



# AGRI MAGAZINE

(International E-Magazine for Agricultural Articles)

Volume: 03, Issue: 02 (February, 2026)

Available online at <http://www.agrimagazine.in>

© Agri Magazine, ISSN: 3048-8656

## Digital Libraries in Agricultural Sciences: Catalysts for Research, Innovation, and Food Security

\*Pratanu Sarkar, Romit Roy, Hrishikesh Talukdar, Sahil Ahmed and Suman Das  
College of Post Graduate Studies in Agricultural Sciences, Central Agricultural University (Imphal), India

\*Corresponding Author's email: [pratanusarkar2002@gmail.com](mailto:pratanusarkar2002@gmail.com)

Contemporary agricultural science demands unfettered access to peer-reviewed research, datasets, technical reports, policy documents, and historical records to fuel innovation amid escalating climate pressures and food security needs. Traditional print resources prove inadequate for rapid, scalable dissemination, positioning digital libraries—searchable online hubs of full texts, multimedia, geospatial data, and metadata—as indispensable infrastructure for knowledge discovery, reuse, and preservation. Platforms like FAO's AGRIS exemplify this by indexing millions of multilingual documents, spotlighting "grey literature" such as theses, bulletins, and proceedings that capture region-specific insights from developing nations, often invisible in mainstream journals. These repositories transcend silos spanning plant biology, soil science, economics, and climate adaptation, enabling interdisciplinary meta-analyses and reproducibility via open datasets (e.g., Dryad). AI-enhanced searches bridge languages—pairing Assamese flood-resilient rice guides with global irrigation policies—while integrations like Research4Life grant equitable access to 150,000+ resources for low-income institutions, empowering Assam's Barpeta farmers with bio-fertilizer data. In India, NDLI (81M+ items) and ICAR's KrishiKosh digitize vernacular extension materials, accelerating lab-to-field transfer through multimedia like drone pest visuals and offline mobile apps. Challenges persist: metadata inconsistencies, linguistic barriers, and access inequities. Adopting FAIR principles, AGROVOC standards, DOIs, CC-BY licenses, and OAI-PMH interoperability—bolstered by NDLI's NEP 2020-aligned policies and ICAR's CeRA—mitigates these. Key global repositories (AGRIS, AGRICOLA, PubAg, KrishiKosh) and recommendations for AI translation, API-farm app linkages, and grey literature prioritization herald a future where digital ecosystems drive sustainable yields, policy reforms, and resilient agriculture worldwide.

**Keywords:** Digital libraries, agricultural science, NDLI, grey literature, FAIR principles, open access, ICAR repositories

### Introduction

Contemporary agricultural science increasingly depends on broad access to peer-reviewed studies, datasets, technical reports, policy analyses, and even archival literature to drive innovation and decision-making. Traditional print materials fall short in meeting the demands for widespread, instantaneous, and scalable information sharing. Digital libraries—online repositories featuring searchable databases of full texts, multimedia files, datasets, and metadata—form the critical backbone for discovering, repurposing, and long-term preservation of agricultural knowledge.

Expanding on this foundation, digital libraries enable seamless global collaboration by aggregating diverse content types, including geospatial data for crop modeling, video tutorials on precision farming techniques, and interactive simulations of climate impacts on yields. For instance, platforms like the Food and Agriculture Organization's AGRIS index

millions of agricultural documents worldwide, emphasizing multilingual records and "grey literature" such as conference proceedings, theses, and government bulletins that often evade conventional journals, thus amplifying visibility for region-specific insights from developing nations.

Additional advantages include advanced search capabilities powered by AI and natural language processing, allowing researchers to query across languages and formats—e.g., retrieving Assamese-language reports on flood-resistant rice alongside English policy briefs on sustainable irrigation. These systems support open-access models, fostering reuse in meta-analyses for evidence-based policymaking, such as evaluating subsidy impacts on smallholder productivity. They also integrate with tools like data visualization dashboards, enabling farmers to overlay historical weather data with modern satellite imagery for predictive analytics.

