accumulation. Among the *Saccharum* sp. *spontaneum* and *robustum* contain more fibre than *Officinarum*. The allied genera *Miscanthus* has the highest fibre of over 51 per cent.

The heterogenous character of bagasse fibre covers three distinct types: (a) rind fibres (45 to 50%), relatively longer, (b) vascular bundles in Cortex (15 to 20%), shorter fibres made of phloem and Xylem, (c) Pith parenchyma cells (30 to 35%), devoid of fibrous structure. Pith has fuel/fertilizer value but needs removal (depithing) to upgrade bagasse for pulping. Fresh bagasse can be directly fed to digesters for pulping, after depithing, but since fresh bagasse availability is limited to the crushing season, must be stored under acidic (pH 4) and anaerobic environment with proliferation of lactobacilli to prevent loss of strength properties.

The fibres in bagasse are short and comparable to hard woods like *Acacia* and *Eucalyptus*. The average fibre length varies from 1.0 to 1.5 mm and width from 0 019 to 0 022 mm with a l/d ratio of 74 to 85. High pentosan and lower lignin confer superior strength properties. All grades of paper can be manufactured from bagasse fibres but bagasse newsprint (BNP) has come of age since the early attempts by Henry Low of Baltimore (USA). Newsprint is a low grade and low priced sheet which can fulfil the requirements of high speed printing presses. There is no rigid definition for BNP, but should contain over 60% bagasse pulp which is technically feasible and economically imperative. Three cardinal points for BNP are: (a) moist and wet depithing to remove maximum pith, (b) proper storage to prevent excessive loss in fibre properties, (c) high proportion of mechanical pulp in the fibrous furnish.

The long and short of it is that though the primary product of sugarcane is sugar it also provides biofuel, fibre and fertilizer and a myriad byproducts besides ensuring ecological sustainability. Truly, it is an eminent source of renewable natural agricultural resource.

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Received 27 September 1993, revised accepted 16 March 1994

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NEWS

Developing a biodiversity information system

India signed the Convention on Biological Diversity at the time of the United Nations Conference on Environment and Development at Rio De Janeiro on 5 June 1992. With the ratification of the convention by thirty countries, it has become an International Convention on 29 December 1993.

The objectives of this convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources to technologies, and by appropriate funding.

For the purposes of the convention 'biological diversity' means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

As per article 7 of the convention each Contracting Party shall, as far as possible and as appropriate, identify components of biological diversity important for its conservation and sustainable use, monitor the components of biological diversity paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use, identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, monitor their effects through sampling and other techniques and maintain and organize data derived from identification and monitoring activities.

Discussion meeting

India is quite rich in the information regarding the taxonomy and distribution of its plants and animals. These information are being collected by different agencies, major among them being Botanical Survey of India and Zoological Survey of India, and it has been accumulated for more than a century. Most of this information is in the form of specimens, field data books and published reports which are stored in different locations. So making all these information accessible to scientists or other users is very difficult. But the revolution in the computer technology, both hardware and software, during the last decade or so has changed the scene completely. Now the computer-based database management systems make it very easy to store enormous amount of textual/graphical data, analyse and retrieve it efficiently.

Also the availability of inexpensive personal computers and computer communication networks makes it possible for scientists and field workers to access the data from remote locations and work collectively for inventorying and monitoring of biodiversity.

Considering the manifold technical expertise available with the Indian Institute of Science (IISc), the Ministry of Environment and Forestry asked IISc to organize a programme of designing appropriate database systems. Consequently, a discussion meeting was arranged at the Jawaharlal Nehru Centre for Advanced Scientific Research, Indian Institute of Science Campus, Bangalore during 10–11 February 1994. People from Botanical Survey of India, Zoological Survey of India, Ministry of Environment and Forest, National Bureau of Plant Genetic Resources, M S. Swaminathan Research Foundation, Foundation for Revitalization of Local Health Tradition and University of Agricultural Sciences, Bangalore participated in the discussion meeting along with the scientists from IISc.

