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# ***PALAWIJA***

# ***NEWS***



The CGPRT Centre Newsletter

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## **Agricultural Information Management Systems in India - An Overview**

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### **Introduction**

The national agriculture research, education, and extension education system in India is one of the largest in the world, both in terms of its size and the complexity of activities undertaken. The system has basically two components, viz the Indian Council of Agricultural Research (ICAR) and the state agricultural universities (SAUs). ICAR, as an apex body at the national level, is mainly responsible for promoting and co-ordinating agricultural research, education, and extension education activities in various branches of agricultural and allied sciences including crops, horticulture, animal science, fisheries, and agroforestry. It also undertakes research, both basic as well as applied, on diverse problems of national importance concerning various aspects of agriculture through its own research network. The research network of ICAR is rather extensive, consisting of 45 institutes, 4 national bureaux, 9 project directorates, 21 national research centres, 71 all India co-ordinated research projects, and over 700 ad hoc research schemes. About 6,500 scientists are employed in the ICAR system. The state agricultural university system has 28 SAUs, with each province in India having at least one

agricultural university. The SAUs have the mandate of fulfilling the regional responsibilities for agricultural research, education, and extension education. ICAR provides substantial financial assistance for the development of these SAUs. The assistance varies from university to university (18 to 55%), depending on the level of financial support received by the university from the respective provincial government and the stage of development of the SAU. The SAU system employs about 24,000 scientists.

India has been divided into 131 agro-climatic zones, and in each zone a regional research station has been either newly established or strengthened with a multi-disciplinary team of scientists. With the help of the World Bank, adequate research infrastructure and physical facilities are provided to these stations to facilitate conduct of location-specific, need-based, and production-oriented research in each of these agro-climatic zones.

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This paper was presented at the meeting on Regional Statistical Database (RSDS), Bogor, October 12-14, 1994.

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The very size of the system demands an enormous allocation of financial resources for managing agricultural research in India. Though the overall funding to agricultural research has been increasing over the years, the relative share of funds for agricultural research as compared to other scientific organizations has been gradually declining, from as high as 22% some ten years ago to the present level of about 8 to 10%. This decrease in the research funding, coupled with increased institutional activities, necessarily calls for efficient and effective management of the scarce financial, physical, and human resources.

India has a large number of highly qualified scientists researching various aspects of agriculture, thereby contributing substantially to the national as well as the global agricultural information pool. The information explosion in agriculture is in full swing now, and thus it is becoming practically impossible for scientists to keep track of the latest developments in any particular field of research. For efficient and effective utilization of the research literature information, it is not enough just to have a large volume of information, but it is also essential that we are able to collate and retrieve the information quickly.

Modern database technology and sophisticated communication technology have great potential to give researchers ready access to a variety of information, be it production data of crops, livestock or commodities, or specific details about natural resources such as land, forests, and water or on the availability and utilization of research resources such as finances, staff, and physical facilities, or on research literature. Information can be retrieved either at a micro level or at a macro level, provided the databases are developed with these purposes in mind. Computerized databases have, in fact, become an effective tool for information management in scientific research and development due to efficient storage and maintenance, and fast processing and retrieval.

### **Existing databases**

In an era of information explosion, the availability of data on various aspects at the right time and in a proper form serves as a strong foundation for proper organizational development. The databases thus developed can be utilized by people at various levels within an organization

either by aggregating or by disaggregating the information as per specific requirements. A variety of computerized databases have already been developed and put to effective use in India. These include personnel, financial, physical and natural resources, research projects, educational infrastructure in agriculture, and also on other general agricultural information.

At the national level, different types of databases are maintained at various locations. These are briefly discussed below.

#### *ICAR headquarters*

The Indian Council of Agricultural Research has grown to a significant size since its inception in 1929. In order to collate information on agricultural research, education, and extension education in the country as a whole, it is necessary to develop individual databases for every ICAR institute and SAU, which can then be pooled at the national level to provide information that might help in the removal of imbalanced growth and also in rectifying the weaknesses of the infrastructural make-up. A computer cell which looks after the development and maintenance of various databases has been established at ICAR headquarters.

The database on personnel contains information on nearly 5,000 scientists working in the ICAR system. This database covers information on personal particulars, educational and service particulars, details on training and visits abroad, and publication details. Time utilization details of scientists on various activities are also being included in this database. The main objective of this database is to improve the personnel management of scientists working in the ICAR system, and it is updated annually. This database is of great use for the Personnel Division of ICAR, and also for the Agricultural Scientists Recruitment Board (ASRB) which recruits scientists for various positions in the ICAR system. A database on cadre strength of scientists working in the ICAR institutes is also maintained for manpower planning.

To improve the budgeting and accounting system in various ICAR institutes, a consolidated database on research budgets is maintained at ICAR headquarters covering all the institutes. This database also contains monthly accounts of institutes, which helps ICAR closely monitor the

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## **Editorial**

### **Regional Statistical Database System**

Seiji Shindo  
Director  
CGPRT Centre

Asian agriculture has witnessed important changes in recent years. Increasing economic growth, a period of productive expansion in many crops and now a stable yield level in rice and wheat are well-known. In general, recognition of diversification has increased. Agricultural diversification is accompanied by intensifying vertical integration between agro-industries and producers, and more recognition for the role of the private sector in the transfer of skills and knowledge. The growing recognition of the process of agricultural diversification has important implications for agricultural monitoring and planning approaches.

The adequate reflection of agricultural diversification in agricultural monitoring and planning requires a massive volume of data, viz area allocation, production, productivity, input-output relations in the

form of spatial distribution and short and medium term trends of a large variety crops. In the early years of the CGPRT Centre, the Centre recognized, with its broad tasks ahead, the need for disaggregated spatial distribution of annual food and industrial crops in humid tropical Asia.

In 1989 the Centre organized the first regional meeting to discuss the broad issues involved in and to identify the steps needed to improve data availability. A clear partnership structure evolved where the national agencies participating in the exercise would gradually incorporate statistical data on a range of annual food crops. The Centre has acted as a facilitating institute and a catalyst in the activities. The major proportion of time invested was carried by the national participating agencies, while the Centre provided support in data processing equipment, advisory services and training, and, in limited cases, set-up costs.

Now the activities have been going for almost seven years; seven countries have established databases on annual food crops; and software circulates in dozens of Institutes and agencies.

Additional countries have expressed their wish to join the network. The Regional Statistical Database System project (RSDS) is an ongoing activity carried by many participants. The RSDS project has focused the contribution of many national and international agencies on efficient and transparent flow of information.

