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Open Source Software KOHA with Special Reference to Agricultural Libraries of ICAR

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ABSTRACT: Koha, the world's first free and open-source Integrated Library Management System (ILMS), has revolutionized library automation by offering flexibility, cost-effectiveness, and community-driven development. Its adoption has significantly grown in academic and research libraries globally, including in India. Within the Indian Council of Agricultural Research (ICAR), Koha is emerging as a preferred solution for modernizing library services across its various agricultural institutions. The software supports key library functions such as cataloging, circulation, acquisitions, serials control, and patron management, all through a user-friendly web interface. Its open-source nature allows for customization to meet the specific needs of agricultural libraries, including the integration of local classification systems, multilingual support, and metadata standards aligned with agricultural sciences. This paper explores the implementation, benefits, and challenges of using Koha in ICAR's agricultural libraries, emphasizing how it enhances information management, accessibility, and service delivery. It also discusses training needs, technical support, and the role of library professionals in successfully leveraging this open-source platform. Koha stands out as a sustainable and scalable solution, aligning with the digital transformation goals of ICAR and the broader mission of agricultural knowledge dissemination.

Keywords: Koha, Open Source Software, Integrated Library Management System, ILMS, ICAR Libraries, Library Automation, Agricultural Information Management, Digital Library Services.

INTRODUCTION

Koha is a fully-featured, open-source Integrated Library Management System (ILMS) that was initially developed in New Zealand in 1999. As the world's first open-source ILMS, Koha has gained global recognition for its flexibility, scalability, and community-driven development. Unlike proprietary systems, Koha allows libraries to modify and adapt the software to their specific needs without the burden of expensive licensing fees. Its web-based interface supports a wide range of library operations, including cataloging, circulation, acquisitions, serials management, patron management, and report generation.

Koha's key features include support for MARC21 and other bibliographic standards, Z39.50 protocol for resource sharing, barcode and RFID integration, customizable OPAC (Online Public Access Catalog), and multilingual capabilities. The software also offers user-friendly dashboards and powerful search functionalities, making it accessible to both librarians and patrons. Koha's open-source nature fosters collaboration among institutions, enabling continuous innovation and enhancements through contributions from a global community of developers and library professionals. Koha is highly relevant as institutions increasingly seek cost-effective, interoperable, and adaptable systems. It aligns with the goals of digital transformation and knowledge democratization by promoting transparency, sustainability, and enhanced access to information.

Importance of Libraries in Agriculture. Libraries play a crucial role in the advancement of agricultural research, education, and extension services. In institutions like the Indian Council of Agricultural Research (ICAR), libraries are not just repositories of books but are vital knowledge hubs that support scientific innovation, policy formulation, and skill development. ICAR, being the apex body for coordinating, guiding, and managing research and education in agriculture in India, operates a vast network of research institutes, universities, and allied organizations, each with its own library system. These libraries serve a diverse user base, including researchers, students, faculty, policymakers, and extension workers, who rely on timely access to scientific literature, data, and reports. Efficient library management ensures that agricultural knowledge is

organized, preserved, and made accessible for both present and future use. With the increasing volume of digital resources, the integration of robust ILMS like Koha becomes essential to streamline operations, improve resource discoverability, and enhance service delivery.

Scope and Purpose of the Study. This paper focuses on the adoption and implementation of the Koha ILMS in the agricultural libraries under ICAR. It examines how Koha can address the specific needs of these libraries, such as handling multidisciplinary agricultural content, supporting multilingual interfaces, and enabling inter-library collaboration across ICAR institutions. The scope includes an analysis of the current status of library automation in ICAR institutions, challenges faced in implementing Koha, and best practices for successful deployment. Additionally, the study seeks to evaluate the impact of Koha on user satisfaction, information accessibility, and operational efficiency. By highlighting case studies and user experiences, this paper contributes to understanding the role of open-source solutions in strengthening agricultural libraries and supporting the broader goals of knowledge dissemination and capacity building in agricultural sciences.

