Symposium on
Accelerated Growth of Agriculture through Information Technology

Chairman :	Dr. S.D. Sharma
Convenor :	Dr. P.K. Malhotra

The following four papers covering various aspects related with the theme of the symposium were presented by the following speakers:

1. Emerging Computing and Communication Techniques for Accelerated Growth is Dairying – An NDRI Perspective — Dr. D.K. Jain

2. Accelerated Growth of Agriculture through Knowledge Management in Plant Genetic Resources — Dr. R.C. Agrawal

3. ICT for Accelerated Growth Resources – Status and Prospects — Dr. Anil Rai

4. A Decentralized Process for Web based Data Management of Agricultural Education — Dr. R.C. Goyal

After detailed discussions, the following recommendations emerged out:

*   More exclusive investment in needed for primary data collection to get quality data.

*   High level co-ordination committee meetings need to be made more interactive and effective to achieve better co-ordination of activities between centre and states.

*   The awareness of simple basic statistical concepts should be improved amongst all policy makers and users. In other words, there should be a positive movement towards basic statistical literacy.

ABSTRACTS OF THE PAPERS PRESENTED

1. Emerging Computing and Communication Techniques for Accelerated Growth in Dairying – An NDRI Perspective

D.K. Jain, A.K. Sharma and A.P. Ruhil

Globalization and growing competition have accelerated the need for knowledge intensive work performance in all the sectors of economy. In the dairy sector, constant application of latest ideas and better work technologies is essential to enhance productivity in the interest of economic well being of the stakeholders and for ensuring food security. Hence, knowledge acquisition has become a significant factor for accelerated growth of livestock sector in general and dairy sector in particular. It has acquired ever increasing importance in view of its significant contribution to the national economy, relatively higher growth in milk sector and its role as an employment provider during the stress period. To this effect, the Computer Centre at National Dairy Research Institute (NDRI), Karnal has made several efforts during the past two decades. The Institute started with a small facility for scientific data processing and gradually developed a Management Information System (MIS) for Animal Management. Ever since, it has expanded its activities to incorporate several advanced aspects of knowledge and information system for accelerating growth in Dairying. This includes development of web-enabled databases/software on various facets of dairying such as National Collection of Dairy Cultures; multimedia-based transferable technologies developed by the Institute; developing various expert systems and decision support systems as well as computational models based on emerging advanced computing and communication techniques/ technologies for precision dairy farming such as wireless sensor network for animal management for organized and unorganized herds, tracking nomadic herds for disease surveillance, soft computing models for intelligent predictions in dairy production and processing applications; dynamic and state-of-the-art Website on Animal Science, Dairy Science and Education along with transferable technologies, *etc*. The Centre is also in the process of implementing NAIP sponsored agroweb sub-project through which it is expected to strengthen the knowledge base of all the stakeholders including dairy farmers, feed and dairy industry and other potential users. Besides this, the Centre has designed and developed

Computer Curriculum for the Dairy Science students at undergraduate and postgraduate levels to equip them with latest computing and communication know-how.

National Dairy Research Institute, Deemed-to-be University, Karnal-132 001 (Haryana)

2. Accelerated Growth of Agriculture through Knowledge Management in Plant Genetic Resources

R.C. Agrawal

Plant genetic resources (PGR) for food and agriculture consists of the diversity of genetic material contained in traditional varieties and modern cultivars grown by farmers as well as wild relatives of crops and other wild plant species that can be used for food, feed, fiber, clothing, shelter, wood/timber, energy, etc. One of the major challenges for food security in the next generation is the effective management of plant genetic resources worldwide. Thus, knowledge management in plant genetic resources becomes very important at the national, regional and global levels to effective conservation of rapidly disappearing genetic stocks for possible future use and also for immediate utilization of already conserved and evaluated/characterized germplasm in the ongoing crop improvement programmes which can lead to the accelerated growth of agriculture. The recent advancement in information technology has led to an explosion in the compilation and collation of information in all fields, including PGR.