This issue of the Centre's newsletter describes the situation in three of the seven participating countries and gives an impression of the issues involved in undertaking a medium term activity with a wide scope. Over the years, the direction of the activities has not changed, however, the focus has concentrated on cost efficient hardware and software configurations to bring the management of vast and complicated data to the reach of the users, viz the national agricultural and specialized agencies. In the near future, the Centre will continue its support in human resources development and database establishment through in-country as well as regional training courses.

On behalf of the Centre and its staff, I take this opportunity to wish all our readers a Happy New Year.

expenditure pattern of the institutes. This database is effectively utilized by senior level managers at ICAR headquarters and the individual institutes for efficient financial management. A database to cover the budget details of the SAUs is also maintained separately at ICAR headquarters.

Physical facilities constitute one of the major resources of any organization. Details on inventory and utilization of various equipment that is available in an institute are often not precisely known. A detailed database on the availability of various equipment in different institutes would be of great use for taking timely and meaningful decisions on the acquisition, deployment and maintenance of various equipment. Such a database would also help in effectively utilizing the funds provided by an outside agency, and also in facilitating inter-institutional collaboration for exchange and effective utilization of various facilities. At ICAR headquarters, a database is maintained on various equipment available in ICAR institutes and costing more than US\$ 6,000.

Recently, computers have made great impact on improving research productivity in agriculture. The need for at least one personal computer (PC) in each institute has been well perceived and realized. The burgeoning use of computers at various research centres and institutes of ICAR bears testimony to this. In order to provide an instant reference on the computer repository in the ICAR system, a database on the computer facilities available in various ICAR institutes and research centres, along with the software details and other facilities associated with the computers, has been developed and is maintained at ICAR headquarters.

In a vast system like that of ICAR, a database on institute profile could be of great use for, ensuring effective supervision and management. ICAR headquarters also maintains a separate database containing various details on the profile of different institutes under the ICAR. The database covers most of the basic details about each institute such as the year of establishment, its mandate, its regional stations and their

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locations, its executive head, the number of research projects which are ongoing and are completed, some broad details on budget and equipment, etc. These details are updated annually. This database is of use to various research managers, both within and outside the ICAR System.

#### *Agricultural Research Information Centre*

An Agricultural Research Information Centre (ARIC), under ICAR, is located at New Delhi, and it maintains and manages various databases. ARIC is the central source of research information on all ongoing as well as completed research projects and schemes, which are undertaken by scientists from both ICAR institutes and agricultural universities. ARIC also maintains a database containing details on scientists' visits abroad. ARIC is the National Input Centre in the country for the AGRIS and CARIS agricultural databases of the Food and Agricultural Organization (FAO) of the United Nations.

Information on various research activities that are undertaken by the different institutions is an essential requirement for research managers to enable them to set research priorities and also to avoid duplication of research efforts. One record is maintained for each of the ongoing research projects in ICAR. This project database contains a variety of details on projects, covering scientific, management, and cost aspects of the individual research projects. This database is of immense use both at the micro level - for the project leaders, and at the macro level - for the managers of the research institutes and the those at ICAR headquarters.

With a view to providing research literature retrieval services to scientists, ARIC also maintains a bibliographic database. The published and ongoing research work in agricultural sciences in India is indexed and sent to FAO, Vienna, and from there it is available to users all over the world. This database also helps to eliminate project duplication and facilitates effective co-ordination among researchers.

Scientists in ICAR often visit other institutions outside India, either for specialized training or for a specific consultancy. Details on the visits of scientists to other countries need to be made available to research managers, administrators, and other scientists working in the system. With

this in mind, a database on scientists' visits abroad has been developed and is maintained at ARIC. These are categorized by scientist, discipline, country, etc, and this database is updated on a continuous basis.

#### *National Academy of Agricultural Research Management*

The National Academy of Agricultural Research Management (NAARM) is one of the ICAR institutes, whose main mandate is to conduct training and research in agricultural management, with technical support from the International Service for National Agricultural Research (ISNAR) in the Netherlands. NAARM has been entrusted with developing and disseminating a suitable management information system (MIS) that would help in efficient management of various research resources such as personnel, finance, and physical facilities. In the absence of relevant information, research managers may find it difficult to perform various management functions such as planning, organizing, monitoring, and evaluating. It becomes, therefore, necessary to develop an organized, computer-based MIS that can generate relevant information for making sound and timely decisions. The MIS emphasizes only the essential information on personnel, including time utilization on various activities and on research projects, which can then be used to generate a variety of outputs to provide useful information for decision-making. In order to develop the MIS, two types of databases are to be generated for each institute or station under the ICAR and SAU systems. The methodology for the development of the MIS is being widely disseminated through training to various ICAR institutes and SAUs who, in turn, develop project and personnel databases for their respective institutes/stations. The project is being implemented successfully and the process will be completed over a five year period.

With financial support from the Department of Science and Technology (DST) of the Government of India, a project titled the Agricultural Universities Information System (AGRIUNIS) is in operation at NAARM, which aims at developing a database on manpower, research, and academic activities of all the agricultural universities in India.

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### *Individual institutes*

Databases on production and related details on crops, animal species and commodities are generated and maintained at those individual institutes which conduct research on those particular crops, animals or commodities. These details need to be maintained centrally at ICAR headquarters. This may not be a difficult task, as these databases are essentially computerized. Library and bibliographic information databases are also being maintained by different institutes.

### *Other agencies*

In addition to the databases developed and maintained by the ICAR institutes, a few more databases which are of relevance to agriculture are being developed and maintained by several other agencies. The Centre of Minor Forest Products at Dehra Dun is engaged in building up an exhaustive database of the non-wood forest products in India. Twenty-two vital items have already been identified for incorporation into this database. The Natural Products Database on medicinal plants is being developed by the Central Drug Research Institute at Lucknow. Attempts are also being made to develop a specialized database on Indian medicinal plants. The Central Institute of Medicinal and Aromatic Plants (CIMAP) at Lucknow has developed a comprehensive database on 45 major Indian aromatic plants. This database includes information on taxonomical, agro-technological, chemical, and bibliographic aspects of Indian aromatic plants.

A specialized database called "Honeybee" has been developed by a group known as Shristi at the Indian Institute of Management in Ahmedabad. This database contains information on various types of informal innovations developed by farmers (indigenous technical knowledge - ITK) for various aspects of agricultural production. The data collected from 53 countries in the world including India are stored in this database. Apart from supplying information to people working in both government and non-government organizations in these countries, this database attempts to facilitate patent applications by farmers for their innovations. More and more individuals, institutions, and countries are joining this novel endeavour and providing input to this unique database.

The Ranganthan Institute of Library and Information Science for Applied Research (RILISAR) at Madras has developed a total data management system, known as CALIBAN MIS. This is a management information system and a quick decision-making tool for top management. It stores statistics on all areas of information. This package has a local area network option, and can serve as a single user system also. It has a database on library documents handled in academic and corporate offices and public libraries, and the data can be retrieved on-line.

