research Journals | 7 (3.17%) | 9 (4.07%) | 61 (27.60%) | 47 (21.27%) | 97 (43.89%) | 3.986 | 1.081 |

Table XV shows the analysis of responses regarding satisfaction with different features of the CeRA platform, which suggests that generally users have a positive view of the CeRA service.

For all the CeRA features rated, mean scores for each feature fell into the "Satisfied" category and ranged from 3.778 to 4.009. The highest satisfaction rating was for the Mobile Access feature (Mean = 4.009, SD = 1.100). Other highly rated features are Access to Research Journals (Mean = 3.986, SD = 1.081) and the Search Mechanism of CeRA (Mean = 3.950, SD = 1.023). Results also indicate that users found CeRA's coverage (Mean = 3.923) and the ability to download (Mean = 3.851) research literature to be convenient and satisfactory. Although User-friendly Interface received the lowest mean score (Mean = 3.778, SD = 1.087), it still falls under the category of satisfactory. It can be deduced that the interface is usable; however, design and navigation aspects can be improved.

Standard deviations of all the variables fell between 1.02 and 1.10, indicating moderate levels of dispersion amongst the responses. This close range indicates that responses concerning the quality of CeRA features were quite uniform among the ICAR scientists.

### *4.16. Chi-Square Test for Model Validation and Group Differences*

To statistically validate whether e-resource retrieval behavior significantly varies across professional career stages (designations), a Chi-Square ($\chi^2$) test of independence was performed. This test compared the designation of the respondents (Scientist, Senior Scientist, Principal Scientist)

and their mode of e-resource retrieval (Search Engines vs. Institutional Library Portals/OPAC).

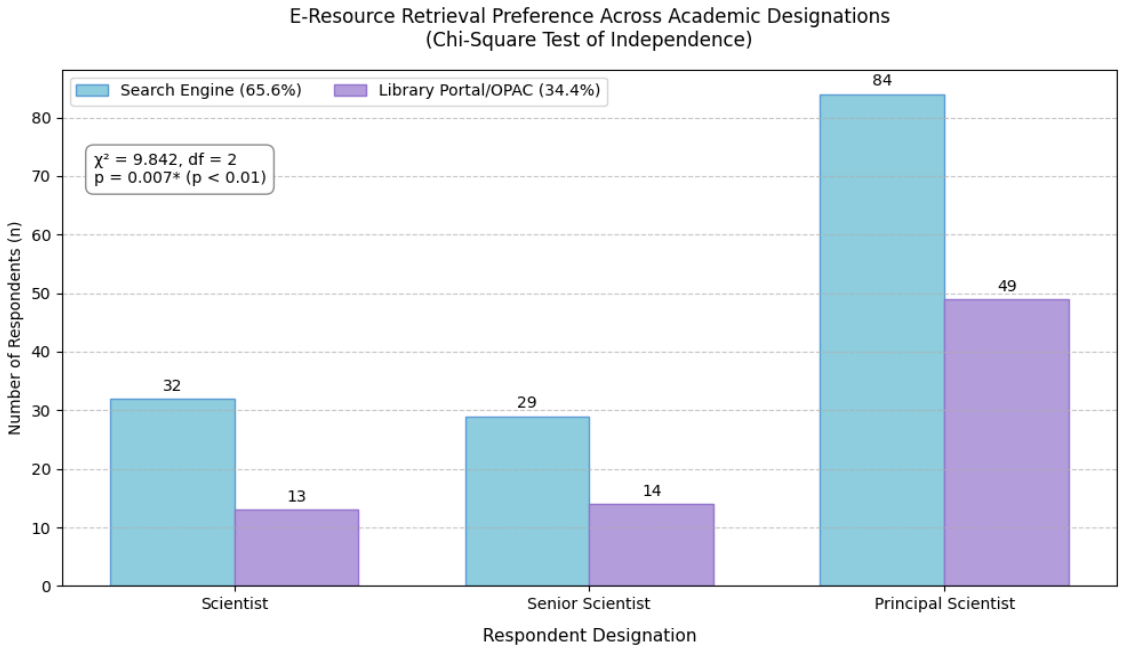



Fig. 2 Chi-Square Test of Independence for E-Resource Retrieval Method by Designation ($\boldsymbol{N = 221}$)

Note: $* p < 0.01$ indicates statistical significance at the 1% level

Fig. 2 shows retrieval channel preferences among 221 scientists. According to the results of the Chi-Square test, there is a statistically significant association between academic level and searching behavior ($\chi^2 = 9.842, df = 2, p = 0.007$). Though search engines prevail at all levels, Principal Scientists use formal library portals much more often than other early-career scientists.

The analysis indicates clearly that CeRA is highly successful in offering easy, accurate, and comprehensive e-information services to its clients. Design and interface improvements may make the service more user friendly; therefore, it would become the most important digital information service in the agricultural research and academic environment.