The National Bureau of Plant Genetic Resources (NBPGR) has been entrusted with the responsibility to plan, conduct, promote, coordinate and take lead in activities concerning germplasm collection, conservation, evaluation, introduction, exchange, documentation and sustainable management of diverse germplasm of crop plants and their wild relatives with a view to ensure their availability for use to the researchers. The Indian Plant Genetic Resources Management System (IPGeRMS) under the aegis of the Indian Council of Agricultural Research (ICAR), spearheaded by the NBPGR, is emerging as a dynamic system which holds prominent place among the global genebanks.

Genebank Information Management System (GBIMS), Plant Genetic Resources Passport Information Management System (PGRPIMS), Electronic catalogues for the recording of the evaluation/ characterization data, database for the inventory of the import and export of the accession have been developed at NBPGR and the complete information related to Plant Genetic Resources as stated above is being documented using the Information Technology Tools for the PGR and the same is being used by the concerned PGR researchers for the knowledge management of the genetic resources in India for the conserved and evaluated/characterized germplasm in the ongoing crop improvement programmes.

National Information Sharing Mechanism on the Implementation of Global Plan of Action (GPA) for the Conservation and Sustainable Utilization of PGR for Food and Agriculture (PGRFA) (NISM-GPA) has also been developed in India for enhancing coordination of plans and activities on conservation and sustainable utilization of PGRFA amongst stakeholders and for sharing information, as well as for priority setting for the GPA implementation. A national network for the knowledge management in PGR is also being executed by the NBPGR to link all the National Active Germplasm Sites (about 50) in India.

National Bureau of Plant Genetic Resources, New Delhi-110 012

3. ICT for Accelerated Growth and Development of Indian Agriculture – Status and Prospects

Anil Rai, K.K. Chaturvedi and P.K. Malhotra

Introduction of personal computers (PC) in 70's created vision of paperless offices, simplified computing, automated process control, management information system, expert system etc. Growth of companies with promises to provide specialist software to farmer and growers during 80's is a clear indicator of high expectation and visualization of ICT in the field agricultural research and development. A review of agricultural software availability and its use has been made by an international team in 1997 called FARMSOFT (Gelb *et al.* 2006). This review was based on eight countries i.e. Belgium, France, Germany, Israel, Italy, Portugal, Spain and the Netherlands. It was found that in 1996 out of 1315 software related to agriculture, 39% were in category of management, 26% were in category of animal husbandry, 8.9% in category of crop production, 7.0% in category of machinery and process control, 0.1% in category of irrigation and 19% in other

categories. Comparison of change in software inventory in 1996 with respect to 1994, it was found that there is around 15% growth in the agricultural software development. The highest positive growth was in the category of management software (38.40%) followed by animal husbandry (10.45%) and others (10.44%). However, highest negative growth was observed in the category of irrigation (-163.15%) followed by crop production (–53.85) and machinery and process control (–30.95). This clearly indicates that overall agricultural software inventory was growing but growth in the software related to agricultural management was sufficiently high whereas there is sharp decline in categories of irrigation and crop production. This change in pattern may be attributed to two main factors, first saturation of software and second bottleneck due to limitation of related technological innovations, socio-economic adoption and infrastructural facilities. Presently, there is increasing trend of using PC with shared resources via networks, audio and visual dissemination of data, information and knowledge in developed countries. Also, in these countries, there is significant shift in adoption of IT related technologies. There is end-user based demand driven situation for technologies such as computers embedded machines, controlled process and production, monitoring and evaluation, elementary decision making etc. Also, demand for tailor made software continues to increase along with strong network connectivity, climatic information, standardized software interface and ICT policy support. In this article attempt was made to discuss various important technologies of ICT, relevant to agricultural sector. Applications of ICT in the field of agricultural research and developments were also discussed. Technological linkages of ICT with supporting field were studied in context of India through patent analysis. Also, ICT knowledge network of Asian countries were discussed top highlight knowledge sharing among these countries. Further, international status related adoption of ICT for agricultural research and development and initiative taken in context of Indian agriculture has been discussed. Future prospects of ICT based technology has been projected based on past experience.