Other agencies such as the Department of Science and Technology (DST), the National Informatics Centre, (NIC), the National Institute of Science, Technology and Development Studies (NISTADS), all located in New Delhi, have also develop useful databases on some specific aspects. For example, the DST publishes a Data Book which contains i) time series data in variety and form on resources deployed to science and technology (S&T) in various sectors including agriculture; ii) S&T personnel available; iii) international comparison of resources input for S&T activities; and iv) some selected economic parameters of reference. NISTADS compiles information on science and technology development, which normally remains scattered over a large number of government departments, research laboratories, academic institutions, and policy documents. Although these documents are available in hard copy, much of the information in these documents can be computerized to develop a meaningful database. Attempts are already being made in this direction. The NIC of the Government of India has developed certain useful databases relating to agricultural production details. There are also other organizations which maintain databases related to agriculture at their own level to suit their specific requirements. However, attempts should be made to get a full inventory of various types of databases maintained by different organizations, so that these databases could be maintained at a central point and the information could be accessed through proper networking in the future.

### *At the provincial level*

At the provincial level, several types of databases capable of providing general as well as scientific information related to agriculture are

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maintained by different institutions. Most of the agricultural universities, with responsibilities for agricultural research, education, and extension education at the provincial level, are currently engaged in the development and maintenance of a variety of databases to supply scientific information. Some of the common databases developed by them include: i) research project database containing scientific and management aspects of research; ii) personnel database containing biographic and scientific details of scientists/teachers engaged in research activities; and iii) financial database containing revenue and expenditure details pertaining to the main campus as well as the regional stations of the university. A few of the well-established agricultural universities also maintain databases on educational activities.

As far as general agricultural information is concerned, there are essentially two agencies involved in the development and maintenance of databases at the provincial level. The first is the District Collectorate, which acts as the input centre for the general information system network (GISNET), where data on area, production and productivity of various crops and commodities are collected and stored for use at the local as well as at the national level. Any government organization located anywhere in the country can have ready access to this database through the network developed by the National Informatics Centre. Basic crop data as well as livestock statistics are also made available by the Bureau of Economics and Statistics through databases developed and maintained in different provinces, although not fully computerized.

### **Hardware and software used**

Although the maintenance of a simple database need not necessarily involve the use of a computer, the increasing complexity and size of the system, as well as the volume of data that needs to be stored, necessitate the use of computers in the development and maintenance of various databases. The advent of small powerful personal computers, availability of suitable software for management of databases, and the possibilities of low cost data storage facilitate have, no doubt, made the databases cost-effective for widespread application in scientific research. However, certain factors must be considered while selecting the hardware and

software. The hardware should be standardized with wide applicability so that the databases, once developed, can be easily accessed through a network. This will facilitate decentralization and wider retrieval of the information contained in the databases. The software should be user friendly as far as possible, and should be readily available. The software should also be capable of generating a variety of graphs and reports. Suitable software can also be developed internally to suit specific needs.

An IBM-compatible PC, XT or AT, should be adequate for most of the existing institute-level database work in India. For the centralized database storage and retrieval work at ICAR headquarters, a mainframe computer with adequate storage capacity should be available. Most of the institutes and centres under ICAR do have PCs. With the support from the World Bank, SAUs and their regional research stations are also being supplied with PCs. However, attempts should be made to transfer the databases, already developed with the old non-IBM-compatible computers, to the IBM-compatible PCs and mainframe computers to facilitate greater decentralization and accessibility of data. Attempts should also be made to avoid duplication in the databases maintained at ICAR headquarters, ARIC, and at individual institutes.

Most of the databases utilize either dBase III+ and LOTUS 1-2-3 packages as such, or internally developed packages to meet specific needs. For the development of management information systems at the institutes, REFLEX, a flat database package, and PARADOX, a relational database, are also used, because of their potential for generating a variety of reports and graphs. For library literature information storage and retrieval, the software package CDS/ISIS, which allows structured non-numerical (textual) databases, is widely used by many institutes and also ARIC. This package is put to wide use with the support from UNESCO. This package, which is exclusively designed and programmed in PASCAL language, is meant for the creation and maintenance of library and bibliographic information databases.

### **Manpower development**

Manpower development is an important aspect of human resource management of any organization. Training, which helps in familiarizing

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learners with the concepts, developing their skills and in bringing about an attitudinal change, is one of the major requirements for manpower development. This aspect has been given due consideration in database development in India. Since computers have become an inseparable component in database development and maintenance, any training needed for the manpower development in this area should essentially consist of two levels of training. The first is foundation training which helps in imparting basic knowledge on the use of computers with specific reference to agricultural research and in developing adequate skills among the target personnel. The second level course should be advanced training for specialized database development using computers.

In India, both of these levels of training programs are being conducted effectively. NAARM has been identified as one of the key organizations for this type of training. With financial support from the World Bank, scientists and teachers working in the various regional research stations of the SAUs, which are also called the National Agricultural Research Project (NARP) centres, follow a two-week training program on 'Computer Applications in Agricultural Research'. Fourteen agricultural universities falling within the jurisdiction of central, eastern, and southern regions of India are under the purview of NAARM for training purposes. So far, three such programs have been conducted and 90 scientists and teachers working in the SAUs of these regions have already been trained in the basics of computer use. Some of these trained teachers and scientists will proceed to the advanced computer-based training on 'Management Information System (MIS) for Agricultural Research'. In addition, NAARM also conducts the basic computer training program on 'Computer Applications in Agricultural Research' for scientists from ICAR institutes. This course is offered annually on a regular basis. The Indian Agricultural Statistics Research Institute (IASRI) at New Delhi is responsible for covering the SAUs in the remaining regions of India for training on 'Computer Applications in Agricultural Research' under World Bank support.

In recent years, ICAR has been actively considering the establishment of a computer-based MIS in the agricultural research system for the collection, collation, and analysis of various

information on research projects, personnel and physical facilities to evolve a rationale for enhanced research productivity, efficient manpower planning and resource utilization. A decision has been taken to launch a program on MIS with a networking facility to link various agricultural research institutions in the country. As a prelude to such a step, NAARM must develop the manpower required, through training, for the establishment and maintenance of MIS in various research institutions. So far, the Academy has organized five specialized two-week MIS courses for scientists from ICAR institutes and SAUs. This course aims at familiarizing the scientists with the concept of MIS, and developing adequate skills for developing and using an organized MIS.