KOHA OPEN SOURCE SOFTWARE OVERVIEW

Koha is recognized as the world's first open-source Integrated Library Management System (ILMS), developed in 1999 by Katipo Communications for the Horowhenua Library Trust in New Zealand (Breeding, 2009). The project was initiated in response to the library's need for a cost-effective and customizable library automation solution. Since its release under the GNU General Public License, Koha has been adopted by libraries worldwide, including public, academic, and special libraries. Over time, its development has been sustained by a global community of developers and library professionals, which has contributed to its continual enhancement and adaptability. The Koha community, which includes institutions like BibLibre (France), ByWater Solutions (USA), and various contributors in India, has played a significant role in its evolution. With regular releases and updates, Koha has grown into a comprehensive ILMS that supports international cataloging standards, digital resource integration, and multilingual interfaces, making it especially suitable for diverse library environments, including agricultural institutions under the Indian Council of Agricultural Research (ICAR) (Kumar & Singh, 2017).

Key Features of KOHA

Koha offers a wide array of features that align with the needs of agricultural libraries:

- Cataloging: Supports MARC21 and other standards, enabling the organization of bibliographic records for books, journals, theses, and digital resources (Chandel & Saikia, 2012).
- Circulation: Manages lending, returns, fines, and member accounts with customizable circulation rules, essential for high-volume academic environments (Rawat & Reddy, 2020).
- OPAC (Online Public Access Catalog): Provides users with a web-based search interface to access the library's holdings anytime, anywhere. Koha's OPAC can be customized with multilingual support, which is crucial in India's diverse linguistic context (Kumar, 2018).
- Acquisitions and Serials Control: Helps track budgets, suppliers, and subscription cycles, ensuring smooth acquisition processes (Sreekumar & Sunitha, 2011).
- Reporting Tools: Offers built-in and customizable reports for usage statistics, inventory checks, and decision-making (Kumar & Sinha, 2020).
- Integration with Digital Resources: Can be linked with institutional repositories and digital libraries, enabling unified access to print and electronic resources (Das & Satpathy, 2017).
- Z39.50 Support: Facilitates resource sharing and cooperative cataloging, useful for interconnected research institutions like ICAR libraries (Pathak, 2015).

Benefits of Using KOHA

- One of Koha's most notable advantages is its cost-effectiveness. Being open source, it eliminates the high licensing fees associated with proprietary software, making it an affordable option for publicly funded institutions such as those under ICAR (Chauhan & Mahajan, 2016).
- Its flexibility and customizability allow libraries to adapt the system to their local needs, including interface translations, regional classification schemes, and subject-specific metadata. For instance, agricultural libraries can customize Koha to handle agri-based taxonomies and multilingual user support, thereby improving information accessibility for researchers and students (Saini & Arora, 2019).
- Koha is also highly scalable, capable of supporting single-branch as well as multi-branch library systems. This is particularly beneficial for ICAR, which operates a network of research institutions and universities across India. A centralized or federated Koha implementation enables resource sharing, uniform cataloging practices, and consistent user services across the network (Ramesha & Kumbar, 2013).
- Another critical benefit is community support. The global Koha community provides extensive documentation, regular updates, bug fixes, and active user forums. This ecosystem fosters innovation and continuous improvement, reducing reliance on a single vendor for technical support (Breeding, 2017).

In the above benefits drown a conclusion; Koha stands out as a powerful, adaptable, and economically sustainable solution for library automation. Its open-source nature and robust features make it a valuable tool for enhancing the efficiency and reach of agricultural libraries under ICAR, supporting their mission to disseminate scientific knowledge and foster innovation in agricultural research.

