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International Information System for Agricultural Sciences and Technology and Indian Participation

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ABSTRACT

The paper briefly describes the history and development of International Information System for the Agricultural Sciences and Technology (AGRIS), its network, documentation tools, products/services, HRD and capacity building programme. An attempt has been made to showcase the contribution of India in AGRIS development. Limitations and problems faced during AGRIS Input preparation have been discussed in detail and an Action Plan is suggested for further progress and success of AGRIS programme in India.

Keywords: Agricultural sciences and technology, database management, agricultural information systems, Food and Agriculture Organisation

1. INTRODUCTION

AGRIS is an international bibliographic information system for the agricultural sciences and technology. The AGRIS database is an enormous collection of 2.6 million structured bibliographical records[1]. This system is managed centrally by the WAICENT/FAOINFO Dissemination Management Branch of the Library and Documentation Systems Division (GIL) of Food and Agriculture Organisation (FAO) of the United Nations. It is a cooperative system in which participating countries input the references to the literature/documents produced within their boundaries and, in return, get an access to the information provided by the other participants. The database contains 75 per cent journal articles, 18 per cent monographs, 6 per cent conferences papers and 1 per cent other literature. The 16 per cent of the records refer to non-conventional literature (not commercially available) and 21 per cent records include abstracts. Language-wise, the database contains English (58 %), French (8 %), German (7 %), Spanish (7 %), Japanese (4 %), Italian (3 %), Russian (3 %), Portuguese (2 %), and other language articles[2] (8 %). To date, 159 national and 31 international and inter-governmental centres participate and submit about 14,000 items per month. The bibliographic inputs submitted by the participating countries are collected and processed in the AGRIS processing unit, Vienna, which is hosted by the Division of Scientific and Technical Information of the International Atomic Energy Agency (IAEA).

2 HISTORICAL BACKGROUND

The AGRIS was created in 1974 by the FAO of the United Nations to facilitate information exchange and provide bibliographical control of the world literature dealing with all aspects of agriculture. The development of AGRIS is based on the development of scientific documentation over several decades. International Nuclear Information System (INIS) was the first attempt to implement the concept of the international cooperative information system. Thus, in order to understand the history of AGRIS, it is necessary to know about the history of INIS. In the second half of the 1960s, the IAEA launched the INIS, a major project to promote the exchange of information on all aspects of the peaceful uses of nuclear energy.

In 1962, a panel of experts recommended that the IAEA should help UNESCO's efforts to encourage R&D on mechanising, storage and retrieval of information, and the broader study of science abstracting at the international level. In 1965, Soviet and US experts outlined a scheme for an international information system to cover the expanding flow of literature on the peaceful uses of nuclear energy and to meet the information needs of countries at different levels of development and different

backgrounds and traditions in the techniques of information handling. In 1968, an international team of experts made a detailed study of the system and drew up a report to the Board. The system was designed to provide machine-processed data on the particular nuclear topic that a user selected. It is decentralised in the sense that each participating State is responsible for preparing and arranging the input of all literature relating to the peaceful uses of nuclear energy that is published or becomes available in that State. In the early 1990s, the INIS database began to be available on CD-ROM as well as on-line and in print. INIS served as a model for other information systems, such as, UNISIST, a worldwide science information system developed by UNESCO, and the AGRIS, a similar system covering food and agriculture, operated by FAO in co-operation with the IAEA.

In 1963, John Sherrod, Director of the Science and Technology Division of the Library of Congress, who had conceived international cooperative information system, became a member of the staff of the Division of Technical Information of the US Atomic Energy Commission (AEC). In February 1968, John Sherrod and A.I. Lebowiz were transferred from AEC to the US National Agricultural Library (NAL) and a working group consisting NAL, Commonwealth Agricultural Bureaux (CAB), FAO, and the European Community was set up. At that time, the major English language agricultural bibliographic tools were National Agricultural Library Catalog; Bibliography of Agriculture published by NAL and a series of abstracting journals covering many aspects of agriculture published by the CAB. Apart from this, there were more than 700 secondary abstracting and indexing services in agriculture. In 1968, agricultural researchers in the US relied on the CAB as the largest agricultural abstracting service[3].