Sixty-three senior level scientists and technicians working in various ICAR institutes and SAUs, who either use information as research managers for decision-making or organize information for such decision-makers, have participated in these programs. So far, 30 ICAR institutes and 17 SAUs representing crop, animal, fishery, and management sciences have taken advantage of this training program. In addition, detailed guidelines on MIS methodology called 'ARMIS' and a few case illustrations pertaining to ICAR institutes and SAUs have been developed by NAARM. The Academy offers this specialized course regularly, at least once a year. Many of the senior level scientists who attended this program have already started developing MIS in their respective institutions by adapting the MIS methodology to suit their specific needs. Their progress is closely monitored by NAARM, and guidance and help are offered whenever needed. These training programs have helped a lot in developing the manpower required for database management in India.

### **Exchange of information**

Availability and proper utilization of information are essential for organizational growth and development. Organizations do have data, but may not have databases. They do have information, but the information is not easily accessible, searchable, and usable. The process of information development, storage, and retrieval is complex, and it calls for effective synchronization of various tools, techniques, and models into a process.

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Up to now, inter-institutional linkage for information exchange has been achieved mainly by the exchange of hard copies, which may further be supplemented by various non-print media such as micro films, audio and video tapes, and audio-visual and magnetic formats. However, these involve a lot of time and effort for effective and complete exchange of information. Networking overcomes these problems in a big way.

Networking is the most modern form of information and resource sharing by using computers and telecommunications links to transmit information or data from one place to another. Database development using computers, and the sharing of data and information through networking, are gradually gaining importance in India. In another ten years time, these will have completely replaced exchange of information through the old system of print and non print media.

The National Informatics Centre (NIC) of the Government of India has established a General Information System Network (GISNET), which connects more than 400 districts in India through satellite link. This is operationalized through personal computers at the district input centres; these are connected to four regional centres having mainframe computers; and finally, all the four centres are connected to the super computer located in New Delhi. This network makes available basic information about India, important national and international information, recreational and tourist information, in addition to agricultural, census, and economic statistics. Through its super computer facilities, the Indian Meteorological Development (IDM) has developed a weather forecasting database by using the data collected on meteorological parameters from over 350 meteorological stations distributed throughout the country.

With growing experience in database generation and maintenance, and with increasing availability of sophisticated communication and computer networks, the Indian library community is now gradually switching over to co-operative library efforts. This has also become essential due to the challenges imposed by increasing financial restrictions coupled with increasing costs of information. The Indian Library Network is the outcome of the efforts in this direction. Most of the libraries are using CD ROM to provide information to their users. The INFLIBNET is a proposed

network of India, connecting various colleges, universities, and R&D libraries in the country. When fully operational, it is expected to provide a user in any part of the country with access to information in any other college, university, and other institutions in the country. The INFLIBNET is a co-operative network, and it will contribute to pooling, sharing, and optimization of resources, facilities, and services of libraries and information centres. It will offer catalogue services, database services, document supply services, and collection, development and communication services. Recently, the INFLIBNET was registered as a society called 'Information and Library Network Programme'; it is located near the Gujarat University Guest House in Ahmedabad, mainly with a view to deriving facilities and benefits from the Indian Space Application Centre, which is in the vicinity.

### **Future plans and areas for improvement**

Keeping in view the importance of computer-based database development and maintenance, the need for networking, and also the state-of-art of database development and networking in India, the following future plans and areas are suggested for improvement.

#### *Need for appropriate software and hardware*

We are in an era when every individual prefers to have a PC in his own chamber and at home to have information at his fingertips. Computers are no longer a luxury. There is, therefore, an urgent need to provide the minimum facility of at least one PC to all the institutes, stations, and research centres under ICAR and SAUs. These centres should also be provided with essential software packages for database development. Funds must be made available for developing these facilities. International funding agencies can also be motivated to help in this venture. World Bank funds are already being utilized effectively for database development. With support from ISNAR, NAARM has been supplying REFLEX software to research institutions interested in developing MIS.

#### *Need for networking*

In spite of the fast emerging information technology infrastructure, the development of various databases in many developing countries

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has been relatively slow. Very little information on agriculture is being made available for distribution and use of researchers, administrators, and policy-makers through information technology networks and systems. There is an urgent need to go for extensive networking in India to access and use diverse information pertaining to different aspects such as agricultural production, economic indicators, research literature information, etc. This should be considered as a major thrust area, notwithstanding the progress made in the already established networks in some aspects of agricultural and allied database systems.

#### *Need for manpower development*

As indicated earlier, India has an enormous scientific manpower in agriculture, numbering over 30,000 scientists. To provide training on computer skills and database development to various levels of scientists working in a number of institutes, bureaux, research centres, universities, regional stations, and in various schemes would be a tremendous job, requiring time and resources. At present, NAARM and IASRI are identified as the nodal points for imparting such training. It would be worthwhile considering various institutions with manpower already trained by NAARM and IASRI as regional training centres. The trained scientists in these institutions, would, in turn, offer training to others in their own institutions, including their stations, with technical support from the faculty of NAARM and IASRI. This process, with its multiplier effect, would help in hastening the process of training scientists at different levels in various institutions, and thus would contribute immensely to manpower development.

#### *Need for sensitizing the policy-makers*

One problem that hinders the speedy development of relevant database and information management systems is the low level of interest shown by senior officials in these activities. To develop effective database and information management systems, merely training the scientists of various institutions is not adequate. The senior level functionaries managing these institutions need to understand computers and their potential in database development for information management. Unless this change is brought about in managers of institutions, the encouragement and logistic support needed for

database development will not be forthcoming. There is, hence, a need for sensitizing these senior executives of ICAR institutes and SAUs. A shorter duration program such as a two-day workshop would be adequate for this purpose. Sensitization workshops should be organized on a regular basis until all the managers and executives of various agricultural institutions in India have been covered.

#### **Conclusion**

Information forms the basis for making sound decisions. The information system has to be dynamic and the processes have to undergo constant changes to meet emerging needs. This is especially true of databases. The databases already developed have to undergo constant changes to keep them up-to-date, accurate, and useful, and new databases will need to be developed. Things are already moving in the right direction in India. It is certain that, with time, database development and management, along with networking, will revolutionize the information systems of the Indian agricultural scenario.

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## **Statistical Database Systems of CGPRT Crops in Nepal**

Kishore K. Sherchand\*

#### **Introduction**

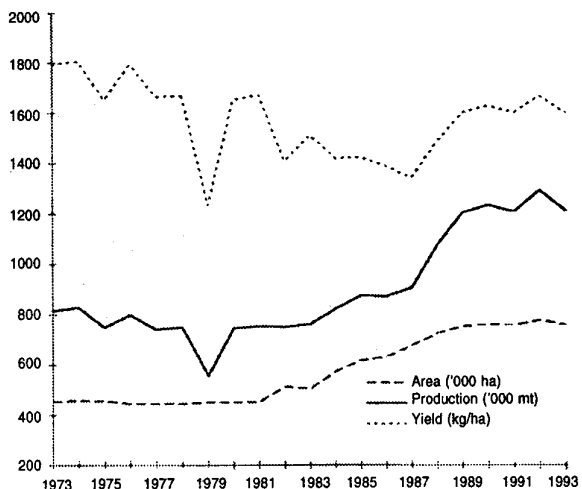
Nepal grows several CGPRT crops. Important among them are maize, finger millet, barley, buckwheat, and foxtail millet among the coarse grains; lentil, pigeonpea, chickpea, soybean, grasspea, and blackgram among the pulses; and the tuber crops, potato and sweet potato. These crops are grown in highly diverse agro-climatic conditions, and they contribute a large share to the national agricultural economy. These coarse grain crops are also considered a major source of food grains in the hills and isolated mountains of Nepal. Maize, for instance, ranks second to rice in area and production, followed by finger millet.

