

## **Design and On-Line Management of Database on Indian Agricultural Education System**

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### **SUMMARY**

The Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs) are the basic sources of agricultural research, education and extension in India. Therefore, the information about the various activities of the ICAR and SAUs is essential for planning, policy formulation and strengthening education for agricultural human resource development for the country's progress in agriculture. The purpose of this paper is to describe the design and on-line management of database on Indian Agricultural Education System through NISAGENET (National Information System on Agricultural Education on Internet). An on-line data management module has been developed for maintaining and disseminating information on various activities of the agricultural universities like academic, research and extension. The system is capable of maintaining an up-to-date agricultural education data bank of all SAUs and deemed universities of ICAR.

*Key words:* Agricultural education, Information system, Academic, Infrastructure, Budget, Manpower, Personnel, Research and development.

### **1. INTRODUCTION**

The Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs) are the basic source of agricultural research, education and extension in our country. Presently there are 29 SAUs with about 200 colleges and 4 deemed Universities of ICAR that are engaged in providing under graduate, postgraduate and Ph.D. programmes in various disciplines of agriculture. Therefore, the information about the various activities of the ICAR deemed universities and SAUs is essential for planning, policy formulation and strengthening education for agricultural human resource development for the country's progress in agriculture.

At present, an adequate database for providing information about the current agricultural development, availability and utilization of various economic resources and research & development activities in education sector does not exist. A strong database and management information system at the national level is required on

agricultural education system. National Academy of Agricultural Research Management had developed an integrated information system, incorporating the data on academic, research and extension activities of agricultural universities, AGRUNIS, with support from Department of Science and Technology (Murli Dhar and Rama Rao 1996). But the major problem with this system was of data updating from participating organizations due to stand-alone nature of software. Indian Agricultural Statistics Research Institute had developed a stand-alone software system NISAGE for storing the information concerning education sector of NARS (Goyal 1998). Again updating of data was the main problem. All this requires the development of a web-based information system that can be accessed by participating organizations using Internet. An on-line information system, NISAGENET (National Information System on Agricultural Education on Internet), has been developed for various activities of Indian agricultural education system. In this paper, we present design and on-line management of database through NISAGENET.

## 2. ARCHITECTURE OF NISAGENET

During last decades, rapid strides have been made in two technologies that have synergistically merged to provide something very powerful. These technologies are distributed technology and web technology. Distributed technology involves autonomous computers that are connected by a network and uses client-server architecture. Client-Server technology has progressed so much from two-tier to three-tier architectures of varying complexity, improves maintainability of software. Web technology, in its popular form, became available in 1990s and has grown explosively. The combined use of these technologies has changed the fundamental way in which systems are engineered.

NISAGENET is a web-based application, based on client-server three-tier distributed structure technology. Implementation details of all the three layers is as below:

- ♦ **Client Side Interface Layer (CSIL):** The Client Side Interface Layer has been developed using HTML 4.0, VbScript and JavaScript that contain reports and forms required for presenting the data to the user and accepting information and other required functionality.
- ♦ **Server Side Application Layer (SSAL):** Server Side Application Layer has been implemented using Active Server Pages (ASP)(Buser *et al.* 1999). These Active Server Pages generate HTML pages according to the user's action and requests.
- ♦ **Database Layer (DBL):** Database Layer is implemented using MS-Access. It has been used for designing the tables, relationships, referential integrity rules and queries. The relational approach has been used to design the database. This tier provides the database management functionality. Finally, database layer has been implemented in SQL Server.

The architecture of NISAGENET has two interfaces one between the CSIL and SSAL and the other between SSAL and DBL. The CSIL-SSAL interface is implemented using the ASP and SSAL-DBL interface is implemented using the Open Database Connectivity (ODBC).

## 3. DATABASE DESIGNING IN NISAGENET

The relational approach has been used in designing the database. The fundamentals of normalization theory have been used to normalize different tables of the database (Date 1998 and Desai 1999). All tables have proper interaction among themselves via primary key - foreign key relationship. This has taken care of the aspect of redundancy. Efforts have been made in particular to restrict the number of tables needed to generate individual reports and answer specific queries.

All the information is grouped into six data pools for SAU's and ICAR deemed universities. These are

- ♦ General and academic
- ♦ Infrastructure facilities
- ♦ Budget
- ♦ Manpower distribution
- ♦ Personal information of the faculty
- ♦ Achievements and highlights (R&D activities)

Table 1 shows the data pools along with the names of tables contained in each data pool.