Indian Agricultural Statistics Research Institute, New Delhi – 110 012

4. A Decentralized Process for Web Based Data Management of Agricultural Education

R.C. Goyal

For data collection various methods like Observation, Interview, Questionnaire, Schedule, Case Study, Surveys and Panels etc. have been commonly used. Bowker (2000), Carbonaro (2002, 2000), Couper (2007, 2001, 2000) have supported and used the World Wide Web for the collection of data with strong perception that the web based data collection in academic research, extension and education might be replacing paper-and-pencil questionnaires in the near future.

This paper describes a process developed for implementing a decentralized system for web based data management of agricultural education. A practical application of the process for regular data collection, compilation and analysis of the data related to the day to day ongoing activities at the State Agricultural Universities (SAUs) and other organizations involved in imparting agricultural education in India will be presented. The advantages and limitations of the web based data collection, compilation and analysis approach may also be discussed.

The processes developed above will act as an independent data collection, compilation and analysis system at the organization level and will become a useful tool for the agricultural education data management at the universities and their affiliated/constituent colleges. Ultimately, it will lead to support and strengthen the National Information System on Agricultural Education Network in India (NISAGENET) hosted through http://www.iasri.res.in/Nisagenet/ at IASRI, New Delhi

Indian Agricultural Statistics Research Institute, New Delhi – 110 012

Symposium on
Agricultural Statistics for Planning

Chairman: Dr. K.C. Seal

Convenor: Dr. H.V.L. Bathla

The following four papers covering aspects related with the theme of the Symposium were presented by the following speakers:

1.   Quality of Agriculture Statistics: Role of NSSO — Dr. A.K. Yogi

2.   Agricultural Statistics Available from National Accounts for Planning — Sh. Ramesh Kolli/Sh. Vidyadhar

3.   Agriculture Statistics for Planning: Perspective, Planning of Land Use Statistics in Uttar Pradesh — Sh. Vinod Kumar Singh

4.   Livestock Statistics and Data Gap — Sh. O.P. Misra

After detailed discussions, the following recommendations emerged out:

1. More exclusive investment is needed for primary data collection to get quality data.

2. High Level Co-ordination Committee meetings need to be made more interactive and effective to achieve better co-ordination of activities between centre and states.

3. The awareness of simple basic statistical concepts should be improved amongst all policy makers and users. In other words, there should be a positive movement towards basic statistical literacy.

ABSTRACTS OF THE PAPERS PRESENTED

1.   Quality of Agriculture Statistics: Role of NSSO
A.K.Yogi

Agriculture continues to remain the predominant sector of Indian economy in terms of employment and livelihood, even though its share in Gross Domestic Product has declined from over 50 per cent in the initial years after independence to around 20 percent in the recent years. Growth rate of non-agriculture sector has also accelerated but strong agriculture- non-agriculture as well as rural-urban divide is seen in the society. In view of the seriousness of this issue, the 11th Plan Approach paper placed a strong emphasis on restructuring policies for achieving accelerated, broad based and inclusive growth. The Steering Committee on Agriculture and Allied Sectors for Formulation of the Eleventh Five Year Plan (2007-2012) highlighted the major concerns of the Indian agriculture and identified the causes underlying the present dismal state of agriculture and also suggested a road map for reviving agriculture with a view to placing it on high, inclusive growth path. The Committee also made recommendations for improvement in Agricultural Statistics.

At present the Directorate of Economic and Statistics, Ministry of Agriculture is the nodal agency for release of basic data on agriculture like area and production statistics for the country as a whole. While the area statistics are collected on complete enumeration basis in respect of permanently settled States and on the ad-hoc methods based on impressionistic approach in case of Assam (hill parts) and other N.E. States; and for the three states viz. Orissa, West Bengal and Kerala a scheme for Establishment of Agency for Reporting of Agricultural Statistics (EARAS) has been introduced. Crop Estimation Surveys (CES) are carried out following a specified sample design. Since the final estimates of production based on complete enumeration of area and yield through crop cutting experiments become available long after the crops are actually harvested, the Government prepares advance estimates of production for taking various policy decisions.