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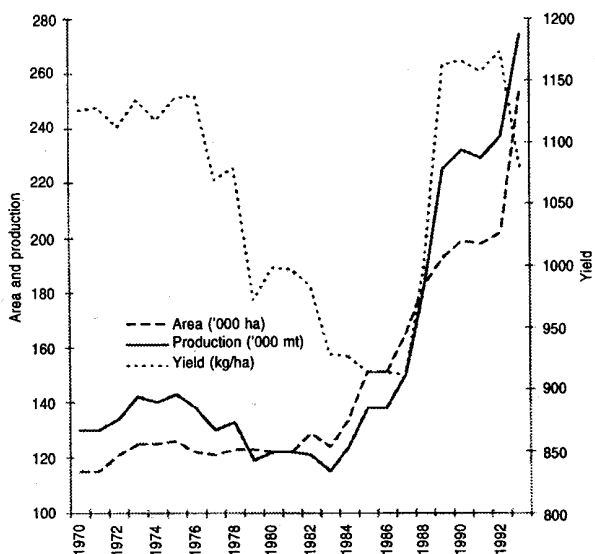
\* Agronomy Division, Nepal Agriculture Research Council, Khumaltar, Lalitpur, Nepal. This Paper was presenter at the meeting on Regional Statistical Database System (RSDS), Bogor, October 12-14, 1994.

Maize and finger millet are usually grown in association. Similarly, barley and buckwheat are also grown in the high hills, but their area and production are small compared to other cereals (Figures 1-3).

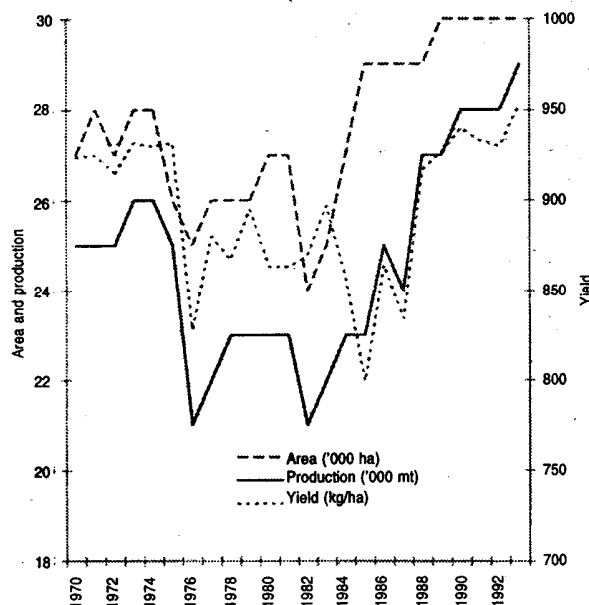
**Figure 1 Maize area, production and yield.**



**Figure 2 Finger millet area, production and yield.**



**Figure 3 Barley area, production and yield.**



Among the pulses, lentil is the most important crop followed by grasspea, chickpea, pigeonpea, blackgram and soybean (Table 1). It is interesting to note that the position of soybean is still minimal; however, with the opening of soybean based industries, its area and production will likely increase. Pulses altogether rank fourth after rice, maize and wheat; however, their productivity remains disappointingly low at an average of less than 500 kg/ha. In the beginning, the nation did not realize their importance in the context of national food and nutrition balance and national economy. With the recent increasing trend of export of pulses, the government is putting more emphasis in boosting production, for example, by establishing the National Grain Legume Research and Development Program.

The important tuber crop of this nation, which comes under CGPRT mandate, is the potato (Figure 4). Although potato is an important crop irrespective of any geographical location, its productivity also remains low (8,755 kg/ha). Because of the importance of this crop, there is a separate National Potato Development Program for extension, research and development.

**Table 1 Area, production and productivity of pulse crops in Nepal, 1984-1993.**

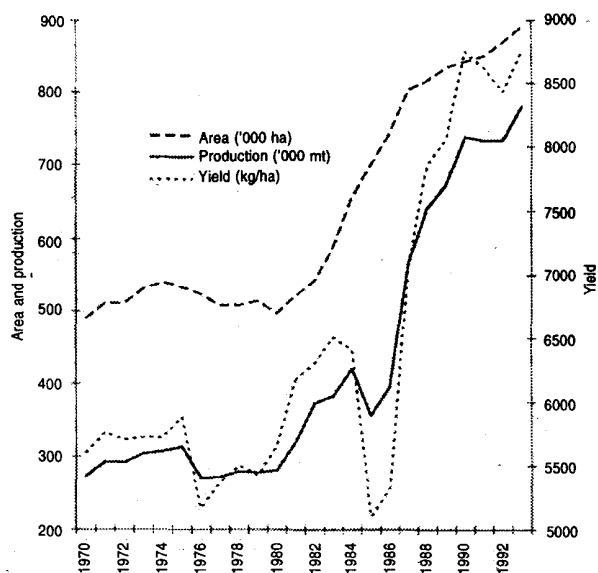
Year	Area (ha)	Lentil Production (mt)	Yield (kg/ha)	Area (ha)	Chickpea Production (mt)	Yield (kg/ha)	Area (ha)	Pigeonpea Production (mt)	Yield (kg/ha)	Area (ha)	Blackgram Production (mt)	Yield (kg/ha)
1984	98,560	58,400	593	25,890	16,000	618	14,260	10,500	736	9,060	4,660	514
1985	103,260	61,200	593	29,390	18,180	619	16,050	12,170	758	13,680	6,610	483
1986	107,310	73,190	682	31,100	21,130	679	17,470	13,350	764	15,430	9,080	588
1987	112,860	63,140	559	29,690	15,620	526	18,460	9,190	498	18,300	10,350	566
1988	120,360	74,360	618	28,830	17,090	593	17,920	12,260	684	17,730	10,070	568
1989	121,970	76,250	625	28,190	16,620	590	18,840	13,300	705	18,410	10,570	574
1990	119,490	73,020	611	27,040	16,700	618	17,930	12,030	671	18,830	11,260	598
1991	119,820	72,960	609	26,970	16,570	614	17,520	11,310	646	17,920	10,140	566
1992	169,350	105,000	620	28,140	15,950	567	22,800	16,520	725	18,240	10,480	575
1993	170,450	109,530	634	28,860	18,000	624	24,450	18,850	771	19,070	11,460	601