AGRICULTURAL LIBRARIES IN ICAR

Role of Agricultural Libraries: Agricultural libraries serve as foundational pillars in the advancement of research, education, and extension activities in the agricultural domain. These libraries are more than just

information repositories; they are dynamic knowledge centers that facilitate access to scientific literature, research data, policy documents, and educational materials vital for agricultural development (Patil & Bhoi, 2011). In the Indian context, where agriculture remains a key sector contributing to the livelihood of a significant portion of the population, agricultural libraries play an indispensable role in supporting innovation and evidence-based practices (Ramesha & Kumbar, 2013). The Indian Council of Agricultural Research (ICAR), as the apex body responsible for coordinating agricultural education and research in India, operates a network of over 100 institutes, universities, and research stations. Each of these entities is equipped with a library that provides targeted information services to researchers, faculty, students, and policymakers (Satpathy & Maharana, 2011). These libraries support the dissemination of scientific research through access to national and international journals, books, theses, databases, and grey literature, thus contributing to the mission of food security and sustainable agriculture.

Moreover, agricultural libraries facilitate collaboration between disciplines such as agronomy, horticulture, veterinary sciences, fisheries, and biotechnology by maintaining comprehensive collections and providing digital access to cross-disciplinary materials (Ravichandran & Muthuraj, 2014). Through their services, these libraries help bridge the information gap between scientific research and field-level implementation, thereby supporting knowledge transfer and rural development.

Library Management Challenges: Despite their vital role, agricultural libraries in India face numerous operational and technological challenges. One of the most pressing issues is limited funding and resource constraints, which hampers the acquisition of new materials, staff development, and the adoption of modern infrastructure (Ghosh & Das, 2015). Many libraries still operate with outdated hardware and software, reducing their efficiency and relevance in the digital age. Manual library systems, still prevalent in several institutions, often result in inefficient cataloging, limited accessibility, and poor resource management (Kaur & Verma, 2012). This lack of automation also limits the capacity for inter-library networking and resource sharing—an essential function in a collaborative research environment like ICAR. Another significant challenge is the need for digitization. While some progress has been made in digitizing theses and research papers, most libraries still struggle with inadequate digitization of their print collections. This not only restricts access to valuable legacy data but also hinders long-term preservation (Singh, 2018).

Lack of trained personnel to manage modern digital tools and systems adds another layer of complexity. Library staff often lack exposure to the latest ILMS platforms, metadata standards, and digital curation practices (Chakraborty, 2013). Furthermore, the absence of structured professional development programs results in a skills gap, especially concerning the implementation and maintenance of open-source systems like Koha.

ICAR Libraries: An Overview: The ICAR library network is one of the largest and most diverse collections of agricultural information in the country. It includes the National Agricultural Science Library (NASL), regional research institutes, and agricultural universities. The NASL, located in New Delhi, functions as the apex library in the ICAR system and serves as a central knowledge hub (Yadav & Pandey, 2017). It maintains extensive collections in agricultural sciences, including books, periodicals, technical reports, and databases.

In recent years, ICAR has promoted digitization initiatives such as the KrishiKosh and e-Granth projects. These initiatives aim to enhance access to research outputs and create a centralized digital archive for agricultural knowledge (Rath & Chand, 2016). KrishiKosh, for example, provides open access to thousands of ICAR research documents, helping disseminate valuable agricultural knowledge to a broader audience, including farmers, extension workers, and researchers (Gupta et al., 2020). The efforts are being made to implement Integrated Library Management Systems (ILMS) like Koha across the ICAR network. These systems enable streamlined cataloging, OPAC access, and improved user services. However, the transition is still in progress, and several libraries require infrastructural support and training to make full use of these tools (Yadav, 2020).