In 1970, FAO set up an ad hoc Study Group to propose 'Possible Frameworks for, a World-wide Agricultural Information System. The first recommendation of the Study Group was to implement Level-I service of AGRIS. No professional leadership was able to represent AGRIS effectively in FAO or outside of it. FAO did not have a Division of Scientific and Technical Information. The FAO established a Research Division in the mid-1980s and a Library and Documentation Systems Division were established. Before 1979, AGRIS was implemented as Level-I so it did not include abstracts. This became AGRIS policy in 1979 and the number of abstracts in AGRIS has consistently increased. At present, more than 21per cent of the citations submitted to AGRIS included abstracts. In the early days of AGRIS, it was decided to develop AGROVOC, a multilingual indexing and retrieval thesaurus with the help of IDRC. After its completion and implementation, the indexes to the printed version of AgrIndex, the principal AGRIS output product were based on AGROVOC. At that point, the indexes were still produced only in English, which were of limited use for their usability in many parts of the world, such as, Latin America and Francophone Africa. After that FAO produced three language versions (English, French and Spanish) of AgrIndex. This AgrIndex was discontinued from 1998.

In order to overcome the lack of coherent and coordinated approaches to the AGRIS information system architecture, an assessment of AGRIS was conducted in 2000. Limitations in AGRIS were identified in four areas: (a) difficult access to the original documents, (b) incomplete coverage, (c) independent systems and (d) structural and institutional constraints. As the AGRIS system aims to decentralise data processing and to prioritise national capacity building and enhancing autonomous management of national agricultural information, a new strategic vision has been developed. To address these limitations, a 'new vision for AGRIS' had been under work since 2000. In 2009, AGRIS adhered to Coherence in Information for Agricultural Research for Development (CIARD), a global initiative of international partner organisations (such as, DFID, CIARD, GFAR, etc.) committed to working to increase the public benefits deriving from investment in agricultural research and innovation for development. Currently, AGRIS continues its research into improving access to science technology and agricultural information globally available on the web, under the CIARD umbrella[4].

3. SCOPE AND COVERAGE OF AGRIS

The scope of AGRIS coincides with the scope of FAO and covers agriculture and its related fields, including fisheries, forestry, food, veterinary science and rural development. The AGRIS categorisation scheme is the basic manual for the categorisation of agricultural literature and agricultural research projects to be included in AGRIS, and gives a breakdown of the AGRIS subject scope into a number of main fields, which are further subdivided into specific subject categories. The subject scope of AGRIS includes all technical, economic and sociological aspects of agriculture, including forestry, animal husbandry, the aquatic sciences and fisheries, and human nutrition. The literature covered includes conventional documents, such as serial articles, books, published conference proceedings, etc., but also non-conventional material, such as scientific and technical reports, theses, conference papers, etc., that are not readily available through normal commercial channels are also included. Non-conventional materials constitute about 20 per cent of the database.

4. WEBAGRIS

The new WebAGRIS Version 2.0 was released to robust information management system having integrated numerous updates, error fixes, and new features. The main achievements in this version include adaptation of

WebAGRIS for compliancy to the AGRIS AP metadata standard, upgradation of the incorporated AGROVOC thesaurus, improvements in the search interface, improvements in the data entry system, export/download features, and inclusion of updated documentation.