**Table 1 continued.**

Year	Area (ha)	Grasspea Production (mt)	Yield (kg/ha)	Area (ha)	Horsegram Production (mt)	Yield (kg/ha)	Area (ha)	Soybean Production (mt)	Yield (kg/ha)	Area (ha)	Others Production (mt)	Yield (kg/ha)
1984	51,170	26,610	520	10,600	5,600	528	11,320	6,180	546	7,160	3,730	512
1985	53,330	28,120	527	12,300	7,050	573	13,810	7,270	526	11,840	5,560	470
1986	53,980	28,920	536	12,130	6,880	567	15,260	8,120	532	10,250	5,420	529
1987	44,020	19,510	443	10,350	5,030	486	18,690	10,060	538	12,200	6,590	540
1988	38,580	19,810	513	8,770	4,350	496	20,710	11,680	564	12,830	7,060	550
1989	38,130	21,190	556	8,810	4,480	509	20,660	12,840	621	13,500	7,980	591
1990	40,860	22,990	563	8,000	4,080	510	21,340	12,730	597	14,230	8,510	598
1991	38,720	20,700	535	7,670	3,730	486	19,690	11,430	580	13,550	7,700	568
1992	40,060	20,040	500	7,710	3,830	497	20,220	11,750	581	13,260	7,570	571
1993	38,270	19,400	507	11,250	6,250	556	21,230	13,630	642	13,260	7,570	571

Source: ASD, DFAMS, 1994.

**Figure 4 Potato area, production and yield.**



### Historical background

Collection, analysis and documentation of agricultural statistics of Nepal started only since 1962. The Central Bureau of Statistics (CBS) was the main institution to carry out this task. Data collection was done merely by interviewing selected samples of farmers and was rather crude and imprecise in nature. In 1971, responsibility for agricultural census taking went to the Economic Analysis and Planning Division (EAPD) under the Ministry of Agriculture (MOA), and later moved to the Agriculture Statistics Division (ASD), under the Department of Food and Agriculture Marketing Services (DFAMS). Data collections were primarily based on reports provided by Junior Technical Assistants (JTAs), kept under the supervision of District Agriculture Development Office (DADO). Again, following the recent structural changes within MOA, DFAMS no longer exists. ASD has now been integrated into MOA

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directly. Other divisions of DFAMS such as the Agriculture Marketing Development Division (AMDD) and the Economic Analysis Division (EAD) went to the Department of Agriculture Development (DOAD).

Another institution collecting agricultural statistics is the Land Resources Mapping Project (LRMP). This was established between 1980 and 1985 under the Department of Survey (DOS). LRMP has used remote sensing and other modern technology to map crops from photographs. In addition, agricultural data are also available from other affiliated institutions, individual projects and independent researchers, etc.

### **Availability of data**

The major institutions that regularly publish and provide agriculture census are i) ASD and EAPD under MOA, ii) CBS under National Planning Commission (NPC), and iii) LRMP under DOS. In addition, other institutions such as APROSC, NARC, Rastra Bank, and international agencies such as FAO, World Bank, and ADB also publish agricultural data.

#### *EAPD and ASD publications*

The organization with most responsibility to collect, analyze and publish data on CGPRT crops is ASD under MOA, followed by EAPD under the same ministry. The "Agriculture Statistics of Nepal" was first published by EAPD in 1972, and later by ASD in 1977, 1983 and 1990. The first publication included only four CGPRT crops, namely maize, millet, barley and potato. The latest publication of 1990, however, also included several pulse crops such as lentil, chickpea, pigeonpea, blackgram, grasspea, horsegram, and soybean. ASD has also published several yearly, quarterly and monthly bulletins, periodicals and agricultural indicators. The other potential sources which are now under DOAD are AMDD and EAD. EMD has published agricultural marketing information bulletins and EAD the cost of production of major crops.

#### *CBS publications*

The first report by CBS on agricultural crops and related subjects came during 1962. CBS published the "Statistical Year Book of Nepal" in 1987 and 1989. However, the source for the data

was ASD. The other important publication of CBS is the "Statistical Pocket Book of Nepal". Included among the CGPRT crops in these publications are maize, millet, barley, potato, lentil, chickpea, pigeonpea, blackgram, grasspea, soybean and others. Following the re-structuring changes in MOA, more responsibility for collecting data and publishing has now gone to CBS, and several staff have also been transferred to CBS.

#### *LRMP publications*

LRMP has published several series of agriculture related data, namely geology, land use systems, land capacity and land utilization mapping. The maps produced by LRMP are printed by the Topographical Survey Branch (TSB).

#### *Other publications*

Several other agriculture related institutions such as APROSC, IRDPs, NARC, and a number of individual researchers have published papers and research reports on CGPRT crops. For example, the Hill Crops Programs and Grain Legumes Programs under NARC have produced separate databases on genetic resources of hill crops such as millet, barley, buckwheat, amaranth and of grain legumes such as chickpea, lentil, lathyrus, and blackgram. Similarly, the Research Division of Rastra Bank and the Economic Survey of the Ministry of Finance also publish relevant information on these crops periodically.

### **Accessibility of data**

Accessibility of data produced by various institutions is not very convenient. Problems of accessibility are generally due to i) limited number of publications; ii) treatment of data as private property by the collector; iii) data provision to bureaucrats rather than to the common users; iv) some data are grossly incomplete; v) frequent changes in district boundaries; and vi) frequent structural changes within organizations. Most of the publications by government organizations are free, except those by CBS and LRMP.

In the beginning, data were kept in the original questionnaires; however with better access to the data management system, data are now assembled in the data bank of ASD. NARC has also started using a data storage system based on Foxbase.

## Sampling Methods

During the early periods of census conducted by CBS, a rather crude stratified random sampling procedure was adopted. This later changed to two-stage random sampling with the district as the basic stratum.

Also, in the beginning of DFAMS, information was collected merely by feedback from Junior Technical Assistants (JTAs) based in the district. Since 1972, ASD started using a crop cutting method. The crop cuttings were further improved by dividing the district into several strata based on soil fertility, topography, irrigation facility, and agricultural practices. Each stratum is further divided into segments of about 40 ha in the hills and 65 ha in the Terai. Each crop cut has a plot size of 5m x 5m for maize and 5m x 2.5m for the others. To determine the total area under crop cultivation, results of cadastral survey are used.