TABLE XVI SUMMARY OF HYPOTHESIS TESTING RESULTS

| Hypothesis | Statement | Test Applied | $\chi 2$ Value | df | p-value | Decision |
|---|---|---|---|---|---|---|
| $H_0$ | No association between designation and retrieval method. | Pearson's $\chi^2$ | 9.842 | 2 | 0.007 | Rejected ($p < 0.01$) |
| $H_1$ | Significant association between designation and retrieval method. | Pearson's $\chi^2$ | 9.842 | 2 | 0.007 | Accepted ($p < 0.01$) |

Table XVI provides a clear summary of the inferential test, explicitly detailing the null/alternative hypotheses, degrees of freedom, $p$-value, and final statistical decision confirming rank-based retrieval differences.

## V. Discussion

### *5.1. Findings of the Study*

The study assessed the availability, awareness, usage trends, and level of satisfaction with electronic resources, particularly the Consortium for e-Resources in Agriculture (CeRA), among ICAR scientists in Telangana. The sample group consisted of a very qualified one since all of them had attained the Ph.D. degree. The majority were males (75.1%), between 50-59 years old (60.2%), and Principal Scientists (60.2%). Even though the scientists relied greatly on the use of digital information, 77.8% of them used the library frequently.

Electronic resources were extensively used to carry out research work (64.7%) and enhance knowledge (83.3%). Some of the reasons that made scientists adopt e-resources included easy digital storage (93.7%), availability 24 hours a day (83.3%), and remote access capability (72.4%). Scientists accessed e-resources mostly through their departments (43.4%) and homes (23.1%). The use of e-resources was largely guided by the use of general internet search engines (65.6%), whereas OPAC was poorly utilized. The most preferred format was the use of e-journals (85.1%), and online databases (81.9%) were highly appreciated formats, having good collections in ICAR libraries.

Awareness levels were high in relation to general and multidisciplinary databases such as Scopus (67%) and PubMed (62.4%), although lower in specialized agricultural databases such as CAB Abstracts. Satisfaction levels regarding the use of electronic resources were generally high (55.6%), and CeRA scored a usage rate of 100%, becoming invaluable for research purposes. However, critical operational constraints included information overload (71.9%), session limits (56.6%), and search competency problems (41.6%). In order to tackle these issues, 76.5% of the scientists expressed their desire to undergo training, emphasizing practical training programs (70.6%) and practical, hands-on demonstrations (59.7%).

*Implications of the Study*

The empirical findings obtained from the research are useful for the decision-makers within institutions, academic librarians, and those who run the consortia. By showing the dependence on e-resources coupled with skills gaps and the use of search engines, it becomes clear that there is an urgent need for implementing a program for digital literacy training. The libraries need to move from just managing the repositories to actively helping with developing capacities via hands-on training and training programs. Moreover, the full adoption of CeRA indicates the strategic need for funding the consortium, improved access authentication, and upgrading the user interface to maximize research productivity across agricultural research institutions.

*Limitations*

Apart from its practical implications, there are some drawbacks associated with this study, which limit its direct application or even its generalization. First of all, geographically speaking, the sample of participants is limited only to ICAR institutions situated in the state of Telangana; thus, it does not give an idea about the dynamics of e-resources usage and infrastructure outside this geographical scope as well as in institutions not related to agricultural science. Moreover, in terms of methodology, the study is based only on self-reported data collected through the surveys, and hence it reflects the perception of the users rather than their actual activity in the system; this could be a source of self-reporting bias. Besides, in terms of methodology, qualitative data was not included in this quantitative study through, for example, focus groups or interviews, which would allow for a greater context of insight into user behaviors. Lastly, due to the fast-changing technology used in digital publishing and open access, the timeliness of these results may change with continued advancements in search engines and consortia access systems.

## VI. Conclusion

The study examined the usage, awareness, and adoption of electronic resources, more particularly, Consortium for e-Resources in Agriculture (CeRA), by 221 Ph.D.-educated scientists from ICAR institutes of Telangana State. Empirical evidence suggests that digital resources are crucial to agricultural research, and that e-journals (85.1%) and online databases (81.9%) are the key resources being used by these scientists. The universal use of CeRA by all scientists (100%) reflects its importance as a crucial research infrastructure. But inferential analysis using the Chi-Square Test of Independence ($\chi^2 = 9.842, df = 2, p = 0.007$) shows that there is a significant difference in usage behavior among academics. Early Career Scientists predominantly depend upon Google (65.6%) rather than the library portal (0.9%). Moreover, constant skill barriers such as information overload (71.9%), poor search strategies (41.6%), and absence of training (39.4%) indicate that abundant resources do not necessarily mean efficient information seeking processes. Therefore, 76.5% of the respondents indicated their clear need for interactive and practical workshops. For future research, it is suggested that geographical diversification of the study be done by conducting similar studies at different zones across the nation with SAUs. Besides this, adding transaction log analysis with UX methods would help gain more mechanistic understanding of real-time search practices and interface optimization.

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