Research Note :

EXPERT SYSTEM : AN EMERGING INFORMATION TECHNOLOGY IN AGRICULTURE

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Expert systems are an important development in information technology and currently considered the most commercially successful product of a Artificial Intelligence Research. The complexity of problems confronting farmers like yield losses, soil erosion, diminishing market prices from international competition, increasing chemical pasticiale costs and pest resistance and economic barriers hindering adoption of farming strategies necessities that they become expert managers of all aspects of their farming operations on the other hand agricultural researchers need to address problems of farm management and discover new management strategies to probe farm success.

Knowledge based system offer an alternative way to represent knowledge about cropping systems and apply that knowledge to solving problems. Their focus is on reasoning and how numerical tools can provide the information needed to make decision. These are the computer programmes that solve complex problems within some definite domain. The differ from conventional computer programmes because they solve problems by human reasoning processes, relying on logic, belief, rule of thumb, opinion and experience. The most commonly known type of knowledge bused systems is the rules based expert system in which the experience and knowledge of a human expert is captured. The objective is to generate expert advice for use by a decision maker.

Expert systems are used to aid the following way :

(1) Single point (e. g; planning) decision such as :

❖ **Design, e. g; of an irrigation system.**
  ❖ Selection e. g; of the suitable crop variety, market outlet or machinery complement.
  ❖ Diagnosis or Identification, e. g; of a livestock disorder.
❖ **Interpretation, e. g; of a set of financial accounts**
  ❖ Prediction, e. g; of extreme events such as thunderstorms and frost.

(2) A sequence of tactical decisions through a production cycle, plant protection and nutrient decisions, and livestock feeding. Further, an expert system for a particular decision problem can be used.

As a stand-alone advisory system for the specific knowledge domain perhaps with monitoring by a human expert.

To provide decision–support for a high level human expert.

To allow a high level expert to replaced by a subordinate expert aided by the expert system.

As a delivery system for extension information.

To provide management education for decision makers.

For dissemination of up-to-data scientific information in a readily accessible and easily understood form to agricultural researcher and adviser.

An agricultural experts system usually provides decision support either for extension agents who have to decide what advice to offer clients, or for farmer who have to decide what actions to take. It is more of an extension tool then a research tool, being one of the most efficient extension tools to take the technology from the

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scientist it the directly without any dilution of content which normally creeps in because of the number of agencies involved in normal technology transfer system.

As a delivery system for extension advice, it has been observed that an expert system could provide more accurate advice that printed recommendation.

Advantages of Expert System :

The following are the advantages of the export system:

Provide a frame work which to capture and apply non-algorithmic knowledge.

Have the ability to human thought and reasoning.

Make modification of knowledge very convenient.

Ability of interpretation and transparence makes interaction more friendly.

With machine learning technique knowledge can be acquired automatically and directly from experimental data and real examples.

Provide expert level recommendations understandable to uses.

Have the ability to handle uncertain information.

Some Agricultural expert system–A number of research and development projects in progress world wide, are applying Expert System Technology in various areas. An attempt is made here to discuss some models of Expert System in the field of agriculture in India and aboard.

Rice- crop Doctor–National Institute of Agricultural Extension Management has developed an expert system to diagnose pests and diseases of rice crop and suggest preventive and curative measures considering all agro-climatically factors like soil type, rainfall, humidity, temperature etc. The rice crop doctor illustrates the use of expert systems broadly in the area of agriculture and more specifically in more area of rice production through development of a prototype, taking in to consideration of a few major pests and diseases and some deficiency problems limiting rice yields.

The prototypes is a result of joint effort by the experts from NIIT and computer professionals of MANAGE while the subject matter expert knowledge on rice pathology and entomology, has been obtained from Scientists of Andhra Pradesh Agricultural University (APAU), Directorate of Rice Research (ICAR).

The following diseases and pests have been included in the system for identification and suggesting preventive and curative measures. The diseases include are rice blast, brown spots, sheath blight, sheath rot and zink deficiency disease. The pests included are stem borer, rice gall midge, brown leaf hopper, rice leaf folder, green leaf hopper and gundhi bug.

Farm Advisory System :

Some of the states Agricultural Universities in our country have developed the Farm Advisory System to support agricultural business management. This system gives recommendations on various farm operations based on expert knowledge.

Computer assisted Agriculture (CAAG) :

This is a distributed knowledge based expert system developed in Tamil Nadu for three levels of three levels of actors viz farmers, agricultural officers, and researchers with a mechanism for interrelationship among them. A native Tamil speaking farmer can interact with this system in his/ her mother tongue.

Expert Systems for Cotton Crop Management :

This expert system has been developed by the United States, Department of Agriculture to provide appropriate management recommendations to cotton growers.

CALEX

This is a blackboard based integrated expert decision support system for agricultural management, developed at University of California. CLEX can be used by growers, pest control advisors, consultant and other managers.