WebAGRIS is a complete, multilingual web-based system for distributed data input, processing and dissemination (through the Internet or on CD-ROM), of agricultural bibliographic information. WebAGRIS also allows to link to documents that are available in electronic format. It is based on common standards of data input (meta-data standard data structure), and dissemination formats (export formats (XML, HTML, ISO2709)), as well as subject categorisation schema and thesauri, i.e., AGROVOC[5]. Depending on the 'architecture' of the production process and resources. WebAGRIS can be used either as a local application or in a joint collection of information (through exporting, harvesting data, etc). Each AGRIS network participating centre can choose to host a website for inputting, searching, and/or sending data to the central AGRIS database for publishing on CD-ROM. WebAGRIS improves accessibility of information, generally, through the use of multi-database or multi-host searching, and harvesting.

The current version of WebAGRIS2 is realised by AGRIS/CARIS and Documentation Group, GILW, FAO in close cooperation with the Institute for Computer and Information Engineering (ICIE), Poland and IICA/CATIE, Costa Rica. The interface is based on html forms, and has been implemented as a CGI program. The program is invoked by the web server process. The access to the CDS/ISIS databases is managed through BIREME's software ISIS-DLL, an application program interface (API) for CDS/ISIS software of UNESCO in the Windows environment.

5. NETWORK OF AGRIS

An AGRIS information exchange network has been created for AGRIS participants, and other partners, who have an avid interest in AGRIS[6]. It is an interactive forum allowing for an open exchange of information, as well as providing an effective mechanism to inform the AGRIS community about new developments. To date, 190 national, international and inter-governmental centres participate in AGRIS. Each centre is responsible for cataloging and indexing all documents within the AGRIS, which are published within its borders. The AGRIS Processing Unit collects input from all centres and merges the information into the database. AGRIS contains information in many languages. All records describing non-English documents include an English translation of the title. Abstracts have been included since 1979. The scope of the AGRIS network is to make available all kinds of relevant agricultural research information, giving particular emphasis to information sources that are not easily accessible through other services (widely known as non-conventional or grey literature, e.g. theses, reports, etc). The network is part of the national agricultural information services of the participating countries. The FAO's role is to assist its member countries to reach the goal of self-sufficiency in information management and to ensure information exchange between national and regional systems. The AGRIS system uses UNESCO's Micro-CDS/ISIS software as a database engine.

5.1 Capacity Building in Proposed AGRIS Network

Information and technology are essential components of capacity building and sustainable development for AGRIS. The Report of the Expert Consultation on the Redesign of AGRIS, held in Rome in January 1998, stressed a transition in emphasis from data processing to information dissemination, with a new focus on developing information management capacities among countries and enabling them to develop a national umbrella for information management programmes. It was also stated that the network of AGRIS national participating centres and skills that have been acquired should be retained and should fulfill capacity building role. The capacities of the individuals, institutions, and countries should be developed and improved in order to allow them to deal effectively and autonomously with the management of agricultural information.

The AGRIS network involves in training in all forms, including the training of trainers, as one of its main priorities. Training is most essential tool required for teaching new skills and enabling effective capacity building.

6. AGRIS DOCUMENTATION TOOLS

AGRIS Hqrs has developed following tools for developing AGRIS database:

- AGRIS/CARIS categorisation scheme
- AGROVOC thesaurus
- AGRIS guidelines for bibliographic description
- AGRIS classification scheme
- AGRIS magnetic tapes specification
- Record format and codes
- Serials list
- OCR instructions
- Terminology and codes for countries

Two main documentation tools of the above list, viz., AGRIS/CARIS categorisation scheme and AGROVOC thesaurus are:

6.1 AGRIS/CARIS Categorisation Scheme

The AGRIS categorisation scheme is one of the tools used for subject control in AGRIS. It can be used jointly with AGROVOC in order to describe completely and precisely the subject of a document or a research project. It has been prepared to:

- Define the scope of AGRIS
- Assign subject categories to entries in AGRIS
- Arrange entries in AgrIndex (printed till 1998) and bibliographies extracted from AGRIS
- Assist in retrieval from AgrIndex (printed till 1998) and from the AGRIS databases

Each subject category is represented by a three digit alphanumeric code. By a process of analysis, concepts expressed in a document or describing the subject of a research project are identified by the indexer and transcribed into the components of the indexing language used in the retrieval system. The subject categories assigned reflect as precisely as possible the main ideas expressed in the documents, in order to locate references relevant to a particular subject quickly and accurately. An expanded 'Subject Index' also has been prepared for AGRIS/CARIS categorisation scheme.