IMPLEMENTATION OF KOHA IN ICAR LIBRARIES

Adoption of KOHA by ICAR Libraries: The adoption of Koha, the open-source Integrated Library Management System (ILMS), by libraries under the Indian Council of Agricultural Research (ICAR) marks a significant step in the modernization and digital transformation of agricultural information services in India. The shift toward Koha began in the early 2010s, spurred by the increasing demand for cost-effective, scalable, and flexible library management systems that could support multi-location operations and multilingual **access** (Kumar & Sinha, 2014). The major driving factors behind Koha adoption in ICAR libraries included the rising costs of proprietary ILMS**,** lack of vendor support, and limited customization options with existing systems. Additionally, Koha's community-driven development model, which encourages collaboration and innovation, aligned well with ICAR's mission to disseminate agricultural knowledge across a vast network of research institutes and universities (Chauhan & Mahajan, 2016).

One of the pioneering implementations of Koha within ICAR was at the Indian Agricultural Research Institute (IARI) in New Delhi, where the National Agricultural Science Library (NASL**)** replaced its legacy system with Koha in 2014 (Rath & Chand, 2016). This transition enabled NASL to streamline cataloging, automate circulation, and provide an enhanced Online Public Access Catalog (OPAC) to its users. Similarly, institutions like the ICAR-Central Institute of Fisheries

Education (CIFE) and ICAR-National Dairy Research Institute (NDRI) also adopted Koha, citing improved resource discoverability and patron satisfaction (Gupta & Meena, 2020).

Technical Setup and Customization: Implementing Koha in ICAR libraries required a careful evaluation of infrastructure and technical capabilities**.** Most libraries opted for Linux-based servers**,** such as Ubuntu or Debian, due to their compatibility with Koha and open-source nature (Ghosh & Das, 2015). The basic technical requirements included:

- A Linux server with Apache, MySQL/MariaDB, and Perl modules
- Adequate RAM (4–8 GB**)** and processor capacity (dual-core or higher)
- Internet connectivity for OPAC access and remote updates
- Barcode scanners and label printers for circulation management

Many libraries used local installations, while others implemented Koha in a cloud-hosted environment to reduce maintenance overhead and improve accessibility (Sharma & Rani, 2017). Customization played a key role in adapting Koha for agricultural library services. For example, cataloging templates were tailored to handle agricultural taxonomies, local classification systems, and ICAR-specific metadata elements. Libraries also added vernacular support to the OPAC, especially for Hindi and regional languages, to improve accessibility among researchers and extension workers (Ramesha & Kumbar, 2013).

Koha's reporting module was customized to generate usage statistics required by ICAR for institutional performance evaluations. Furthermore, the acquisition module was modified in some libraries to align with the public procurement and budgeting practices used in government research institutions (Kumar & Singh, 2017).

Staff training was a critical part of the implementation process. Workshops were conducted across ICAR institutions with support from Koha experts and partner organizations such as INFLIBNET and e-Granth ICAR project, helping to build internal capacity for system administration and user support (Pathak, 2015).

Integration with Other Systems: Koha's open architecture and support for standards like Z39.50, MARC21, and SRU/SRW protocols enabled ICAR libraries to integrate it with several external databases and digital repositories. A notable integration was with KrishiKosh**,** the institutional repository developed under the e-Granth project, which aggregates theses, dissertations, and research publications from across the ICAR network (Das & Satpathy, 2017). Through this integration, users could search digital resources directly from the Koha OPAC, ensuring a unified discovery interface for both print and electronic materials. Libraries also linked Koha to CAB Abstracts, AGRIS, JSTOR, and ScienceDirect via federated search tools or metadata harvesting protocols to enhance research visibility and access (Sreekumar & Sunitha, 2011).

Moreover, some libraries have experimented with integrating Koha with RFID-based automation systems to streamline circulation and inventory processes. For instance, the Punjab Agricultural University Library implemented Koha with RFID integration to manage self-checkout, shelf management, and automated issue-return functions (Kaur & Verma, 2012).