Role of NSSO in Quality Improvement

Timeliness and quality are the two essential features of any statistics. As far as the crop statistics are concerned, the Timely Reporting Scheme (TRS) is intended largely to take care of timeliness. As for quality, the scheme for Improvement of Crop Statistics (ICS) was introduced in rabi 1973. Now it operates in 20 States and 2 UTs. The scheme ICS was prepared jointly by the M/o Agriculture and NSSO. The programme envisaged under the ICS scheme includes:

1. Physical verification of crop enumeration done by the patwaris in a sample of 10,000 villages in each recognized season by NSSO and States on equal matching basis.

2. Checking about the accuracy of the area statistics transmitted from the village level through crop abstracts in the very same 10,000 villages; and

3. Providing technical guidance and supervision at the harvest stage in the conduct of about 30,000 crop cutting experiments distributed among principal crops in various States.

The role of NSSO confines to assisting the States in developing suitable techniques for obtaining reliable and timely estimates, providing technical guidance and ensuring adoption of uniform concepts, definitions and procedures in the Crop Estimation Surveys. It reviews the design, plans, details of implementation and the results of the surveys, participates in the training camps organized for the State field staff and supervises the primary field work undertaken by the staff of the state agencies. NSSO after processing of ICS data releases a comprehensive report "Review of Crop Statistics System through Scheme for ICS" for each season for each State. In addition another report called "Consolidated Results of Crop Estimation Survey on Principal Crops" is also released.

Findings of NSSO

Area enumeration

1. On an average timely submission of TRS statement is found in around 45% villages only. The timely submission is also found to be abnormally low in autum season, it improves in winter, rabi and falls in summer.

2. Submission of TRS Statement even without completing girdawari.

3. The errors are of three types viz. (i) crops actually sown are not reported , (ii) reporting of crops which are not sown; and (iii) incorrect reporting of crop area.

Crop cutting

1. Most of the States do not follow minimum number of experiments under CES i.e. 80-120 CC experiments for major districts and 40 experiments for minor districts.

2. The major errors observed relate to (i) selection of survey number/field, (ii) measurement of field and dimensions of plot, (iii) location of correct experimental plot, (iv) weighment of produce, (v) use of equipments.

3. The percentage of CC experiments found without errors varies from state to state and from season to season. For example less than 75% experiments observed to have been conducted without errors even in the major states like Maharashtra, Tamil Nadu, J&K and Rajasthan.

Inspite of regular reporting of weaknesses and drawbacks in season wise reports over the years, the State agencies have not taken serious measures to effect improvements in their work. Rather further deterioration continues.

Recent Reviews by Commissions and Committees

The National Statistical Commission (2001) examined the state of affairs of agricultural statistics and made several recommendations for improvements. Also the Steering Committee on Agriculture and Allied Sectors for Formulation of the Eleventh Five Year Plan (2007-12) of the Planning Commission headed by Prof. C.H. Hanumantha Rao commented on the system of agricultural statistics as "The agricultural statistics system has run down in many states. The conduct and supervision of crop cutting experiments has weakened, complete enumeration of land use and cropping and irrigation down to the plot level become difficult. The present status of implementation of various recommendations of the National Statistical Commission (NSC) clearly shows these recommendations have not been taken seriously by the concerned organizations". The also suggested that various recommendations by the NSC should be rigorously pursued and implemented at the earliest. The database for agricultural sector needs

to be thoroughly reviewed for bringing lasting improvement in the basic system of Agriculture Statistics.