**Table 1.** Names of tables contained in various data pools in NISAGENET database

Name of data pool	Name of tables
Academic	insttA_managers, insttA_program, insttA_eligibility, insttA_addmode, insttA_job, insttA_scholarship, insttA_reservation, insttA_studentspass
Infrastructure	facility, facility_data
Budget	instt_expenditure, instt_budget_alloc, instt_budget, instt_income
Manpower	manpower_strength
Personnel	personnel, personnel_academic, personnel_career, personnel_technology, personnel_activity, personnel_training
R & D Activities	technology, awards, uni_publication, rd_Activities
Administrative	instt, award_type, publications, discipline, manpower_type, agency, resource, facility_type, facility_attr, state

### 4. ON-LINE DATA MANAGEMENT IN NISAGENET

NISAGENET has two components one for on-line management of data and other for generating queries and reports. Data Management Module has been designed for adding, updating, deleting and viewing the contents of the database on-line. For security reasons the database access is restricted to super user and administrator. Super user and administrator can modify the database contents while end user can only view the data. A user name and password would be provided to each university for maintaining their respective database. The system has been tested with the test data from two universities namely G.B. Pant University of Agriculture and Technology and Acharya N.G. Ranga Agricultural University, Hyderabad. This module has seven sections each relating to academic, infrastructure, budget, manpower, personnel and research & development activities of concerned organizations.

#### 4.1 Academic

This section of data management module has been developed for entering data related to academic activities of the universities. Various input forms have been designed and developed for entering the basic information about the university, under graduate, post graduate and Ph.D. programs run by universities (see Fig. 1), eligibility criterion for various courses,

scholarships available at various levels of courses, number of students passed from various colleges in universities etc. Facilities for adding, deleting, updating and viewing the records of the database have been provided. Various validation checks have been implemented to ensure the accuracy and integrity of data.

#### 4.2 Infrastructure

Information on infrastructure facilities available in universities is of prime importance to policy makers as well as for students. This section of data management module has been developed for entering this information to the central database. A generic approach has been followed in database designing that helps super user to enter information about any infrastructure facility with any number of attributes to the database e.g. super user can enter information about hostels, labs, playgrounds, libraries etc. (see Fig. 2). Within each of these facilities, say hostel, super user can enter information about rooms, mess, bed, table etc.

#### 4.3 Budget

This section includes the forms for entering budget related information into the database. This section can take data about budget allocation, unit wise budget expenditure, financial receipts from various agencies (see Fig. 3) and resource wise income for universities/ colleges.

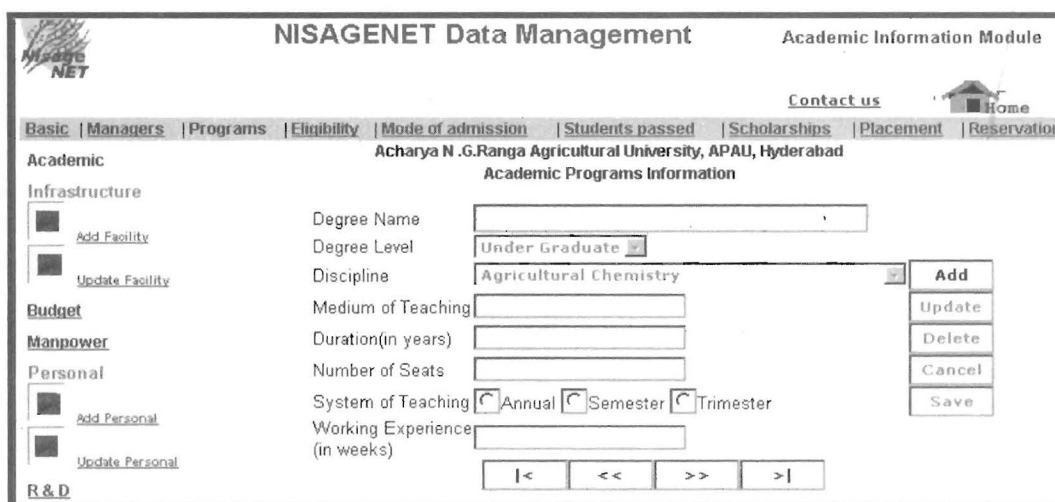


Fig. 1. Screen showing form for data entry of academic programs for a college

The screenshot shows a web-based data entry form for 'Infrastructural Facilities' at Acharya N.G.Ranga Agricultural University, APAU, Hyderabad. On the left, there is a navigation menu with categories: Infrastructure (Add Facility, Update Facility), Budget, Manpower, Personal (Add Personal, Update Personal), and R & D. The main form area contains the following fields: Name (text input), Division (dropdown menu showing 'Dairy Chemistry'), Type (dropdown menu showing 'Hostel'), Created (date picker), Modified (date picker), and Incharge (text input). At the bottom right, there are 'Add' and 'Save' buttons.