The adoption and implementation of Koha in ICAR libraries have significantly contributed to improving the efficiency, transparency, and user satisfaction in agricultural knowledge services. The flexible technical architecture, cost-effectiveness, and vibrant support community make Koha an ideal ILMS for a diverse and research-intensive environment like ICAR. As digitization efforts continue to expand across the agricultural research sector, Koha is poised to play an even more pivotal role in enabling open access, collaborative learning, and evidence-based agricultural innovation.

IMPACT OF KOHA ON AGRICULTURAL LIBRARIES

The implementation of Koha**,** a widely-used open-source Integrated Library Management System (ILMS), has brought significant transformation to agricultural libraries, particularly those under the umbrella of the Indian Council of Agricultural Research (ICAR)**.** As these libraries serve as crucial centers for disseminating agricultural knowledge and supporting research, the shift to Koha has enhanced efficiency, user experience, and access to information across the board.

Improved Resource Management

Koha has significantly improved resource management in agricultural libraries by providing robust modules for cataloging, circulation, acquisitions, and serial control. Before Koha, many ICAR libraries relied on fragmented or manual systems that often led to duplication of resources, poor inventory control, and limited data consistency (Kumar & Sinha, 2014). Koha has introduced standardized cataloging using MARC21, allowing for consistent metadata practices across institutions.

The circulation module enables real-time tracking of check-outs, returns, renewals, and overdue notices, thereby reducing delays and improving accountability (Gupta & Meena, 2020). Moreover, libraries now manage serials and subscriptions with ease, tracking volumes, issues, and renewal dates in an integrated interface. This has proven invaluable for agricultural libraries managing hundreds of journals, including highly specialized periodicals and newsletters.

In institutions like the National Agricultural Science Library (NASL**)** and ICAR-Central Marine Fisheries Research Institute (CMFRI)**,** Koha has helped automate inter-library loan requests, simplify inventory audits, and generate custom reports that support data-driven decision-making (Rath & Chand, 2016).

Access to Information. Koha has significantly improved access to agricultural knowledge and research for a wide range of users, including students, researchers, extension workers, and policymakers. Its Online Public Access Catalog (OPAC) serves as a centralized search interface for both print and digital collections, making it easier to locate relevant materials from any location (Chauhan & Mahajan, 2016).

Integration with digital repositories like KrishiKosh has further enhanced discoverability of theses, technical reports, and institutional publications (Das & Satpathy, 2017). By linking Koha's OPAC with these repositories, users can search across multiple databases simultaneously, reducing the time needed to find relevant information. Agricultural researchers especially benefit from access to grey literature and project documents that are often not indexed in commercial databases (Singh, 2018).

Koha also supports federated search tools and protocols like Z39.50 and SRU, enabling resource sharing among libraries. This is particularly beneficial for agricultural libraries with limited budgets, allowing them to extend their offerings through collaboration and resource exchange (Ghosh & Das, 2015).

Furthermore, Koha's support for Unicode and multilingual interfaces makes it accessible to a broader user base, including non-English-speaking users who work in local extension services or rural development programs (Yadav, 2020). This is crucial in an agricultural context, where regional language access is essential for inclusivity.

Efficiency Gains. Koha has introduced **efficiency gains** across library workflows, minimizing manual tasks and enabling staff to focus on higher-order responsibilities such as user engagement and knowledge curation. Automated circulation, fine calculations, and batch processing of data have drastically reduced time-consuming clerical tasks (Ramesha & Kumbar, 2013).

The system's web-based interface allows librarians to manage operations remotely and provides real-time updates on stock, acquisitions, and user activities. This has become especially valuable during pandemic-related disruptions, where remote library management ensured continuity of service (Sharma & Rani, 2017).

Customized management reports have empowered librarians to analyze user behavior, track popular resources, and monitor gaps in the collection. Libraries have used this data to fine-tune acquisition strategies and tailor services to user needs (Kumar & Singh, 2017).

Additionally, some ICAR libraries have integrated Koha with RFID-based inventory systems and self-service kiosks**,** reducing wait times for patrons and streamlining the issue-return cycle. The result is a more responsive and agile library system that aligns with the fast-paced needs of modern agricultural research (Kaur & Verma, 2012).