VARIEX

This expert system developed at Technical University Brno, Czechoslovakia enables selection of the best cultivators for different agricultural situations.

ESFARM

This decision support system of farming

system and agricultural management, designs, analyses, evaluates and forecasts farming systems for farmers.

GOSSYM/COMAX

This knowledge-based system is a decision aid for cotton crop management. It advises cotton farmers on their management practices ranging from water and fertilizer stress, pest control to cost and benefit analysis.

WAQUM

Water Quality Monitoring (WAQUM) is a tool for knowledge based control of drinking water quality in Yugoslavia. This system provides solutions to remove the cause of water quality deviation, toxicity and pollution.

CROPS

This crop rotation planning system (Crops) generates whole farm crop rotation and tillage plans which are environmentally viable. It has been used to generate whole farm plans for two farms in Virginia, U.S.A.

Agricultural Databases: CD- ROM Technology

CD- ROM :

The latest technology available for the wide distribution of databases is the Compact Disk Read only Memory (CD - ROM). CD – ROM based on optical technology, is a new method of data storage and retrieval. Compact Disks (CDs) are plastic disks usually 4.72 inches in diameter with a storage capacity of over 500 megabytes which is roughly equal to 2,50,000 pages of text or 1500 floppy disks.

Devices and Functioning–CDs are read on a "player" or "drive" that can be attached to a personal computer. A laser reads the pits etched on the disks. The information stored on the disks can be accessed randomly. It is estimated that there are about 850 such databases available in the field of science and technology. Most of these CD- Rom databases are available as cataloguing aids, for bibliographic searching, etc.

Advantages–The following are advantages of CD- Rom

Data protection–Data can be erased like in case of a book.

Durability–Since the drive head does not touch the plate when scanned for retrieval, there is no wear or tear. Shelf life is more than 10 years.

High Density Storage–Can record data of more than 1,50,000 pages on a disc

Portability–Physical portability is excellent and can be mailed in a cover.

Data Transfer–Data on the disc can be transferred to any other medium through personal computer.

Agricultural Databases–Some of the databases available in the field of agriculture on CD- ROM are:

AGRIS covers all aspects of agricultural science and technology and is based in the world's most extensive network for the compilation of bibliographic data. The network is coordinated by the food and Agriculture Organization of United Nations with participating countries and 21 regional and international centers. AGRIS covers agricultural on an international level. At present the database has more than 2 million records with approximately 1,30,000 new items added each year. In India, Agricultural RESEARCH Information Center (ARIC) of Indian of Agricultural Research (ICAR) is the input center for AGRIS database.

AGRICOLA

AGRICOLA is the most comprehensive source of US agricultural information. It contains information about agricultural literature collected by the National Agricultural library and other specialized Institutions like food and Nutrition Information Center (FNIC) and American Economic Documentation Center (AEDC). The data base over 3 million records with 1,00,000 added annually.

AGRISEARCH

This is a combination of five important research databases in one compact disc. AGRISEARCH includes CRIS from U.S. Department of Agriculture; ICARE from the Canadian Agricultural Research Council, ARRIP from Australian Standing Committee on Agriculture; SIS from the special programme for African Agricultural RESEARCH and AGREP from the commission of European Communities. The

coverage of AGRISEARCH is Agricultural and its allied aspects have approximately 70,000 records.

CABCD

Complied by CAB INTERNATIONAL CABCD is the equivalent of CAB abstract. The database covers all aspects of agriculture, forestry and allied disciplines and has over 9,30,000 bibliographic records with records with abstracts, with 1,30,000 being added annually. CABCD is the only major agricultural database extensively prepared by and for professional scientists.
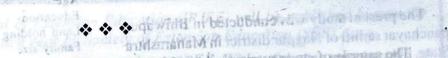
TROPAG & RURAL

TROPAG & RURAL is the most important database in the field of agriculture and rural development in tropical and subtropical regions. This is a combination of major tropical agricultural research databases. They include, Abstract on Tropical Agriculture (TROPAG), Abstract on Rural Development in the Tropics, AGRITOP from CIRAD and UK National Resources Institute's abstract. The TROPAG and rural information comes from royal Tropical Institute, Netherland, and database contains more than 80,000 records.

CONCLUSION

The Users of agricultural information are as diverse as the components Subjects to from agriculture It self. likewise the sources of agricultural information are also pervasive which has lead to an enormous explosion of information in the area of agriculture, making it impossible for users of agricultural information to access all information in their limited valuable time. The rapid progress in the field of electronic data processing with the advent of micro- processors has made storage, processing and retrieval off information very easy leading to the genesis of database–storehouses of knowledge from where it is possible to get required information pin-pointedly, by just pressing a few keys on the keys on the keyboard attached to a personal computer.

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