Yashwantrao Chavan Maharashtra Open University

Agricultural Information Technology

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Yashwantrao Chavan Maharashtra Open University

Vice-Chancellor : Dr. B. P. Sabale **Director :** Dr. Surya Gunjal

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Rahuri

Expert Writer

Prof. G. A. Shaikh
Ex Registrar,
Vasantdada Sugar Institute,
Pune

Dr. S. M. Kareppa
Associate Professor of Statistics,
Mahatma Phule Krishi Vidyapeeth,
Rahuri

Dr. M. J. Wattamwar
Associate Professor of Statistics,
College of Agriculture,
Pune

Editing Team

Dr. Surya Gunjal
Director,
School of Agricultural Sciences
YCMOU, Nashik

Prof. Madhav Palshikar
Senior Lecturer,
School of Computer Sciences
YCMOU, Nashik

Dr. Somnath Suryawanshi
Co-ordinator (PG),
School of Agricultural Sciences
YCMOU, Nashik

Dr. Prakash Atkare
Reader,
School of Agricultural Sciences
YCMOU, Nashik

Production : Shri. Anand Yadav, Production Officer, Print Production Centre, YCMOU, Nashik

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FOREWORD

Dear Students

The School of Agricultural Sciences of our university has always remained at the forefront in planning and implementing need based and innovative programmes in Agricultural Sciences through the distance mode. They have worked out a unique and flexible model of multiple entry and multiple exit that provide for vertical mobility for each and every aspirant in the farming community.

This university has received an International Award of Excellence in Distance Education from the Commonwealth of Learning, Canada, for its innovative approach in operating distance education to suit the common man and woman in every sphere of life. The university has catered to over six hundred thousand learners in Maharashtra including 40000 farmers since its establishment in 1989. The School of Agricultural Sciences has contributed substaintially in this endeavour.

The School of Agricultural Sciences would now like to move further ahead and cater to the educational needs of village leaders, extension specialists and policy makers in the field of Agricultural Education and Development. Taking into account the national perspective, these are the nontraditional areas that need to be addressed with the help of the powerful tools of Information and Communication Technology (ICT) in order to reach the unreached.

The Post-Graduate and Research programmes in Agricultural Communication, Agricultural Extension and Agricultural Development would definitely equip and arm the agricultural experts in using tools of Information and Communication Technology and promote Virtual Education in Agriculture and Rural Development. The virtual education would proceed from Class Education to Mass Education and would cover distance learners from un-reached communities including farmers and farm women.

I am quite confident that the learners striving to complete these innovatively developed educational programmes would soon establish themselves as pillars of the distance education movement in India.

I wish you all a happy and rewarding learning experience in this university.

Professor B. P. Sabale
Vice-Chancellor
Yashwantrao Chavan Maharashtra Open University, Nashik

WEL COME

Dear Friends

On behalf of the School of Agricultural Sciences, I would like to welcome you to our Post Graduate and Research programmes in Agricultural Communication, Agricultural Extension and Agricultural Development. The programmes would meet the long felt need of extension workers and policy makers in the field of Agriculture and Rural Development.

The term distance education refers to Intentional Processes of Teaching and Learning in which physical space separates teachers and learners. Teachers and learners communicate through various media and an educational organization exists to design, facilitate and evaluate the educational process.

The Food and Agriculture Organization (FAO) is an international catalyst involved in promoting distance learning for diverse and globally distributed learners, organizations and communities, whose capacities and actions ensure the achievement of Food Security and Rural Development

The role of FAO in distance education and learning was spelt out in the Rome declaration on World Food Security, in 1996. The international community leaders had made the core commitment thus "We recognize the need to adopt policies conducive to investment in human resource development, research and infrastructure for achieving food security. Our sustainable development policies will promote full participation and empowerment of people, especially women and equitable distribution of income, access to health care and education and opportunities for youth." Consistent with their commitment, FAO has recognised the best practices in pedagogy of distance education and distance learning.

With this commitment from FAO, it may safely be assumed that at flexible mode will soon be capable of reaching every home and will empower each individual to achieve a better standard of living. Since you are the 'early bird' having an access to distance education, your involvement as a student in our post-graduate programme, will certainly go a long way in benefiting the distance learning system in the country.

I wish you all the best in your learning endeavours.

Professor Surya Gunjal
Director
School of Agricultural Sciences
Yashwantrao Chavan Maharashtra Open University, Nashik

Unit 1 : Computer System and Development

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1.1 Introduction

In handling bulk of information and complexity problems human performs very poorly and also in doing repetitive calculations human get bore. To handle such situations man needed some machine. His one of the invention is computer, which made its first appearance in the late 19th Century, but became popular only in the 20th century. Today it has become a part and parcel of almost everybody's life and its reach is expanding day by day. Therefore, it is essential to know the historical development, applications and the basic components of the computer.

After the study of this unit, you will be able to know and understand :

- Important Characteristics and functions of computer
- History and Development of Computer.
- Characteristics of various generations of computer.
- Types of computer and their characteristics
- Block diagram of computer
- Binary System.

1.2 Content

1.2.1 Definition and Applications of Computer

1. What is Computer ?

The term **"Computer"** is derived from the word **"Compute"**. In fact, the original objective behind the invention of the computer was to create a fast calculating machine. But now computer is used for many other purposes than just calculating.

In simple terms, the computer can be defined as an electronic data processing machine that accepts data, process it according to the provided set of instructions and produces the desired output. Computer is a device with certain characteristic like high speed, memory, stored programme, etc.

Basically any computer is supposed to carry out four functions.

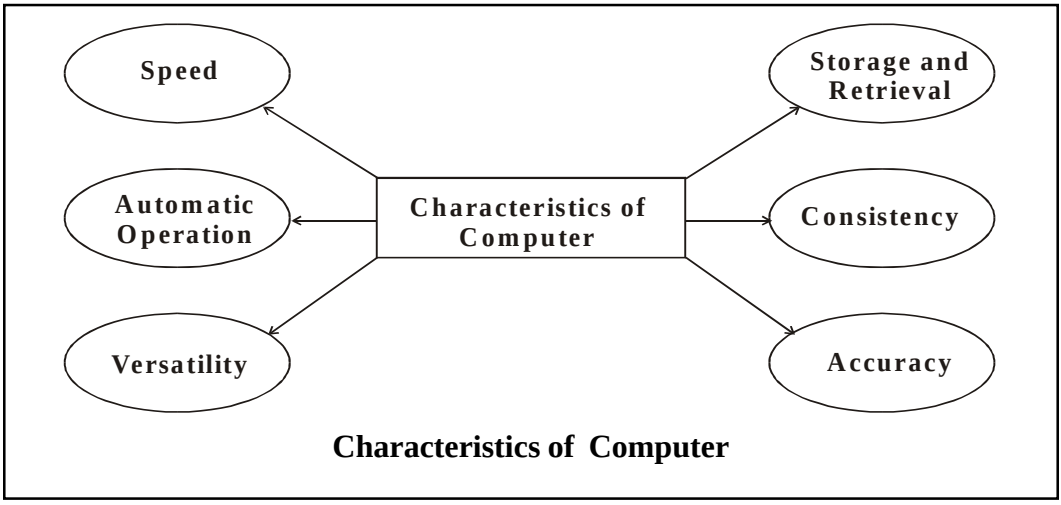
1. Accepting the data and instructions as input.
2. Storing the data and instructions in its memory and retrieving the same as and when required.
3. Processing the data as per instructions to convert it into useful information.
4. Communicating the information as output.

Data and Information : Data is the name given to basic facts. Data can be numbers, alphabets or any other form like pictures, sound, etc. Information is the data which has been converted or organized into a more useful or meaningful form for the people who receive it. For example, the sequence of digits 280658 is meaningless by itself, since it could refer to a date of birth, a part number of automobile, population of town, etc. But once we know what this sequence refers to, then it becomes meaningful information.

Here we should remember that data for one person can be information for someone else. Similarly what one sees as information can be just a data for others.

Process : Processing could be any mathematical (addition, subtraction, multiplication and division) or logical operation done on the data.

2. Characteristics of Computers



Characteristics of Computer

The following characteristics of computer makes it a powerful tool.

1. Speed : The speed of electronic computers is very fast. Today's powerful computers can perform 8 to 12 million simple arithmetic operations per second. The speed of the computers has made possible many things such as weather predictions, missile control and guidance, reservation booking within few seconds. Speed of the computer is measured in MHz.

2. Storage and Retrieval of Information : Computer can store large amount of data, instructions and information on its internal memory or secondary storage device and the same can be accessed and retrieved accurately as and when required. Storage capacity of computer is generally measured in Megabytes (MB) or Gigabytes (GB).

3. Consistency : Unlike human beings computers do not become bored or tired or lose concentration while performing repetitive jobs. Every time same work is done with same speed and accuracy without any halt or delay.

4. Automatic Operation : Once data and program (set of instructions) have been fed into computer memory, it executes these instructions without need of human interventions until it receives the stop instructions.

5. Accuracy : Computer can perform simple, complex or repetitive calculations very accurately and results are always same as per design. This accuracy is useful in

the field of research, engineering, medicine, defense, banking and almost in all the facts of day to day life.

6. Versatility: General purpose computers may be used for variety of purpose, depending upon the programs fed into the computer.

3. Limitations of Computers

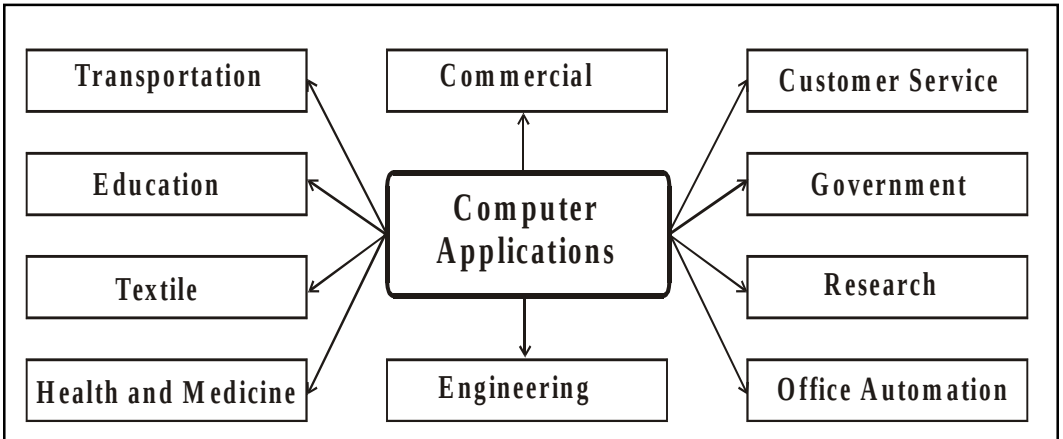
There are certain limitation of computers, we must remember while using them:

1. Lack of Common Sense: Computer acts like human being, but it is only a tool. It can not think itself. It does not have intelligence and it is incapable to take decisions on its own, like human beings. For each and every thing to be done, you have to give instructions to the computer.

2. Inability to Correct : Computers need to be given correct data and instructions to generate desired information. It cannot detect mistakes on its own. If wrong details are given to it, the results generated are also erroneous. This situation is known as **GIGO** (**G**arbage **I**n **G**arbage **O**ut).

4. Applications of Computers

The computers are used in practically all fields of the modern society. Use of computers is so widespread that it is impossible to draw up a complete list of computer applications. A brief list of applications are given below.



Applications of Computer

1. **Commercial Applications** : Pay roll, Accounts, Invoices, Personal records, Market research, etc.
2. **Customer Service** : Electricity bill, Railways and Airlines reservations. Banking sector, Telephone bills, etc.
3. **Education** : Computer aided instructions, Result processing, online examinations like GRE (Graduate Eligibility Test), etc.
4. **Government** : Planning, Budgeting, Intelligence records, Criminal records.
5. **Textile** : Creation of fashion pattern, Colour sheds, etc.
6. **Industry** : Robots, Process control, Production control, Inventory control.
7. **Engineering** : Design and drafting, Simulation, Mathematical modeling, etc.
8. **Research** : Space technology, Medical research, Applied science and technology, Agricultural research, etc.
9. **Office Automation Systems** : Word processing, Record keeping, etc.
10. **Transportation** : Air traffic control, Traffic signal control, etc.

1.2.2 History and Development of Computers

1. History of Computers

The present state of computer development has been reached after a series of failures and successes in the past. In fact, the development of the first calculating machine, called ABACUS, dates back to 500 B.C. Today, we have the so called super computer which is millions times more versatile than the ABACUS. Even today the efforts are still going on to make the computer devices more and more powerful. Let us quickly see the major events in the historical development of computers.

- **Around 500 B.C. :** The Chinese devised the Abacus. It is the world's oldest known computing device. In ABACUS, beads are used to represent numbers. Simple addition and subtraction operations can be carried out quickly and efficiently with it. ABACUS is still used in far east and Japan.

- **1614 :** John Napier, a Scottish mathematician devised a tool called Napier's Bone. Its revised versions were in use even around 1890.
- **1642 :** Blaise Pascal, a French mathematician and philosopher, invented an automatic desk-top machine for additions and subtractions. This mechanical device was called Pascaline. This machine was later modified by a German Philosopher Gottfried Leibniz in 1671. The new device, Stepped Reckoner, was used for doing multiplications and divisions.
- **1801 :** French weaver Joseph Marie Jacquard came up with an idea which automated a weaving loom.
- **1830 :** Charles Babbage, English mathematician, conceived the idea of an automatic digital computer in 1812. In 1822, he developed a small calculator to perform certain mathematical computations to eight decimals. During 1830 he developed plans for a device called Analytical engine. It was a kind of general purpose computer designed to solve any arithmetic problem. In fact it had most of the elements present in today's digital computer system. Babbage worked on his analytical engine until his death in 1871, but technology of that time was not advanced enough and it was never completed. Therefore, Charles Babbage called as father of modern computer.
- **1833 :** English Mathematician Lady Ada Augusta Lovelace became interested in Babbage's Analytical Engine. She created a programme for this machine. Since she discovered some of the key elements of programming and program design, she is called the first computer programmer of the world. Another 19th century mathematician George Bool had introduced a theory of logic (Boolean logic) that was to prove very important to the development of electronic computers.
- **1896 :** Dr Herman Hollerith, mechanical engineer and statistician from United States, used punched cards to record 1890 census statistics and processed these cards by electric machine. He new that he had come up with money-making invention. Dr Hollerith set up Tabulating Machine Company in 1896 which later merged with other firms to form the International Business Machine Corporation (IBM).

- **1937-1944 :** Howard Aiken and his students at Harvard University completed a project with the help of four IBM engineers. The 50 feet long and 8 feet high electro-mechanical machine called Mark-I – the first digital computer was formed.
- **1938-1942 :** Dr. John Atanasoff, a professor of physics and mathematics at Iowa State College, build the first entirely electronic digital computer with the help of his student Clifford Berry. The machine was known as ABC (Atanasoff-Berry Computer).
- **1943-1946 :** The world's first electronic computer named Electronic Numerical Integrated calculator (ENIAC) was built as a war time project at Moore School. About 15 meters long and 2 meters high, with around 30 tons of weight, ENIAC had occupied the entire basement of the Moore School. It used 18000 vacuum tubes, which needed a huge electric power to run. Interestingly this huge computer was capable of storing only 20 numbers of 10 digits each.
- **1946-1952 :** The Moore School Personnel and the ballistic research laboratory of U.S. army built the computer named EDVAC (Electronic Discrete Variable Automatic Computer) which was based on John Neumann's "stored programme" concept. Neumann was the first to introduce the stored program concept in a computer. Almost simultaneously Britishers developed the EDSAC (Electronic Delay Storage Automatic Calculator).

Commercial production of computers began in early of 1950's with UNIVAC (Universal Automatic Computers) built by Remington Rand Corporation and it was built by using vacuum tubes. It was first used by US Bureau of Census.

2. Computer Generations

After the world war II, the growth of computer development was accelerated. The development passed through distinct phases known as computer generations. Computer generations differing from each other in technologies being applied to them.

(i) First Generation Computers (1942-1958) : First generation computers developed during the year 1942 to 1958 were based on vacuum tubes. UNIVAC 1 and IBM 650 are examples of first generation computers. Being comparatively

inexpensive at that time, IBM 650 was widely accepted. It gave IBM the leadership in computer production in 1955.

Characteristics of First Generation Computers

1. Too bulky in size requiring large rooms for installation.
2. Use of vacuum tubes. Large number of vacuum tubes used emitted large amount of heat. Hence proper air-conditioning was required.
3. Very high power consumption.
4. Memory capacity : about 15,000 character
5. Speed : few thousands instructions per second
6. Binary notation was used instead of decimal notation.
7. Computers were entirely electronic .
8. Storage program concept was used.

(ii) Second Generation Computers (1959-1965) : In 1948 the three physicists at the Bell Telephone Laboratories- Bardeen, Brattain and Shockley- invented a tiny, deceptively simple device called a transistor. Second generation computers developed during 1959-1965 were based on transistors. Transistors were less costly to manufacture, more reliable, faster, consume less power and generate less heat than vacuum tubes. Their operation speed is approximately 1 million (10 lakh) operations/ second. IBM 1401, IBM 1620, CDC 1604, RCA 501 are few examples of second generation computers.

High level languages lime COBOL (COmman Business Oriented Language), FORTRAN (FORmula TRANslation), ALGOL(ALGOrithmic Language) were developed during this period.

Characteristics of Second Generation Computers

1. Use of transistor
2. Heat generation was less as compared to first generation. But still proper air-conditioning was required.
3. Memory capacity : 4000 to 6400 character
4. Smaller in size as compared to first generation.

5. More reliable, less heat generator and higher operating speed (Ten times faster than the first generation)
6. Reduced manufacturing cost and reduced running cost because of low power consumption (One tenth of vacuum tubes).
7. The program written on one machine usually required modification before it could be run on different computer.
8. Magnetic core memory for storage. Magnetic tapes were widely used for auxiliary storage.

(iii) Third Generation Computers (1965-1974) : Third generation began with the announcement of System 360 by IBM. Third generation computers employing **I**ntegrated **C**ircuits (**IC**) were introduced between 1965 and 1974. Integrated circuits based on silicon technology are much more smaller in size, more reliable, faster and less expensive. Compatibility problem of second generation was almost eliminated. Multiprogramming became possible due to increase in speed. Use of magnetic disks as auxiliary storage was encouraged. Due to large demand of small computers in business and for scientific applications many companies manufactured only small computers. Digital Equipment Corporation (DEC) and Data General (DG) took an early lead in manufacturing of mini computers.

Standardization in operating systems, programming languages took place. American National Standards Institute (ANSI) standardized COBOL and FORTRAN languages (COBOL 68, FORTRAN IV). It became possible to port programs written for one computer to another. New programming languages like PASCAL, PL/1, BASIC were introduced during third generation.

Characteristics of Third Generation Computers

1. Use of Integrated Circuits (ICs).
2. Memory : 32,000 to 4 million character
3. Smaller in size, more reliable, low heat generator, low power required and faster as compared to previous generation computers.
4. Maintenance cost was low because hardware failures are rare.
5. Easily portable.

6. Unbundling of software from hardware.
7. Extremely powerful **CPU**, main memory increased up to 4 **MB** and time shared operating systems were developed.
8. The concept of upward compatibility allowed the users to easily upgrade their systems without worrying about converting all their existing software.

(iv) Fourth Generation Computers (1975-1989) : Fourth generation computers based on **VLSI** (**V**ery **L**arge **S**cale **I**ntegration) chips and microprocessor chips were introduced. Computers in this generation have become less expensive, faster in operation and more reliable. In the early 1980s a major revolution in the world of computers took place which brought computers closer to the common man. This was the beginning of the age of the PC (Personal Computer). Large number of computers were deployed in office and home. By 1978, Apple II and TRS-80 were the most dominant personal computers. IBM came out with its own PC in 1981, popularly known as IBM PC. The IBM PC and its compatibles became a popular standard for the PC industry during this generation.

Characteristics of Fourth Generation Computers

1. Smallest in size, so easily portable. Entire CPU now a scale chip (Microprocessor).
2. Heat generated is negligible. So no air conditioning required.
3. Very reliable, hardware failure is negligible and hence minimum maintenance is required.
4. Much faster in computation than previous generation computers.
5. Totally general purpose.
6. Cheapest among all generations.

(v) Fifth Generation Computers (1989 onwards) : Massive sums of money are being spent in trying to develop the so called “Fifth Generation” computers. What is being aimed for is a machine can speak to in simple plain language, and which is able to conduct a conversation with human in a human-like manner. Such a machine exhibits what may be called Artificial Intelligence (AI). Other features being aimed at super speed, computer “sight” and “mobility”.

During this period memory became cheaper. Large capacity storage disks came into the market. Main memory also became larger. PCs with 256 MB main memory and 80 GB hard disks are available now.

More powerful supercomputers based on parallel processing technology emerged in this generation. There is tremendous growth of computer networks. Internet and multimedia became popular.

1.2.3 Types of Computers

The computers may be classified in two ways viz., purpose wise and size wise.

(a) Purpose-wise Classification of Computer

(i) Special Purpose Computers : A special purpose computer is one that is designed to perform only one specific task. The program or set of instructions is permanently stored in such a computer. Although it lacks versatility, it dose its single task quickly and efficiently. For instance, process control computer is employed for controlling and monitoring thermal power plants, steel plants, chemical plants, etc.

(ii) General Purpose Computers : General purpose computers which can perform almost unlimited variety of functions with the help of proper software. The versatility of a general purpose computer is limited only by human imagination.

(b) Size-wise Classification of Computer

Computers are classified into following four categories, in ascending order of size.

(i) Laptop or Notebook Computers: These are portable computers which are meant for use by people who need computing power wherever they go. They are small in size (8.5 x 11.0 inch) and lighter in weight (about 2 kg). Foldable flat LCD screen (Liquid Crystal Display) is used. Instead of mouse, track ball is used in these computers. They are mostly used for word processing, spreadsheet computing, data entry and preparing and making presentation materials. These computers are more expensive than Personal Computers (PCs).

(ii) Personal Computers (PCs) : Personal computers are called so because they are designed for personal use or individual small business. They are designed to be used by one person at a time. Desk Top model and Tower model are two most commonly used models of PCs. PC employees several chips on main circuit board called mother board. Personal computers are distinguished by the microprocessor chip used as their CPU. Pentium IV computers with 1GHz and higher speeds are available today.

Personal computers can be used for variety of applications like : Computer literacy, Fun and Games, Professional applications, Electronic spreadsheet, Telecommunications, Database management, Accounting, Word processing, etc.

(iii) Mini Computer : By early 1960, economic and technical factors combined to make small, inexpensive computers attractive for many applications. This led to advent of minicomputers. These mini computers become a multi-user, or shared system. Speed of execution, memory and other characteristics of mini computer increased with advances in technology.

Introduction of 32 bit mini-computers led to support of more simultaneous users and handling more peripheral devices and larger memories than previous mini-computers. Horizon, PDI 11/70 are the examples of mini computers.

(iv) Main Frame Computers : The main frame computer is faster and costly. It has a very high speed CPU, large memory size. Fast line printers are used as an output devices. The terminals are connected at several places for interaction with computer by several users. The primary function of main frames today is to support large data bases. Large business and government organizations need a central depository of data that can be managed and controlled centrally. Only the main frame computers has the processing power to handle large data base systems.

VAX 8000 series, CDC-CYBER 180 series, IBM 4300 series are the examples of main frame computers.

(v) Super Computers : These are the fastest computers ever made and solve a range of large scale problems, which require extensive numerical calculations. A super computer consists of very high speed disks, high speed magnetic tapes and main frame computer as a front end processor terminal. These machines are typically

capable of handling Hundreds of Millions of Floating Point Operations Per Second.

The super computers has limited use and because of its price tag, a limited market. Only a few dozen of these machines are operational in India. Super computers are mostly used for weather prediction, structural calculations, complex modular and military purposes.

CRAYXMP 416, CRAJ2, ETA by CDC, SX2 by Nippon and PARAM by C-DAC Pune are the examples of super computer.

1.2.4 Bits and Bytes

Every computer stores numbers, alphabet and other special characters in a coded form. The digital computer operates on binary system, because the electronic circuitry used in digital computers have two stable states. Either they are passing current (**ON**) or not passing current (**OFF**). The same thing can be symbolically represented as '**0**' and '**1**'. Therefore, all data are represented only in form of '**0**' and '**1**'. This form of representation is known as the binary representation of data. All numbers, alphabets and special characters are also converted into binary representation. "Binary digit" is often referred as bit. A "**bit**" in computer technology means either a **0** or a **1**. Thus all the data pieces are group of bits. A group of 4 bits is popularly known as a nibble and 8 bits is a Byte. One byte is equal to one character. This is the smallest unit of memory.

Memory is measured on the scale of bytes. The modern computer have a large memory. Using bytes to measure this huge memory would require a very long number. So the concept of counting bytes in thousands and its multiples have been applied.

The standard of this is :

0 or 1	=	Bit
4 Bits	=	Nibble
8 Bits	=	1 Byte (1 character)
1024 Bytes	=	1 Kilobyte (Kb or KB)
1024 Kilobytes	=	1 Megabyte (1 Mb or MB)
1024 Megabytes	=	1 Gigabyte (1 Gb or GB)
1024 Gigabytes	=	1 Tetra byte

ASCII Code

Computer understands the language of zeros and ones. Thus, all the numerals, characters, alphabets, punctuation, etc. have to be codified in the computer compatible language. Most of the computer systems use **ASCII** (**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange) Code.

1.3 Glossary

Computer : Computer is an electronic device which accepts data, process information in a pre-designed fashion and produces the desired output.