The major thrust of the meeting was to discuss issues such as:

(i) What is the size, type and format of the existing biological data

(ii) Who are the users of the data

(iii) Who collects the data and what is the quantum of data added periodically

(iv) How is the information disseminated now

(v) With the advanced computer technology and information science, how the data storage, retrieval and dissemination could be improved

(vi) What is the present computer technology (hardware & software) for a large information system.

Madhav Gadgil of CES, IISc inaugurated the meeting, briefed the participants the nature and type of databases available and pointed out that the existing databases are inadequate in the context of India having signed the biodiversity convention to:

(i) sustain claims as country of origin of genetic resources

(ii) organize a strategy of indigenous industrial development/export with informed consent

(iii) actually regulate export

(iv) work out co-operative arrangements with neighbouring countries

(v) properly channelise benefits to local communities.

A. K. Ghosh, Director, Zoological Survey of India (ZSI) and Vajravelu of Botanical Survey of India (BSI) elaborated the methodology for data collection, storage, type and quantum of data available with their organizations. Fifty-five teams of ZSI survey different part of the country every year and there are three million specimens in their collection.

Gopinath and Manohar of CSA, IISc, talked about the capabilities of computer-based information system. They pointed out that information about the quantum of data in the form of text, line drawings, photographs, etc. is very critical to the design of a database system. Conversion of all the data in the pictorial form to line drawings would be useful because the size of the line drawings stored in the computer readable format is much less than the size of the pictures stored as such (that is in the bitmap format). Gopinath gave a detailed account of different storage media, its price and price-performance ratio. The commonly used magnetic disk costs one dollar per one MB of data storage whereas at the same cost optical tape can store 200 MB of data and 1/2" Laser Tape can store 1400 MB of data. He also talked about different data compression techniques available which is very useful in saving storage space.

Participants of the meeting felt that the geographical distribution of the biological species is also very important in the information system. This raised the question of linking the computer-based information system with geographical information system (GIS). Gopinath suggested that the information technology industries should also be involved in developing the biodiversity information system as there are industries who have indigenously developed relational database systems and GIS. Another important point discussed regarding the computer-based information system was to choose an appropriate database management system (DBMS). The standard DBMS now available and commonly used one is the relational data-base management system (RDBMS). But the experts from CSA felt that the newly developing Object Oriented Database System (which is not standardized yet) may be more appropriate for the biodiversity information system.

Some of the organizations which are dealing with biological databases were represented in the discussion meeting. R. L. Sapra of National Bureau of Plant Genetic Resources (NBPGR), New Delhi presented the activities of his organization The national gene bank of NBPGR has a germplasm collection of more than 178,000 accessions. Under the Indo-USAID PGR project, NBPGR is developing computer-based crop database, taxonomic database, etc. Ravichander represented the Foundation for Revitalization of Local Health Tradition (FRLHT), Bangalore and he said that his organization is a nodal agency in the network for medicinal plant databases. The responsibilities of FRLHT include

(a) Standardize data architecture which is user-oriented and user-friendly

(b) Computerize data as per these formats

(c) Encourage satellite agency participation to broaden and accelerate database building

(d) Provide data efficiently to end-users.

S. K. Puri, who represented the Indira Gandhi Conservation Monitoring Centre (IGCMC) said that his organization would operate as a national information facility for monitoring environment and conservation efforts in the country. Government of India recognizes that IGCMC would perform a primary role in enhancing the capacity of the country to organize, maintain and disseminate data on biodiversity. Balaji of M S. Swaminathan Research Foundation, Madras explained the Mangrove Information System developed at their organization and it was demonstrated to the participants of the discussion meeting and everybody appreciated the information system. The indigenously developed GIS system, viz. ISROGIS, was demonstrated by M/s Pegasus Software Consultants Pvt. Ltd., Bangalore.

A collective effort will be needed to accomplish the task of developing a biodiversity information system. As a pilot project the Department of Computer Science and Automation, IISc would develop an object-oriented database system.

Janardanan Pillai, Indian Institute of Science, Bangalore.