National Sample Survey Organization (FOD), Ministry of Statistics & Programme Implementation, Government of India, New Delhi

2. Agricultural Statistics Available from National Accounts for Planning

Ramesh Kolli

The Central Statistical Organisation (CSO) in the Ministry of Statistics and Programme Implementation, is entrusted with the responsibility of compiling National Accounts Statistics (NAS) for the country. In this role, the CSO releases annual national accounts statistics, quarterly estimates of Gross Domestic Product (GDP), and Input-Output Transactions Tables once in five years. The national accounts statistics provide a wealth of data on various sectors of the Indian economy and more particularly on agriculture sector.

The estimates of GDP for agriculture and allied economic activities are compiled by valuing the total production of each commodity in the country, and deducting inputs from this value of output. By virtue of this compilation, data on value of output at current and constant prices, state-wise and crop-wise becomes available.

The data base at all India level that is now available on value of output, inputs and value added is from 1950-51 to 2007-08, by crops, both at current and constant prices. At state level, crop-wise information on value of output at current and constant prices is available from 1960-61 to 2006-07. On livestock sector, such detailed data is available at state level from 1990-91 onwards.

With the above available data, the users can construct price indices, crop-wise and state-wise. This extensive and vast data is extremely useful in understanding the price movements of various crops in different states over a long period of time. Such detailed data is not available from any source, except from the national accounts statistics.

With the help of the same data source, users can also construct volume indices of production of agricultural crops (crop-wise) by states, as also for the livestock products. Analysis of these data provides production dynamics of various crops across the states.

From the demand side, the national accounts provide detailed data on investment made in agriculture and allied sectors, and again by institutional sectors, such as public sector, private corporate sector and private household sector.

The paper gives, along with a gist of datasets that are available from national accounts on agriculture and allied activities for the purpose of planning and decision making, a summary of data sources and estimation procedures adopted in the compilation of national accounts, and few summary tables at relatively aggregated level.

Central Statistical Organisation, New Delhi

3. Agriculture Statistics for Planning: Perspective Planning of Land Use Statistics in Uttar Pradesh

Vinod Kumar Singh

Man derives all his sustenance from the land and as land is limited, the need to make the most judicious use of land is imperative. It should be so used as to produce enough to satisfy the minimum need of mankind and remain enriched for posterity.

The Agricultural Statistics collected by the Department of Revenue, Uttar Pradesh should be used for planning the most judicious use of land.

Uttar Pradesh has about 242 lakh hectares of reporting area. The present land utilisation is somewhat imbalanced in the sense that very large proportion of area is under cultivation and relatively smaller area is under forest or orchards. Extent of barren and culturable waste is quite large of the total reporting area, about 7 percent is under forest, 68 percent is under cultivation and 4 percent is barren and culturable waste.

According to 2001 census, the population of Uttar Pradesh was 16.61 crore and is projected to be about 23.14 crore during the year 2020.

Production of food grains and other agricultural commodities is and will continue to be most important land use. The present production of foodgrains in the State is about 421 lakh tonnes. It is estimated that in the year 2020, a total quantity of 493 lakh tonnes will have to be produced annually to meet the requirement of the expanded population as well as to satisfy other demand, such as use for cattle feed, seeds, wastage in storage,

etc. Requirements of oil seeds, sugarcane and other agricultural products are expected to increase at a faster rate.

As the area under forests, groves and pastures are already less and as non-agricultural use of land such as for expansion of urban communities, roads and railroads, dams and canals, industries and public utilities; it is proposed to restrict the net cultivated area to near about the existing percentage i.e. 68 percent. Additional agricultural production is proposed to be obtained by increasing the intensity of cropping from the present 153.34 percent to about 180 percent as also by increasing per hectare yields. This is proposed to be achieved by the required increase in agricultural inputs comprising irrigation, fertilizer improved seeds, pesticides etc., and by the programme of extension and education.

Lack of adequate and proper knowledge of our soil resources and of the problems caused by erosion, floods, water logging and salinity has hindered the preparation of comprehensive land use plan. It is proposed to survey the entire State within the next 2 years for which Soil Survey Organisation will have to be further strengthened. Even though increase in net cultivated area is not proposed, barren and usar lands have to be reclaimed on a priority basis in order to substitute for agricultural land necessarily being put to non-agricultural uses. It is also necessary to reclaim it for adding to grove lands, pastures and forests. Reclamation of such lands and for ravines is also necessary to prevent their further march and encroachment into agricultural lands.