Data : Data is the name given to basic facts, comprises of number, alphabets or any other form.

Information : Information is a data which has been converted into meaningful results.

Processing : Processing could be any mathematical or logical operation done on data.

PC (Personal Computer) : PC is a computer with its own CPU, used by one person at a time, as opposed to a terminal linked to a main frame.

Microprocessor: Microprocessor is a miniature electronic device consisting of thousands of transistors and related circuitry on a silicon chip. It is brain of the computer (**PC**).

ASCII : Symbolic representation of American Standard Code for Information Interchange. ASCII use code **0** and **1** to represent letter, numbers and symbols.

Bit : Bit comes from the term **B**inary dig**IT** which is the basic unit of information in a digital computer. It may be either the digit **0** or **1**.

Byte : Byte is a unit of eight bits in a computer.

Megahertz (MHz) : It refers to speed of the computer.

1.4 Summary

The computer performs three basic functions: arithmetic operations, logic comparison and storage and retrieval operations. There is very fast advancement in

the technology of computer particularly after invention of microprocessor in 1970. Day by day the size, price and maintenance cost of the computer are decreasing, whereas speed and storage capacity is increasing. Computers are classified as supercomputer, main-frame computers, mini-computer, personal computer and lap-top or notebook computers, personal computers (PCs) are today most widely used because they provide high performance at a low cost.

1.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Define the computer with its important characteristics and limitations.
2. Explain history and development of computers.
3. Explain the functions of computer in detail.
4. Define the computers and classify the digital computers.

Unit 2 : Computer Hardware

Index

2.1 Introduction

Computer is a group of integrated parts that have the common purpose of performing the given operations. We have seen four categories of the computer in the last unit. Microcomputers are relatively cheap and are capable of performing almost all types of business and scientific applications. Like other type of computers they do not need specially controlled environment conditions regarding temperature, humidity and dust. Because of these characteristics, number of microcomputers in India is very large as compared to other types. For this reasons, we are going to concentrate more on microcomputers. Hence where there is mention of computer it should be understood as microcomputer.

After the study of this unit, you will be able to know and understand :

- Parts of computer hardware
- Functioning of computer.
- Functioning of Central Processing Unit
- Different Input, Output and Storage Devices and their uses.

2.2 Content

2.2.1 Anatomy of Computer

1. Block Diagram

The computer is divided into four basic components:

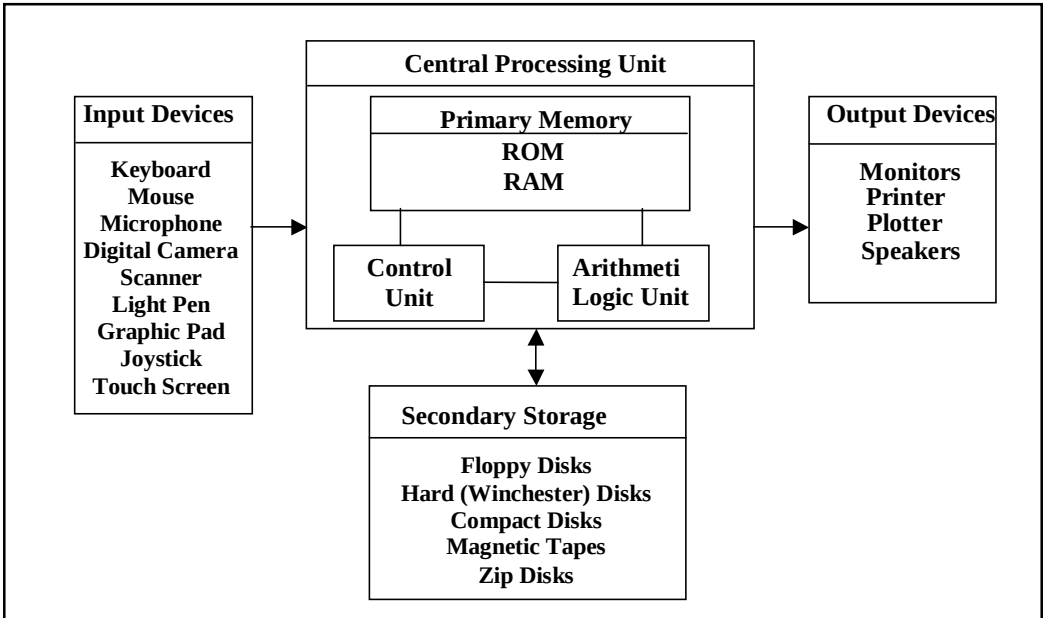
a. Input Devices to enter data, information and instructions into the computers.

b. Central Processing Unit to process data or information according to programmed instructions.

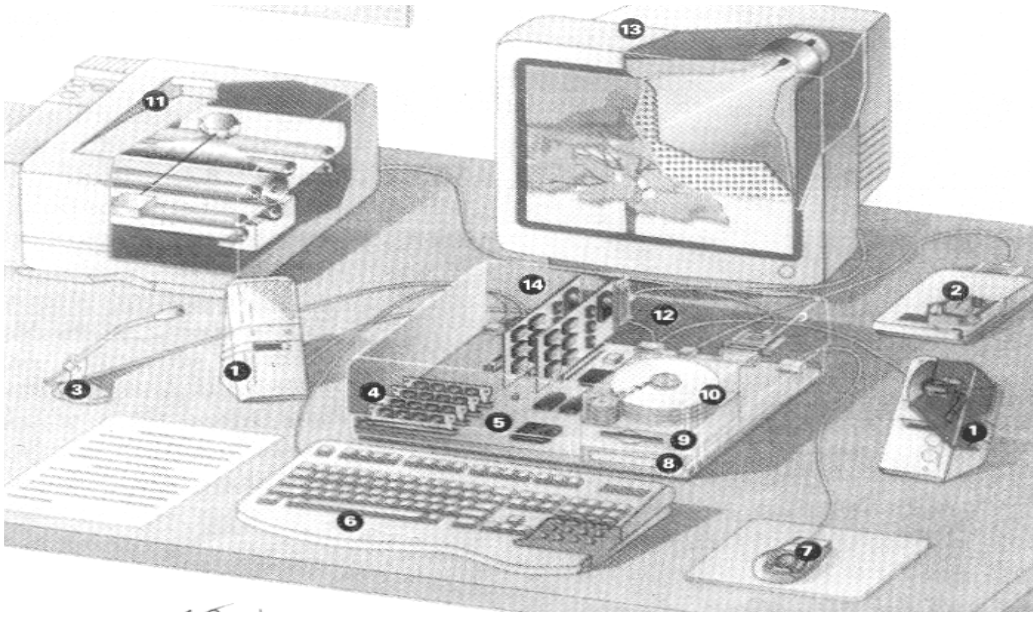
c. Output Devices to communicate information to the outside world.

d. Storage Devices to store and retrieve information.

All these components are part of the computer hardware. The hardware is defined as a set device which can be seen and touched and have colour, size and shape. Input, output and secondary storage devices are also called as peripherals. Block diagram of computer is shown in following figure.



Block Diagram of Computer System

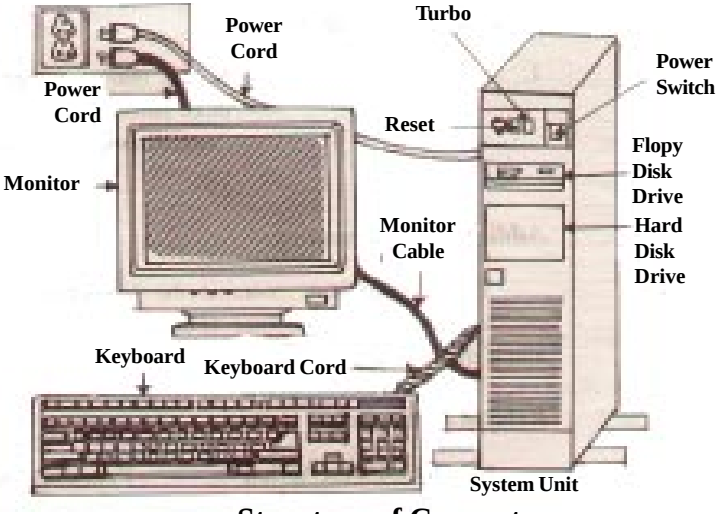


Computer hardware at a glance

(1) Speaker (2) Modem (3) Microphone (4) RAM (5) CPU (6) Keyboard (7) Mouse (8) CD Drive (9) Floppy Drive (10) Hard Disk (11) Printer (12) Ports (13) Monitor (14) Expansion Board

2. Structure of a Computer

Computer is really a collection of separate items working together as a team. Some of the components are essential, other simply make working more pleasant and efficient. Computer system is made up of following parts.



Structure of Computer

(**i) The System Unit :** The system units controls and executes all your computer operations. The system unit, links your keyboard, monitor, mouse, printer, etc. Moreover, the hard disk, floppy disk drive and CD drive are also inside this unit. System units are of different shapes (Desktop and Tower type).

(ii) Front of System Unit

a. Power Switch (on/off) : Generally computer have a main power switch on the front of the system unit which is used to switch on/off the computer.

b. Reset Button : This button is used to re-start the computer, without switching off the power. If your computer "hangs", i.e. if it doesn't respond to any commands, you may start it again using the reset button. Pressing the reset button loses all the work you haven't saved in that session. So use it only as the last option.

c. Floppy Disk or CD Drive : With 3½" floppy and CD drive, It is possible to store and retrieve data on CDs and floppies. Floppies & CDs are useful for moving data from one machine to another.

(iii) Back of the System Unit

a. Power IN and OUT Sockets : Cables plugged into these sockets carry power from the electrical outlet to system unit and from system unit to the monitor. Generally 230 V AC single phase is essential. Do not run other AC and heavy power consuming equipment on same phase where from you are giving supply to the computer.

b. Serial Port : Serial ports are used to connect to mouse or modem to your system.

c. Video or Monitor Port : A cable from the monitor plugs into this port and carries the information to be displayed on the monitor.

d. Parallel Port : This port is usually used for connecting a printer to the computer.

e. Keyboard Port : The cable from your keyboard plugs into the keyboard port.

f. Fan Housing : The electronic components in computer generate a lot of heat. To prevent overheating a fan is placed at the back of unit helps in removing hot air from the system.

g. Expasion slots on Matherboard : Computers are easily expandable to provide a modem, sound or faster graphics. You can plug cards into expansion slot inside the computer.

2.2.2 Central Processing Unit (CPU)

The Central Processing Unit (CPU) is the nerve center (Brain) of the computer system. It is also called as microprocessor. The CPU performs actual calculations, makes decisions and co-ordinates all parts of the computer system.

The speed of the computer depends on the computing speed of the CPU. Today's CPU executes 100 million instructions per second. Computer execution speed is measured in MHz (Mega Hertz). 1 million (10 lakh) hertz means one mega hertz. Today's computer works with the speed of 1.2 to 2.8 GHz.

The CPU has three components : (1) Control Unit, (2) Arithmetic and Logic Unit (ALU), (3) Primary Memory.

1. Control Unit : As the name indicates this part of the CPU controls, manages and co-ordinates the entire activities of the computer system. It works as supervisor of the computer.

The control unit performs following functions:

i. Controlling the peripheral devices.
ii. Supervising the flow of data from input to main memory.
iii. Directing flow of data within the CPU.
iv. Transferring data to ALU for arithmetic and logical operations.
v. Transferring the result to the memory.
vi. Transferring the result from memory to output devices or storage devices.

2. Arithmetic and Logic Unit (ALU) : All arithmetic calculations (addition, subtraction, multiplication, division) and data manipulation by logical actions are done here. Intermediate results of the operations are stored in main memory.

3. Primary Memory : Main (Primary) Memory is of two types : (1) Read Only Memory (ROM) (2) Random Access Memory (RAM)

(i) Read Only Memory (ROM) : Information in this memory is written at the time of manufacturing. User can not modify this information. The instructions stored in ROM can only be read and are permanent i.e. they do not get erased even when the electricity is switched off. Hence it is also known as non-volatile memory. ROM is used to store permanently required programs called as Firmware. When you start computer this program checks all parts and peripheral devices connected to it.

(ii) Random Access Memory (RAM) : RAM is a read or write memory. Information or data can be read from it and can be written to it. It is a temporary memory used to store data, instructions and intermediate results during processing. The term Random Access means any storage location can be directly accessed using its address. RAM is volatile memory means the data stored in RAM is lost when you switch off the computer or power fails.

2.2.3 Peripheral Devices

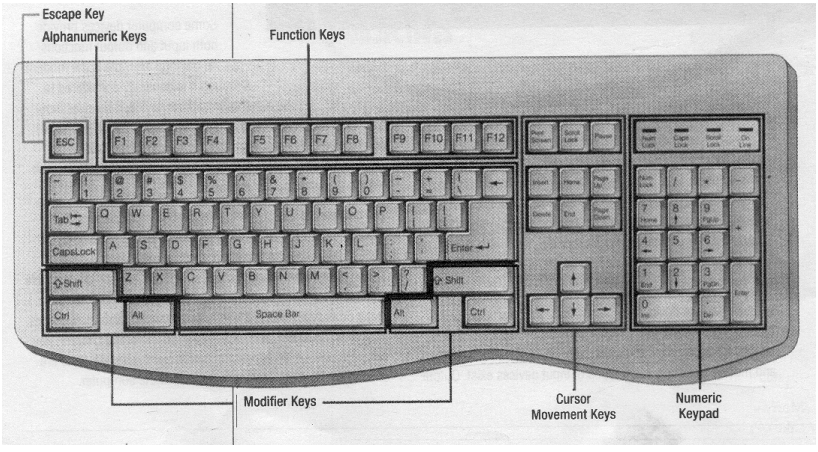
Peripherals are the devices attached to a computer in order to get useful information into and out of the computers. Input, output and storage devices together are called as peripherals of computer.

1. Input Device

The devices through which the data and instructions are entered into the computer are called input devices. Input devices are major link between the user and the computers. Radical changes have occurred over the years in the methods, media and devices used for data entry. Therefore the trend is to design the input devices that are easy to operate, allow the maximum freedom of expression and are as convenient as possible. As the data vary in their types and format, numerous kinds of input devices have been developed. Some are ideal for entering letters and documents, others provide a format for drawings and maps; still others allow easy and accurate input of numbers and figures. Keyboard and Mouse are the most frequently used input devices today. input device is used to enter data and instructions into the computer system. Keyboard,

Mouse, Microphone, Digital Camera, Scanner, Magnetic Ink Character Recognition (MICR) reader, Optical Character Recognition (OCR) device, Optical Mark Reader (OMR), Joystick, Light Pen. Graphic Pad, Touch Screen are the examples of input devices. Most commonly used input devices are keyboard and mouse.

(i) Keyboard : At present the keyboard is used as a primary device for interaction for the user with the computer. In fact every computer is sold with a keyboard as an integral part of the system. Keyboard enables you to input instructions and data to the computer. Initially the layout of the computer keyboard was made similar to that of typewriter keyboard. Over a period of time extra keys are added to this keyboard to increase the efficiency of keyboard operation. Function keys, Numeric keypad, Cursor movement keys and other special keys make the keyboard use easier and comfortable.



Computer Keyboard

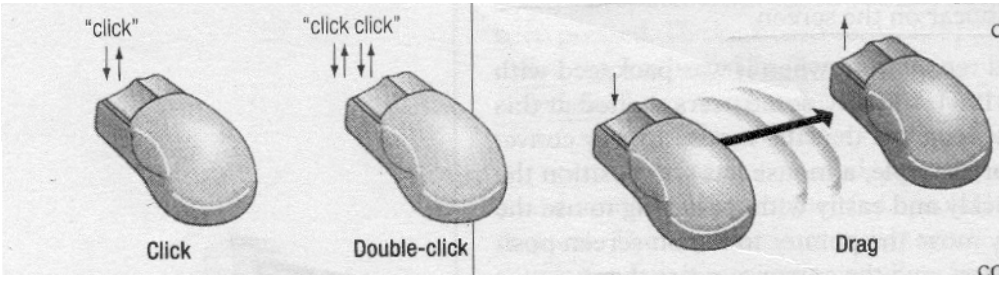
The computer keyboard consists of :

1. Typewriter keys with letters, numbers and punctuation symbols and Space bar.
2. Numeric keypad
3. Cursor movement keys
4. Function keys (F1 – F12)
5. Movement keys (Home, End, PgUp, PgDn)

6. Text editing keys (Back space, Del, Ins.)
7. Modifier keys (Shift, Ctrl, Alt)
8. Special keys (Enter/Return key, Print Screen, Scroll lock, etc.)

(ii) Mouse : Mouse is another most commonly used input device. It is useful for point and click operations. In such operations a menu consisting of various options appears on the screen. As the mouse is moved across the mouse pad, arrow (ë) on the screen also moves. Cursor is moved to the option that a user wants to select. He clicks the mouse (presses one of the buttons of the mouse) to select the option. These operations can also be performed with the keyboard but the mouse is more efficient for such operations.

A mouse is a hand-held pointing and drawing device. A standard mouse has two buttons. It is possible to configure these buttons.



Computer Mouse

Generally, the Computer Mouse Functions as follows :

1. Moving the mouse moves the arrow on your screen
2. Single click and double click options are used for performing different actions by different packages. (e.g. Single click of the button places your cursor on the screen, activates certain functions on the screen, etc)
3. Drag and Drop: While keeping the mouse button pressed it is moved to move the pointer to desired position and then the button is released.

Scanners : Another input device which is widely being used is a scanner. Whenever any readymade material like pictures, photographs or text that is available

on paper and is needed on the computer disk for further manipulation, a scanner can be used. A scanner can scan an image and transform it into ASCII codes and graphics, which are stored on the disk, can be edited, manipulated, combined and printed.

Magnetic Ink Character Recognition (MICR) Readers : In this method human readable characters are printed on the documents using a special magnetic ink. A magnetic ink character reader can recognize such characters. MICR is widely used by banks to process the tremendous volume of cheques being written each day. The bank identification number, depositor's account number and other special symbols are printed with a special ink that content magnetizable particles of iron oxide. The speed of reading MICR is around 1200 documents a minute.

Optical Character Recognition (OCR) Devices : Optical Character Recognition (OCR) can read printed characters directly and convert them into appropriate codes and store them in the computer. Hand made marks are also be interpreted by OCR. OCR reading examine each character, once the whole character has been scanned, the pattern detected is matched against a set of pattern stored in the computer. Whichever, pattern it matches is considered to be the character read. Patterns, which cannot be identified, are rejected.

Optical Mark Reader (OMR) : In this method special preprinted forms are designated with boxes, which can be marked with dark pencil or ink. Each box described distinctly so that the user clearly understands what response he has given. This technology is used in :

i. Objective type answer papers in examination.
ii. Market surveys, population surveys, etc.
iii. Order forms containing a small choice of items.

Joystick : Children can play with computers easily by using joystick. It allow you to move the objects around the screen easily. It is designated in the shape of handle that moves in 360 degrees, enabling their users to control screen figures.

Light Pen : It is a pointing device which can be used to select a displayed menu option on special screen for a particular program by just pointing to it. The pen consists of a photocell placed in small tube. It has a photo-detector at its tip which

helps it perform its task as per the screen brightness to identify, where the user is pointing. The light pen is also useful for graphics work and the user can select different colours and line thickness.

2. Output Devices

We are interested in the result produced by the computer. Output from the computer is also essential for proper man-machine interaction. Monitor and printers are commonly used output devices. There are other types of output devices such as plotters, speakers, etc.

(i) Monitor : Monitor looks like a television set. In fact it is based on the same technology as employed in television. It uses a Cathode Ray Tube (CRT) to display the output generated by the computer. Monitor is also known as screen or VDU (Visual Display Unit) or CRT (Cathode Ray Tube). A monitor is connected to a computer through an interface circuit called video adapter.

Like TV sets, computers can have black and white(monochrome) or colour monitors. Monitors are available with various resolutions. Resolution of the monitor is the total number of pixels it can display along horizontal and vertical directions. Higher the resolution better is the quality of the picture.

Whatever is typed with the keyboard gets displayed on the monitor screen. Also whenever a program is executed the information is displayed on the monitor. The flashing underline symbol on the screen is called a cursor. This position indicates where the next inputted character will be displayed.

According to the controlling circuit of monitor there are four types of monitors.

a. Monochrome Monitor (MONO)
b. Colour Graphic Monitor (adapter) (CGA)
c. Video Graphic (adapter) (VGA & SVGA)
d. Enhanced Graphics Monitor (EGA)

(ii) Printers : Printers are used to get output on a paper. Output or information on paper is also known as hard copy. The quality of the printout depends on the type of the printer used to print it. Printers come with different speeds, quality and other

facilities. The printers are broadly divided into two categories: Impact and Non-Impact Printers.

(a) Impact Printers : If there is mechanical contact between the printer head and paper such printers are called Impact printers. Images are placed on paper by striking (impacting) a pattern against an inked ribbon, which in turns strikes the paper and thus the image is printed.

The most common impact printer is Dot Matrix Printer.(DMP). DMP prints the character as a combination of dots in a matrix or square form. Selected print needles on the print head strike the inked ribbon against paper to produce an image. Dot Matrix Printers can be used for printing graphics output also. The speed of a DMP ranges between 180 to 800 characters per second (CPS).

High speed line printer also uses impact method to print line at a time. There are two types of line printers: Drum printer and Chain printer. The line printers can print 600 to 3600 lines per minute.

Daisy wheel printers are also impact printers. High quality output is obtained from daisy wheel printers. In daisy wheel printer each spoke of the plastic wheel has a character embossed on it. Daisy wheel printers are slow and they can not be used for printing graphic images.

(b) Non-Impact Printers : This category printers are developed in such a way that they do not strike ribbon against paper to produce the image. These printers use different technologies under the control of computer to produce the images. The non-impact printers are very powerful in printing sharp graphic images. All impact printers can produce multiple copies by using carbon paper but non-impact printer can produce only one copy at a time. There are three types of non-impact printers. Each one uses different technology.

1. Laser Printer : Light beam is used to produce the image on paper. Laser printers are used to produce high-quality output. Laser printers are capable of printing about 15-20 pages per minute.

2. Inkjet Printers : An ink-jet printer system produces characters by spraying small ink droplets onto paper. The printer head is a specially designed nozzle in

which ink is stored. It is also called cartridge. Cartridge is easily removable. Colour inkjet printers are also available. These printers operate at high speed. Moreover these printers are cheaper than laser printers. The cost of printing is also low as compared to laser printer.

3. Electrostatic Printers : A printer of the electrostatic type forms characters by impressing static charges of electricity on special paper. The charges attract a toner to the charged spots. These printers are capable of very fast speed, up to 20,000 lines per minute. Electrostatic printers can also be used for graphic works.

(iii) Plotters : They are expensive output devices. They are mainly useful for printing engineering drawings, maps, charts, pictures in single and multi colours. It is used by engineering companies, architecture and design firms. There are two types of plotters: (1) Pen plotter, (2) Dot matrix plotter.

3. Secondary Storage Device

Sometimes when the data to be processed is large then it cannot fit in the primary memory as primary memory is limited and volatile. The data in it get lost when computer is switched off. To avoid these problems secondary storage is used. Secondary memory is also known as auxiliary memory. The most commonly used secondary storage devices are floppy disk, hard disk and Compact Disks. Magnetic tapes, Zip disks are also used as secondary storage devices.

(a) Hard Disk : Hard disks can store large amount of data. Operating System and application software are stored in it. It is also used to store raw and processed data.. The hard disk is also known as Winchester disk. Hard disk is located in the system unit cabinet and hence is protected from dust. The capacity of the hard disk is from 20 MB to 80 GB.

(b) Floppy Disk : Floppy disk is used to move the data from one machine to another. It is also used to take backup. Most commonly used floppy disk today is 3.5 inch floppy. The diskette is encased in a hard plastic shell with a sliding metal cover. It can not bend easily. Its read or write window is closed with sliding metal door. When the disk is inserted into the drive, the cover slides back to expose the diskette to the read or write head. So it is dust proof and very low chances of data loss or

damage of floppy disk. The storing capacity of floppy depends upon its density and recording sides. The 3.5 inch floppy can store either 1.44 MB data or 720 KB data.

(iii) Compact Disks : Today Read and Write (R/W) CDs and CD writers are becoming cheap. So many are preferring to use CDs for taking backups or for transferring data from one machine to another. CD is more reliable than the floppy and its storage capacity is huge. It uses optical storage technique instead of magnetic storage. Single CD can store 700 MB data. Compact Disks on with read only memory (CD ROM) are also available. On such CDs we can write only once.

2.3 Glossary

CPU : Central Processing Unit.

CD-ROM : Compact Disk Read Only Memory is a special optical storage device.

Cursor : The blinking underline on the screen.

Disk : A storage device. Disk are of three types: hard, floppy and compact disks.

Dot Matrix Printer : Uses a series of pins to create an image on paper.

Floppy Disk : A removable disk.

Hard Disk : A high-speed long term storage device for a computer.

Micro Processor : The computer's brain, where all the calculations take place and control center for the entire computer.

Monitor : The monitor is a display unit like a television screen.

RAM (Random Access Memory) : Refers to the memory chips in which newly input data or data during operations are stored. It is volatile memory.

ROM (Read Only Memory) : Refers to the memory chips in a computer which contain information about the operation of the machine, that cannot be changed by the user.

BIOS : Basic Input output system. The BIOS is actually some low level instructions for the computer, providing basic control over the keyboard, monitor, disk drives and other parts of computer.