6.2 AGROVOC Thesaurus

The AGROVOC is a multilingual structured thesaurus of all subject fields in agriculture, forestry, fisheries, food security, and related domains (e.g., sustainable development, nutrition, etc). It consists of words or expressions (terms), in different languages and organised in relationships (e.g. 'broader', 'narrower', and 'related'), used to identify or search resources. Its main role is to standardise the indexing process in order to make searching simpler and more efficient, and to provide users with the most relevant resources. The AGROVOC thesaurus was developed by the FAO and the Commission of the European Communities, in the early 1980s. It is updated by FAO in about every three months and users can see the specific changes on the AGROVOC website.

The AGROVOC is available in the six official FAO languages: English, French, Spanish, Arabic, Chinese, and Russian. It has also been translated into Czech, Farsi, German, Hindi, Hungarian, Italian, Japanese, Korean, Lao, Polish, Portuguese, Slovak, and Thai, and is being translated into other languages such as Malay, Moldavian, Telugu, Turkish, and Ukrainian. The Hindi version of the AGROVOC thesaurus was developed in cooperation with the Indian Institute of Technology, Kanpur (India). National organisations and institutes are invited to translate AGROVOC into their local languages. Queries should be directed to the AGROVOC team (FAO-Agris-Caris@fao.org). AGROVOC is made up of terms, which consist of one or more words representing always one and the same concept. For each term, a word block is displayed, showing the hierarchical and non-hierarchical relations to other terms: BT (broader term), NT (narrower term), RT (related term), UF (non-descriptor).

These relationships provide the scope and structure for the AGROVOC thesaurus. For instance, knowing that a broader term for 'Air pollution' is 'Pollution' and that related terms are 'Atmosphere' and 'Greenhouse effect' defines the scope of information represented by these terms. Additional scope notes are used in AGROVOC to clarify the meaning and the context of terms when necessary. Taxonomic and geographical terms are tagged for easy searching, filtering and downloading. AGROVOC can be downloaded freely for non-commercial use. It is available in MySQL, Microsoft Access, Tag Text, ISO2709, XML, SKOS, and OWL formats.

AGROVOC web services have recently gone online as part of the initiative to encourage developers of agricultural information management systems to incorporate AGROVOC into their applications via web services, instead of using local copies of the database. With web services, updates to the thesaurus are immediately available, reducing the time and effort necessary to regularly download and incorporate the latest version of the thesaurus into applications.

7. REDESIGN OF AGRIS

The AGRIS systems were set up over 36 years ago to enhance the capacities of FAO member nations to access, exchange, and use agricultural literature and research data in a way that would stimulate agricultural development. The focus since this time has been on the building of the AGRIS databases through a co-operative input programme, which has been valuable in: (a) providing complementary coverage, in particular, of national gray literature not cited in other international indexing or cataloguing databases, and (b) capturing information on agricultural research projects in developing countries. In addition, in many FAO member countries, the AGRIS databases and associated tools and services have served as a catalyst for the development of national and regional agricultural information services.

7.1 Scope and Mandate of New AGRIS Information System

The AGRIS aims to encourage the exchange of information among developing countries, whose literature would not be covered by other international systems. In practice, however, the overall increase in input to AGRIS in recent years has largely come from some European countries, Australia, and USA, and mostly represents a

catching up on data converted from non-AGRIS formats. The input from Latin America, the Caribbean and Africa has been very low, so it is questionable whether under the current complex environment the existing AGRIS databases alone can contribute effectively to meet the changing information needs of member nations. It is also doubtful whether the current system is cost-effective, given the heavy expenditure that FAO incurs in collecting, converting, checking, and correcting the data received from input centres, and the limited efforts that FAO and participating centres devoted to dissemination. Hence, it is recommended that the effort put into the AGRIS systems be redirected in support of a more general role in improving the production, management, accessibility, and dissemination of agricultural information, with priority attention being given to the neediest countries.