User Experience. Koha has significantly enhanced the **user experience** for both patrons and library staff. The interface is **intuitive and user-friendly**, with customizable dashboards, mobile-responsive design, and support for accessibility features such as screen readers and keyboard navigation (Chakraborty, 2013).

For library staff, Koha's modular structure allows easy navigation between cataloging, circulation, and administrative tasks, making training and onboarding more efficient. Regular updates from the global Koha community ensure that the system remains current with new features and bug fixes (Pathak, 2015).

For patrons, the OPAC allows personalized experiences such as viewing account history, placing hold requests, and receiving notifications via email or SMS. This has increased user engagement and satisfaction, particularly among postgraduate students and researchers who rely on timely access to materials (Gupta & Singh, 2020).

Feedback from users at ICAR institutions has consistently pointed to faster search results, better catalog accuracy, and improved service delivery as outcomes of Koha implementation (Yadav & Pandey, 2017). The ability to search using keywords, subjects, authors, and other parameters makes information retrieval seamless and efficient.

Moreover, open access to the catalog from any device has helped students and scholars in remote agricultural colleges and research stations, reducing the information divide between central and regional institutions (Sreekumar & Sunitha, 2011).

The adoption of Koha in ICAR agricultural libraries has catalyzed a significant transformation in how resources are managed, accessed, and delivered. Through improved cataloging, real-time circulation, and enhanced digital integration, Koha has strengthened the role of libraries as hubs of agricultural knowledge. The resulting efficiency gains and improved user experience have not only benefited researchers and students but also advanced the broader goals of sustainable agricultural development and food security.

CHALLENGES AND LIMITATIONS

The adoption of Koha, an open-source Integrated Library Management System (ILMS), has brought notable benefits to agricultural libraries within the Indian Council of Agricultural Research (ICAR) system. However, like any technological intervention, its implementation and usage come with certain challenges and limitations. These include technical difficulties during deployment, training needs, resistance to change**,** and functional limitations specific to the unique needs of agricultural libraries.

- **Implementation Challenges**

— One of the most frequently cited barriers to implementing Koha in agricultural libraries is the technical complexity of installation and configuration**.** While Koha is open source and thus freely available, it requires **a** Linux-based environment and technical knowledge of web servers, databases (MySQL/MariaDB), and Perl scripting (Kumar & Sinha, 2014). Many ICAR libraries, especially those in rural or semi-urban areas, lacked in-house IT staff with the necessary expertise (Chauhan & Mahajan, 2016). This dependence on external consultants or service providers increased initial setup costs and delayed implementation timelines.

— Another key challenge was training and capacity building. Transitioning from a manual or proprietary system to Koha required extensive staff training, not only in system use but also in cataloging standards such as MARC21 and metadata handling (Ramesha & Kumbar, 2013). Given the diverse technical backgrounds of library staff in ICAR institutions,

achieving uniform competence across the network was difficult.

— Resistance to change was also reported, particularly in libraries where staff were accustomed to legacy systems or manual procedures. The perceived complexity of Koha's interface and the fear of technology replacing traditional roles led to psychological resistance and slow adoption (Ghosh & Das, 2015).

— Another challenge was related to data migration. Libraries with decades of legacy records found it difficult to standardize and import data into Koha. In many cases, bibliographic data lacked consistency or was not in machine-readable formats, leading to errors and loss of information during the migration process (Pathak, 2015).

— Additionally, infrastructural challenges such as poor internet connectivity, outdated computer hardware, and unreliable power supply—particularly in state agricultural universities—hampered the real-time functioning of Koha and its web-based OPAC (Sharma & Rani, 2017).