2.4 Summary

Computer is a electronic device, which performs operations with some physical devices. Computer system consists of Central Processing Unit and peripheral devices. Central Processing Unit is a brain of computer. It consists of Arithmetic Logic Unit, Control Unit and Primary Memory. Primary memory is of two types. Read only memory and Random access memory. Random Access memory is volatile memory. Peripheral devices consist of input devices, output devices and storage devices. Keyboard and Mouse are the most commonly used input devices while monitor and printer are most commonly used output devices. Compact Disks are replacing floppies.

2.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Draw the block diagram of computer and explain its various parts.
2. Write note on computer peripheral devices.
3. Explain various types of printers and their functions.
4. Explain various secondary storage devices and their characteristics.

Unit 3 : Computer Software

Index

3.1 Introduction

Hardware and software are the two important parts of the computer. Computer can not work without software. In order to get work done from the computer, a user has to issue appropriate and precise instructions. This set of instructions is called as software. Without software, computer is as good as dead. The software required to carry out a task will vary according to areas of applications. Broadly software is classified into three categories : Programming languages, Application packages and System software.

After the study of this unit, you will be able to know and understand :

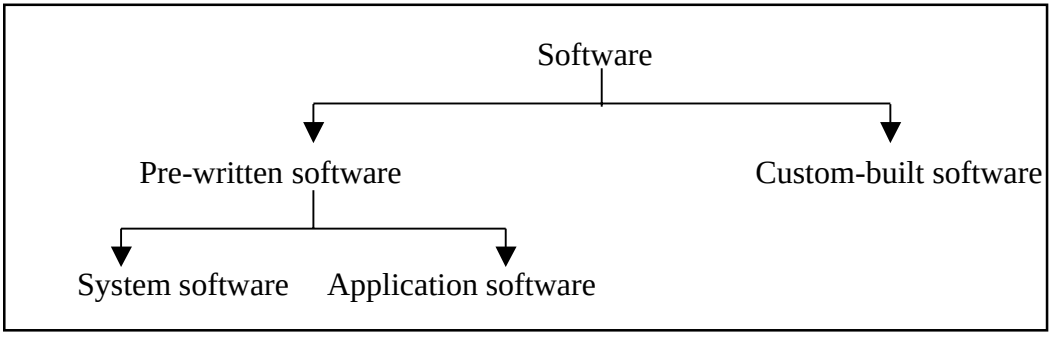
- Software terms and their types.
- Functions of operating system.
- Various programming languages.
- Difference between high level, low level languages, complier and interpreter.
- Different of computer virus.

3.2 Content

3.2.1 What is Software ?

Software governs the operations of computer system and makes the hardware to run. The term "**Software**" refers to computer programs. Software is a set of programs and program is a set of instructions, which enables the computer to solve the problem. Software includes program prepared by the user for their own applications as well as supplied by the computer manufacturers and software houses. The software is the soul of the computer.

Software are of the following types :



1. System Software

These programs are essential for computer to function. Without these programs, no interaction is possible with computers. These programs facilitate in accepting instructions and executing them. The system software makes the CPU to co-ordinate with the other parts of the computer. The operating system like Disc Operating system (DOS), Windows, Unix, etc. are system software.

2. Application Software

Application software are used to execute a special task. For each type of application, different application software is required. Some application software categories are : word processors, Spreadsheets, data base management, drafting, etc. Microsoft Office, FoxPro, AutoCAD, Oracle are some of the examples of application software.

3. Custom-Built Software

The application software available commercially are ideally suited because they are tested and less costly. But for some applications, exact ready made package may not be available. For such situation customized application software has to be developed. These software are developed for a particular individual or organization as per their requirement. It is very expensive as compared to application software.

3.2.2 Operating Systems (OS)

Operating system is a collection of programmes which acts as an interface between a user and the computer hardware. It provides the environment in which the user can easily use the computer. Second goal of operating system is to use all hardware facilities in an efficient way. The main advantage of operating system is that people can use computer without detailed technical knowledge about the machine.

Operating system can be defined as a collection of programmes that monitor, control and manage the activities and resources of a computer system and provide an environment in which the user can work with ease. There are four major functions of an operating system.

1. File and software management
2. Input/Output and peripherals management
3. Memory management
4. CPU time management

Graphical User Interface (GUI) : Software developers borrowed the idea of graphical sign and decided to use it to make the Operating System (OS) flexible, fast and user friendly. The software using the picture images (icons) of various components have been appreciated by all classes of users of the computer. The users can interact with the computer with the help of icons rather than writing long character-based commands. Some GUI operating systems are windows95, windows98, windows2000, OS2. Two types of operating systems are available in the market.

1. Single-User Operating System : With this operating system, only one person can use the computer at a time. Such a system has a single CPU and just a set of Input

and Output devices. Microsoft Disk Operating System (MS-DOS) is the example of single user operating system.

2. Multi-User Operating System : With this operating system, more than one person can work at a time. In this number of terminals are attached to the main (server) computer.. Xenix, Unix, VMS, Windows, are examples of multi-user operating systems.

3.2.3 Programming Languages

Computer languages are used for communication between computer and user or programmer. There are various computer languages used for different type of application.

1. Low Level Language (LLL)

In early days programmers communicated with computers directly in terms of binary numbers. Low level languages are machine oriented languages in which instructions correspond to a machine instruction. The (symbolic) low level language must be translated into machine language before use.

(a) Machine Language : Machine language is the only language that computer can execute directly. Instructions in machine language are in the form of binary code, also called machine code and are known as machine instructions. Programmer using this language should have good knowledge of computer's internal structure. This language is machine dependent. Program written in machine language for one machine can't be used on other machine. Also to write machine code program is a tedious, cumbersome and time consuming job. The program in this language is called object program.

(b) Assembly Language : The assembly language is merely a humanized form of machine language which permits to use mnemonic operation codes. These codes are easier to remember. The programmer need not keep the track of memory locations. The memory addresses are replaced by the variable names. The insertions and deletions are quite easy and revision of complete programs is quite easy. **Assembler** is used to translate assembly language program into machine language.

The assembly languages suffer from the defect of non-standardization. Different manufacturers use different mnemonics for the same operation. So program in assembly language becomes machine dependent.

The limitations of Low Level Language(LLL) are as follows :

(i) Programming is a relatively time-consuming job for the programmer

(ii) Low level languages are machine oriented, each conforming to the instructions set of the machine on which they are to be used.

2. High Level Languages

The development of high level language(HLL) was intended to overcome the limitation of low level languages. High level languages are machine independent. The use of HLL allowed programmers to write programmes without knowing the internal working (i.e. low level details) of the computer on which they were programming. The high level languages have an extensive vocabulary of words, symbols and sentences. Examples of higher level languages are: COBOL, FORTRAN, BASIC, PASCAL, C, etc. Visual Progrmming Languages like Visual C++, Visual Basics are more user friendly. These languages allow programmers to develop programmes with a minimum amount of coding.

Advantages of High Level Languages

1. The high level languages being similar to commonly used languages in our day to day work, are quite easy to learn and use.
2. The writing of programs in these languages does not require the knowledge of the internal structure of computer.
3. Allocation of memory location for instructions and data is done by machine itself.
4. Modifications, if required, in programs written in these languages are quite easy and straight forward.

Programs written in high level language is known as **Source Program**. To execute this program, it is required to convert into machine language. For this purpose translators are used called as compiler or interpreters.

3. Compiler and Interpreters

1. **Compiler** : Compiler is a system program which translate high level language program into machine language program. Firstly, it scans the high level language program for errors and then translates it into equivalent machine language program. Compiler translates an entire program into object program at one time.

2. **Interpreter** : It is translator, which translates high level language program into machine language line by line. It translates first line, executes it and then moves to second line and so on till the end of the program instructions.

Low Level Language (LLL)	High Level Language (HLL)
1. It uses binary codes	1. It uses English words and mathematical notations
2. It depends on the internal structure of the computer (machine dependent)	2. It does not depend on internal structure of computer (machine independent)
3. It is difficult to learn and understand	3. It is easier to learn and understand.
4. Programs are big in size	4. Programs are small and compact.
5. Programmer must know all about the internal structure of computer	5. Programmer need not know internal structure of computer.
6. Programs can be directly loaded and executed	6. These programs must be compiled and then it becomes object programs. Object programs must be linked to make executable programs. Executable program will be executed.

3.2.4 Computer Programming

The development of the programs (group of instructions that cause a computer to execute a task) for various requirements is called programming. A suitable language depending upon the application area can be selected from various available languages. One must know the language to write a computer programme with it. But writing algorithm or drawing flow chart for any task is easy. This helps a lot while developing the computer programme. We will study these techniques.

1. Algorithm and Flow Charts

Algorithm : Any complicated task or problem can be broken into simple subtasks if we understood the logic of tackling it. Once divided into simple subtasks we can solve the problem by performing these simple tasks in order. While writing algorithm we break the problem into simple, easy to solve parts. Algorithm is a sequence of instructions designed in such a way that if the instructions are executed in the specified sequence, the desired results will be obtained. Algorithms can be written in our language. There is no need to know programming language to write algorithm. Some characteristics of algorithms are:

- Each instruction should be precise and unambiguous.
- It must be possible to execute each instruction in finite time.
- Algorithm must be terminated ultimately.
- After execution of algorithm desired results must be obtained.

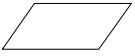
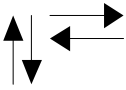
Start with writing algorithms for simple problems and proceed to complex problems.

Flow Chart : It is pictorial tool to represent the logic of solving problem. All the operations to be performed and path of processing and logic of program are indicated in the flow chart. It becomes easy to write program from the flowchart.

Flow chart uses boxes of different shapes to denote different types of statements. The actual instructions are written in these boxes using clear and perfect statement.

These boxes are connected by arrows to indicate the flow that is sequence of execution.

Flow Chart Symbols : Following are the most commonly used flow chart symbols. These symbols have been standardized by the American National Standard Institute (ANSI).

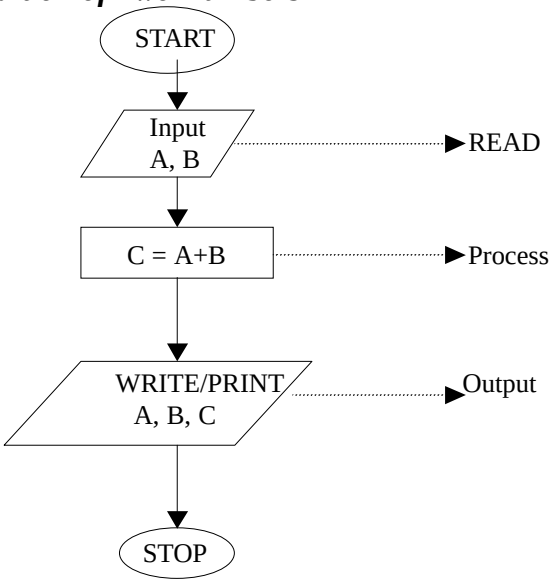
Symbol	 Oval	 Parallelogram	 Rectangle	 Diamond	 Arrow	 Circle
Function	Start / Stop	Input/ Output	Process	Decision	Data flow direction	Connector

Uses of Symbols

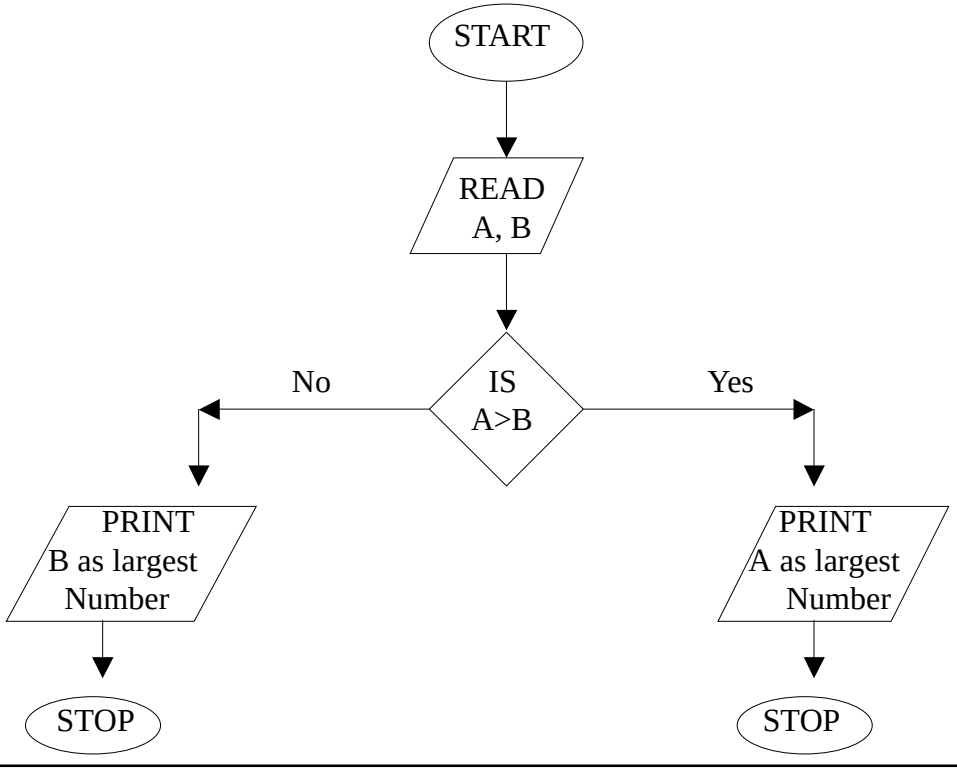
1. **Start / Stop** : It is used to indicate beginning and end of the algorithm.
2. **Input/Output** : Data is either to be brought into the algorithm (READ) or results are to be returned by the algorithm (WRITE).
3. **Process** : This is used for performing arithmetic operations.
4. **Decision** : A question is posed, and answer determines the next step to be performed.
5. **Data Flow Direction** : Arrows are used to indicate the flow of operations i.e. the exact sequence in which the instructions are to be executed.
6. **Connector :** If flowchart becomes very long, it can not fit on single page. Or some times it becomes complecated, if arrows showing flow cross each other at many places. To avoid such situation and make flow chart more readable connectors are used.

Flow Chart Examples

(i) Flow Chart for Addition of Two Numbers



(ii) Picking of Largest Number from Two Numbers



3.2.5 Computer Viruses

A computer virus is basically a computer program written for destructive purpose. It is written in such a way that it can enter the computer without the knowledge of the machine or the user. It enters the machine through an infected floppy or program. It has capacity to replicate itself and cause abnormal functioning of the machine. When a virus infected floppy is used or program is executed, it may infect the files on the disks leading to a loss of stored information and data.

Types of Viruses

The viruses can be divided into three broad categories according to the way of function. However day by day the number is increasing of different types of viruses.

(a) Time Bomb Viruses : These viruses are designed to get activated on a certain date and time. e.g. Jerusalem virus was designed to get activated on Friday 13th May, 1988.

(b) Trojan Horses Viruses : These viruses attach themselves to programmes but have no ability to replicate. These viruses are found on computer networks. When a programme containing this type of virus propagates to various computers and used by users, it gets spread.

(c) Warm Virus : These viruses do not corrupt data but occupy part of the computer memory and slow down the system.

3.3 Glossary

Program : A set of instructions given to the computer in logical sequence.

Software : It is collection of programs which enables the computer to reach the solution of problem.

System Software : The system software makes the CPU to co-ordinate with the other parts of the computer.

Application Software : Application software is used to execute special task.

Operating Systems (OS) : Operating system acts as an interface between the processor, application program and user.

GUI : Graphical User Interface.

Compiler : Compiler is a system program, which translates high level language program into machine level language program.

Algorithm : Algorithm is a logical sequence of precise instructions, after performing them desired result should be obtained.

Flow Chart : A pictorial or graphical presentation of an algorithm is called flow chart.

Computer Virus : A computer virus is a program written for destructive purposes.

3.4 Summary

Computer hardware works as per the instructions given by the software. Software is soul of the computer. Software, also known as programs consists of organized sets of instructions for controlling the computer. The software packages are of three types : (i) System software, (ii) Application software, (iii) Customized application software. Software is set of programs. To write program, several high level languages are available. Each language is suited for a particular type of application. It is good practice to draw a flow chart before starting programming. It presents the programmer a diagrammatic representation of the logic in a given procedure. A flow chart is a pictorial representation of an algorithm that uses boxes of different shapes to denote different types of instructions. Virus is also a program written for destructive purpose and is self replicable.

3.5 Exercises for Practice

Answer the following questions in 200 words each.

1. What is software ? Explain different types of softwares.
2. What are the different types of computer languages. and explain differences between LLL and HLL ?
3. What is purpose of flow chart in programming ? Explain the different symbols used in flow chart?
4. What is flow chart ? Give brief discription of various symbols used in flow chart.

Unit 4 : Software Applications for Office Use

Index

4.1 Introduction

In the 21st century computer is used at every walk of life. Now the letters and applications are directly composed on computers. Accounting, calculations, data management is done with the help of computer. Messages are composed and sent using e-mail facility. In short, computer is now fully used in office automation process. To help the office automation processes many software are available. Lotus Suite and Microsoft Office are two commonly used software. With both these packages, you can keep track of your calendar, make your financial reports and also produce impressive presentations. Microsoft Office includes the following applications.

Word for Word Processor, Excel for Spreadsheet, Access for Database Management and PowerPoint for Presentation Software

After the study of this unit, you will be able to know and understand :

- Features of Word processing.
- Words for creating simple documents.
- Features of Desk Top Publishing (DTP) package
- Various parts of Page-maker window
- Features of Spreadsheet applications.
- Excel for creating simple workbooks.
- Features of Access.

4.2 Content

4.2.1 Word Processing

Word processor is a computer program that enables you to create, edit, print and save text for future retrieval and revisions. You enter the text into the computer by using a keyboard. As you type, your words are displayed on a screen and are stored temporarily in the computer memory and permanently on the disk once you save it.

MS-WORD is a window based word processor, used to produce document easily. Creating letters, memos, fax sheets, is made very easy as there are readymade templates to choose from. Special effects, fonts, pictures can be used in documents, Spell-check facility automatically checks and corrects the spelling mistakes.

MS-Word is one of the very powerful and convenient word processor.

1. Advantages of Word Processor

There are many advantages of a word processor over a conventional typewriter. Some of them are :

(i) Revision without Typing : We can change the text without typing entire text again.

(ii) Making Copies : Word processor can print as many original copies as you want, because every printout is original copy, whereas on typewriter you will get only one original copy.

(iii) Manipulation of Text : It allows you to copy a text, move a part of the text from one place to another and combine two texts.

(iv) Increase Productivity : It enables quick on-line editing and hence faster completion of work is possible.

(v) Special Printing Effects : There are several printing effects (like bold, italic, font size, colour, etc.) in word processor. Therefore, the text looks neat, attractive and organized.

(vi) Faster Proof-reading : It has tools that check spellings, grammar and meaning of words to speed up the process of proof reading.

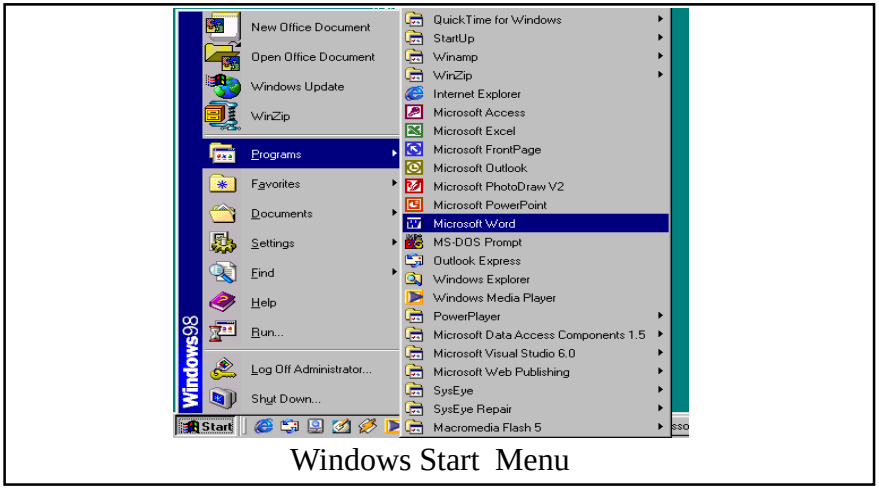
(vii) Image Insertion : It offers built-in drawing tools that lead you create diagrams in the document.

2. Working with MS-Word

It is very user friendly, since it operates under the Windows environment. It has many useful features. You should learn the features that are useful for your work. Here we take overview of word. Procedures for doing some commonly used word operations are also given. These are very few among the many facilities word provides. You should explore them while using word. Going through this information will help you when you start using word.

(i) Starting Word : Word operates under the windows environment. Therefore, you must start windows before starting word.

(a) After starting windows, click on START button at the left corner of the screen, the long menu of items will be displayed, it will look similar to the shown in following figure :

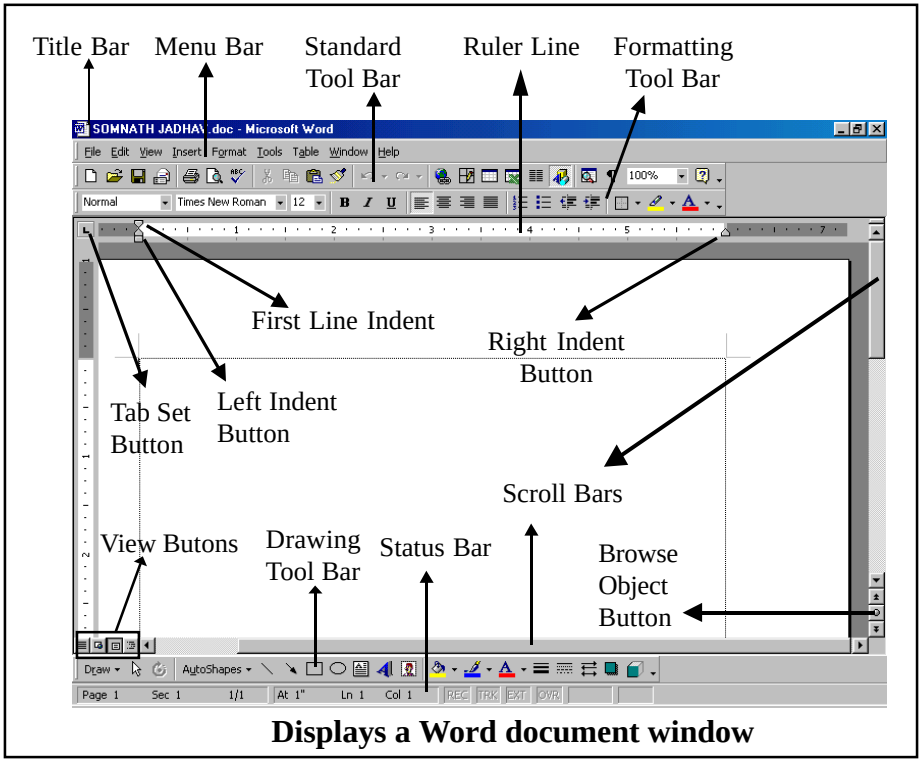


Windows Start Menu

(b) Select the program option of the start menu.

(c) Select the Microsoft word option from the programs Sub-menu.

(ii) Components of Document Window : The components of the document window are as under :



Displays a Word document window

(i) Title Bar : This bar appears at the top of the screen. It displays the name of the active program(MS Word), the name of the currently active word document(Document2), the control menu icon, the minimize button, maximize button, Restore and close buttons.

(ii) Menu : It is positioned below the title bar. It contains nine options – File, Edit, View, Insert, Format, Tools, Table, Window and Help. Each of these menu bar items has drop down menus.

(iii) Toolbars : A toolbar is a bar displayed below the menu bar with icons representing buttons for activating a particular command. There are several other toolbars. But two of them are very important : standard and formatting toolbars. Toolbar provide a shortcut way of executing word commands.

(iv) Ruler Bar : Ruler bar enables you to format the vertical alignment of text in a document and is also used to get tab stops on a line of text.

(v) Status Bar : The last row at the bottom of the screen, known as status bar, displays the status information like current page number, total number of pages, location of the cursor in the text by distance from top and also by line number and column number, the current time, etc.

(vi) Work Space : Work space is the area in the document window, where text is entered.

(vii) View Buttons : The word document window consists of four view buttons – Normal View, Web Layout View, Print Layout View and Outline View at the left of the horizontal scroll bar. These buttons are used to see the document in different views.

(viii) Insertion Point : It is a tall blinking vertical cursor that indicates that where you are in the document.

(ix) Mouse Pointer : It is I-beam, when you move the mouse, the position of the pointer changes on the screen.

(x) Scroll Bars : The word document window consists of two scroll bars – Vertical scroll bar and horizontal scroll bar- used to move a document vertically and horizontally.

3. Creating Document

To create a document, follow the steps.

(i) Select '**File**' option from main menu.

(ii) Select '**New**' option from File Menu of the menu bar.

A new document window opens. This is a blank screen where you can type document using keyboard. Word has default setting of margins, font, font size, line spacing, tab stops, page dimensions and many other document attributes. Every character you type will be placed at the cursor position. You can move this cursor within the text by moving mouse and mouse pointer. In word, words automatically flows to the beginning of next line after completing one line. This feature is called word-wrap.

4. Saving Document

When you use save key in your document, the document is stored in the internal memory of the computer. In order to preserve the document for future use, you must save it in the secondary storage. By default, the document is saved with an extension .doc. To do so :

Select **'File'** option from the Menu bar. Word provides two commands in the 'File' menu to save your document namely, **Save** and **Save As**.

(a) Save As Command : Use the command Save As to save a document for the first time, or save a previously saved document with new name or to save the document in a different locations (on another disk or in another directory).

* Selecting Save As command will open the Save As dialog box.
* In the drives and directories list box, select the location (drive and directory) in which you wish to save the document.
* In the file name text box, type the name of file.
* Click on OK button.