Moreover, digital libraries ensure knowledge resilience against physical degradation, with features like version control for evolving datasets and blockchain verification for data integrity. In India, this aligns with NDLI and ICAR's KrishiKosh, which digitize vernacular extension materials on organic pest control, directly aiding rural users in regions like Barpeta, Assam, by reducing reliance on outdated print advisories amid climate variability. Ultimately, they bridge academia, extension services, and on-farm application, accelerating breakthroughs from lab to field.

### Why Digital Libraries Matter

Agricultural challenges inherently intersect multiple fields, such as plant sciences, soil management, livestock health, agricultural economics, and environmental factors like climate change. Digital libraries bridge these silos by unifying literature across languages, regions, and disciplines, enabling comprehensive synthesis, meta-analyses, and interdisciplinary breakthroughs essential for advancing farming practices.

Beyond peer-reviewed journals, these platforms safeguard "grey literature"—including technical reports, student dissertations, extension pamphlets, and conference proceedings—that often contain actionable, field-tested insights overlooked by mainstream publications. For example, FAO's AGRIS database excels here, indexing millions of such resources globally to surface practical knowledge from local contexts, like smallholder irrigation strategies in South Asia. Open-access data repositories further enhance scientific rigor by promoting reproducibility; researchers can directly access raw datasets for verification, reducing errors in studies on crop yields or pest dynamics. Platforms like Dryad exemplify this, hosting reusable agricultural datasets for large-scale simulations, such as validating AI-driven models for drought prediction using historical soil moisture records.

Equitable access remains pivotal, with initiatives like Research4Life providing low- or no-cost subscriptions to over 150,000 journals and books for 13,000+ institutions in low- and middle-income countries, narrowing the North-South knowledge divide and empowering farmers in places like rural Assam with evidence on resilient rice varieties. Additional benefits include integration with geospatial tools for mapping disease outbreaks or yield gaps, fostering collaborative platforms where extension agents co-create content with farmers. In India, NDLI and KrishiKosh exemplify this by offering vernacular datasets on bio-fertilizers, supporting community-led meta-reviews that inform policy, such as subsidies for climate-smart agriculture. They also incorporate multimedia like drone footage of pest infestations or podcasts on market linkages, accelerating tech transfer from labs to fields while ensuring long-term preservation through cloud backups and metadata standards.

### Challenges and Best Practices

Major obstacles involve metadata formats, linguistic obstacles, inconsistent quality of grey literature and subscription barriers restricting access to top journals. To overcome these following principles (Findable, Accessible, Interoperable, Reusable) together with standardized metadata formats and vocabularies like AGROVOC is crucial. Global initiatives and regulations such, as AGRIS, OpenAIRE and CGIAR's open-access policy encourage

interoperability and open frameworks. Researchers and librarians must submit datasets and preprints to reliable repositories that assign DOIs use vocabularies, for easier discovery and implement open licenses to specify usage permissions.