• **Limitations of KOHA**

— Despite its flexibility, Koha has certain limitations that become evident in the context of agricultural libraries. One of the most prominent issues is the lack of domain-specific functionality. Agricultural libraries require support for specialized classification schemes (e.g., Universal Decimal Classification for agriculture, CAB Thesaurus integration) and taxonomic indexing, which are not natively supported by Koha (Kumar & Singh, 2017).

— Another limitation is related to localization and language support. Although Koha supports multiple languages, including Hindi, the translations are often incomplete or not aligned with agricultural terminology, reducing the effectiveness of the system for vernacular users (Das & Satpathy, 2017). This is particularly problematic in rural libraries serving extension workers and non-English-speaking researchers.

— Koha also lacks in-built tools for digital rights management (DRM) and research data curation**,** which are becoming increasingly important for libraries that deal with sensitive or proprietary agricultural datasets. Unlike digital library systems such as DSpace or Greenstone, Koha does not support robust multimedia handling or data visualization, limiting its utility for modern digital scholarship (Sreekumar & Sunitha, 2011).

— Furthermore, Koha's reporting and analytics modules, though customizable, are not intuitive for users without programming or SQL knowledge. This creates a barrier for library staff who wish to extract usage statistics or generate reports for institutional planning (Chakraborty, 2013).

— Another concern is vendor dependenc**e**. While Koha is open source, many ICAR institutions have had to rely on third-party vendors for installation, customization, and ongoing maintenance. This reliance sometimes leads to inconsistent service quality and higher long-term costs (Gupta & Meena, 2020).

• **Solutions and Recommendations**

— Addressing the challenges and limitations of Koha in agricultural libraries requires a multi-faceted approach involving technological, organizational, and policy-level interventions.

— First, ICAR should consider establishing **a** centralized Koha support unit with regional technical hubs. These hubs can provide standardized training, centralized hosting, and technical assistance to affiliated libraries, thereby reducing dependency on external vendors and ensuring uniform implementation quality (Rath & Chand, 2016).

— To overcome training challenges, structured e-learning modules, hands-on workshops, and certification programs can be developed. Collaboration with national organizations like INFLIBNET, NIC, and e-Granth could expand the training network and reduce knowledge gaps across institutions (Kaur & Verma, 2012).

— In terms of system limitations, the Koha community can be engaged to develop agriculture-specific plugins and modules**,** such as integration with CAB Abstracts, KrishiVigyan Kendra datasets, or rural outreach portals. A collaborative development model involving academic institutions and IT professionals can generate customized solutions that address unique needs (Gupta & Singh, 2020).

— Localization efforts should be expanded to include agricultural terminology in Indian languages, enabling inclusive access. This could be done in partnership with language institutes and agricultural universities to ensure accurate translations (Yadav, 2020).

— To improve analytics, user-friendly reporting interfaces or dashboards should be developed for non-technical users. Integrating Koha with data visualization tools like Power BI or Tableau can offer librarians intuitive insights into user behavior and collection performance (Singh, 2018).

— Finally, policy-level support is essential. ICAR can issue national guidelines for library automation, offering financial incentives, technical roadmaps, and evaluation metrics to monitor Koha implementation. Such a framework would encourage accountability and ensure sustainable digital transformation (Chauhan & Mahajan, 2016).

SUMMARY OF FINDINGS

This study explored the adoption, implementation, and impact of Koha, an open-source Integrated Library Management System (ILMS), within the agricultural libraries of the Indian Council of Agricultural Research (ICAR). Koha has proven to be a significant technological advancement in library automation, offering features such as cataloging, circulation, Online Public Access Catalog (OPAC), acquisitions, and digital resource integration, all essential for modern-day information services.

The study highlighted that ICAR libraries, tasked with supporting agricultural research, education, and extension activities, faced numerous challenges in managing growing volumes of literature, research data, and user demands. The adoption of Koha has led to

notable improvements in resource organization, accessibility, and service delivery. Libraries that implemented Koha reported enhanced efficiency in operations, better cataloging standards, and greater user satisfaction.