(b) Save Command : Use save command to save a document with its current name and at its current location. Save updates a saved document, it replaces

the last saved version of the document with new version of the document on your screen.

* Select the **Save** option from the **File menu** and click on the **Save** button.

5. Closing a Document and Exiting Word

When you have finished working with document i.e. after you have saved it, you should close the document window by selecting '**Close**' option from the File menu. Your final step of every word session is to exit word. Never turn off your computer before closing all application windows. To exit word and return to windows click '**Exit**' option from File menu.

6. Opening Document

To open the existing document file, follow these steps :

* Select '**Open**' option from the File menu. An Open dialog box will be displayed.
* Select the appropriate drive (in the drive list box) and directory/folder (in the directory list box)
* Click on the desired file (in the file name list box) and then click on **OK** or simply double click on the desired file to load the document.

When you open a file, word places a copy of the file in the document window on your screen. You can revise it without changing the original document stored on your disk. Original document will be changed only when you save your revised document as a file with the same name, and in the same location.. So if you want to preserve the original document, make sure to give your revised file a new name.

7. Editing Text

One of the strongest reason for switching from a typewriter to a word processor is the greatly increased ease of editing your document. Editing can be defined as making corrective changes to a document. It includes : Inserting text, Deleting text, Moving test, Correcting spellings and grammar, etc. These changes are incorporated in the document without retyping the entire document again.

(a) Selecting Text : Text can be selected by using the mouse, the keyboard, or both.

* **To select one word** : Place the insertion point on the word and double click on it.
* **To select a sentence** : Hold down the Ctrl. Key while clicking mouse pointer anywhere in the sentence.
* **To select a paragraph** : Place the mouse pointer in the selection bar and double click it.
* **To select specific text** : Click and drag the I-beam pointer over one character, one word or the text to be selected.

(b) Inserting Text : Place the insertion point/cursor to the position where you want to insert new next and type it.

(c) Deleting Text : A character is deleted by pressing either the Backspace or Del Key. The Del Key removes a character from the current cursor position, the Backspace Key removes the character to the left of the cursor, one position to the left. To delete block of text from a document, the steps are:

* Select the text to be deleted.
* Select the **Cut** option from the Edit menu or click on the **Cut** button of the standard toolbar.

(d) Cutting and Pasting Text : Using the '**Cut**' option you can remove a text from a particulars place in the document and then paste it at desired place in the document using '**Paste'** option. To move the text form one point to the another point, the steps are :

* Select the text to be moved.
* Select **Cut** option from the Edit menu.
* Position the insertion point, where you want the text to appear.
* Select the **Paste** option from the Edit menu or **Paste button** of Standard toolbar.

(e) Copying and Pasting Text : You may require to use the same piece of information at more than one places. Instead of typing it again, you can use

the feature copy and paste provided by word. The steps are :

* Select the text to be copied.
* Right-click on the highlighted text. A shortcut menu appears near the highlighted text.
* Select the **Copy** option from shortcut menu.
* Move the insertion point to the location where you want to paste the text.
* Select the **Paste** option from the Edit menu to paste the selected text in the desired location.

(f) Checking Spelling and Grammar : The spell check feature consists of set of built-in dictionaries. These files contain correct spellings of all words in the standard dictionary. If the word is misspelled, it is marked with a red wavy underline. You can either go back and correct the word or run the spell check option to get some suggestions. You can check the spelling mistakes and the grammatical mistakes for an entire document or selected word or paragraph with the help of "Spelling and Grammar Check". Perform the following steps to do so.

* Select the text to be checked.
* Select '**Tools**' option from the main menu.
* Click '**Spelling and Grammar**' option.
  This will start the spell and grammar check. Spell checker will provide suggestions if there is an error.
* If you want the text according to the suggestions then click on '**Change**' button otherwise click on '**Ignore**' button.

(g) Thesaurus : Thesaurus is used to find a more precise expression for a given word. To make use of thesaurus perform the following steps :

* Select the word for which you want an expression.
* Select the '**Tools**' option from the main menu.
* Select the '**Language**' option from the menu.
* Click on '**Thesaurus**' option.

The list of related word and synonymous will be displayed. If you want to replace the word with the given expression then

* Click on '**Replace**' button. The word will be replaced.

(h) Using Undo and Redo Operations : Many times after modifying something you may feel that the original thing was correct. Word gives the facility to go back to the original thing. You can undo or redo the edits in a word document by using the Undo or Redo options.

* **Undoing Edit** : The Undo command is used to reverse actions. Suppose you have drawn a circle and you decided to delete it. Click the Undo button on the standard toolbar to do so. Undo command that allows you to reverse one or more of the most recent operations that you have performed.
* **Redoing Edit** : The Redo option is used to reverse the last Undo. To Redo a change, click the Redo button on the standard toolbar.

8. Formatting Text

The overall effectiveness of a document is directly related to the way it looks. The document can be made effective by formatting. Formatting a document includes assigning fonts and font sizes, aligning text, adjusting the line and paragraph spacing etc. We will see how to format text, paragraphs and pages. There are two types of formatting : 1. Character formatting and 2. Paragraph formatting

(a) Character Formatting :

Changing Font Styles : The size and appearance of the text is controlled by the fonts you choose. You can select a font before you begin typing or you can select text and change its fonts and text attributes at latter time. Font size is measured in points. Normal template document has font size of 10 or 12 points, Times New Roman, by default. To convert the ordinary text into highlighted one, you can use the options like Bold, Italic and Underlined. Steps for changing font styles.

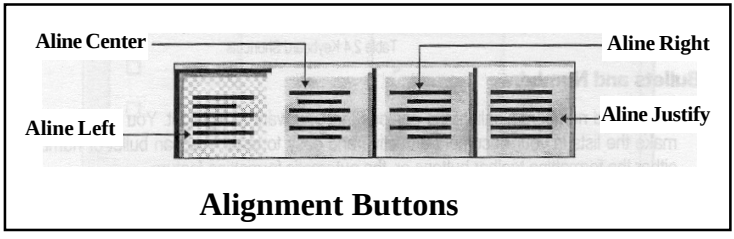
* Select the desired text.
* Select '**Font**' option from Format menu. Font dialog box appears.

* Select desired Font style (font, its size, style, colour, effects, etc.)
* Click **OK**.

You can change font and font size using dropdown boxes and style buttons on formatting toolbar.

(b) Paragraph Formatting : The paragraph is one of the basic units of a document. Every time you press the enter key a new paragraph is created. Word provides the following paragraph formatting facilities. (1) Paragraph Alignment, (2) Paragraph Spacing, (3) Change Case

(1) Paragraph Alignment : Alignment is a way of organizing the text. It refers to the position of the text between the left and right margin. Word provides four types of paragraph alignments i.e. left-align, right-align, center align and justified. You can do this by using the four buttons on Formatting toolbar as displayed in followint Figure.



Alignment Buttons

(i) Right –Alignment : Text is aligned with the right margin of the page.

(ii) Left-Alignment : Text is aligned with the left margin of the page.

(iii) Center-Alignment : Text is centered between the margin. This option is normally used to Center the heading and text.

(iv) Justified-Alignment : This features aligns a paragraph with both the left and right margins. Inter-word spacing is adjusted such that each line of text being at the left margin and ends at the right margin.

(2) Paragraph Spacing : Spacing can be used to design your document and make it more readable.

(a) Line spacing : You can set spacing to single, double or one and half lines. To set the line spacing, follow these steps :

* Select the paragraphs.
* Select the paragraph option from Format menu.
* Select desired line-spacing from the Line Spacing list box.
* Click on OK.

(b) Paragraph Spacing : You can define the amount of white space placed before and after paragraphs by using paragraph dialog box. To add white space before or after a paragraph, follow these steps :

* Place the insertion point in the paragraph or select multiple paragraphs.
* Select the paragraph option from the Format menu.
* Enter the Before and After dimensions or both in the spacing area.
* Click on the OK button.

(3) Change Case : Word's change case feature is easy to use. It is used to change the case among Sentence, Lower, Upper, Title or in Toggle case.

* Select the text you want to change.
* Select *Change Case* from the Format menu a Change Case dialog box appears on the screen
* Select the option you want and click **OK**.

4.2.2 Desk Top Publishing (DTP) and Printing

Desktop publishing application allows to combine text and graphics that have been created with other software. Many word processing applications today can integrate text and graphics but main advantage of Desktop Publishing packages is that, it gives finer control over the text, including line spacing, letter spacing, more precise placement of graphics and the ability to prepare a publication for professional printing. The DTP application is able to import files created by other software. A new style can be added to publication style sheet at any time while working with the publication. One can produce high quality documents on desktop with enough

resolution for razor-sharp text and rich looking photographic images. PageMaker is one of the world's leading desktop publishing software.

1. PageMaker

PageMaker 6.5 is world's leading cross-platform professional page designing software. It automates all the steps in developing a printed document. Page designing means process of laying text, graphics, lines, pictures, boxes, drawings and colours on page. The beauty of PageMaker is that it is very simple to use and easy to learn. Its users are Graphic Designers, Artists, Technical Writers, Marketing Groups, Newspapers, Magazines and Book Publishers. PageMaker has the capability to type any text, insert image, change layout, resizing images, etc. and they can be easily revised.

The Graphical User Interface (GUI) revolutionized the printing process. It introduced the concept of WYSIWYG (What You See Is What You Get), which ensures that, what the user sees on screen will appear on the printout.

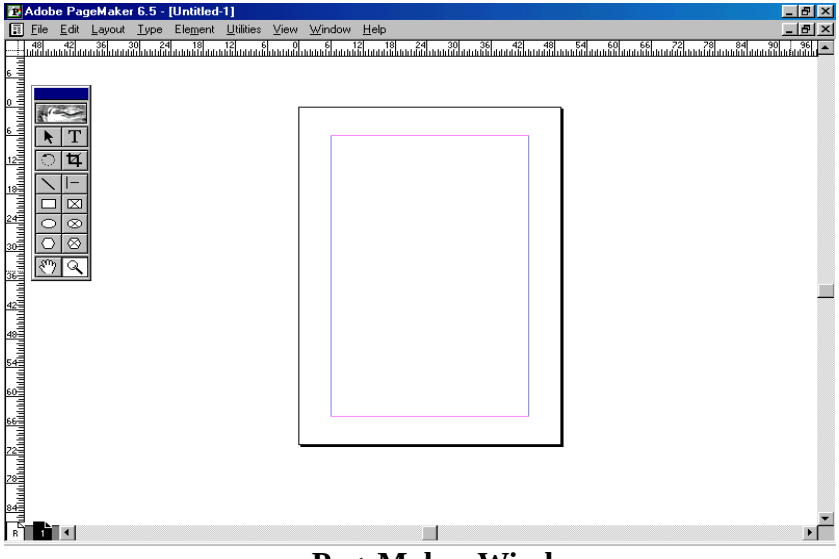
Features in PageMaker : Main features are listed below.

1. **Document Layers** : Layers allow you to place elements one over the other. The layers can be used for adding annotations, floating or background images.
2. **Easier Layouts** : PageMaker can hold any type of text or images. PageMaker free from layout capabilities have become even more flexible with its framed text control.
3. **Better Integration** : PageMaker can work seamlessly with PhotoShop, illustrator, etc. It also builds the ability to drag and drop images and elements directly from one application to the other.
4. **Colour Controls** : PageMaker introduces new colour technologies, which helps in reducing high fidelity colours in your publication.
5. **Internet Ready** : PageMaker includes an option to export your PageMaker documents to Internet ready HTML (Hyper Text Markup Language) files with the links preserved.

2. PageMaker Window

PageMaker window means the working space for creating and producing publication. It provides an interface between the user and PageMaker. The components of PageMaker window are as below.

1. **Title Bar** : Located at the top of the screen. It displays the name of application (PageMaker) and active document.
2. **Pull Down Menu** : The main pull down menu controls all PageMaker functions.
3. **Tool Box** : Gives us different tools available for use.
4. **Application Window** : The application window means our document page or our drawing board on which we prepare documents and graphics.
5. **Rulers** : Rulers are displayed beside application window. It provides ongoing page measurements and can be changed at anytime. It helps to position the cursor, text and graphics on the page.
6. **Scroll Bar** : Horizontal and vertical scroll bars are shown beside application window used to scroll the page up, down, right and left as required.
7. **Menu Bars** : The standard bar contains all the main menus for file, layout, elements and other utilities.



PageMaker Window

8. **Master Page Icons** : Clicking it will display the master page. It contains text, graphics, layout and settings, which are common throughout the publication.
9. **Page Icons** : The page icon shows the list of pages in publication with currently selected page in black. Clicking a particular page icon will display that page.
10. **Pasteboard** : Area of white space surrounding the page is known as pasteboard. It is used to store graphics and text. These text and graphics can be selected and moved regardless of the currently working page.

3. Tool Box

Tool Box contains all the tools used to create a publication in PageMaker. Following are the some tools.

1. **Pointer Tool** : Pointer tool is used to pick, drag and drop graphics and text.
2. **Text Tool** : Text tool is used to edit, select and insert text frames. The text tool creates a free flowing text box.
3. **Rotate Tool** : It is used to rotate text and graphic objects.
4. **Crop Tool** : The crop tool is used to crop imported graphic images to the required size.
5. **Oblique Line Tool** : It is used to draw slanting line.
6. **Constrained Line Tool** : It is used to restrict the drawn line to horizontal or vertical.
7. **Rectangle Frame** : Rectangle Frame is used to type text inside the box.
8. **Circular Tool** : Circular frame is used to type text inside a circle or an oval.
9. **Polygon Tool** : Polygon tool is used to draw a shape with more than four sides.
10. **Hand Tool** : It is used to move the screen. It helps you to easily navigate in a large page.

11. **Zoom Tool** : It allows you to in and out of document view.
12. **Control Palette** : It displays the properties of selected paragraph, character or object. It is a sort of shortcut to the object, text and paragraph properties.

4.2.3 Spreadsheet Application

A spreadsheet is a generic term for the software package that simulates a paper worksheet. Excel is a versatile spreadsheet package. It has user interface features common to other Microsoft Office applications. It is commonly used to automate financial statements, business forecasts, account receivable and account payable. The package provides statistical, analytical, scientific functions and graphical presentation tools.

Some of the major features of Excel are :

(i) Excel has 65536 rows and 256 columns in its worksheets.

(ii) Based on the data, graphs or charts can be created.

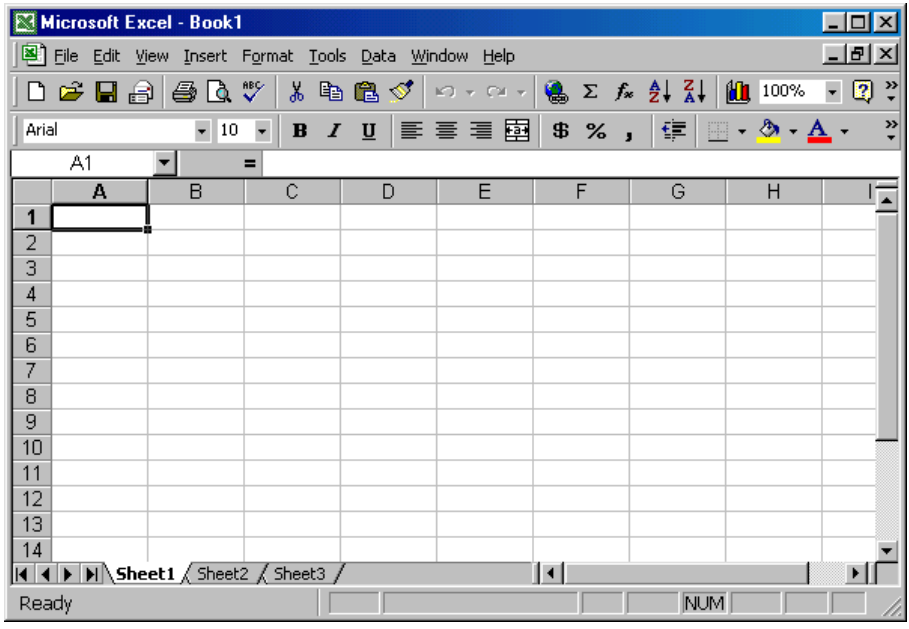
(iii) Excel can create formulas by using row and column headers. This feature is known as the Natural Language formula.

(iv) All formula entries should begin with an = (equal to) sign.

1. Working with Excel

Files created by a spreadsheet package are known as worksheets. You can move around in a worksheet with aid of mouse or keyboard. Many editing and formatting procedures of Excel are same as that of word. So it is easy to work with Excel if you already familiar with Word.

When you start Excel the opening screen is displayed as shown in Figure. You can make a cell active by clicking on it. By default A1 is always active cell in a new worksheet.



Excel Spreadsheet (Worksheet)

(a) Entering Data : Data entry is accompanied by feeding the data in the active cell. You can make a cell active by clicking on it. As you type, the data is displayed in the active cell as well as in the formula bar that is right above the worksheet.

(b) Selecting Cell Range : Calculations sometimes require you to select cell ranges, and clicking on each one of them becomes a very tedious task. To select a cell range in an instance, you can do the following.

* Click on a corner of the range you want to select.
* Drag the mouse over the range.
* When you reach the end of the range, release the mouse button.

(c) Saving Workbooks : Whenever workbooks are created, they are named by default as workbook1, workbook2 and so on. To save the worksheets you should follow the steps :

* Select the save option from the file menu.
* You can also click on the save button on the standard toolbar.
* Name the file you have saved.

2. Editing Worksheet Data

The data that exists in cell may require some editing, such as moving data from one location to the other location, clearing cell contents, and so on.

(a) Editing a Cell : To edit the contents of a cell, double-click on the cell. The insertion point appears at the end of the cell which can be moved to the required position for editing.

(b) Clearing a Cell : To clear a cell is to erase the cell content. It is not similar to deleting a cell.

* Highlight the cell or range of cells to be cleared.
* Click on the right mouse button.
* Select the clear contents from the shortcut menu.

(c) Copying Data : To create multiple copies of worksheet data, use copy and paste feature:

* Select the range of data that you want to copy.
* Click on the right mouse button.
* Select Copy from the shortcut menu.
* Select the cells in which you want to paste your data.
* Click on the right mouse button and select the paste option from the shortcut menu.

(d) Moving Data : When you select the cut command to move the data, a copy of the data is stored in the window clipboard. Later when you use the paste option, the data is placed in another area of the worksheet. The steps to do that are :

* Select the range of data you want to move.
* Click on the right mouse button and select the cut option from the short menu.
* Select the cell in which you want the data to be placed.
* Click on the right mouse button and select the paste option from the shortcut menu.

(e) Inserting and Deleting Rows, Columns and Cell Ranges : You can insert rows, columns and cell ranges, if required.

(i) Column Insertion : To insert a column using the shortcut menu, the steps are :

* Position the cell pointer in the column header where you want your new column should be inserted.
* Click on the right button and select the insert option from the shortcut menu.

(ii) Deleting a Column

* Select the letter of the column you want to delete.
* Click on the right mouse button and select the delete option from the shortcut menu.

(iii) Inserting a Row

* Select a cell in the row below where the new row should appear.
* Click the right mouse button and then select Insert option from shortcut menu.

(iv) Deleting a Row

* Select the row which you want to delete.
* Click the right mouse button and select the Delete option from the shortcut menu.

(v) Inserting a Cell or Cell Range

* Select the Cell or Cell range where new cell should appear.
* Select the cells option from Insert Menu.

(vi) Deleting a Cell or Cell Range

* Select the cell or Cell range that you want to delete.
* Select the Delete option from the Edit menu.

3. Data Computing

Various numerical calculations can be very conveniently done using the formulas. Excel can perform different kinds of calculations correctly and provide some built in formulas. Excel uses standard computer operator symbols for mathematical and logical operators.

Operation	Symbol	Operation	Symbol
Addition	+	Subtraction	-
Multiplication	*	Division	/
Exponentiation	^	Equal to	=
Not equal to	<>	Greater than	>
Less than	<	Greater than or equal to	>=
Less than or equal to	<=		

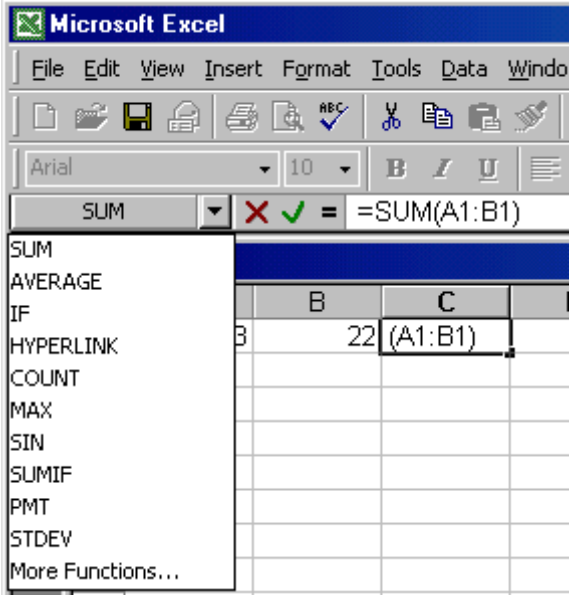
(1) Formula Bar

(i) There are three boxes that exist between the Formula Bar and the Name Box.

(ii) The first box with a cross (X) symbol used to cancel the entry made in the cell.

(iii) The second box with a right (3) mark use to accept the data in the cell.

(iv) The third box contains an equal to (=) sign. This is the Edit Formula feature that simplifies the calculation tasks. It helps you to select the appropriate function required in the formula.



Edit Formula Function's Drop-Down List

(2) Entering Formulas : The most significant feature of Excel is its potential to use formulas for calculations. Expressions can be calculated by typing the formula in the formula bar. A Formula is a set of mathematical instructions that you enter in the worksheet cell. Formula establish relationships between two or more cells. Each formula carries out its instructions to perform a specific calculations. To enter a formula into a worksheet cell.

* Select the desired cell.
* Type an equal sign (=)
* Type the desired formula and Press Enter.

For e.g. = 800+600, which generates the value 1400. However, you will find it more efficient to enter the numbers into individual worksheet cells and then to create formulas that refer to these cells. Excel automatically updates the result of the formula, whenever you change the contents of any of the cells to which it refers.

For e.g. If you have entered 800 in cell G1, 700 in cell G2 and =G1+G2 in G7, the value 1500 (800+700) would appear in cell G7. If you then change the contents of cell G1 to 2100, Excel will automatically recalculate and display the value 2800 in cell G7.

(3) Using Functions : Functions are calculation tools that help you to create powerful formulae. A function may contain one or more formulas used together to calculate a result. Excel provides a large number of functions, organized into different categories (financial, statistical, logical, text, database, and so on). Each function has to be used in specific manner. This is known as the Syntax of the function. You can use functions offered by Excel for making calculations. To enter a formula that contains a function, follow the steps.

* Click on the cell in which you want to enter the formula.
* Click on Edit Formula button in the formula bar.
* Click on the down arrow head right next to the Functions box to invoke a drop-down list of available functions which includes SUM, COUNT, AVERAGE, MAX and so on.

* Click on the function you want to use. If the function doses not appear in the list click on more functions.
* Enter the arguments for function.
* When you complete the formula, press the Enter Key.

The other convenient way of choosing functions is by using the paste function that appears on the standard toolbar

Examples of two functions are given below:

(a) Average Function : The function should begin with name and should followed by an opening parenthesis

= AVERAGE ( )

The input to the function will be after open parenthesis and known as arguments of the function. If there are two or more arguments, they are separated by commas. The function ends with the closing parenthesis.

= AVRERAGE (B2, B3, B4, B5).

The answer is called the return value of function. Type numeric values in cell B1 to B5. Enter the function in the cell D7. The average will be displayed in cell D7. You can also write = AVERAGE (B2:B5).

(b) Summation :

= SUM (B2:D7) will add the values from cell B2 to cell D7.

(c) Some commonly used Statistical Functions :

Syntax	Utility	Example	Result
Average(num1, num2, …)	Average of numbers	=AVERAGE (2,7)	4.5
Count (val1, val2,…)	Count of numbers of arguments	=COUNT(2,7,6,8)	4
Max (num1, num2,…)	Maximum/minimum value	=MAX(10,15,20)	20
Min (num1,num2,…)	out of the argument	=MIN (10,5,6,11)	5
Product(Num1, Num2,…)	Product of number	=PRODUCT (22,3)	66
SQRT (Number)	Square root of number	=SQRT (144)	12
ABS (Number)	Absolute value of number	=ABS(-15.6)	15.6
Median (Num1, Num1,…)	Median of the number	=MEDIAN (1,2,4,6,8)	4
Mode (Num1, Num1,…)	Most frequently occurring number	=MODE (1,2,1,3,1)	1
Stdev (Num1, Num2,…)	Estimates standard deviation	=STDEV (1,2,3,4,5)	1.58

(4) Charts and Graphs : Charts are an effective way of representing value through the visual presentation. They not only enhance the look of the worksheet but also allow user to gather a lot of information in much lesser time. MS-Excel automatically scales the axes, creates columns categories and labels the columns. In Excel there are two types of charts : (a) Standard Types, (b) Custom Types.

(a) Standard Types : In standard type excel provides subchart types. Some are given below.

(i) Column chart, (ii) Bar, (iii) Line, (iv) Pie, (v) XY (Scatter), (vi) Cylinder, (vii) Cone, (viii) Pyramid, (ix) Area, (x) Surface.

(b) Custom Types :

(i) Area Blocks, (ii) Column-Area, (iii) Blue Pie, (iv) Colored Lines, (v) Floating Bars, (vi) Smooth Lines, (vii) Tubes and so on.