On the other hand, LRMP adopted aerial photographic survey. The scale of photographic mapping was 1:125,000 for geology and 1:50,000 for land utilization, land capability, and land systems. The minimum area of cultivation to be mapped was a 25 ha block delineated on the photographs. Hence, any isolated area which is less than 25 ha was not mapped by LRMP. This was the reason that the crop coverage data of major cereals taken by LRMP mapping closely agreed with ASD, while those of minor crops showed a great discrepancy.

## Information available for CGPRT crops

### Crops

- Maize, millet, barley, buckwheat
- Potato
- Lentil, chickpea, grasspea, pigeonpea, blackgram, soybean and others.

### Information

- Area, production and productivity at national, regional, zonal and district levels.
- Marketing - average retail price (Table 2), average wholesale price annually at national and district levels.
- Procurement price of certain CGPRT commodities.

- Export and import of certain CGPRT commodities, particularly pulses and maize.
- Cost of production analysis of maize, millet, lentil, pigeonpea, chickpea, and potato at district level.
- Genetic resources of landraces of finger millet, barley, buckwheat, amaranth, chickpea, lathyrus, and pigeonpea of Nepal.

**Table 2 National annual average retail price of CGPRT crops (NRs/kg).**

Year	Maize	Millet	Black-	Pigeonpea	Green-	Lentil	Soybean	Potato
	gram			gram				
1984	2.88	3.17	9.91	10.83	9.48	6.89	6.17	2.80
1985	3.62	4.11	11.72	11.08	13.75	10.27	7.62	3.43
1986	3.79	4.58	12.02	12.51	14.73	10.67	8.15	4.75
1987	4.36	4.06	13.90	16.54	15.57	10.76	9.53	4.47
1988	4.73	5.88	16.44	19.45	21.63	14.62	11.29	4.68
1989	4.81	6.09	18.78	19.52	22.40	15.39	13.65	5.69
1990	4.76	6.86	20.49	22.28	23.53	16.71	13.53	5.67
1991	6.19	7.96	21.61	27.05	24.29	20.95	13.26	6.15
1992	6.96	8.89	32.03	28.52	28.02	22.28	15.64	7.59
1993	6.29		22.06	26.89				

Source: EAD, DOAD, 1994.

## Future developments

1. Nepal Agriculture Research Council (NARC) has proposed a network of information systems for each of the 4 regions of Nepal for NARC research activities.
2. NARC in the near future will have a division or unit which will co-ordinate database information networks of NARC research activities, commodity programs, etc. Different commodity and divisional programs have already tried to maintain databases of their respective activities, eg, crop genetic resources, rice-wheat farming system, soil fertility, soil survey, animal genetic resources, insect genetic resources, etc.
3. NARC will also be glad to co-ordinate with international institutions for the exchange of information systems regarding crops, animal, socio-economics, farming systems and their research activities.

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# The Statistical Database of the Socio Economics and Planning Centre of the Department of Agriculture, Sri Lanka

Y.M. Wickramasinghe<sup>\*</sup>

## Introduction

The Department of Agriculture (DOA) has three crop research and development institutes and nine different centres. The Socio Economics and Planning Centre (SEPC) is one of them. Each institute or centre has a separate database to meet its basic requirements. SEPC has a fairly large database. The main purpose of having a database is to provide information required by the DOA, the Ministry of Agriculture, Land and Forestry, and other public and private sector organizations.

## The database

Development of the database started in the 1960s as a small unit attached to the Division of Agricultural Economics, Statistics and Farm Management of DOA. It was expanded gradually over time to satisfy the increasing demand for agricultural statistics.

At the present, this unit is staffed with an agricultural economist, a statistical assistant and a statistical investigator. The agricultural economist attends to the database on a part time basis, while the other two officers are occupied full time. The Department of Census and Statistics (DOCS) has stationed a statistical investigator in this unit in order to facilitate co-operation between the two institutes. The unit has a computer for data storage. Data files can be copied to floppy diskettes or can be obtained as computer printouts from this unit on request.

Primarily, statistics on production, marketing and consumption of major food crops (ie paddy, condiments, pulses, coarse grains, oil seeds, root and tuber crops and horticultural crops) are available in this database, because the promotion of these crops is the mandate of DOA.

Information available on vegetable and fruit crops is not as complete as the information on major food crops. Production statistics are available by district and at the national level in annual and seasonal forms. Price data are available at the farm gate, retail and wholesale levels. Consumption data and import-export data are also available at the national level. The unit has a large collection of time series as well as cross sectional data.

This unit compiles data reported by the provincial departments of agriculture on agricultural production as well as data reported by agencies such as the Agrarian Research and Training Institute, the Central Bank of Sri Lanka, state banks, the Food Commissioner, Sri Lanka Customs and several other local agencies. The majority of the data is computerized. However, there exists a large volume of data yet to be computerized. This unit is the only place that compiles data on cost and return of different seasonal crops on a seasonal basis. Various government and non-government agencies other than DOA utilize our data. Due to inherent weaknesses in data retrieval, we find difficulties in satisfying demands in certain instances.

## Data storage and reporting

Data storage is done with software packages such as LOTUS 1-2-3 and dBase III. Wordperfect, SAS and Harvard Graphics are the packages that are used to analyze and report data. Since data are stored in large spreadsheets, it is difficult to retrieve data quickly in specific forms requested. As a result, data retrieval takes a large portion of our scarce time. The frequency of econometric analysis is low, due to the problems associated with retrieval.

At present, the reporting of production statistics from the district level to the national level does not function properly. Therefore, it is difficult to obtain accurate data in time. This centre has officers stationed at district offices to attend to this work, but, after a re-organization of DOA, they are no longer under our control. To remedy this situation, it is possible to send a group of officers to districts at regular intervals, but resources are inadequate. Furthermore, none of the officers attached to the statistical unit is trained in database management.

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<sup>\*</sup> Department of Agriculture, Peradeniya, Sri Lanka.  
This paper was presented at the meeting on Regional Statistical Database System (RSDS), Bogor, October 12-14 1994.

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## Future plans

It is necessary to revise the data storage system to permit more selective retrieval of data required for specific purposes. Furthermore, it is necessary to publish data in the form of a statistical bulletin and to circulate this to different users.

To maintain the database effectively, it is necessary to train officers attached to this unit in database management and there is a need to enhance their computer skills. In addition, more manpower is required to collect reliable data in timely fashion at the district level.

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# CGPRT Centre News and Activities

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In the last quarter of 1994, the CGPRT Centre held the Twelfth Session of the Technical Advisory Committee (TAC), and the Thirteen Session of the Governing Board. The Centre also conducted the fourth meeting on Regional Statistical Database System (RSDS).