**Table 1 : Key Digital Libraries and Repositories for Agricultural Sciences**

Sl No.	Digital Library / Repository	Host / Owner	Scope	Content Types	Access	Notes
1	AGRIS	FAO	Global agricultural science + grey literature	Bibliographic records, abstracts	Free, open	Supports AGROVOC multilingual thesaurus
2	AGRICOLA	U.S. National Agricultural Library (NAL)	Agriculture and allied fields, historical to present	Catalog records, citations, some full text	Free	Catalog for NAL, wide-ranging agricultural materials
3	PubAg	USDA / NAL	USDA-authored research	Full-text articles, citations	Free	Broad access to USDA research outputs
4	CABI / CAB Abstracts	CABI	Applied life sciences (agriculture, vet, environment)	Abstracts, indexing, some full text	Subscription	Leading abstracting service for applied life sciences
5	CGSpace / CGIAR OA Repository	CGIAR	CGIAR centers' agronomy, breeding, socioeconomics	Publications, datasets, theses	Open Access	Central repository for CGIAR research
6	Krishikosh	Indian Council of Agricultural Research	Indian agricultural research and education outputs	Theses, reports, bulletins	Open Access	Implements ICAR open-access policy
7	agriRxiv	agriRxiv (COS/CABI platform)	Preprints in agriculture and allied sciences	Preprints, working papers	Open Access	Rapid sharing before journal publication
8	AgEcon Search	University of Minnesota	Agricultural & applied economics literature	Working papers, journal articles	Free, open	Focus on agricultural economics research
9	DOAJ	DOAJ Foundation	Open access journals including agriculture	Journal articles and metadata	Free	High-quality open-access journals
10	Zenodo	CERN / OpenAIRE	General research including agri datasets and software	Datasets, preprints, software	Open Access	DOI issuance and data curation
11	Dryad	Dryad (nonprofit)	Biological and agricultural science datasets	Datasets with DOIs, metadata	Open (some fees)	Data reuse and stable citations
12	OpenAIRE	EU-backed infrastructure	Aggregates open publications and datasets	Publications, datasets	Open	Compliance with EU Open Science requirements
13	Research4Life	Public-private partnership (WHO, FAO, etc.)	Health, agriculture, environment journals	Journals, e-books	Free or low-cost	Access for eligible institutions in developing countries
14	GBIF	International network	Biodiversity occurrence/specimen data	Occurrence records, metadata	Open	Useful for agroecology and species distribution modeling
15	Scopus	Elsevier	Multidisciplinary scientific abstracts	Abstracts, citations	Subscription	Powerful for bibliometrics and literature reviews
16	Web of Science	Clarivate	Multidisciplinary citation index	Citation records, abstracts	Subscription	Cross-disciplinary literature discovery

17	WorldCat	OCLC	Global union catalog of library holdings	Bibliographic records	Free search	Find physical/digital documents worldwide
18	NAL Digital Collections	U.S. National Agricultural Library	USDA historical and current materials	Digitized reports, images	Open	Valuable for historical and grey literature
19	FAO Open Knowledge Repository	Food and Agriculture Organization (FAO)	FAO publications, datasets, policy documents	Books, reports, maps	Open	Official policy and research data source
20	World Bank Open Knowledge Repo	World Bank	Agricultural development and economics	Reports, policy notes, datasets	Open	Important for global agricultural development policy

Choosing the digital library relies on user requirements: platforms like Dryad and Zenodo specialize in sharing raw data and ensuring reproducibility; agriRxiv is ideal for fast distribution through preprints; AGRIS and AGRICOLA provide broad bibliographic content, including grey and regional materials; whereas Scopus and Web of Science offer subscription-based detailed discovery and impact evaluation. Institutional repositories like Krishikosh and CGSpace grant access, to research findings promoting inclusiveness and aiding local agricultural development.

### Recommendations for Future Development

To maximize their influence, agricultural digital libraries must adopt open metadata standards like AGROVOC and utilize OAI-PMH protocols for seamless interoperability and heightened discoverability across diverse repositories. Promoting dataset citations via DOIs and favoring permissive licenses such as CC-BY fosters accountability, incentivizes sharing, and streamlines reuse in everything from policy briefs to farm apps. Capacity-building programs modeled on Research4Life empower researchers in under-resourced settings not just to access but also to contribute content, such as localized soil health guides from Assam's flood plains. Prioritizing the archiving of grey literature—including farmer manuals, theses, and field trial reports—directly equips extension workers and growers with pragmatic tools often absent from formal journals. Further enhancements involve embedding AI-driven translation for multilingual queries, enabling a Tamil Nadu horticulturist to tap Assamese pest control data effortlessly. Mobile-first interfaces with offline caching ensure usability in remote areas, while gamified contributor badges spur community uploads of vernacular audio advisories on crop rotation. Integrating APIs with farm management apps allows real-time data pulls for personalized recommendations, like micronutrient plans based on NDLI-sourced theses, ultimately amplifying on-ground impact from research silos to sustainable yields.