Chart Components : Regardless of type, charts contain a few basic components. As you create charts from your spreadsheet data, you will include some or all of these components. The basic chart components are given below.

Command	Description
Title	The chart name or name of the certain chart component.
Legends	Label, colours and patterns, that describe the data components of the chart.
Label	Text that labels data value or other chart components.
Data	The values upon which a chart is based.
Data Table	A spreadsheet – displays actual values, associated with current chart.
Grid lines	Lines across a chart that help you interpret precise data values.
Trend lines	A data analysis tool that helps predicts trends.

Creating Charts : You can create a chart using following steps.

* Select a range with data and labels.
* Click on the chart wizard tool on the standard toolbar.
* The chart wizard dialog box gets invoked. The chart wizard then guides you to different steps of creating chart of your own choice.

* Click on the finish button to complete the process of creating charts.

4.2.4 Database Application

The database systems basically is a computer based record keeping system, whose overall purpose is to record and maintain information. In general there are two types of databases : (i) Integrated data base, (ii) Relation Database Management System (RDBMS).

(i) Integrated Database : Sometimes called Flat File Database – This file system stores data in files without indexing. File management systems lack flexibility in data manipulation.

(ii) Relation Database Management System (RDBMS) : RDBMS enables users to manipulate data in more sophisticated ways. RDBMS avoids redundancy in data and defines the relationships between sets of data.

Microsoft Access is RDBMS. With Access, you can perform the following tasks:

- Organize data into related units.
- Enter, locate and modify data.
- Extract subsets of data based on specific criteria.
- Create custom forms and reports.
- Automate common database tasks.
- Graph data relationship.

In Access, the term database refers to a single file that contains a collection of information. A database consists of the following objects. (1) Tables, (2) Queries, (3) Form, (4) Report, (5) Macro, (6) Module.

(1) Tables : Tables are the foundation of database. Table store data in a row and column format similar to spreadsheet. Tables can be created using table design view. Design view allows you to create a table from the scratch.

* Select a database by using the Open Database option of the file menu. This invokes the Database Window for the selected database.
* Select the Tables tab from the Database Window and click on the new button.

* Select the Design View option from the New Table dialog box. Access displays a blank Table 1.
* After setting properties for each field, close the table window. For each field you must specify the following properties.
* **Field Size** : refers to the maximum number of characters you can enter in the field.
* **Format** : refers to the display layout for the field.
* **Input Mark** : is a pattern for all the data to be entered for the field.
* **Caption** : Default field label in a form or report.
* **Default Value** : is a value that is automatically entered in this field for new records.
* **Validation Rule** : Expression that defines data entry rule.
* **Required** : refers to the requirement for data entry in a field. It can take one of the two values, Yes, No.
* **Allow Zero Length** : refers to the requirement for a zero length field. It can accept one of the two values. Yes, No.
* **Indexed** : Single field indexes to speed searches and sorting on field.

(2) Queries : Query provides you a way to question your database. The result of a query (the answer) can then be printed or viewed on the screen. A query is a statement that communicates to Access what kind of information you need to extract from one or more tables. Queries can be used as a source of information for forms and reports. Access enables you to create the following types of queries.

* **Select Query** : Used to extract data from the tables based on criteria specified in the query object.
* **Action Query** : Used to perform an action on records that meet the criteria specified in the query object. This query enables you to change or move the data, create new tables.
* **Totals Query** : Used to group data with sums, averages or other summary calculation.
* **Cross tab Query** : Used to summarize data in a spreadsheet format, based

on criteria specified in the query object. This query is mostly used to calculate data for graph.

* **Union Query** : Used to combine sets of records from different tables with common fields.
* **Pass Through Query** : Used to send commands to Structural Query Language (SQL) database.
* **Data-Definition Query** : Used to perform actions on an Access database with SQL statements.

Access places the results of query or filter operations in a Dynaset. A Dynaset looks and behaves like a table, but it actually provides a dynamic view if the data is from one or more tables. You can enter and update data in a Dynaset.

Creating a New Query : To create a new query, you need to load New Query dialog box. To do this :

* Switch to the Database window and select the queries tab.
* Click on the New button. The new Query dialog box is displayed, which provides five basic types of generic queries as below.
    * Design View – enters the Query Design displaying a blank query from the table(s) you select.
    * Simple Query Wizard -Creates a select Query from the field you select.
    * CrossTab Query Wizard - summaries the query data in spreadsheet format.
    * Find Duplicates Query Wizard – locates duplicate records in a query.
    * Find Unmatched Query Wizard – locates records in one table that do not have matching records in a related table.
* After you finish setting criteria close the window. Access confirms Query name and returns to the Database window.
* To see the results, highlight the Query name and click on the open button.

(3) Form : One way of viewing table data is by using forms. You create the link between the form and its record source by using graphical objects called controls. Forms offer several advantages compared to the Data Sheet View and your table data.

* Forms can display complete record at a time.
* Forms allow you to customize the appearance with fonts, colours and graphics.
* Forms can display fields that the user cannot edit and can edit.
* Forms enables you to rearrange the fields.
* Forms enable you to automate tasks and display custom menus.

Creating a Form with a Wizard *:*

* In the Database window, click the Table or Query button.
* Select the table or Query on which you want to base the form.
* Click the Autoformat button on the toolbar.

Microsoft Access displays the form in a single-column format.

(4) Report : A report is an effective way to present your data in printed format. You have full control over the size and appearance of a report. To make an effective and presentable report you need to review the tables, forms and queries used in your database.

To create a new report :

* Display the Database Window
* Select the Report tab.
* Click on the New button. The New Report dialog box is displayed.
* Select the appropriate options.
* Click OK.

(5) Macro : A macro is a named list of instructions that can be created for Microsoft Access to follow. Each instruction is called an action. You can use macros to automate repetitive tasks and extend the capabilities of your database.

To create a Macro :

* In the Database Window, click the macro Button.
* Choose the New button to open the Macro window.
* Click the arrow to display the action list.
* Select the action you want from the list.

You can also type the name of the action, you want in the Action column.

(6) Module : A module is a collection of Access Basic declaration and procedures. You can store related procedures in a single module. Your database can include multiple modules, including global, form and report module.

Microsoft Access displays a new module in the module window.

* In the Database window, click the module button. Microsoft Access displays a list of modules in the database.
* Select the module you want to open.
* Double click the module name.

4.3 Glossary

Title Bar : Display the name of program and currently active document.

Tool Bar : The Toolbar provide a shortcut way of accessing commands.

Workspace : It is area on the document where you enter the text.

Undo : Undo reverse the effects of your last action.

Excel : Excel is spreadsheet application for organizing analysing and presenting data.

Worksheet : A worksheet consists of grid of columns and rows.

Formula : A Formula is an entry to a cell that calculates data.

Chart : Chart is an effective way of representing value.

Cell : Specific area of a worksheet, where data is stored.

PageMaker : PageMaker is a desktop publishing software.

RDBMS : Relational Database Management System.

Tables : Tables store data in a row-and-column format.

Queries : Queries extract data from a table on user-defined criteria.

Forms : Forms display and print data from a table(s) or a query based on a user defined custom format.

Macros : Macros automate common database actions based on user specified commands and events.

4.4 Summary

To help the office automation process Microsoft Company developed the window base software known as MS-Office. The MS-Office includes the following applications:

Word : Word Processor
Excel : Spreadsheet
Access : Database Management
PowerPoint : Presentation Software

Word helps you to create letter, memos, reports and term papers. Word enables you to create, edit, format, print and save the document for future retrieval and revision.

Excel is a versatile spreadsheet package. Excel provides statistical, mathematical and financial functions for analysing data. It provides various charts for graphical representation of data. It is also used to automate financial statements, business forecasts, account keeping.

Page-maker is the desk top publishing software. It is easy to make page layouts of text and graphics using page-maker.

Access is Relation Database Management System. It is part of the Microsoft Office. It can be used to manage the data.

4.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Explain the components of word document window.
2. Write note on DTP and printing
3. What are the advantages of word processor ?
4. Explain the features of Excel with formula and function ?

Unit 5 : Telecommunication and Computer Networking

Index

5.1 Introduction

Today computer is being used by millions of people. Thousands of organizations are implementing the concept of paperless office. Managers wants to monitor their branches spread over a large geographical area simultaneously. This is where networking comes into picture. Network is group of computers that are connected together for sharing information and resources. Setting up speedy communication, best utilization of resources like printer, scanner, etc. becomes easy with networking. In this unit, we will see how to connect the computers, and what we need to be able to do so. We will also see how networks are classified depending on size and architecture. We will also go through the different media used for networking.

After the study of this unit, you will be able to know and understand :

- Concept of Computer Communication and Networking.
- What is Computer Network?
- Deference between LAN and WAN.
- Network Topology.
- Advantages of Networking.
- Devices and Media's of Networking.
- Network Protocol.

5.2 Content

5.2.1 Network Application

A network is simply a group of computers that are connected together for sharing information and resources. The computers can be connected to each other with the help of cables, telephone lines or Satellites. You can do the following things on the Network.

1. Communication with other people using e-mail, video conferencing.
2. Getting information.
3. Sharing the peripherals.

Networks are classified according to their size and architecture. According to size, networks are classified as Local Area Network(LAN) and Wide Area Network(WAN). Each of the above can further classified according to logical relationship among computers as either client or server networks or peer-to-peer networks.

5.2.2 Local Area Network (LAN)

A network of computers located relatively close to each other is termed as Local Area Network (LAN). Network of interconnected computers in a single room, rooms within a building or building with the same premises (small geographical area) is Local Area Network (LAN). A LAN can consist of as few as just two or three PCs

connected together or as many as several hundred computers of different kinds.

LAN allows all the computers connected to it, to share hardware, software and data. The most commonly shared resources are disk storage devices and printers. In addition to shared hardware, LAN can provide all the other benefits of networks, including simultaneous access, enhanced personal communication and easier backup.

1. Advantages of Local Area Network (LAN)

(i) File Sharing : A LAN enables many users to share a single copy of a file stored on a central file server. This helps the organization in keeping its records, documents and other files consistent.

(ii) Transfer Files : A LAN enables you to copy files from one machine to another without having to exchange floppy diskettes.

(iii) Sharing of Computer Hardware : Using LAN you can share one or more expensive hardware's (printer, modem, fax) among several workstations.

(iv) Sharing of Computer Software : A LAN enables people to use the same copy of expensive software. The LAN administrator can install software updates that affect everyone immediately.

(v) Communication : LAN can be used to send memos, reports, messages to other people in other parts of the buildings and it provides a paperless "interoffice memo" environment.

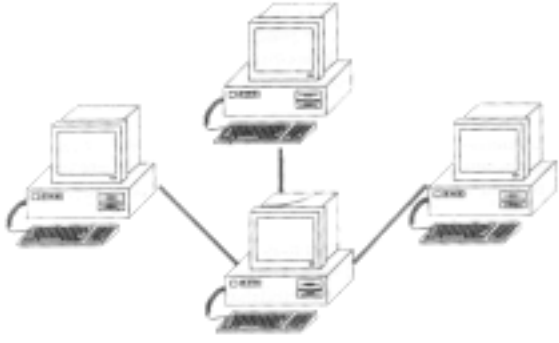
2. Network Topologies

Topology is the physical layout of the cables that connect the nodes of the network. LAN can defer in their topologies. There are three Network topologies: Bus, Star and Ring. Depending upon number of factors the topology is selected for implementing network.

(i) Bus Topology: This topology is used when a network installation is small, simple and temporary. A single cable winds from station to station, connecting all computers along the way. Only one computer can send a message at a time. A computer must wait until the bus is free before it can transmit.

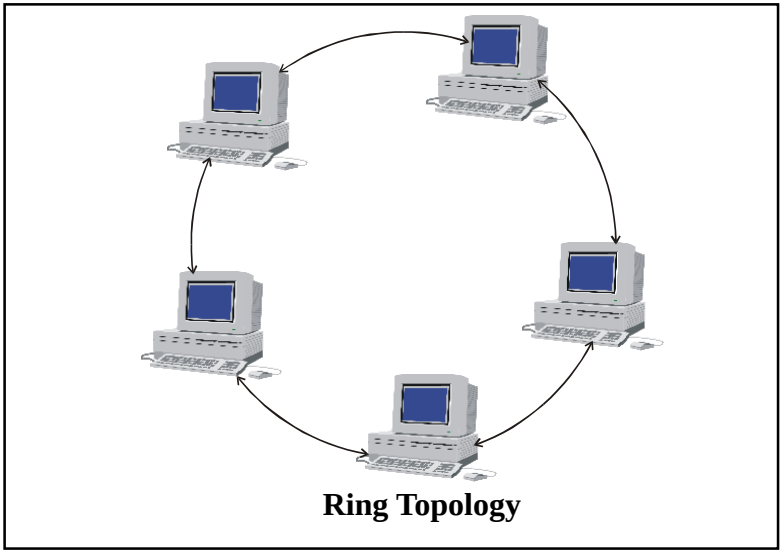
Bus Topology

(ii) Star Topology : All the cables run from the computers to a central location, where they are all connected by a device called hub. Each computer communicates with the central hub, that sends the message to the destination computer. It is easy to remove or add computers to the network without disturbing the rest. Main disadvantage is that if central hub fails entire network fails.



Star Topology

(iii) Ring Topology: Each computer is connected to the next computer with the last computer connected to the first. Ring is used in high performance network. Message flow around the ring in one direction. Some ring networks do token passing. The main disadvantage is that failure of one computer on the ring can affect the entire network.



Ring Topology

5.2.3 Wide Area Network (WAN)

The term Wide Area Network (WAN) is used to describe a computer network spanning a regional, national or global area. When many Networks in the world connected to each other either by Optical Fibre Cables (OFC), Telephone lines or Satellites, then it is called as Wide Area Network. Internet is the ultimate system of WAN, because it connects many thousands of computers and LAN around the world.

In India number of private and government organisations are establishing LAN and WAN. Railway booking all over India, District head quarters connected through NIC (National Informatics Center) network, networks established by industries like Sudarshan Chemicals, TELCO, BAJAJ are some of the examples.

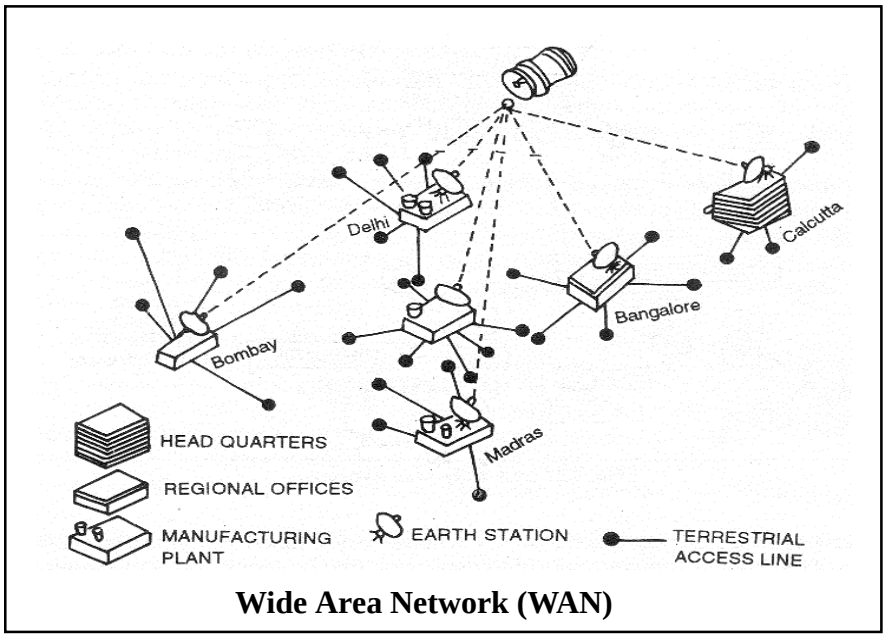
Advantages of Wide Area Network (WAN)

(i) It enables communication and exchange of information.

(ii) Sharing of expensive hardware amongst all computers.

(iii) Sharing of expensive software amongst all computers.

(iv) Centralized administration of all computers and users.



Wide Area Network (WAN)

5.2.4 Network Devices and Media

A LAN is a combination of computers, LAN cables, network adapter cards, network operating system (NOS) software and LAN application software. No matter what topology is used, all networks rely on media to link them together. In network communication media refers to wires, cables and other means by which data travels from source to destination. The most common media for data communication are twisted pair wires, coaxial cables, fibre-optic cables and wireless links.

(1) Workstations (Clients) : The workstations are the various PCs or terminals connected to the file server. People use these PCs as a stand alone machines or with network software, link to the file serve to access programs, data, printers, etc. Workstations are sometimes referred to as clients. A workstation usually has a smaller capacity hard disk (100 MB or less).

(2) File Servers : A file server is a computer that serves all the workstations – primarily by storing and retrieving data from files shared on its disk. File servers are usually fast Pentium computers with large capacity RAM. They usually have monochrome monitors, inexpensive keyboard, with fast, large and expensive hard disks. The file server's hard disk(s) must be durable and reliable.

(3) LAN Cables : LAN cables are the nervous system of local area network. These cables connect every computer peripherals such as printers to the file server and. LAN cable comes in different varieties as follows :

(i) Coaxial Cable: Coaxial cable, sometimes called coax. There are two conductors in coaxial cable, one is a single wire in the centre of the cable, and the other is a wire mesh shield that surrounds the first wire with an insulator in between. This cable is widely used for cable TV networks. Coaxial cables can carry more data than earlier twisted pair wires, and it is less susceptible to interference from other wiring. This cable is expensive and hence less popular. Two types of coaxial cables are used in networks: Thin and Thick.

(ii) Twisted Pair Wire: Normally consists of four or eight copper strands of wire, individually insulated in plastic twisted around each other in braided pairs and bound together in another layer of plastic insulation. Indoor wiring for telephones uses twisted pair wire, so twisted pair is often called telephone wire. There are two type of twisted pair wires: Shielded Twisted Pair(STP) and Unshielded Twisted Pair(UTP). Networks based on twisted-pair wires support transmission speeds up to 150 megabits per second (Mbps).

(iii) Optic Fibre Cable (OFC) : It is a thin strand of glass that transmits pulsating beams of light instead of electric frequencies. Because light travels at much higher frequency than electrical signal fibre optic cables carries data at the rate more than billion bits per second. Disadvantage of OFC is that it is more expensive and more difficult to install.

(4) Wireless Links : Today, wireless communication is competing with twisted-pair, coaxial, and fibre-optic cable. The advantage of wireless communication is the flexibility that it offers in terms of the network layout. Wireless communication relies on radio signals or infrared signals for transmitting data. Corporate WANs often use microwave transmission to connect two LANs within the same metropolitan area. If a company has building on opposite sides of town, it can set up a microwave antenna on top of each one to move data back and forth quickly. This type of communication, however, requires an unobstructed line of sight between the two

antennas. WAN that cover long distance often use satellites and microwave communication.

(5) Network Adapters : A network adapter card, like a video display adapter card, fits in a slot in each workstation and file server. The NIC is a printed circuit board that fits into one of the computer expansion slots and provides a port on the back of the PC to which the network cable can be connected. The computer also requires network software, which tells the computer how to use the NIC.

(6) LAN Software : LAN must have a network operating system. The most popular network operating systems are Netware from Novell, Windows95, Windows NT from Microsoft and OS/2.

(7) Internet Terminology : The Internet is the ultimate WAN. So you need to be familiar with the terminologies of Internet, which are used frequently. The terminologies are as follows:

(i) Modem : The term modem stands for Modular/Demodulator. A modem is a device that enables a computer to transmit data over telephone lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms.

(**ii) TCP/IP** : A protocol can be defined as a standard set of rules to be followed by all computers wanting to talk to each other. This enables different types of computers running different types of operating system to communicate efficiently. The de-facto standard today is **TCP/IP**. The acronym **TCP/IP** stands for **T**ransmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol.

5.2.5 Network Protocol

Both the network software and the NIC have to adhere to network protocol, which is a set of standards for communication. A network protocol is like a language computer use for communicating data. For computers to share data, they must speak the same language. The network operating systems (NOS) components on each workstation and the file server communicate with each other using a computer language called a protocol. Some of the protocols are as follows :

(1) FTP : One of the methods of getting information via network is called File Transfer Protocol (**FTP**). Using **FTP** a user can copy computer files from a remote computer to his computer. This process is called file downloading. Similarly, a user can also send files from his computer to a remote computer. This is known as file Uploading. **FTP** is a standard protocol i.e. it consists of a standard set of commands for file downloading and uploading.

The remote computer from which you are transferring (i.e. copying) files is called the **FTP** server.

(2) Ethernet : Currently, Ethernet is the most common network technology used. Originally it was designed for bus topology but now Ethernet is used with star topology also. Ethernet requires each computer or workstation on the network to take its turn to send data. It must first determine whether the network is available. If two nodes inadvertently transmit simultaneously, the conflict is detected and they retransmit one at a time. This approach to network communication is called CSMA/CD (Carrier Sense Multiple Access/Collision Detection). With many computers on Ethernet, access time can become noticeably longer.

(3) Token Ring : Token ring is used with Ring topology. The controlling hardware in a network transmits an electronic token which is passed between computers one after other. If the token is not currently in use, a computer can copy data into the token and set the address where the data should be sent. The token then continues around the ring in the direction in a controlled manner. With this approach, data cannot collide and no complex mechanism is required for controling.

(4) ARCnet : **ARCnet** (**A**ttached **R**esource **C**omputer **net**work) has both a topology and prptocol all its own. ARCnet uses either twisted-pair or coaxial cable and star topology is formed with hubs attached to the network.

5.3 Glossary

Computer Network : Interconnected computers.

LAN : Local Area Network.

WAN : Wide Area Network.

Topology : Physical layout of the cables that connect the nodes of the network

Client : computer or program that requests a service of another computer or program.

Server : computer or program that provides services to other computers or programs.

Baud Rate : The baud rate is the speed at which your modem can transfer data Baud rate is also called **BPS** (**B**its **P**er **S**econd).

5.4 Summary

Today, the networking technology has become the most explosive area of growth in the entire computer industry. The world network has several definitions. The most commonly used meaning is a way to connect computers together so that they can communicate, exchange information and pool resources. Networks come in many varieties, such as LAN (Local Area Network) and WAN (Wide Area Network) – especially the Internet. All networks rely on media to link their nodes and serves together. The most common media for data communication are twisted-pair wire, coaxial cable, fibre-optic cable and wireless links. The commonly used wireless communication media are radio signals, telephone links and modem, microwave antenna, and satellite. A network protocol is like a language computer use for communicating data. The most common protocols used in networks are TCP/**IP**.

5.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Write on significance of Network in modern communication.
2. Write note on network devices and network media.
3. Explain Bus, Star and Ring Topology of Network Technologies.
4. What is Networking ? Explain the different types of networking with examples.

Unit 6 : Internet Technology

Index

6.1 Introduction

In 1969, United States Department of Defence Advanced Research Projects Agency (DARPA) project established the ARPANET. It was the first WAN and had only four sites. In 1973, American computer scientist Vinton Cerf developed Internet technology as part of DARPA project.

In the late 1980's, the American government through it's agency the National Science Foundation (NSF) set up five supercomputer centers, which become the main nodes of the internet, to which the universities and research labs all over world got connected. Later the NSF permitted commercial network to be connected to Internet. In 1984, development of technology and the running of network were turned over to the private sector, research and scientific agencies for further development. Now the Internet has emerged as one of the most powerful tools for global communication. There are millions of internet users and the number is growing every

day. The information and services that the Internet provides is also increasing everyday. Technology and the Internet have supported global collaboration among people and organizations, information sharing, networking innovations and rapid business transactions. Gradually, commercial use increased as the restrictions were eased. Today the American Government has no part in running and maintaining the internet. It is governed by INTERNIC (Internet's Network Information Centre). The growth of Internet became faster when World Wide Web (WWW) came into existence.

After the study of this unit, you will be able to know and understand :

- What is Internet.
- Applications of Internet.
- Features of e-mail
- Hardware and software required for internet connection
- Working of Internet

6.2 Content

6.2.1 What is Internet ?

Internet is a worldwide network of computer networks. It is an open interconnection of networks that enables connected computers to communicate directly. These networks are scattered all over the globe, yet are interconnected making it possible to communicate with each other in seconds. Internet is not owned by any individual, organization or country; it is a free for all open service facility.

In India, the Internet services were officially made available to public from 15th August 1995 onwards through Videsh Sanchar Nigam Limited(VSNL). Today there are many service providers offering Internet services.

6.2.2 Use of Internet

Internet has become popular because of its variety of uses. Some of them are listed below:

1. Communicating with other People

There are many ways by which you can communicate with people on the Internet. Some of them are as follows:

(i) E-mail : the most common use of the Internet is electronic mail (E-mail). Using e-mail a user can send text, pictures, sounds, programs, or even movies to any other person anywhere in the world. There are two main advantages of using e-mail over normal mail. The first is the speed at which delivery takes place almost instantaneously and the second is that it costs almost the same regardless of the fact that you are sending mail to next door or to someone living 10,000 km away. You have to pay only for the connect time necessary to transmit the message.

(ii) Internet News : There are a number of news groups on the Internet. The messages sent to a newsgroup are simply posted on the electronic notice board. Anyone can see these messages. You can place your own news items or can access the news items placed by others. There are thousands of newsgroups. These newsgroups are organised by their content type. For example, the COMP groups are computers related while the REC groups are recreational in nature. The wild and most unpredictable groups are the ALT or alternative groups.

(iii) Chatting and Conferencing : Yet another method of communicating on the Internet is known as Internet Relay Chat (IRC). Using IRC you can speak to other users around the world virtually in real time as though you were in the same room. Now-a-days, you can also have Audio and Video conferences using appropriate software.