In fulfilling this new strategy, the infrastructure and skills that have been built up to support the production of the AGRIS databases has to be retained, and, where necessary, reorganised, but with work programmes redirected in order to help fulfill this more general capacity-building role. The FAO should keep the responsibility for coordinating the work required, which should be executed under a new and invigorated AGRIS conducted in close partnership not just with member countries but also with like-minded regional and international organisations. The specific tasks of FAO under this system should be to:

- Develop tools and methodologies for the collection, storage, management, and dissemination of agricultural information, based on electronic technologies and following the WAICENT model, which can be used at national, regional, and international levels as part of a global information exchange process
- Assist in the development of human capacities for information management and dissemination
- Help mobilise the financial resources needed by developing countries to acquire and manage information
- Help establish links and partnerships among countries and organisations, with the appropriate resources, experience, and capabilities, in pursuit of the capacity building goal
- Support the development of information policies and strategies in the agricultural sphere consistent with national development plans and the countries' international obligations, such as intellectual property rights
- Play a leading role in setting standards and guidelines for the collection, management, and exchange of information
- Facilitate the exchange of information at national, regional, and international levels, by promoting collaboration, information sharing, and joint projects

The role of the member nations under the new system are to focus on facilitating decentralised and distributed access to a wider range of information sources and services to guarantee that a country's information reaches a broader audience both within and outside the country, and to ensure that users have efficient access to information needed for research and decision making. Instead of sending bibliographic references to FAO, participants will facilitate access to their references, data, and full-text information wherever it is located by linking it to FAO's information system. In exchange, all participants will have access to more information, including source documents, in a more timely and effective way.

7.2 Products and Services

For over 36 years, the AGRIS input centres have focused most of their effort on compiling, organising and processing agricultural information published within their national boundaries and sending that information in a common format to be integrated in a centralised database. That integrated database was then distributed in print format, magnetic tape form, online and compact disc.

- AgrIndex was monthly bibliography product of AGRIS database published in English, French, and Spanish language. It was discontinued in 1998
- Magnetic Tapes: These tapes contain same information as in AgrIndex and these were also sent to AGRIS centres on demand
- CD ROM Products
    - AGRIS 1998: Containing bibliographical references for 1998 from the AGRIS database
    - AGRIS 1999: With bibliographical references for 1999 from the AGRIS database
    - AGRIS 2000: Produced to coincide with the World Food Summit-5YL, and holding bibliographic references for 2000 from the AGRIS database
    - AGRIS 2001: Bibliographic references for 2001 from the AGRIS database
    - AGRIS 2002: Bibliographic references for 2002 from the AGRIS database
    - AGRIS disc set: Published by Silver Platter comprising the archival disc (records from 1975-1998), the Current disc (records from 1999-

present, with quarterly updates; and the AGRIS FHN (Food and Human Nutrition) disc covering 1975-present, updated twice yearly. Available directly from Ovid Technologies/Silver Platter

- AGRIS Resources CD
  - Complete AGRIS dataset from 2000
  - Latest version of AGROVOC
  - AGRIS archive of guidelines, tools and software
  - Beta1 version of the new WebAGRIS
  - Set of documents for the introduction of new standards for the exchange of data
  - Manual on cataloguing and indexing
  - New tools from UNESCO, Bireme and ICIE to manage ISIS databases