However, the journey was not without challenges. Issues such as technical complexity, lack of trained staff, data migration problems, and resistance to change were common during the implementation phase. Furthermore, Koha's current structure showed some functional limitations, especially in catering to the specialized needs of agricultural libraries, such as handling indigenous languages and integrating scientific taxonomies.

Despite these challenges, Koha's flexibility, cost-effectiveness, and vibrant global community have positioned it as a valuable tool in transforming agricultural library services across ICAR institutions.

FUTURE SCOPE

The future of Koha in agricultural libraries looks promising, especially as the global open-source community continues to improve and expand the platform's capabilities. With increasing demand for digital transformation in research institutions, Koha is well-suited to evolve into a comprehensive knowledge management platform, supporting not just traditional bibliographic records but also institutional repositories, research data, and multimedia content.

In the context of **d**eveloping countries like India, open-source software like Koha presents a sustainable and scalable alternative to proprietary systems. The low-cost nature of open-source adoption is particularly important for publicly funded agricultural institutions, where budget constraints often limit the scope of IT modernization.

Community-driven innovations—such as modules for agrarian metadata, support for multilingual interfaces, and integration with platforms like AgriCat, KrishiKosh, and DSpace—can further enhance Koha's role in agricultural libraries. Additionally, the ongoing shift toward cloud-based Koha hosting could minimize infrastructure burdens on smaller institutions and facilitate easier access to updates and support.

As libraries evolve into hybrid physical-digital spaces, Koha can serve as the backbone of this transformation, ensuring seamless discovery, delivery, and dissemination of agricultural knowledge to researchers, students, farmers, and policymakers.

Recommendations: Based on the findings and observations in this study, the following recommendations are proposed for agricultural institutions and research libraries considering Koha:

1. Establish Centralized Support Systems: ICAR and similar institutions should consider creating centralized help desks or regional Koha hubs to provide consistent technical and training support across affiliated libraries.

2. Invest in Training and Capacity Building: Continuous skill development programs for library staff—covering Koha operations, MARC21 cataloging, and metadata standards—should be institutionalized to ensure smooth transitions and long-term sustainability.

3. Customize Koha for Agricultural Needs: Collaborate with Koha developers and the agricultural academic community to build agriculture-specific plugins, such as modules for scientific taxonomies, local languages, and agronomic thesauri.

4. Pilot Projects and Knowledge Sharing: Encourage pilot implementations in diverse types of ICAR institutions (colleges, regional centers, KVKs) and promote inter-institutional sharing of best practices, case studies, and customization templates.

5. Integrate with Digital Repositories: Facilitate integration of Koha with digital libraries like DSpace, institutional repositories, and national agri-portals to support comprehensive resource management.

6. Secure Long-Term Funding and Policy Support: Government and ICAR should provide long-term financial and policy support for open-source library systems, emphasizing their strategic role in agricultural innovation and knowledge dissemination.

7. Encourage Community Participation: Promote active participation in the Koha open-source community, encouraging Indian developers, librarians, and academics to contribute to its growth and contextual relevance.

CONCLUSIONS

Koha offers a robust, flexible, and future-ready solution for agricultural libraries in India. As an open-source integrated library management system, it empowers libraries with powerful tools for cataloging, circulation, reporting, and digital resource management, all without the burden of expensive licensing fees. Its customizable nature allows institutions like those under ICAR to adapt the system to their specific needs, including support for regional languages and agricultural research databases. The continued development of Koha, driven by a vibrant global community of developers and librarians, ensures that it remains technologically up-to-date, secure, and aligned with evolving library standards. Policy support from government and academic bodies further strengthens its adoption and sustainability. Koha's role will become even more critical as libraries transition further into digital-first environments. With advancements such as integration with RFID systems, cloud hosting, and support for mobile access, Koha has the potential to redefine library management in the field of agriculture and allied sciences.

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