2. Getting Information

Internet provides a tremendous wealth of information. There are millions of computer programs and data that have been made available to the users. These files may be text files, graphics files, sound files, full motion video files or even program files. There are number of ways in which you can obtain the desired information.

(i) **World Wide Web (WWW) :** It is set of interconnected pages that represent specific web sites. These web pages are rich in illustrations, graphics and multimedia contents.

(ii) **FTP :** File Transfer Protocol enables files to be downloaded from various computer file servers and archives. Many hardware and software manufacturers, educational organizations and institutions have set up FTP sites from which you can download software, instruction materials, updates, etc.

(iii) **HTTP :** Hyper Text Transfer Protocol is the preferred means of transferring hyper text documents over the Internet.

3. Connecting the other Systems

We can link to a remote computer via the Internet and gain access to the data, information and programs stored on it. Computer can be linked to remote computers using other communication media such as direct connection using a cable, but in such cases the cost of communication is too high and most people cannot afford it.

Using an appropriate program such as Telnet, an Internet user can use the Internet's transmission medium to connect to other computer system directly. Once a connection is established with a remote computer, the user can use that remote system as if his computer were a hardwired terminal of that system.

Using the above mentioned features, a user can do almost anything, he wants to do on the Internet like :

- Sending and receiving messages (e-mail).
- Receiving news updates about specific events or topics.
- Reading or copying information stored on other computers.
- Reading newspapers, magazines and newsletters.
- Downloading computer software.
- Sharing of expensive hardware.
- Centralized administration of all computers.
- Posting and reading public messages to exchange news and information about certain topics or areas of interest.

E-mail

Undoubtedly, e-mail is the most commonly used and arguably the most useful service on the Internet. It enables this to keep in touch with far-flung friends and to get tons of publication and lively discussion delivered in your e-mail boxes. It also had a tremendous impact on global business communications. E-mail provides an entirely new wrinkle on communicating in a quick, casual, and often spontaneous way. Just think of all the people you talk to via e-mail (many whom you've met online only) with whom you wouldn't have stayed in such close contact by snail mail or telephone. Unlike the phone, e-mail doesn't interrupt your immediate attention. It waits patiently for you to read it and answer. E-mail is a point-to-point communications, offering relative privacy in an increasingly public world.

E-mail is like a magic. Type your message, tell your mailer whom the message is supposed to be delivered to and click the mouse. And within a few seconds, the message can travel right to the person to whom we wanted to send it to. It is possible to send attachments with e-mail. Attachment can be text, picture, audio or video.

To use e-mail facility you must have an e-mail account. There are many e-mail services available offering you e-mail account. Some of them are free. Each e-mail service has its own strengths. You will have to decide which service suits you best based on your specific needs.

6.2.3 Requirements for Internet Connection

In order to start internet connection, in addition to computer and telephone connection facilities, the following requisites are ncessary :

1. Browser

A browser is a software which allows you to get connected to the Internet and browse its contents. Browsers act as interface between you and the Internet. When you ask for some information, the browser sends the query to the web server and on receipt of the same displays it on the screen. A browser can either be text-oriented or have a graphical interface. Internet Explorer or Netscape Navigator are the commonly used internet browsers.

2. Modem

Modem is required to communicate/transfer data between computers at different placed through telephone line. Modem is a device that takes digital information from your computer and converts into analog that can be transmitted through phone lines. Those can be converted back into digital information by the other computer's modem. Modem can be divided into two categories according to their internal structure, one is half-duplex and other is full duplex. Half-duplex can perform only one function at a time, it will transmit or receive the data at particular instant. Full duplex can perform both functions at a time.

Modem can be internal or external to the computer. External modem looks like a small box which should be connected externally to computer. Internal modem comes in the form of circuit board which should be fitted on mother board. External modems are more popular than internal modems.

Every modem has capability to transmit and receive data. Modem with different speed (measured in kbps – kilobytes per second) are available in market. With higher speed of modem, you can exchange data faster. Hence it is recommended to use high speed modems. Today the transmission speed 56.6 Kbps (Kilobytes per second) is the preferred standard for modems. GVC, US Robotics, D-link are some of the companies providing modems.

3. Internet Service Provider

While the Internet facility is free for all, you just can not avail of it directly. You have to register with an Internet Service Provider (ISP). ISP is an agency or an organization, which provides the user an access to the Internet. VSNL, BSNL, Satyam are some of the ISPs in India.

6.2.4 How to Connect Internet ?

Type of connection you require is depends on your usage i.e. how many hour you are going to use your connection, for what purpose you are going to use internet. There are two ways you can connect to your Internet Service Provider: Using dial-up account or using a leased line.

1. Dial-up Account

This is the least expensive means of accessing the Internet and it requires very modest hardware and software resources. If your Internet usage is 1or 2 hours per day or it is limited, dial-up account is suitable. Dial telephone number of your service provider and connect your computer to service provider's server. You can log on to the internet either by way of Serial Line Internet Protocol (SLIP) or Point to Point protocol(PPP). The major disadvantage of Dial-Up connection is their slow speed and low reliability. Regular telephone lines are used that may be very busy during peak hours thus slowing the process. Also, telephone lines are not very reliable. A little disturbance may break the connection to the Internet.

Dial-up account also has 2 categories as follows:

SHELL ACCOUNT : In a Shell account your computer acts as if it is a terminal directly connected to some Internet host. Shell account can view only text based information on the terminal. You can not view graphics or hear sounds. Using a Shell Account you can use FTP, IRC and e-mail. However, the shell accounts are not very useful in accessing the WWW. Shell accounts are not very user friendly as they provide only text-based interface. The only advantage of shell account is its low cost.

TCP/IP ACCOUNT : Transmission Control Protocol/Internet Protocol (TCP/IP) is more expensive but you can access graphics, picture, audio and video with this type of account.

Internet Protocol (IP) is the transmission protocol. IP ensures a through path for the transmitted data packet by searching for alternate data transmission routes from amongst a number of possible connection choices. IP is not assigned the role of ensuring error-free transmission. The need for error-free packet transmission was fulfilled by another protocol called Transmission Control Protocol (TCP). TCP and IP together ensure error-free data transmission in a fault tolerant manner over the entire network from anywhere to anywhere. The combined protocol is called TCP/IP protocol. All the networks of the Internet use the TCP/IP data transmission protocol. TCP/IP account allows your computer to function as an Internet host. TCP/IP accounts are very user friendly and provide a graphical interface to the users. You can view graphics and play sound if you have a TCP/IP account.

2. Leased Line

This option provides full Internet access by dedicating a leased telephone line between your network (or individual PC) and an Internet Service Provider (VSNL/ SATYAM). If you require 24 hour internet connection or you are engaged in management of web server leased line is necessary for you. This uses a cable or a dedicated telephone line to connect directly to your ISP. The dedicated connection has many advantages. The major advantage is the fast speed and better reliability. With direct connection, you can have many users of your LAN connected to the Internet through a single leased line. You do not need a modem on each individual computer that is connected to your LAN. The computer on your desktop is always connected to the Internet.

You can be a provider of information, not just a user. If your network is connected directly, you can make information about your organization available to anyone on the Internet. Which is not possible in case of a dial-up connection. In dial-up connection you can only access the information on the Internet.

An example of this mode is the widely used ISDN (Integrated Service Digital Network) line, which is a higher speed version of the standard telephone line and can handle data transfer speed more than 56.6 kbps.

The disadvantage of dedicated connection is that the cost of communication is too high. Also dedicated connection is more complex and difficult to maintain.

6.2.5 How Internet Works ?

You don't need to understand exactly how the Internet works to use it. However little background knowledge can be helpful.

Internet works on networking principles. Internet is a network of billions of computers linked together by standard telephone lines, fiber optics cables and satellite. At the core of Internet is a network of powerful mainframe computers- known as super computers-located at sites all over the world. These machines are connected by high speed links which are known as "backbones".

For the majority of ordinary users, access to the internet comes in the form of commercial service providers who run powerful computer system connected to the

supercomputer backbone. In internet there are two types of computers. One is "client" and second is "server". The computer holding all the information is known as server and the computer through which you request for information is called "client".

1. Protocols

We know that internet is a network of computer spread all over world. All computers in this network are not similar. Hence to transfer information from one computer to other or for proper communication between two computers some rules are laid down. These rules are know as protocols. We will see some of protocols and their use in internet.

(i) Transmission Control Protocol/Internet Protocol (TCP/IP) : It converts your message into small packets. These small packets are then transmitted to other computer. This protocol is always used with Internet Protocol. Hence, they combinely called as TCP/IP. The following example will illustrate this working :

If you sent e-mail to your friend in Mumbai, TCP will convert your message into small small packets. Every packet will be given particular number. Your address and your friend's address is then attached to these packets. Internet protocol (IP) will transfer these packets to your friend's address. At your friend's computer, TCP will collect all these packets and if any packets are not properly collected, it will ask to send same packets again. After receiving all packets, it organises all packets in proper sequence and deliver to your friend.

(ii) Point to Point Protocol (PPP) : PPP account is one of the services provided by TCP/IP connection. With PPP account, any computer on Internet can establish direct connection with your computer. Main advantage of PPP account is that you can use many client programs at time, e.g. you can use web client, mail client and FTP client at a time.

(iii) POP : POP has two meaning one is point of presence. This means, at any place or city, if POP service provider is present you can connect your computer to internet by dialing a local call. Second meaning is post office protocol. Every Internet service provider provides e-mail account with every connection. POP is type of e-mail account.

(iv) Hyper Text Transfer Protocol (HTTP) : This protocol is used to transfer hyper text file from one place to other place on internet.

(v) File Transfer Protocol (FTP) : All over the world many laboratories, institutes and research centers have lot of information regarding various subjects on their computer. In computer language, this information on computer is called as files. You can get these files using file transfer protocol (FTP).

Computer on which these important information is available are called as FTP sites/servers. To find information from such FTP sites search engines like Archie are used.

(vi) Gopher : This is yet another approach used to search for desired information on the internet, developed by the University of Minnesota. Gopher systems are more structured and easy to use.

(vii) WWW (World Wide Web) : The World Wide Web is officially described as a wide-area, hypermedia information retrieval initiative aiming to give universal access to a large universe of documents. WWW provides a consistent means to access a variety of information in a simplified manner to the users on computer networks. Some people consider the WWW to be the Internet. This is not correct. WWW is just one of the many technologies that the Internet makes possible. We will discuss about WWW in next unit.

2. Domains and Addresses

Every computer connected to the Internet is identified by a unique address. The term unique means that no two computers connected to Internet can have the same address. There are two types of addresses: (i) Domain Names, (ii) IP addresses – that help in locating a computer on the Internet.

(i) The Domain Name System (DNS) : A domain name helps in locating a computer on the Internet. A typical domain name indicates the country in which the computer is located and which organization owns it. The term Domain Name System (DNS) refers to the systematic hierarchial organization of domain names. The hierarchial organization of domain names helps in locating a computer on the Internet. These domain names are organised either on the basis of geographical regions or on

the basis of type of the organization that owns the computer.

Examples of domain names : Geographical Location: They indicate the country in which the computer being referred to is located. (in – India, us – USA, au – Australia,)

Organization type: edu – educational organizations, com – commercial organizations, net – Network Service Providers; gov – Government Organizations; org – Non commercial organizations

Internet service providers : sancharne – Bharat Sanchar Nigam Limited, vsnl – Videsh Sanchar Nigam Limited

Each Internet user is identified by the unique address. Each user is identified by his user name followed by @ symbol and domain name.

For example, smk@sancharnet.in refers to a user smk on a computer identified by sancharnet.in. BSNL is the service provider here.

However, there are also a number of non-geographical domain names. Some of the common non-geographical and geographical domain types are listed as follows:

(ii) IP Addresses : The domain name system is of no use for computer as they understand only numbers. Therefore, each DNS name has a corresponding numeric address called IP address (Internet Protocol address). Each computer connected to the Internet is called host, and each host is identified by its IP address. Whenever you specify a DNS name to access a computer on the Internet, this DNS name is first mapped on to an IP address. This IP address is then used to locate the computer on the Internet. The IP addresses are read and managed by computers. You just have to remember the DNS name corresponding to an IP address.

IP address can be compared with telephone numbers. For example, a telephone number 91-022-57856924 identifies a unique telephone subscriber (57856924) located in India (91) at Mumbai (022). Similarly an IP address is made of four parts and look like 202.54.24.230. Parts of an IP address are separated by periods. Each part is referred to as an octet. Each octet is basically an 8 bit binary number, thus an IP address is a 32-bit number. Using this addressing scheme, it is possible to have 232=4,294,967, 296 unique addresses.

(iii) Universal Resource Locator (URL) : A standardized way of representing different documents, media and network services on the World Wide Web is called URL. A URL is composed of a protocol type, an address, a port number in some cases and a path. The protocol type may be one of the many types like **http** which signifies a **www** server, gopher which implies a gopher server, FTP, telnet standing remote login, etc. As a user we need not worry about URLs; the HTML and HTTP takes care of them.

6.3 Glossary

HTTP : Hyper Text Transfer Protocol

HTML : Hyper Text Mark-up Language.

ISDN : Integrated Services Digital Network.

LAN : Local Area Network.

WAN : Wide Area Network.

WWW : World Wide Web.

Internet : Network of Networks.

URL : Universal Resource Locator

ISP : Internet Service Provider

Modem : The term modem stands for Modular/Demodulator. A modem is a device that enables a computer to transmit data over telephone lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms.

Client : Client is a computer or program that requests a service of another computer or program.

Server : Server is a computer or program that provides services to other computers or programs.

Baud Rate : The baud rate is the speed at which your modem can transfer data. Baud rate is also called BPS (Bits Per Second).

TCP/IP : A protocol can be defined as a standard set of rules to be followed by all computers users wanting to talk to each other. This enables different types of computers running different types of operating system to communicate efficiently. The de-facto standard today is TCP/IP. The acronym TCP/IP stands for Transmission Control Protocol/Internet Protocol.

Hyper Text Transfer Protocol (HTTP) : This is a protocol that world wide web (WWW) clients and servers use to communicate.

Universal Resource Locator (URL) : A standardised way of representing different documents, media and network services on the world wide web. For example, http://www.ycmou.com is a URL, which refers to a hypertext item.

6.4 Summary

Internet is network of computers and computer networks worldwide. Internet is used for many purposes. E-mail is the one utility that everyone with access to the net uses. E-mail has changed the communication methods drastically. With introduction of WWW Internet has become so popular that it has billions of users today and the number is increasing every day.

There are different ways of getting connected to Internet. Dial up networking is the one which uses telephone lines. It has again two types: Shell Account and TCP/IP account. Due to WWW most user are now preferring to have TCP/IP account which supports graphic and other media. Those who use Internet heavily prefers leased line connection. It is more reliable and high speed communication is possible. The Internet consists of diverse computers, operating systems and people. It needs a common standard set of protocols, interface specifications and usage guidelines. The network operating systems (NOS) components on each workstation and the file server communicate with each other using a computer language called a protocol.TCP/IP, PPP, HTTP, FTP are some commonly used protocols.

To identify each computer on the Internet unique addressing system is essential. DNS and IP addresses take care of this. Using this addressing scheme, it is possible to have 232=4,294,967, 296 unique addresses.

6.5 Exercises for Practice

Answer the following questions in 200 words each.

1. What is Internet ? Explain its uses in modern age.
2. Write a note on e-mail communication.
3. Explain the Domain Address in detail and give its advantages.
4. What is mean by Protocol ? Enlist the different protocols and their importance.

Unit 7 : World Wide Web

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7.1 Introduction

The World Wide Web (WWW) was developed in 1989 by an English computer scientist Timothy Berners Lee to enable information to be shared among internationally dispersed teams of researchers. It subsequently became platform for related software development and the number of linked computers and users grew rapidly to support a variety of endeavors, including a large business marketplace. Today WWW has become the most active ingredient of Internet.

WWW sites have easy to use, point and click, multi media endowed graphical interface that provides a web of inter linked and interrelated documents over the net. Most of the web sites have graphics that are stunning, animations that attract and hold your attention, the built in background music that almost intoxicates, videos that captivate you.

After the study of this unit, you will be able to know and understand :

- World Wide Web
- How to access WWW
- Web Multimedia

7.2 Content

7.2.1 World Wide Web

The World Wide Web is officially described as a wide-area, hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

The term hypermedia has been derived from hypertext. Hypertext is text that is non-sequential or non-linear in nature. The reader is able to choose a path to delve deeper into the information. Hypertext describes the ability to link related documents together using words and phrases. Hypermedia is a natural extension of hypertext in that the contents of each document include much more than text. They include multimedia (images, sounds and video).

WWW provides a consistent means to access a variety of information in a simplified manner to the users on computer networks.

Some people consider the WWW to be the Internet. This is not correct. WWW is just one of the many technologies that the Internet makes possible.

WWW is a system of resources available to computer users who are connected to an Internet. It enables users to view and interact with a variety of information, including magazines, archives, public and university library resources, current world and business news and programs. It provides a web of interactive documents that contain text, pictures, graphics, multimedia, animations, etc. WWW resources are organized to allow users to move easily from one resource to another. Hypertext and hypermedia links the resources. The user can navigate through information by pointing to specially designated text or other objects on the screen. These objects link the user to other WWW pages on the same server or any other WWW server on the network.

The WWW links exist across the global Internet to form a large scale, distributed, multimedia knowledge base that relates words, phrases, images or other information. Web pages are hosted by various individuals and organizations, both public and private. Anybody who wants to post the information on web can create a web site. WWW has become one of the most cheap, lucrative and easy means of advertising on the Internet which commands global attention. No organizational setup, no investment for setting up shops and show rooms is required. Whole world is your market. The increasing popularity of WWW can be gauged from the fact that from a mere few hundred web sites in October 1993, today the number is in billions and it is still expanding.

7.2.2 Web Browsers

Web browser is software which is required to see information on internet. These browsers provide you with powerful, easy to use features that allow you to take full advantage of the Web contents. The browser presents formatted text, images, sound or the objects such as links in the form of a WWW pages on a computer screen. It also give access to special multimedia contents that provide audio, video and interactive web pages. In past it was only used as web browser but now many leading web browsers provide other internet services such as e-mail, news group, telnet etc. Two popular browsers are Netscape Corporation's Netscape navigator and Microsoft's Internet Explorer.

1. Internet Explorer

At present Internet explorer version 6.0 and higher is available in market. When you load this browser, browser window will appear on your screen.

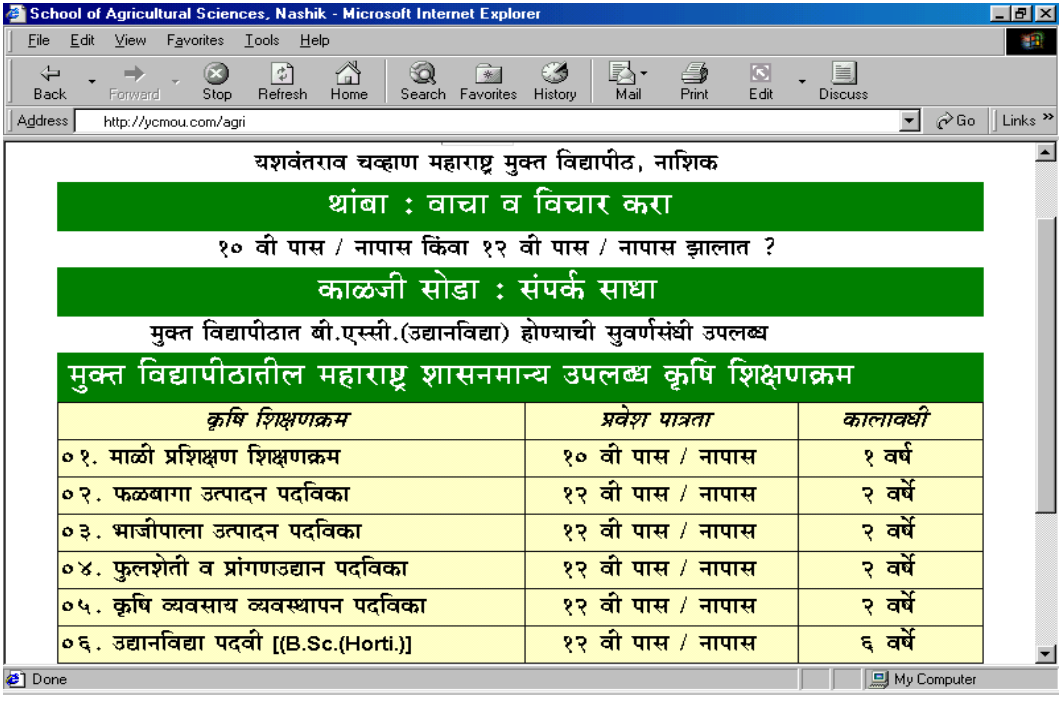
(i) **Address Box :** this address box shows which site you are seeing. If you want to go to particular site, type it's address here and press enter.

(ii) **Activity Icon :** when this icon is moving, it shows that your browser is receiving information from server.

(iii) **Navigation Tool Bar :** it is used while surfing the Internet. Detail use of each button on navigation toolbar will the described later.

(iv) Scroll Bar : To move web page in upward and downward direction.

(v) Status Bar : It shows you status of receiving information e.g. which page your computer is receiving, how many items are still to be received etc.



Now we will see uses of each button in navigation Tool Bar.

(i) Back : This button will take you back to previous page you have seen.

(ii) Forward : This button will take you to immediate next page you have visited before.

(iii) Stop : Stops all activities

(iv) Refresh : Reloads the current page.

(v) Home : Home page appears in the browser window.

(vi) Search : Search for topic or new topic.

(vii) Print : Prints the information on the web page.

(viii) Favorites : You can store your favorite sites here for front action. To store your favorite site, open the site. In menu bar, go to favourites and click on "Add to favourites". To open this site again, click on favourites in navigation bar and select it. Your site will be on the left side.

(ix) History Folder : when you are on internet you go through lot of sites but after some time you can't remember which sites you have seen. This list is available in history folder. To see this list click on go in menu bar and then click on open history folder. List will appear in front of you.

Netscape navigator also similar to Internet explorer, with slight differences.

7.2.3 Searching Information on Web

Searching information on net is just like searching book in any library, to get particular book you have to tell subject or author name to librarian. Librarian is there to help in your search. Similarly search engine will help you to search on net. Only difference is that librarian is a human being hence he can judge what you want but computer will do search according to keyword given by you. Some search engines ask you questions to narrow your search.

Performing a search varies little in principle from one search tool to another. Type a keyword or series of keywords, which are used to generate a list of websites that contain these keywords. This list usually contains brief description of each site along with its listed address. By clicking the listed address, you move directly to the chosen site.

Search Tools

With at least millions pages on world wide web, the task of finding precisely what you are looking for is difficult. Search tools available on the web, makes your search more easy. Many web based search Engines are available. They return the results of an Internet search in a matter of seconds. The two main types of search tools are web directories and search engines.

(i) Web Directory : web directories are well organised lists of topics and subtopics through which you can navigate to find a web site that matches what you are looking for. This is much like consulting a huge index. Following are some famous web directories :

Accufind : http://uin.com

Galaxy : http://galaxy.einet.net

Magellan	:	http://magellan.mckinley.com
Pointcom	:	http://www.pointcom.com
Yahoo	:	http://www.yahoo.com
The yellow pages	:	http://theyellowpages.com

(ii) Search Engine : Search engines are more powerful in that they do the searching for you by following the instructions you give. The more detailed your instructions, the more accurate the results will be. Some of the most famous search engines are : **altavista, google, khoj, yahoo**

7.2.4 Web Multimedia

More new and exciting applications of internet multimedia are invented almost daily. Some work well, is of value, and survive consumer tastes and competition. Some enjoy little short lived success and become eclipsed by other products and technology. Within all this competitive innovation are some common aspects that are important to developers of Internet multimedia content and applications.

Using Internet multimedia as an added-value component :

Multimedia technology enables the inclusion of media content (text, image, audio, video, etc.) as data in many forms of applications. Because it has a huge source of such diverse data and software applications, the internet could conceivably function as a vast virtual disk drive attached to your computer having almost infinite store of digital wealth. Using a browser application you can access the applications and data on millions of web pages throughout the world.

1. Thin Client Network Computers

Computer users can function productively forever, if all the software and reloaded data, is accessible on-line. To use these applications and data fully, computers would not have to be very sophisticated –just powerful enough to process quickly internet multimedia applications and the data they use. Computers would not have to have huge hard drives, CD-ROM drives floppy disks and many other features of full blown deskpot computer system. They could be smaller, cheaper and more optimised for internet use than their deskpot multimedia cousins. This is the concept behind a new

family of computers called thin client network computers. Several mainstream manufacturers are beginning to producing these thin systems. Compared to an internet-ready multimedia desktop system, the prices of these computers are very attractive. As an internet multimedia developer, you have a tremendous opportunity to create application for such systems.

2. Internet Aware Applications

Following the same concept of the internet as a vast disk drive, many new desktop software applications are incorporating links to internet websites within the application itself or through the system's browser application. Beyond providing a URL address for information, upgrades, and technical support, applications are now making the actual Internet connection for registering the new software product over the internet during the installation.

Already, a new generation of applications one providing web site –based help files and on-line technical support accessible from within the application itself. Many accounting references, market information, and other applications provide results and research data based on instantly updateable source of data.

Software is generally becoming more multimedia oriented and internet aware. for example, many book publishers have their own web sits at which you can find out about the latest advances and updates about the book published, and link to related sites.