7.3 AGRIS on the Web

To improve the accessibility of AGRIS database to a wide audience AGRIS database was made available on the web. A beta version became available on the web in January 1999[1]. Now, the entire AGRIS database from 1975 onwards is available on web. The new AGRIS search application gives the user the possibility to search the entire AGRIS data, comprising about 3 millions bibliographic references, stored in the AGRIS XML format. This new interface exploits the advantages of both open-source full-text search engine APIs (Lucene), and structured XML. The result is an extremely fast application, as with a Google query language but with the potential to formulate highly complex queries. The new AGRIS search application is based on open source technology which can be easily further developed. After the release of version 1.0, AGRIS is preparing a smaller update for autumn that will increase the usability of the search assistant. Since the beginning of 2007, AGRIS included semantic search improvements that exploit the use of AGROVOC in AGRIS. The released AGRIS search application has a very simple function that transfers the title of a selected reference into Google and searches the internet for this resource. Similarly, AGROVOC is now also accessible on the internet[2] in English, French, Spanish, and Portuguese. The two web products are tightly integrated, allowing the user to consult the AGROVOC thesaurus directly from the descriptors in a given AGRIS record. Upon its release, the availability of the web-based database was announced within the AGRIS information exchange network. A number of specialists both in the developed and developing world were identified and invited to test the database on the web and to offer their comments and suggestions for changes and improvements. Many useful comments were taken into consideration in developments of the AGRIS database on the web. AGRIS database on the web is being widely used. During the first two months of 2006, there were approximately 300 user sessions per day, each with an average length of about 5 min. To provide a comprehensive information service to the AGRIS/CARIS community, an electronic information centre has been launched on the web[1], which is the central point for information exchange between AGRIS centres and for the dissemination of data produced within the AGRIS network. The information centre has become the clearing-house mechanism for the centres, the AGRIS Coordination Unit in FAO, and all the AGRIS partners. A new search engine was also made available on the AGRIS FTP server (windows-based stand-alone application). It is a user-friendly retrieval tool, which is designed to work with any CDS/ISIS database. The monthly outputs of AGRIS are published in ISO2709 exchange format.

8. AGRIS IN INDIA

India has an extensive network of agricultural and allied sciences research institutions and agricultural universities under NARS of India, comprising hundreds of institutions and thousands of researchers. Likewise, the information generated is also no less than an ocean in the form of varied types of publications including age-old manuscripts and ever increasing number of new additions to them. The Indian Council of Agricultural Research (ICAR), being an apex scientific organisation at the national level plays an important role to generate, manage and disseminate agricultural information. In 1961, the Council decided to create a system to record on-going research projects and of late shifted towards digitisation of records. An attempt is made here to present major progress made in this direction along with future vision. In 1974, Govt. of India took decision to participate in AGRIS database of FAO. Consequently, Agricultural Research Information Centre (ARIC) of ICAR was made the national input centre for inputting Indian agricultural information to this database[7]. Since then, ARIC under the Directorate of Knowledge Management in Agriculture (DKMA) has digitised approximately one lac bibliographic records of research information published in various Indian journals and made available to world agricultural community through the AGRIS network. In India alone, 47 agricultural universities and about 500 specialised institutions and non-governmental organisations are engaged in agricultural research, education, and developmental activities. Together they generate a large volume of research information which consists of about 1500 doctoral theses, 5200 post graduate dissertations, and 14,000 research papers published in 565 journals, 3000 books, 2500 project reports, 2500 conference papers, etc.

8.1 Products and Services from AGRIS in India

8.1.1 Indian National Agricultural Bibliography

The Indian National Input Centre (INIC) for AGRIS of FAO, ARIC of DKMA, has brought out Indian National Agricultural Bibliography in four volumes derived from AGRIS database. This bibliography contains about 30,000 Indian bibliographical records contributed by the ARIC to FAO during 1975-1984.

8.1.2 Abstracting Journals

The publications of AGRIS in India include *Indian Agricultural Sciences Abstract* and *Indian Animal Sciences Abstracts*. The frequency of these journals is half-yearly. These journals were printed up to June 2006, after which they are only published on the ICAR's website[3] under open access. These publications cover all aspects related to agricultural and animal sciences. Entries are arranged alphabetically as per the FAO category scheme. The entries have been arranged under different subject headings to facilitate reference by users of varied interests according to their subject preference. The entries include bibliographic details like author name, affiliation, title, journal name, volume and issue number, page, publication date, keywords, abstract, etc[8].