## **Technical Advisory Committee (TAC), Bogor, 29 November to 1 December 1994**

The Centre's Technical Advisory Committee discussed and provided advice on the Centre's programmes for the period of 1994-95. The meeting was attended by Dr Claude Aubert, Dr S.M. Elias, Dr Euan Fleming, Mr Maso Kikuchi, Dr Ibrahim Manwan, Mr Kiran Pyarkuryal, Dr Boonjit Titapiwatanakun and Dr W.G. Wolters.

The TAC discussed the Centre's activities, both in 1994 and for 1995, in depth by project and activity, and gave suggestions and guidance for their effective implementation. The TAC suggested that the Centre stress the economic and agricultural sustainability of upland agriculture. It also noted that the Centre needs to strengthen its efforts to expand the portfolio of projects for fund-raising and implementation.

## **Governing Board, Bogor, 6 to 8 December 1994**

The meeting was attended by the representatives of Bangladesh, France, India, Indonesia, Japan, Myanmar, Papua New Guinea, the Philippines, the Republic of Korea, Thailand and Viet Nam as members of the Board, and non-Governing Board members, Cambodia, Laos and Malaysia also attended. Representatives from several international organizations also attended.

The representative of Papua New Guinea, Dr.

R.D. Ghodake, and the representative of Indonesia, Dr Prabowo Tjitropranoto, were elected chairman and vice chairman respectively. The representative of Thailand, Mr Boontam Prommani, was elected rapporteur.

The Board was informed of the Centre's activities in 1994, and considered the planned work for 1995-97. The Board expressed satisfaction with the expansion of activities in 1994, and further for 1995, and the Centre's emphasis on transferring knowledge and strengthening its relations with its partners. It approved the proposed programme of work for 1995.

The Board was also informed of the expenditure of programme and institutional support resources in 1994, and the estimated expenditure and the subsequent financial situation for 1995. It noted the need for expansion of these resources in order to effectively implement the programme activities. While the Board expressed appreciation for increases and commencement of contributions from India, Indonesia, Papua New Guinea and Thailand in 1994, it urged that members indicate to their respective governments the need for increased contributions for institutional support resources. The Board also expressed appreciation to the Government of Indonesia for convening the Informal Consultative Meeting in Jakarta in March 1994, and noted its positive effect on the resource mobilization.

The Board, in approving the report of expenditure in 1994 and planned expenditure for 1995, endorsed recommendations regarding strengthening the financial and human resources which will be transmitted to the ESCAP Commission at its next session in April 1995.

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## BEYOND FARMER FIRST

Rural people's knowledge, agricultural research and extension practice

*Edited by Ian Scoones and John Thompson, with a foreword by Robert Chambers*

The interest and support that the *Farmer First* philosophy has received has led to a virtual revolution in the agricultural sciences. While many hail this populist perspective as a step in the right direction, some have argued that it fails to capture the complex cultural, social and political dimensions of knowledge creation, innovation, transmission and application within rural societies and scientific organizations. Because they do not adequately address these fundamental issues of power and knowledge, critics charge that some *Farmer First* initiatives encounter many of the same problems as conventional transfer of technology strategies.

The purpose of *Beyond Farmer First* is to reveal how agricultural research and extension, far from being discrete, rational acts, are in fact part of a process of coming to terms with conflicting interests and viewpoints, a process in which choices are made, alliances formed, exclusions effected, and worldviews imposed. By going beyond *Farmer First*, this theoretically informed perspective describes agricultural development as what it is: a highly ideological and political process. As Robert Chambers notes in his foreword, the concerns of *Farmer First* with performance and *Beyond Farmer First* with process, indicate that a radical rethinking of knowledge, power and agricultural science is well under way.

This book consists of some thirty-six contributions representing the disciplines of agronomy, agricultural science, anthropology, ecology, entomology, forestry, geography, management science, pedagogy, sociology and others, with detailed case material from Africa, Australia, Central and South America, and Europe.

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## INTERNATIONAL COURSES ON FOOD PROCESSING

### **Quality Assurance and Marketing in Food Processing Enterprises**

August 13 – November 18, 1995

### **Food Fortification for the Elimination of Micronutrient Malnutrition**

October 8 – November 18, 1995

International Agricultural Centre, Wageningen/  
The Netherlands

#### **Quality Assurance and Marketing**

Unfortunately, many small and medium scale enterprises face serious problems to enter or to compete in the market. Problems include the transfer of technology to maintain product and packaging standards, but also lack of information regarding the selection of technology from among existing alternatives. Another problem is the adjustment of production to shifts in market demand. At the same time, training and consultancy services for entrepreneurs from this sector are almost non-existent.

During this 14 weeks course, participants will identify and solve problems in food processing by focusing on selection of technology, quality assurance and marketing.

#### **Food Fortification Management**

IAC participates in the Program Against Micronutrient Malnutrition (PAMM), a global network based in Atlanta USA, that is working towards the virtual elimination of iodine and vitamin A deficiency disorders and a one-third reduction of iron deficiency anemia by the year 2000.

This six week international course program on food fortification management provides information on fortification technology and processes, appropriate food vehicles that may be fortified, and fortificants that convey micronutrients. The program includes strategic planning, personnel, information and social marketing management, and a laboratory management course.

For further information contact: International Agricultural Centre (IAC).

## **44th INTERNATIONAL COURSE ON RURAL EXTENSION**

June 11 – July 8, 1995 and

## **INTERNATIONAL COURSE ON RURAL EXTENSION AND SPECIALIZATIONS**

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International Agricultural Centre, Wageningen/  
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The course gives professionals with diverse extension experiences an opportunity to review their experience in the light of new perspectives. The program aims at providing insights into ways of making extension a more effective instrument for facilitating rural development.

The courses are held in English and French and are revised and up-dated annually. The intensive workshop activities are complemented by lectures and field exercises in the Dutch agricultural setting. The English ICRE courses are held in June/July 1995. The French ICRE courses will be held in January/February 1996.

Participants are offered two study options to accommodate their availability and interests:

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- management of extension programs,
- training for trainers of extension workers, or
- research-extension-farmer linkages.

For further information, contact:

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### CGPRT Centre

The Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

### Objectives

In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

### Programmes

In pursuit of its objectives, the Centre has three programmes which are mutually supportive:

1. Research, which entails the preparation and implementation of studies covering production, utilization and trade of CGPRT crops in the countries of Asia and the South Pacific.
2. Training of national research and extension workers,
3. Information and documentation which encompasses the collection, processing and dissemination of relevant information for use by researchers, policy makers, and extension workers.

### Palawija News

Contributors are invited to submit concise summaries of significant social research related to CGPRT crops for publication. Figures (graphs or tables) may accompany the article. All articles are subject to editing to meet space limitations.

Please send all queries relating to articles in *Palawija News* to Publications Section, CGPRT Centre, Jalan Merdeka 145, Bogor 16111, Indonesia.

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