7.2.5 Indian Agriculture Web Sites

Addresses of some Indian Agriculture Web sites are given below. You can start web browsing with these sites. You can use search engines for finding sites of your interest and needs.

www.ycmou.com/agri
www.khetiwadi.com
www.kisan.net
www.krishiworld.com
www.nic.in/agrico

www.pravara.com
www.agrinto.com
www.nabard.org
www.agriwatch.com
www.ciks.org/agri.html
www.agri.mah.nic.in

7.3 Glossary

World Wide Web (www) : The hypermedia document presentation system that can be accessed over the internet using software called a browser.

Web Pages : Information written in web languages to display on Internet.

Website : It is collection of web pages gives information about that Company or Institute or Organization.

Web Server : Computer in which Web site is stored or hosted.

Web Site Address : Unique address of the computer (web server) in numeric or character form for identification e.g. http://www.ycmou.com

Web Browser : Software that allows user to access and view HTML documents as well as most other Internet services. Netscape Navigator and Internet Explorer are two popular web browsers.

Home Page : First page of the web site which gives general idea about the web site (Organization, Institute or University). A default page which appears on the screen, when you connect to internet is also known as Home Page.

Chat : Conversation in IRC (Internet Relay Chat) and other text based conversation areas of the Net are called chats IRC programmmes are called chat clients. American Online calls its “People Connection” areas Chat rooms.

Client : A computer (or application) that has access to services over a network. The computer that can be accessed by the client is called a server. Once connetcted, the client can access the various services available on the such as FTP, Gopher and HTTP.

Cyberspace : Word coined by science fiction writer William Gibson to refer to a near –future computer network on which users can mentally travel through matrices of data. The term is now often used to describe today's Internet.

Document : The term document is used generically to refer to any digital file type, whether text, graphic, sound, etc.

FAQ (Frequently Asked Questions) : Allegedly pronounced "fak," although we always say "F-A-Q."A text file on the Internet that answers commonly asked questions on a given subject. FAQs are a major source of Net-related knowledge and wisdom.

Gatewey : A computer that transfers data between ordinarily incompatible applications or networks.

Host : A computer that users can log on to in order to run programs and access services.

HTML Document : Any document tagged in the HTML format. HTML documents that are accessible on the Web are referred to as web documents.

HTTP (Hyper Text Transport Protocol) : The communications protocol used to transfer documents from servers to clients over the World Wide Web .

Packet : A standard unit of data on the internet, data is broken down into small bundles and are recombined on the receiving end to present the data in its original form.

URL (Universal Resource Locator) : The addressing system used in the world wide web and a proposed addressing standard for the entire Internet. The URL contains information about the method of access, the server to be accessed and the path of any files to be accessed

7.4 Summary

WWW is a system of resources available to computer users who are connected to an Internet. It enables users to view and interact with a variety of information.. Web browser is software which is required to see information on internet. These browsers provide you with powerful, easy to use features that allow you to take full

advantage of the Web contents. Internet Explorer and Netscape Navigator are mostly used web browsers.

With at least millions pages on world wide web, powerful search engines are required to find the things on the web. Many web based search Engines are available. They return the results of an Internet search in a matter of seconds. The two main types of search tools are web directories and search engines.

For internet use, computer could be smaller, cheaper than their desktop multimedia cousins. A new family of computers called thin client network computers are emerging. Several mainstream manufacturers are beginning to producing these thin systems. Compared to an internet-ready multimedia desktop system, the prices of these computers are very attractive.

7.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Why search tools are required in Internet ? Explain the different search tools.
2. What is the use of browsers ? Explain in details of Internet Explorer
3. What is WWW ? Explain Indian Agriculture in World Wide Web with example.
4. Explain the Navigation toolbar in Internet Explorer.

Unit 8 : Communication and Electronic Web

Index

8.1 Introduction

In this unit, we discuss about various communication means and electronic WEB. Due to Internet, large amount of information is available to us. Communication via-e-mail is the fastest and most convenient, common way of communication. It is the communication between sender and receivers where no other in between agency like postman (manual), transportation (physical) and other machinery delay components are involved.

For e-mail communication both sender and receiver must have e-mail account (may be on hotmail, rediffmail, yahoo or any other), and Internet access. There is no need for having Internet connection; you can use Internet from cyber cafés.

You can even set up a network in your home or apartment. Then you can share files, use one Internet connection, and play interactive games with others on the net.

After the study of this unit, you will be able to know and understand :

- Various information services available on internet
- Characteristics of fax and voice mail communication
- E-mail account and use e-mail service.
- Meaning and benefits of video conferencing
- Factors affecting data communication.

8.2 Content

8.2.1 Fax, Voice and Information Services

With communications capability, computer users can transmit and receive data and gain access to information resources in electronic form.

Communication systems present many opportunities for transmitting and receiving information, giving you access to many resources.

Connectivity means you can connect your computer by telephone or other telecommunications links to other computers and information can be shared. This includes computers with their large storage devices, such as disk packs having enormous volumes of information.

Let us consider the options that connectivity makes available to you. These include facsimile (fax), e-mail, voice-messaging systems, video-conferencing systems, shared resources and online services.

1. Facsimile (Fax)

Facsimile transmission has become most convenient tool in almost all offices, business corporate Government as well as private sectors. These devices scan the image of a document (May be text, photographs, sketches and mechanical and engineering drawings, etc), convert the image into signals that can be sent over a telephone line to a receiving fax machine. The machine at receiving end prints the image on the thermal paper. Microcomputer, using fax/modem circuit boards, can also be used to send and receive fax messages. The most of the scanners can be used

as a FAX- cum- scanner- cum Xerox machines but their efficiency in terms of pixel differs varyingly.

2. Voice Mail

With the advancement of electronics and telecommunication voice message system, voice answering system, etc. can be used with our telephone system. Under a voice message system the caller can record the message and send it to more than one person at a time. The receiver(s) can open their voice mail box and know who has sent the message and can store and use the message whenever required. There is facility of forwarding calls to any other telephone, if you wish. Recorded messages can be accessed at the latter time when you come back.

3. Internet Information Services

(i) Web Portals : Web portals are sites that offer a variety of services related to the portal subject. It provides mail service, subject updates, news, discussion forums, FAQs, links to selected web sites related to the portal subject. It acts as your home base and can be used as a gateway to these resources. There are two types of portals. Horizontal Portals are designed to appeal to mass audiences. They offer general interest services and links, vertical portals present focused content to appeal to special interest groups.

(ii) Web Pages : Browsers interpret HTML documents to display web pages. Once the browser has connected to a web site, a document file is sent to your computer. Typically, the first page of a web site is referred to as its home page. The home page presents information about the site along with references and hyperlinks, or connections to other documents that contain related information text files, graphic images, audio, and video clips. These documents may be located on a single computer or on different computers located anywhere around the world. The references appear as underlined and colored text and or images on the web page. All you have to do is to click on the highlighted text or image to access the referenced material. A link is automatically established with the computer containing the material. And the referenced material appears on your screen.

(iii) Web Utilities : Web utilities are programs that work with a browser to increase your speed productivity and capabilities. Many utilities are find in the latest versions of browsers, and others are available free or for a nominal charge. Three are two categories of utilities: plug-ins and helper applications.

(iv) Plug-ins : Plug–ins are programs that are automatically loaded and operated as a part of your browser. Many Web Sites require you to have one or more plug-ins to fully experience their content. Some Widely used plug-ins include:

- Shockwave from Macromedia, used for a variety of web based games, live concerts, and dynamic animations.
- QuickTime from Apple, required by over 20,000 web sites to display video and play audio.
- Cosmos from silicon Graphics, displaying three dimensional graphics and used in sites displaying virtual realities.

(v) Helper Applications (Add-ons) : Also known as add-ons, helper application are independent programs which can be executed or launched from your browser. There are hundreds of helper applications. Most of them are designed to maximize your efficiency. Four of the most common types are off-line browser, information pushers, off-line search utilities, and filters.

(vi) Online Services : Several businesses offer services specifically for computer users. Four well known service providers are America online, AT & T, World Net Compuserver, and Microsoft Network. Typical services provided are:

(vii) Teleshopping : You dial into a database listing prices and descriptions of products such as appliances and clothes. You then order what card the merchandise is delivered later by a package delivery service.

(viii) Home banking : If you arrange it with your bank you may be able to use your computer to pay some bills. Such bills include those owed to big department stores and utility companies. You can also make loan payments and transfer money between accounts.

(ix) Investing : You can get access to current prices of stocks and bonds and can buy and sell online. Similarly you can have market data as demand and supply of agricultural products.

Travel reservations Just like a travel agent, you can get information on airline, railway schedules and fares. You can also order tickets, charging the purchase to your credit card.

4. Off Line Browsers

When you search for WWW for any scientific information e.g. Biological control agents in agriculture, Home pest control etc. it takes time to appear on your screen. In order for a web page to appear on your screen, its HTML document has to be downloaded from the web site to your computer and executed. Data down loading takes huge time when Internet is crowded. It leads to increase in your telephonic bills. Off line browsers offer a solution.

Also known as web downloading utilities and pull products, Offline browsers are programs that automatically connect to selected web sites, download HTML documents and save them to your hard disk, when connection speed is high. You can view the web pages later without being connected to the internet and without waiting for document to be downloaded. Two popular off-line browsers are incontext Flashsite and Teleport pro.

8.2.2 Electronic Mail (E-mail)

It is a way of sending an letter or message in electronic form using internet. E-mail can also be used to communicate same message to more than one person at a time. We can send any type of files (audio, video, images, document) as attachment to the e-mail. Various websites on internet provide this service. Hotmail, Yahoo, Rediffmail are to name a few. Many of the websites on Internet provide free mail facility. In fact one major reason for the astounding popularity of the Internet is its free Electronic mail services.

As compared to other forms of communications, E-mail has many advantages. Firstly, the communication is practically instant. Secondly it reaches the person's mail box to whom it is addressed- no fear of lying on some one else's table for days. Thirdly and most importantly, it is very cheap.

Using E-mail you can communicate with almost any one in the world, irrespective of the recipient's location, distance or time. You can send and receive messages in minutes. If you have right tools, you can even chat with anyone in real time across many thousands of kilometers. E-mail has become a key part of the communications networks of most modern offices.

In order to use e-mail, you require an internet access and e-mail account. You can have internet account of your own or can access it from cyber café. For getting E-mail account you have to register with e-mail service provider. E-mail address is like having a postal address so that the postman can deliver letters to you. The format of e-mail address looks as: username@host.domain.

In order to understand the working of email you should know the following important operative steps

1. How to create an email account.
2. How to access email account.
3. Receiving and Sending an messages.
4. Know more about your mail-box

1. How to Create an Email Account

Email account can be created on rediffmail.com, hotmail.com, yahoo.com, sify.com or any other email service provider. The steps for opening account on rediffmail are given below. The steps are more or less similar for any other service provider.

* Launch the internet explorer.
* Write http://rediffmail.com in address/Location bar.
* Now you will see rediff.com on left corner and corresponding site.
* You will find User Name i.e. email account id and password with a GO button. Below that is a line New user Sign up.
* As you have not yet created account, Click on Sign up and fill the form and submit it. Some of the information on the form is mandatory while some is optional. You have to fill all the mandatory information. It will ask for a user name which is not already used by anyone else. So you may require to

select different name as a user name for your account. Also you will be asked to accept terms and conditions laid down for the use of this service.

* Finally your account will be created.

2. How to Access Email Account

* Now again go to the home page of rediffmail.com
* Enter your User Name and password.
* Now you will see the page on the screen where you will find a link saying "Go to Inbox".
* Click on Go to Inbox and you will be in your mailbox.

You can come out of your mail box by clicking on LOGOUT button.

(a) Receiving Messages

* Clicking the link "Go to Inbox", you will be in the inbox of your mailbox where you will see received mails along with senders names.
* To read the message click on the name.
* You can delete messages by checking the boxes and clicking on Delete button. By doing this you will not be able to view those messages again.

(b) Sending Messages

* Click on Compose button of your mail box and you will see compose screen.
* Here you will find message text area where you can type the message to be send.
* Fields like To, CC, BCC.

To : Type the address of the receiver here.

If you are replying to the message already received in your mailbox you can click on the buttons Reply or Reply All and the compose screen will appear where field To having the e-mail address.

Cc: Here a receiver's address is typed to whom you want to send a carbon copy of the message.

* **Subject :** Here the subject of the letter is typed. This is displayed along with the senders User name in the receivers inbox..
* Attachments Files or images can be attached to this message by using Attachment link, attachment up to 1 MB can be send for one message. (This limit varies from package to package. You can also have more memory by paying for it.)
* Add/remove attachment is used to Add/ Remove attached files.
* Send This button is clicked to send message.
* Save draft is used for saving message and sending it on later date.

(c) Know more about your Mail-Box

* Addresses By using this you can save the list of email addresses and permanent addresses you need frequently.
* Folders :

Inbox : Received messages can be viewed here.

Trash : Deleted messages are stored here temporarily.

Sent Message : Copy of the sent messages can be saved here while sending messages.

Drafts : Messages are saved here for sending them on later date.

. You can create their own folders by using Create New Folder and save important messages/information to these folder.

Empty Trash To delete trash messages permanently from Mail-box.

Settings : You can set or change the earlier specified detail.

(d) Set Personal Details

Change Personal Details You can change your display name, contact information etc.

Change Password You can change your password.

Signature You can attach a digital signature to your outgoing mail.

Tell us your Interests If you specify here your interest you are bound to receive the related information and offers in your inbox.

Set Automatic Reply You can set this option to send an Automatic Reply to your mails while you are away.

(e) Stop Unwanted Mail

Block Sender :You can block a person from sending mail to you.

Adult Filter :You can stop pornographic contents from reaching your Inbox.

Message Filter : You can set your own rules to redirect messages to specified folders.

Junk Mail Filter : You can send all junk email to 'Trash' folder by applying this filter.

(f) Set SMS Preferences

Set Mail Alerts : You can specify email addresses you want SMS alerts for.

Assign Short Names : You can assign short names for complete email addresses. It becomes easy to use short names in place of complete email addresses.

Read Other Mail : Get mail from your other accounts on your mobile phone.

8.2.3 Video Conferencing

Videoconferencing systems are computer systems that allow people located at various geographic locations to have in–persons meetings. Although very expensive, video conferencing saves resources, valuable time and speedup the operation of implementation of any organization. It is finding its place in various corporate sector organizations. Central and State governments, most of the companies having their offices all over India /world like TELCO, BAJAJ, Phillips are using video conferencing facility for conducting meetings, giving instructions or getting information. Meetings can be conducted with short notice. Information can be exchanged very fast and is very helpful in emergency situations. Government personnel in Mumbai can have a

urgent meeting with the collectorate personnel in far east district like Chandrapur, Gadchiroli etc. through video conferencing. Courts have also accepted the use of this technique in legal proceedings.

8.2.4 Factors Affecting Data Communication

Several technical matters affect data communications. They are bandwidth, serial versus parallel transmission, modes of transmission and protocols.

1. Bandwidth

A term used to describe the data–handing capacity of a communications system is bandwidth. Bandwidth is the range of frequencies that is available for the transmission of data. When dealing with peripheral devices, we talk in terms of character per second. However in case of data transmission we talk in terms of bits per second. A communication data transfer rate is measured in a unit called baud. In general usage baud is identical to bits per second. This bits-per-second transmission capability of a channel is called its bandwidth. The different communication channels have different data transmission speeds.

(i) Voice Band : Voice band channels handle moderate data volumes and can transmit data at speeds up to 9600 baud. Major application of Voice Band is telephone voice communication. They are also used for data, depending on their transmission speeds communication channels (paths) are grouped into three basic categories – narrowband, voice band, and broadband As might be expected the cost of the service increases with speed. Hence analysis of the business needs and associated costs is necessary for making a proper choice.

(ii) Narrow Band : Narrowband is also known as sub voice grade channel. Speed range is from 45 to 300 baud. They are used for handling low data volumes and are adequate for low-speed devices. They are used mainly for telegraph lines and low speed terminals. Transmission from card reader to CPU or from CPU to line printer. Moreover, most remote terminals are connected to computers through voice band channels.

(iii) Broadband : Broadband or wide band channels are used for transferring large volumes of data with at high speed. With broadband the data transmission rates of 1 million baud or more can be achieved.

2. Serial and Parallel Transmission

Data travels in two ways: serially and in parallel. In serial data transmission, bits flow in a series or continuous stream, like vehicles crossing a one-lane bridge. Serial transmission is the way most data is sent over telephone lines. For this reason, external modems typically connect to a computer through a serial port. With parallel data transmission, bits flow through separate lines simultaneously. It is a standard method of sending data from a computer's CPU to a printer through parallel port.

3. Models of Data Transmission

Data may be sent by asynchronous or synchronous transmission. Asynchronous transmission Data is sent and received one byte at a time. Asynchronous transmission is often used for terminal with slow speeds. Its advantage is that the data can be transmitted whenever convenient for the sender. Its disadvantage is a relatively slow rate of data transfer. Synchronous transmission is used to transfer great quantities of information by sending several bytes of a block at a time. For the data transmission to occur, the sending and receiving of the blocks of bytes must occur at carefully timed intervals. Thus, the system requires a synchronized clock. Its advantage is that data can be sent very quickly. Its disadvantage is the cost of the required equipment.

8.3 Glossary

Bandwidth : A term used to describe the data–handing capacity of a communications system

Baud : A unit of measuring communication data transfer rate. In general usage baud is identical to bits per second.

E-mail : Electronic mails used for passing information.

FAX : Data is send digitally on telephone lines and Fax machines are used to decode the same.

Uploading : Uploading data on internet sites or attachments in mail

Downloading : Downloading information from Internet for personal as well as professional use.

8.4 Summary

There are Internet information services available like web portal, webpages, online shopping, home banking, etc. Offline browsing is cost effective. Fax and voice mail facilities are used by individuals and offices. Computer can also be used for sending and receiving fax. Electronic mail is one of the most popular services of Internet. We have discussed various operative steps, which will help you while using email. We have seen how to create an email account, how to access it, how to receive and send messages. Although very expensive, video conferencing saves resources, valuable time and speedup the operation of implementation of any organization. It is finding its place in various corporate sector organizations. Factors such as band width, transmission type, transmission mode affects the data communication.

8.5 Exercises for Practice

Answer the following question in 200 words each.

1. Describe connectivity options : fax machines, e-mail, voice-messing systems, videoconferencing systems, shared resources, and online services.
2. Explain what is bandwidth, serial versus parallel transmission and protocols.
3. Write note on various Folders and Settings in e-mail account.
4. What are the factors affecting data communication ?

Unit 9 : Introduction to Multimedia

Index

9.1 Introduction

There are several medias available. Text, pictures, photographs, audio, video animation are different medias used for communication. Using combination of these medias is termed as multimedia.

In multimedia, all these five mediums are used to represent the information to the users via the computer giving special effects. In practice, many multimedia packages comprise of only two or three mediums because many times the use of all mediums may not be appropriate for the information exchange. To use multimedia packages we need a multimedia computer.

After the study of this unit, you will be able to know and understand :

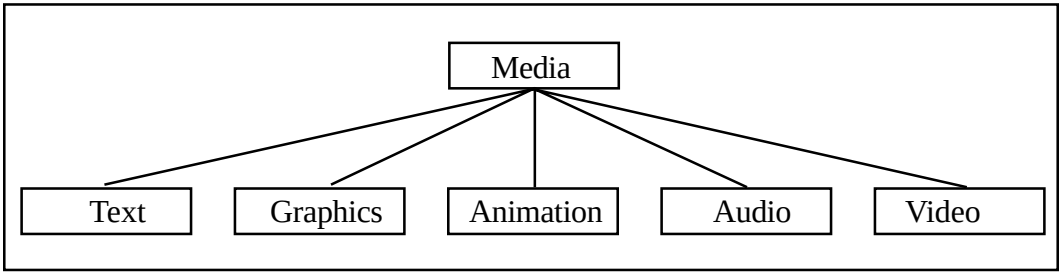
- Multimedia and its components
- Multimedia database management system
- Application of Multimedia computers

9.2 Content

9.2.1 What is Multimedia ?

Media is used to communicate the information. Different medias such as text, audio, video are well known to us. These medias can either be separately used or can be combined to get composite effect while presenting the information. The word multimedia refers to the integration of multiple media – such as graphics or images, text, video, sound and animation, which together can multiply the impact of your message to be communicated.

Commonly used media in computer systems are shown as below :



In computer world multimedia is a technology that meaningfully combines more than one of the above listed media to communicate ideas and deliver information. Multimedia provides powerful ways to educate, entertain and inform human beings.

The variety of media of interaction with the computer opens up many possibilities, which were simply not available while interacting with the computer through single medium of text. For example, while reading a book, the knowledge that you acquire mostly comes through the text and the graphics media. The books are not capable of showing animation (moving pictures), or play audio. Multimedia modes of interaction with computers have become very popular. The rapid development of the Internet has given a boost to multimedia technology.

The multimedia technology is a powerful tool for the user, which can greatly enhance communication by delivering multi-sensory experience. The information technology is making maximum utilization of multimedia technology (MMT). Internet Webster or information kiosk are being designed to provide information automatically

to the users without any human intervention. Digital video and audio media are the most demanding of the new media that are being added to the repository of computing and communication systems. The exchange of information in MMT takes place in a variety of ways than ever before. The wonderful thing about the multi in multimedia is that it offers you an endless variety of options for packaging your information. We require various compression and decompression techniques for this. Now a days concept of virtual reality is getting prime importance in the era of digital illusion.

In order to use and apply the multimedia technology, we should understand the basic principles underlying it.

9.2.2 Components of Multimedia

There are basically following five major components of multimedia :

1. Text

- Text is the most popular medium of expression and communication.
- Text is widely used.
- Text is hard to read on screen as it sometimes strains eyes than reading from paper, if proper fonts and style are not used.
- Hypertext is a text, which provides a choice to the user in reading or not reading the information in detail, and it provides hyperlinks HTML Linking to some important topics directly. It is called branching.

2. Images

- One picture is equivalent to thousand words. Images have greater impacts over the layman and impact lasts for longer time.
- Images enhance the overall look of a multimedia package and make them attractive.
- Images can be obtained using a drawing packages such as AUTOCAD, storyboard, or by scanning photos from digital scanners or by capturing still frames from digital camera.

- Images are bulky or larger in size to store (sizes vary according to the storage file formats.)
- Image file size mainly depends on:
  (1) Size of the image (in pixels)
  (2) Resolution of image, higher the resolution larger the file size.
  (3) Colour depth (no. of colours) as colours are formed by additive method of mixing of R,G,B components.

3. Video

Video allows to show things that really happen.

- One video clip is equivalent to one book.
- Video is formed using sequence of images.
- The conversion of analog video into digital format requires an additional piece of hardware i.e. a video capture card.
- Digital video requires large storage space.

4. Animation

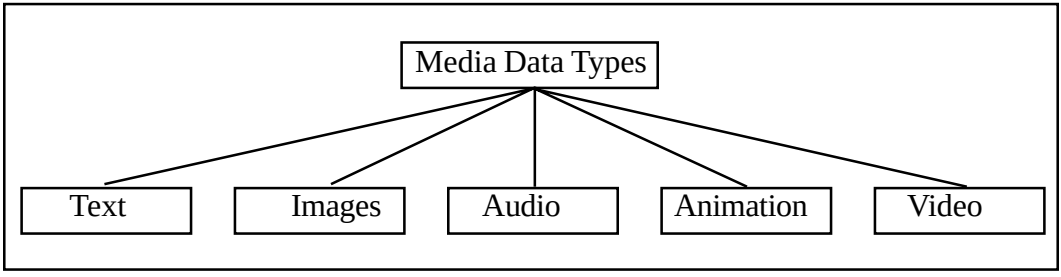
- Animation uses the display of moving images to convey information.
- Animation enables you to visualise some pictorial representation in sequence.
- Animation requires less processing power, RAM and storage space compared to video.

5. Sound

- Sound is used to create a mood or atmosphere.
- Sound and speech provides an analysis of a language.
- Sound is recorded and played using the sound card.
- Sound also requires a fairly large file.
- Sound file size depends on resolution of recording, whether sound is stereo or mono.

9.2.3 Multimedia Database Management System

Multimedia database management system is basically a software program that can manipulate media data types consisting as followes :



Multimedia data is typically stored outside the database, in different file formats. When the number of Multimedia objects is relatively small, features provided by the database are usually not important. Database functionality becomes very important when the number of multimedia objects stored is fairly large, issues such as transactional updates, querying, indexing become important

Multimedia database systems require a proper storage technology and file system. The database management software needs to support various facilities like:

- Editing data of various types
- Sharing of multimedia objects between multiple users and applications
- Storage and retrieval system
- Facilities to create transmit and print or display multimedia objects.

These objectives can be accomplished in various different ways. Relational database management systems are being expanded to handle multimedia data types. In multimedia database systems, there are not only different media types, but also different ways to query databases. The query mechanisms may include:

- Free text search
- SQL like querying
- Content-based querying
- Icon-based techniques
- Querying based upon the entity-relationship (ER) diagram
- Sound based querying
- Virtual reality techniques.

1. Multimedia File Managers

Multimedia file managers are used to categorize and select multimedia contents using descriptors and indexing for retrieval. These are relatively simple programs that allow users to organize, index, and retrieve multimedia objects stored in conventional files in their typical file formats. These programs are normally stand-alone tools designed for evaluation and section of Multimedia objects that are without relationship to each other or any other data.

2. Data Compression

Multimedia data is large in volume. It also requires real time and continuous delivery. Hence multimedia applications require massive storage space, high bandwidth and high data transfer rate. Data compression techniques are used to reduce the volume of multimedia data. The technique of reducing the size of data is known as compression. Some standard multimedia compression techniques are listed below:

(i) JPEG (Joint Photographic Experts Group) : This compression technique is used for still images. Compressed images are of high quality. Compressed image is stored in a file with extension jpg.