8.1.3 Selective Dissemination of Information and Document Delivery Services

Selective dissemination of information (SDI) and document delivery services are provided free of cost to all agricultural scientists, researchers, and students who require specific information for various purposes such as review of literature, research planning, decision making, etc. Requests for these services are received from Indian as well as foreign nationals. On an average, 50 such requests are served every month.

8.2 Human Resource Development /Capacity Building Programme

Capacity building is the combination of efforts needed to develop, enhance and utilise the skills of people, institutions and countries to manage and support sustainable development, and to incorporate the principles of sustainable development in strategic plans and programmes. It is closely associated with an approach, which emphasises negotiation, participation in development processes, planning and implementation and building of institutional frameworks, which favour such advancements. Training is one of the major components of the AGRIS programme in India.

The ARIC of ICAR has organised trainings on indexing and input preparation for AGRIS database for librarians from ICAR institutions, professional societies in agriculture and state agricultural universities[9] (SAUs). Aim of these training programmes was to give an exposure to participants in inputting research information for inclusion in the AGRIS. In turn, these trained professionals from ICAR institutions and professional societies from all over the country are expected to input their institutions' research information into AGRIS. Participants were given on-hand training on use of AGROVOC thesaurus, FAO subject categorisation scheme, input preparation, data entry, data export/import and operational aspects of the software. AGROVOC thesaurus, AGRIS/CARIS categorisation scheme and software were distributed to the participants. They were allotted 3 to 5 Indian journals already available in their libraries for inputting into the database. These libraries supply their input to the INIC for AGRIS at ARIC, who after quality audit of the data, sends the data to FAO for inclusion in AGRIS.

So far the INIC of AGRIS has sent one lakh data records, thus accounting for 3.85 per cent of the total data in AGRIS. So far trainings have been given in indexing and input preparation for AGRIS to librarians from 46 ICAR institutions/SAUs/professional societies from National Agricultural Research System (NARS) in India. The list of these institutions is as follows:

1. All India Soil & Land Use Survey Society, New Delhi
2. Allahabad Agricultural Institute, Allahabad
3. Andhra Agricultural Union Journal Society, Bapatla
4. Central Avian Research Institute, Izatnagar
5. Central Inland Fisheries Research Institute, Barrackpore
6. Central Institute for Research on Buffaloes, Hisar
7. Central Institute for Research on Goats, Mathura
8. Central Institute of Brackish Water Aquaculture, Chennai
9. Central Institute of Fisheries Education, Mumbai
10. Central Plantation Crops Research Institute, Kasargod
11. Central Potato Research Institute, Shimla
12. Central Research Institute for Dryland Agriculture, Hyderabad
13. Central Research Institute for Jute & Allied Fibers, Barrackpore
14. Central Sheep & Wool Research Institute, Avikanagar
15. Central Soil Salinity Research Institute, Karnal
16. Central Tobacco Research Institute, Rajamundry
17. Central Tuber Crops Research Institute, Thiruvananthapuram