Fig. 2. Screen showing the form for data entry of facilities available in a college

The screenshot shows a web-based data entry form for 'University Financial Receipts' at Acharya N.G.Ranga Agricultural University, APAU, Hyderabad. At the top, there are navigation tabs: Budget, Income, Expenditure, and Budget Allocation. On the left, there is a navigation menu with categories: Academic, Infrastructure (Add Facility, Update Facility), Budget, Manpower, Personal (Add Personal, Update Personal), and R & D. The main form area contains the following fields: Year (dropdown menu showing '1996-1997'), Funding Agency (dropdown menu showing 'Public and Private Industries'), Plan (in Lakhs) (text input with value '0'), and Non-Plan (in Lakhs) (text input with value '34'). At the bottom right, there are 'Add', 'Update', 'Delete', 'Cancel', and 'Save' buttons.

Fig. 3. Screen showing the data entry form for agency wise financial receipts for a college

#### 4.4 Manpower

This section of data management module has been designed to enter discipline wise sanctioned strength, post filled by males/ females and additional requirement of staff for all universities/ colleges at various levels like faculty, administrative, supporting, auxiliary and other (see Fig. 4).

#### 4.5 Personnel

One of the important components of any research organization is information about its personnel. This module deals with management of information on faculty members of college/ university. A large number of parameters ranging from personnel, professional and academics are covered in the module. This section has

been designed to maintain information on various personnel aspects like personal information (see Fig. 5), professional qualifications, professional experience, percentage time allocation on various activities like research, teaching, training & extension, number of publications, list of on-going projects etc.

#### 4.6 Research and Development

Research and Development section of data management module includes the forms for entering the information about number of awards obtained, number of publications, various activities like kisan mela, farmers workshops, summer school, extension activities organized etc., technologies developed, on-going projects for college/ university (see Fig. 6).

Fig. 4. Screen showing the data entry form for manpower distribution for a college

Fig. 5. Screen showing the data entry form for personal information for faculty

Fig. 6. Screen showing the data entry form for on-going projects for a college

**4.7 Master Tables Updating**

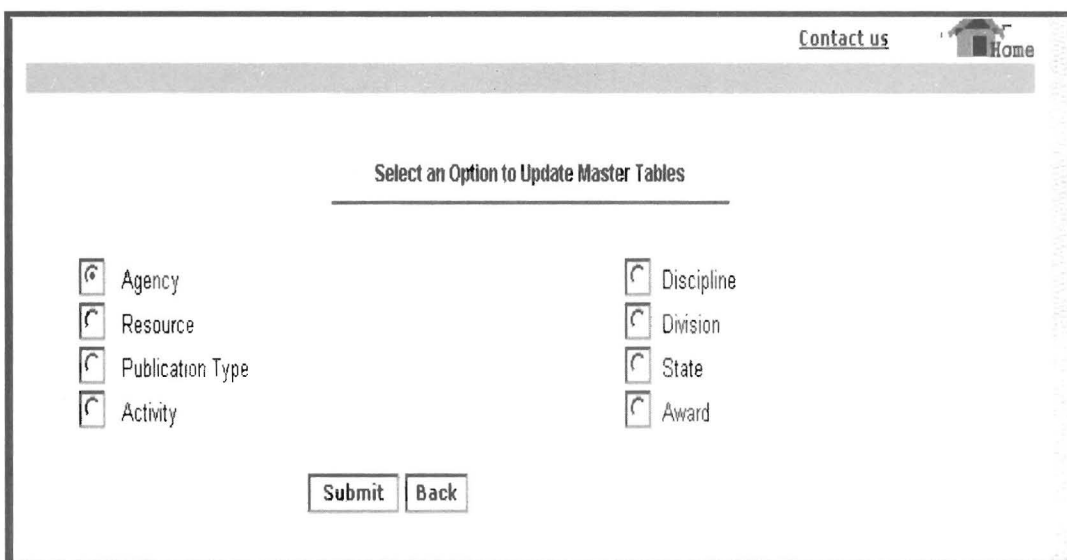
A separate administrative module has been developed for maintenance of master files. Facilities to add, delete, update and viewing the data have been provided. Proper checks are implemented in the software to avoid the duplication of data. Facility for adding new college/ university has been provided only to the authorized person i.e. the administrator. Fig. 7 shows the menu for updating master files.