### Policies for Digital libraries

India's digital libraries, particularly the National Digital Library of India (NDLI), operate under a framework of government policies emphasizing education access, digitization, and preservation. These are shaped by national initiatives like the National Education Policy (NEP) 2020 and phased projects funded by the Ministry of Education.

#### Key Policy Frameworks

The NDLI project unfolds in phases aligned with policy milestones: Phase I (2015-2017) focused on pilot development; Phase II (2017-2021, extended due to COVID-19) launched the portal in 2018 under then-HRD Minister Prakash Javadekar; and Phase III (2021-2026) enhances capabilities post-pandemic. NEP 2020 integrates NDLI to democratize knowledge for 50 million+ students, promoting multilingual resources and institutional digital repositories (IDRs).

National Mission on Libraries (NML) drives public library digitization, while Digital India and National Knowledge Network support infrastructure for academic libraries. For

agriculture, ICAR's eGranthalaya policy under NATP/NAIP mandates ICT adoption in libraries, transforming them into web-based systems.

### Operational and Usage Policies

NDLI's Terms & Conditions require accurate user registration for individual access only—no sharing credentials—and restrict commercial use, publishing, or data mining without source permission. Content is for personal/institutional learning; users indemnify IIT Kharagpur and the Ministry against misuse, with logging for UX improvements but no absolute data secrecy guarantee.

### Copyright and Fair Use Policies

NDLI's Copyright Guide (2020) aids libraries with fair dealing templates under Indian Copyright Act, but critics note it may overly restrict user rights, like limits on copies for disabled access or event reporting. Policy favors copyright-free works for DLI digitization; permissions needed for protected materials.

### Agriculture-Specific Policies

ICAR policies via CeRA ensure e-resources access for NARES, with KrishiKosh promoting open archiving of theses and bulletins under open metadata standards. These align with Digital Agriculture Mission for farmer advisories, emphasizing grey literature preservation.

### Challenges and Reforms

Policies face issues like inconsistent implementation and funding delays, prompting calls for streamlined processes and data privacy enhancements. Future focus includes NEP-driven clubs (5,800+ institutions by 2024) for activity-based learning.

### Conclusion

The evolution of agricultural science from isolated print archives to interconnected **digital libraries** represents a fundamental shift in how humanity manages food security and environmental resilience. As explored, these platforms are no longer mere repositories of static information; they act as dynamic engines that democratize access to knowledge, bridging the critical gap between high-level academic research and on-ground application. By aggregating diverse resources—from peer-reviewed journal articles to vital "grey literature" and raw geospatial datasets—digital libraries serve as the connective tissue between the laboratory and the land.

The success of this digital transformation relies heavily on adherence to **FAIR principles** (Findable, Accessible, Interoperable, Reusable) and the adoption of open-access models. As demonstrated by platforms like **AGRIS** and **Research4Life**, removing subscription barriers allows for a truly global exchange of ideas, where insights from a smallholder in South Asia can inform policy in Sub-Saharan Africa. Furthermore, the integration of advanced technologies, such as AI-driven translation and blockchain verification, ensures that this knowledge is not only accessible across linguistic divides but also preserved with integrity against technological obsolescence. In the Indian context, initiatives like **NDLI** and **KrishiKosh** exemplify the power of localized knowledge management. By digitizing vernacular extension materials and aligning with national mandates like the NEP 2020, these repositories empower rural communities—such as farmers in **Barpeta, Assam**—to combat climate variability with evidence-based strategies. Ultimately, the future of sustainable agriculture depends on the continued interoperability and expansion of these digital ecosystems. By fostering a culture of open sharing and prioritizing the "last mile" delivery of information, digital libraries will remain indispensable tools in accelerating innovation, influencing policy, and ensuring that scientific breakthroughs translate into tangible harvest yields.