18. Fisheries Society, CIFRI, Barrackpore
19. Crop Protection Research Centre (CPRC), St. Xavier's College, Tirunelveli
20. Directorate of Groundnut Research, Junagadh
21. Directorate of Knowledge Management in Agriculture, New Delhi
22. Directorate of Oilseeds Research, Hyderabad
23. Directorate of Wheat Research, Karnal
24. Govind Ballabh Pant University of Agriculture & Technology, Pantnagar
25. Indian Agricultural Research Institute, New Delhi
26. Indian Agricultural Statistical Research Institute, New Delhi
27. Indian Grassland & Fodder Research Institute, Jhansi
28. Indian Institute of Sugarcane Research, Lucknow
29. Indian Society of Agricultural Biochemists, CSAUAT, Kanpur
30. Indian Society of Agricultural Economics, Mumbai
31. Indian Veterinary Research Institute, Izatnagar
32. Journal of Interacadamecia Society, Kalyani
33. National Bureau of Animal Genetic Resource, Karnal
34. National Bureau of Plant Genetic Resources, New Delhi
35. National Centre for Agricultural Economics & Policy Research, New Delhi
36. National Centre for Integrated Pest Management, New Delhi
37. National Dairy Research Institute, Karnal
38. National Institute of Research on Jute & Allied Fibre Technology, Kolkata
39. National Research Centre for Equines, Hisar
40. National Research Centre for Sorghum, Hydrabad
41. National Research Centre for Soybean, Indore
42. National Research Centre on Camel, Bikaner
43. National Research Centre on Mithun, Jharnapani
44. National Research Centre on Rapeseed Mustard, Bharatpur
45. Vevekanand Parvatiya Krishi Anusandhan Sansthan, Almora

8.3 Limitations and Problems Faced during AGRIS Input Preparation

- Many participating centres could not start supplying their information due to financial and administrative problems
- Lack of adequate facilities and manpower at the INIC and other data input centres located in the ICAR institutes, is an impediment to speed inputting of information
- Most of the institutes' libraries and ARIC does not have sufficient number of computer and other equipment for preparing input as per AGRIS guidelines. This assignment could be completed with the help of outsourcing. ARIC of DKMA does not have sufficient manpower for input preparation and data entry work. The available staff with ARIC can only monitor the work as well as quality control
- There is no adequate arrangement for in-service training or refresher course for those who are engaged in this work
- Library staff of ICAR institutes is not familiar with AGROVOC thesaurus
- Shifting of trained manpower at the INIC and other data input centres is proving barrier for development and further growth of NARD/AGRIS

8.4 Challenges Ahead

- Inclusion of regional language literature in the AGRIS
- Receiving cooperation from all ICAR institutions/ SAUs/professional societies in agriculture in inputting the data
- Inclusion of conferences paper, reports, case studies, thesis and dissertations (grey literature) in AGRIS

8.5 Steps to be Taken by Indian National Input Centre

- There is need for regular training programmes for librarians of ICAR institutes, SAUs and professional societies for input preparation for AGRIS and after training the progress should be monitored regularly to solve problems and doubts
- Since sufficient manpower is not available for data entry and input preparation, this work needs be outsourced
- There is a need to increase staff at the INIC of AGRIS located at ARIC of DKMA
- Strengthening of infrastructural facilities, and addition of more technical staff at the input centres
- To keep pace with the new development, it is imperative that ARIC team is trained periodically in the

field. Such trainings could be organised in-house or at local/national/international levels

8.7 Action Plan for Success of AGRIS in India

The required steps include increase in the AGRIS management staff, no shifting of trained staff, strengthening of infrastructural facilities, addition of more technical staff at input centres. In order to keep pace with the new development, it is imperative that AGRIS team is provided refresher trainings periodically, which could be organised in-house or at local/national/international levels. A proper manpower development plan has to be prepared to include data generated in the different organisations. The volume of information on agriculture and allied sciences in India is so large that one or two institutions may not be able to handle it. A close link between different information generating institutions is essentially vital as large volumes of information remains uncovered in this information system of national/ international importance. There is an urgent need to identify regional agricultural information centres (4 or 5 over the whole country) where capability to handle regional information has to be created and strengthened. A consortium may be formed under the overall co-ordination of ARIC of the DKMA of ICAR. The role, functions and responsibilities of each consortium member be defined. The consortium members should meet regularly to exchange experiences, to address the problems being faced and plan future strategies to meet emerging needs of the end users of the database. Lastly, it is highly desirable to sensitise authorities and other potential users and beneficiaries of database about the importance of information management and ensuring its free flow among people to draw maximum advantage of it.

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