Fig. 8 shows a sample screen for updating of master table Resource.

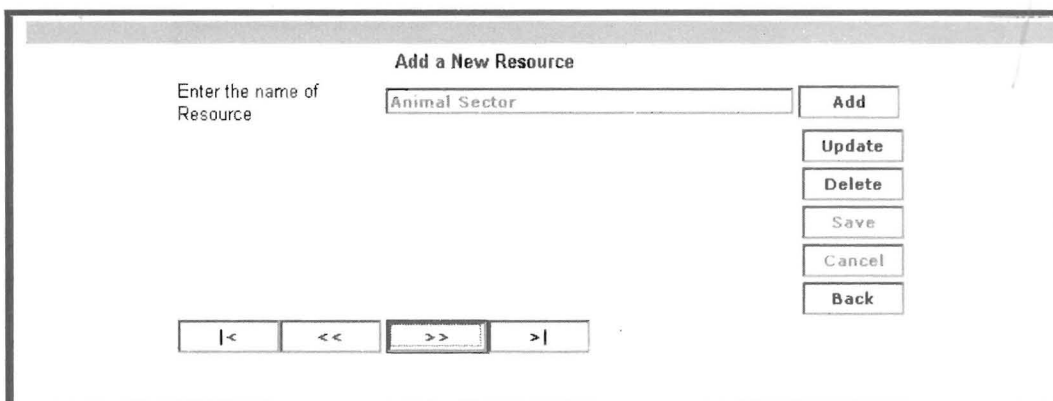
**5. REPORTS/ QUERIES GENERATION THROUGH NISAGENET**

Reports/ queries module of NISAGENET has been developed to disseminate the information as per requirements of the users. User customized reports have been designed to generate the information on various parameters of interest for universities. The brief descriptions of outputs that can be generated from NISAGENET are as follows

- ◆ Reports on basic information about university/ college, about academic programs being run, eligibility criterion for admission, mode of



**Fig. 7.** Screen showing the menu for master table updating



**Fig. 8.** Screen showing the data entry form for updating master table resource

admission, reservation details, scholarships available etc. for academic programs, and discipline-wise placement status of students.

- ◆ Reports on infrastructure facilities available in the university/ college e.g. information can be generated on laboratories, lecture rooms, hostel facilities etc. available in the university/ college.
- ◆ Reports on budget receipts from various agencies, income from various resources, budget expenditure on each unit and budget allocated to university/ college.
- ◆ Reports to generate information on discipline-wise staff positions (sanctioned, filled and vacant) for faculty, technical, administrative, auxiliary and supporting staff for the university/ college.
- ◆ Reports to generate the personnel information for faculty members in the university/ college. Information can be generated on parameters like personal attributes, professional experiences, educational qualifications, technologies/ packages developed and the publications for faculty members.
- ◆ Reports to generate information about the achievements of university/ college. This includes information on publications in English or Hindi, number of awards obtained, workshops, seminars, summer schools, kisan mela etc. organized, the details of the technologies developed and the on-going research programs for a university/ college.

## 6. CONCLUSION

NISAGENET is a well structured, properly designed and fully computerized information system on agricultural education at country level. NISAGENET has facilities for on-line updating, retrieval and dissemination of data at the national level. The database of NISAGENET system would be enriched by data collected from all the state agricultural universities and

ICAR deemed universities. On-line access to system would help in timely and easy updating of data by participating organizations. Security of such a large database is of prime interest and has been taken care off by providing security at administrator and data entry level. System is capable of ensuring that the valid information is entered into the system. The authenticity of the information entered is also monitored by system. The system is capable of maintaining an up-to-date agricultural education data bank and would be quite useful to academicians, scientists and technologists in planning their research and technological activities; to planners and policy makers in having an overview of teaching, training, research activities for providing appropriate funding for uplifting the existing facilities; to students for undergoing higher education in agriculture, and to other related individuals and institutions.

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