Programme of land reclamation on such large scale would necessitate involvement of people. This would require research, demonstration and training.

Irrigation facilities are available from the state and private sources in an area of about 133.13 lakh hectares against the gross cropped area of 254.15 lakh hectares. The existing irrigation facilities are, generally not adequate for intensive agriculture. The irrigated area will require to be increased to 170 lakh hectare by the year 2020 in order to provide for need of agricultural production envisaged at that time.

Balanced and conjunctive use of surface water and ground water is proposed in order to prevent water logging on the one hand and excessive depletion of underground water by over pumpage on the other hand. The State tubewells will also be needed to augment canal

supplies in areas where requirement cannot be met otherwise.

The area under forests is about 16.57 lakh hectares which is about 7 percent of the total reporting area. According to the National Forests Policy the area under forests should be about 20 percent. Considering other demands on the land, increase in forests area to 20 percent does not appear feasible. Forest area is, however proposed to increase to about 36 lakh hectare, i.e. 15 percent of the total area by the year 2020. The additional forest area will be found by reclaiming usar and barren lands.

To ensure the desired level of yield rates, adequate agricultural inputs will have to be provided.

Department of Agriculture, Government of Uttar Pradesh, Lucknow

4. Livestock Statistics and Data Gap

O.P. Misra

Reliable data base of Livestock Statistics plays an important role in formulation of various livestock development programmes in the country. The basic statistics on livestock include the population of livestock in terms of breed, sex, age, composition, distribution of livestock by size of land holdings, output of different livestock products, and by–products, marketing of livestock products, infrastructure facilities in the form of various farms in State, Veterinary hospitals, artificial insemination centres etc., incidence of livestock diseases, feed and fodder statistics, consumption pattern of livestock products, import and export of livestock and related products, etc.

The two main sources of livestock data includes livestock census being conducted on quinquial basis since 1919 and estimation of production of major livestock products through conduct of integrated sample surveys. At present 18th Livestock Census with reference date 15th Oct., 2007 is in progress. Most of the States/U.Ts have completed the field work relating to census. Data entry is in progress. In order to ensure that the data can be collated at all India level, the National Informatic Centres (DADF) have been assigned the task of providing the data entry module for entry of data and related software for generation of various tables as per the tabulation plan from the census data. The 18th Livestock Census results are likely to be available by

March 2009. During the current census, lot of emphasis has been placed on collection of breed wise data. For the first time the country will have its breed wise population of livestock. This would also help in protecting the endangered species of animal i.e. such breeds which are on the verge of extinction.

In order to ensure effective implementation of the Integrated Sample Survey Scheme during the 11th Five Year Plan, following decisions has been taken:

1. Funds to meet 75% expenditure on salary of Officers/Staff would be provided under the scheme to the States by the Govt. of India.

2. An Office of Asstt. Director (Livestock Statistics) would be created for a group of every 4 districts in all States/UTs with two Supervisors-cum-Data Entry Operators and 4 Enumerators.

3. For "Web based Solution" all the Asstt. Director (Livestock Statistics) and Supervisors-cum-Data Entry Operators would be provided with a computer and necessary peripherals.

4. Studies would be conducted to fill up the data gap in livestock sector.

5. The Officers/Staff would be trained about the methodology, selection of sample, data collection, data transfer, etc. at regular intervals.

6. The time lag in finalization of all the estimates should be brought down to 3 months.

7. All States/UTs would be asked to collect, maintain and provide cost of production data on regular basis.

8. A Committee consisting of representatives from DADF, IASRI, Planning Commission and NIC would be constituted to revise the schedule/format for collection of data and methodology for conduct of sample surveys.

Department of Animal Husbandry, Dairying and Fishery, Ministry of Agriculture, New Delhi