(ii) MPEG (Motion Picture Experts Group) : This is compression technique used to compress digital audio and video.

9.2.4 Multimedia Computer

Computer is a machine capable of gathering, processing, storing and disseminating data. Computers with capabilities to interact through text, graphics, animation, audio and video are called multimedia computers. Today modern personal computers come with all the multimedia components already installed. As there are many computer manufacturers, multimedia computers differ in their configuration, However common Multimedia PC should contain:

- PC with a high-resolution screen display.
- High speed CD-ROM drive
- Speakers and microphones for audio input and output.
- Sound card (normally in-built)

- Adapter boards to decompress and playback audio and video material
- Software that supports the device drivers for adapters and sound card.

The multimedia computers used to develop multimedia products need to be more powerful and of higher configuration than what is required for the presentation of the product. Typically, development systems require the following additional features:

- Adapter boards to capture, digitise, compress, manipulate and edit audio and video material.
- In addition to the previously mentioned software drivers following additional softwares are needed
- Media capture software to acquire and record various types of media clips
- Media editing software for modifying, joining, cutting and pasting media objects and clips.
- Special effect software to enable the developer to enhance media elements by addition of a variety of special effects.
- Authoring Software for integration of the various media elements in a single multimedia product.
- Libraries of clip art, music, or video.

Multimedia Devices

The main peripheral components of multimedia system are the input and output devices necessary for multimedia. Most of these devices are available as consumer electronics, resulting in the relatively low cost. e.g. Microphones, headphones, speakers, digital cameras. Monitor serves for video output.. Monitor characteristics such as colour, resolution and flat and large shape affects the video quality.

9.2.5 Multimedia Applications

There are many multimedia applications used by number of users from different fields. We will discuss some of them here.

(1) Entertainment

(i) Video Games : Personal computers at home are mostly used for playing video games. Many thrilling and exciting games are available on computers. These interactive games use effective animations.

(ii) Animation Films : With computerized animation it is now easy to make animation films as compared to earlier days. High quality animation films are produced using computers.

(2) Education

(i) Computer Based Teaching (CBTs) : Good quality CBTs are available for many subjects. Student can self study the subject using these CBTs.

(ii) Encyclopedia : Encyclopedia is available on CDs. It becomes easy to refer encyclopedia. Audio clips, video clips and animations are included which makes it more interesting.

(3) Marketing

(i) Presentations : With the use of multimedia, the product presentations become more effective.

(ii) Catalogue : Video clips can be included in the catalogue to give better idea about the products. Simulations can show working of the parts.

(iii) Advertisements : Several of the advertisements on TV uses computerized animation to increase effectiveness.

(4) Information Dissemination

Multimedia Kiosks : These are now used in public places like railway stations, airports, etc. to provide information to the public. These are used for giving information of tourist places, hotels along with images, video clips and maps. It generally has touch screen monitor with a very user friendly graphical user interface for ease of operation by general public.

9.3 Glossary

Multimedia : use of more than one media for communication.

Multimedia Computer : A computer which can used for integrating, storing and reproducing multimedia packages.

Multimedia Database : A collection of multimedia data files such as text, pictures, audios and videos

JPEG : Joint Photographic Experts Group. This compression technique is used for still images.

MPEG : Motion Picture Experts Group. This technique is used for compressing audio and video data.

9.4 Summary

Multimedia refers to the integration of multiple media – such as graphics or images, text, video, sound and animation, which together can multiply the impact of your message to be communicated. Multimedia computers are required to use multimedia packages. Some advanced hardware and specialized software is needed for the development of multimedia.

Multimedia is used in various fields like education, entertainment, advertisement, marketing. Multimedia Kiosks are also becoming popular.

9.5 Exercises for Practice

Answer the following questions in 200 words each.

1. What is Multimedia ? Explain advantanges of using multimedia in education.
2. What is the multimedia computer system ? Explain the important components of multimedia.
3. What is Multimedia Database Management System ? Explain its different types and worksing.
4. Write situation in agriculture where multimedia can be effectively used.

Unit 10 : Information Technology in Business

Index

10.1 Introduction

In the past information processing was done manually by using files. After introduction of computers, the information storage and processing has become very easy. The advance technique of e-commerce has been introduce for business by using World Wide Web. Now one is able to use and reach the potential market throughout the world. With the help of web server, we can select e-commerce site as such information technology is playing vital role in world wide business. It is estimated that in future most of the business will be conducted with the help of e-commerce web site. The seller and user may not be known to each other personally, however the transactions will continued with the help of this modern technique.

After the study of this unit, you will be able to know and understand :

- Modern information proessing
- E-commerce site development and business chain
- World wide marketing, advertising and sale.

10.2 Content

10.2.1 Modern Information Processing

Traditionally information processing was done manually using files. It was cumbersome and creating problems with storage of the files. With the emergence of computers, information storage and processing has become very easy today. If you consider agriculture, then there are many variable parameters, which need to be considered while taking any decision. Now if all these parameters are well documented and database is created then with its help, decision making will be very easy. This will be easier to understand with the following example. *Consider a company that wants to cultivate grapes. If all process is kept manual then following things need to be Performed :*

- Finding a suitable location.

  For this you need to decide which variety of grapes you are going to cultivate. Accordingly you need to check what type of soil is suitable, what climate is optimal.
- After finding locality you have to decide on time of plantation, then type of plantation i.e. in which direction plants are to be planted.
- How to prepare planting material.
- What planting methods to be used.
- Planting distance – spacing of planting to be decided according to the varieties.
- When pruning of vines to be done?
- When training of vines to be done?
- What training system to be used?
- How should be manuring done?
- What special treatments to be used to improve quality?
- What diseases are likely to be threats to the crop?

And what remedies are available?

- When should the harvesting be done?
- How should the grapes be stored?
- How should the grapes be marketed?

Now all these issues are easy to handle, if you decide to cultivate only one variety. But if your concern is really big and you want to cultivate many varieties then maintenance becomes very difficult. Here computer comes handy. If you create a comprehensive database related to each species detailing all the activities then management becomes easier. With the help of such database forecasting becomes easy. You can accurately find at what instant, how much produce is available for sale.

You can also calculate the costs incurred on it which can aid in deciding the selling price. As information is available at all steps it will be easier to cut down losses and increase profit.

1. Computer and Production

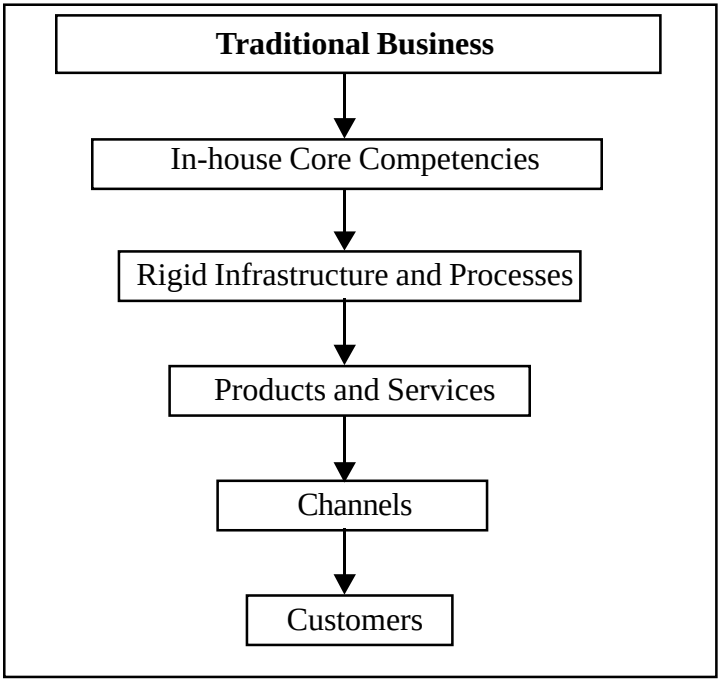
Computers are increasingly finding their way to production. e.g. computer controlled green houses. In Hi-tech green houses, temperature and humidity is controlled. Robots too are being used some times where high risk is involved. They are programmable machines.

2. Production Planning

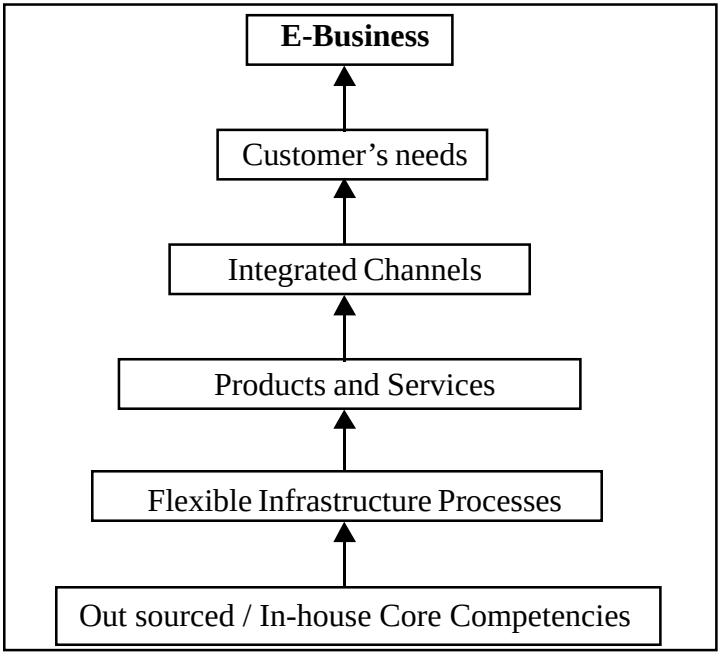
Planning for production is as important as production. Cost and revenues must be considered carefully in deciding the quality to be produced. Time of plantation is very important. Production schedule should be prepared. Location of production site influences directly the total profit. If the farm is located in a remote place, then the transportation cost will be very high.

If relevant database is created for planning crop schedule then decision making will become very easy. As you will get instant information at tip of your hands on changing the variables, decision making and forecasting becomes easy.

3. Traditional Business Design



4. E-Business Design



E-Commerce is nothing but conducting business on Internet. It is estimated that in future most of the business will be conducted via worldwide web. Now one should be able to reach this potential market arena in a realistic way.

This section focuses on techniques and decisions to maximize the potential while minimizing the risks.

10.2.2 E-Commerce Site Development

Many methods of constructing and conducting E- Commerce are currently available. You can choose whichever is suitable for your need. To simplify your choice, best way is to learn about your target market (whomever you wish to visit your site) and your product. Secondly you also need to discover which vendors can provide most suitable tools for those goals.

To meet these goals, following points should be considered while creating an outline for overall process for planning and designing site.

1. Formulate design goals. This includes examining business issues such as product and its potential customer base. Example- Customers for cut flowers will be city based hence demand will be more in cities.
2. Think of products and services that you will sell according to customer expectations.
3. Determine hardware and software you need to support the site.
4. Develop storyboard.
5. Develop, test and implement the site.
6. Decide security and payment mechanisms.

1. Formulate Design Goals

Planning is first step in designing your E- Commerce site. Goals must be designed to satisfy customer expectations and needs. Failure to properly plan development and deployment of your website will decrease quality, increase development time causing delay and making project costly and cost ineffective.

Few points are to be considered while planning ---

- What products do you plan to sell? Are they well suited to Internet sales?
- Who is your target audience (market)? Whether local, national or international. Issues including language and currency conversion must be considered.
- What additional services or information you will offer? Who will provide content (text and graphics) for these services? What software exists to facilitate user? Does such product already exist or needs to be developed?
- Are you going to sell advertising space on your website? Should management of Internet advertising be in-house or outsourced to some Internet advertising firm?
- What e-commerce arche types should you utilize for your site?
- How to make your website graphically appealing and functional?
- Will you allow customers to use credit card for online purchases?
- Should development and management of site take place in-house or outsourced?

2. Site Name

First and foremost you must decide the name for your company and site. You need to check the name chosen by you is not already registered. This can be done by checking sites like **www.networksolutions.com**. If name is already registered you need to choose another name.

3. Products and Services

Product and service you are selling will determine the sites front-end and backend design.

You also need to categorize your product or service.

For example. Business related to agriculture can be categorized as :

Farm Enterprise	Non Farm Enterprise
Growing of Food-grains, vegetables, Fruits and flowers. Eggs and Poultry. Dairy, Milk products. Fibers, Meat, Oilseeds, Sugarcane, Fish.	Manufacturing of Fertilizers, Pesticides, Farm equipments, Machinery, diesel, Electricity and repair Services etc.

Now you have to decide which products you are offering. For example, if you decide to sell flowers then you need to develop backend solutions which will provide search facility depending on various categories (name, variety, colour, etc).

4. Categories of Products

Hard Goods : Physical items like food grains, flowers etc.

Soft Goods : These include online books on agriculture, information about agriculture.

Services : Repair services, consultancy, expert advice, rental service of equipments.

Front-end design is dependent on activities of prospective customers to greater extent. When designing the site, consider who the users are, what tasks they will perform and the environment in which they will operate.

Users include customers as well as administrators and internal users.

5. Examples of Design Goal

- Easy interface, as users are generally not technically savvy.
- System must support multiple payment options.
- System must support product searching using different categories.
- New products need to be added and updated regularly.
- System should be available whenever users want it.
- System needs to integrate with existing business systems to avoid duplicate data entry tasks.

6. Providing Archetypes

Archetypes are nothing but certain standard elements. These archetypes make customers experience more interesting and they visit repeatedly. for examples :

Archetype	Description and Usage
Catalog / Shopping Cart	Choose items for purchase by adding to customers virtual " Shopping Cart"
Time based / Usage based	Best for selling services e.g. Site serving as game server may charge based on user connection time.
Subscription	Similar like time based. Uses fixed time period for which a fee is charged to access information or services, independent of actual usage. e.g. Online magazines and dating services.
Advertising	Used for services, soft goods. E-Commerce sites base their revenue on charging for advertising based on number of visits by users to site in given period.

7. Develop Storyboard

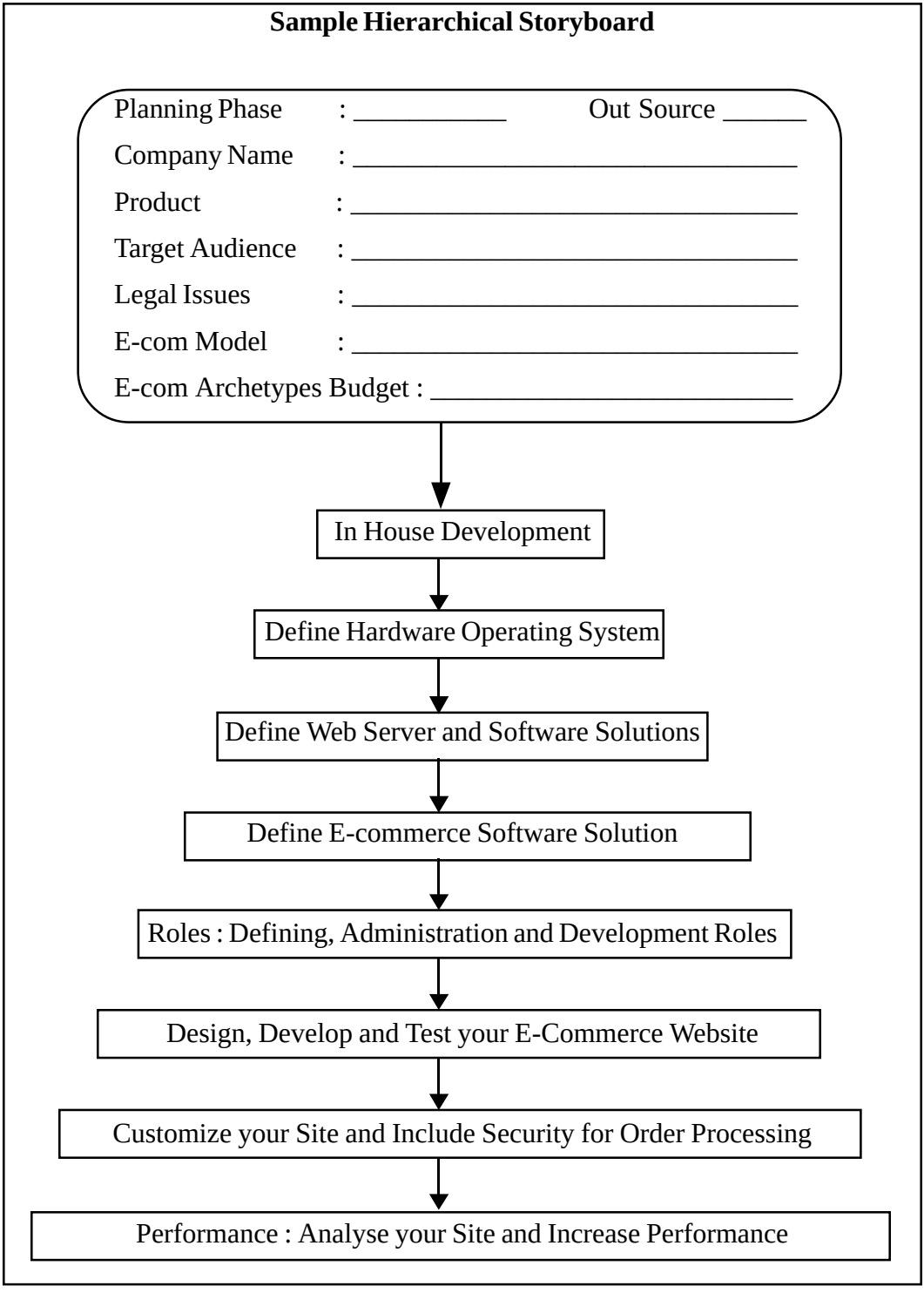
Story boarding process of creating an overall plan showing structure, sequence and Connections of each logical step and details surrounding web pages or nodes. There are three types :

(i) Linear : Like a book introductory page is followed by pages 1,2,3,------. Good for tutorials and tours. Navigation links should allow users to go back, next and to home page. Each page should stand alone for random visitors.

(ii) Hierarchical : Main page serves as an index to lead users down different paths. e.g. Topic 1,2 and 3 Each main topic page may lead to further sub-topics with more and more details. Navigation aids should provide a way back and next within the topic, up to main topic page and home index page.

(iii) Random : Main page links to other pages, loosely related but arranged in no specified order. Users Navigate to whatever interests them. Should provide maps, menus and homepage links.

Sample Hierarchical Storyboard



8. Develop, Test and Implement Site

This final stage never really ends at most e-Commerce sites. At this point, everything is assembled and put to use. Specific implementation activities include :

- Testing for dead hyperlinks.
- Improving database connectivity programs.
- Installing latest and / or most effective service patches for your servers.
- Reviewing logs to determine popular products, popular areas of site.
- Reviewing logs for security breaches.
- Altering site so that it supports company's marketing strategies.
- Keeping abreast of latest design and site architecture issues.

9. Web Server

You now have plan for your company. You have site name and determined the exact nature of your product.

After considering some front end and backend issues involved in selling your product, now you can take first step in creating e-commerce site i.e. choosing and installing your web server.

Web server uses Hyper Text Transfer Protocol (HTTP). This protocol enables web server to receive requests and transmit replies.

Web servers often deploy both client-side and server-side scripting. Client-side scripting includes use of Java-script and VB-script. If you embed these scripting languages into an HTML page, you are engaging in client-side scripting. Server-side scripting is the use of scripting languages to create programs that run on the web server itself.

10. Choosing your Web Development Software

After web server you need to select the development software for your e-commerce site.

Parameters for product choice are :

Ease of use, cost , the support software, the hardware and the development learning curves.

The installation of support software is vital in successful development of an e-commerce site.

Choice of website development software must match the needs of your e-commerce objectives. Issues like cost, control, customization and security must be considered.

Microsoft Site Server 3.0 Commerce Edition uses Windows NT as operating system along with Microsoft SQL Server for database support. Visual Interdev and Front page 98 are used to customize site content.

(i) SQL Server Features

- Ease of installation, deployment and use.
- A Set of administrative and development tools that help you to install, deploy, manage and use SQL Server on several sites.
- Scalability.
- One multi-platform database engine.
- Data warehousing.
- Tools for extracting and analyzing summary data for online analytical processing (OLAP) and for visually designing databases and analyzing data using English-based questions.
- System integration with other server software.
- Integration with e-mail, internet and windows.

(ii) Internet Commerce Servers (ICS) : Internet Commerce Servers (ICS) are rapid application development tools (RAD) that help to plan, develop, deploy and manage websites that cater to both customers and business partners in a cost effective manner.

These tools provide comprehensive solution for website management and makes it easy to enhance and maintain sophisticated Intranet and Internet sites.

Example – Microsoft's site Server 3.0 Commerce Edition.

IBM's Net.Commerce.

Inc.'s Ariba Intershop and Broadvision.

Site Server 3.0 Commerce edition includes Site Server, Commerce Server, Ad Server, Front Page 98, Visual Interdev, Internet Explorer 5.0 and Microsoft Wallet.

Commerce Server provides tools like Site Builder Wizard, Site Manager Pages, Pipeline Editor, Site Foundation Wizard, Certificate Management Tool, Commerce Site Packager and Microsoft Wallet.

Site Server Commerce Edition helps achieve following: -

- Build and implement new commerce sites or add commerce capabilities to existing Internet and Intranet.
- Engage customers and business partners online by creating cost effective commerce sites.
- Deliver high impact advertisements and promote products online.
- Analyze site content and customer activity.
- Deploy a website.
- Personalize user's experience by delivering requested information.

(iii) Security : Security applies to various parts of Internet environment but most important of it is securing transmissions. This includes message privacy, software distribution, secure connections to websites, digital signatures which can prove that a message comes from a certain sender. Security can be assured by using encryption techniques. Encryption is process of changing a messages content in a way that disguises its meaning.

(a) Verisign : Most widely accepted certificate authority (CA) on Internet is Verisign at http://www.verisign.com

(b) Practices : Verisign is first vender to specify a Certification Practice Statement (CPS) This comprehensive document sets the de facto standards for a CA.

(c) Technolog;y : Verisign's digital IDs feature strongest available cryptographic techniques to ensure that they are not tampered with or forged.

(d) Facilities : Verisign uses comprehensive security systems like multi-level physical access controls, biometric scanners and sound firewall technology.

11. Types of Certificates

Level one → e-mail address to be provided for verification.

Level two → driving license, social security number etc.

Server Certificate → on basis of domain- name.

Verisign Certificates are backed by varying amounts of insurance that guarantee the security of certificate. If the certificate is forged and used to damage an individual or an organization, Verisign insurance will reimburse up to the limit set for each individual certificate.

(i) Payment Method : During design phase, you should decide methods to be used for processing of payments.

Three main tasks must be accomplished to implement online transactions.

- Prepare server and eCommerce site. Your web pages must be capable of handling requests as well as integrating with database for each transaction.
- Set up an online merchant account. This is required to process a payment transaction online. OMA typically include both a merchant ID (MID) and a terminal ID (TID).
- Install payment website like cyber cash, vPOS. The Software chosen should allow for online validation of credit cards or payment information, including the need for network access

Site server can incorporate online transactions if online merchant account along with payment Software is provided.

(ii) Credit Card Processing : After acquiring the merchant account information from you financial institution, payment Software should be implemented. Site server commerce can integrate several vendors' payment packages into the commerce site.

e.g. Clear commerce, cyberCash, cyberSource, ICverify, veriFone, etc.

(iii) Digital Cash : Instead of credit card payment model, electronic money can also be a viable option but for that everyone must have same package. Due to this constraint electronic money is rarely used.

Electronic money offer attractive features-

1. No need of backend processing. Transactions using electronic funds are completed immediately.
2. Transactions have no cost.

Digital money ensures anonymity of consumer. Properly implemented digital money does not leave any trails.

Vendors of digital cash – DigiCash and CyberCash.

(iv) Implementation : To use electronic cash you need following S/W

- The Wallet
- The print-of-sale program.

(v) The Wallet : It is so called because it mimics the functionality of a physical wallet; it contains electronic cash. Both consumers and merchants need wallets of same type.

(vi) The Point of Sale Program – (POS) : In addition to wallet, merchant need POS module, which integrates the web-site, the merchant's wallet and bank's financial network. This POS program acts much like payment gateway. It is responsible for several merchant activities. It initiates fund transfer between consumer and merchant wallets. It also validates and logs activity. This module is later accessed for administrative activities and reports. It is generally integrated with merchant's website. To implement point of sale module, a merchant must register with electronic cash component supplier so that merchants systems can be configured to repond and store appropriately.

Once POS module is integrated, merchant can accept electronic cash payments. Consumers must first load their wallets with money before they can spend it. Here the currency is converted from conventional to electronic. Loaded wallet indicates willingness of the buyer to purchase something from merchant's site. Merchants can transfer funds from their wallet to their regular bank accounts.

(vii) Payment and Security Requirements : Since the parties have no physical contact electronic transactions require higher assurance of trustworthiness. To make electronic transactions trustworthy and to ensure payment information doesn't get compromised following issues need to be addressed:

- Confidentiality of payment information
- Integrity of payment information transmitted over public networks
- Verification that the account holder is using a legitimate account
- Verification that a merchant can accept that particular account.
- Interoperability between software and network providers.

10.2.3 E-commerce Business Chain

It is important to understand the complete e-commerce food chain to understand where the Internet storefront begins and ends and where more traditional back office technology comes into place.

(i) Marketing : General goal of marketing is to target potential buyers and entice them to give your site a whirl. What is new is the ability to use the medium of the Internet to target consumers in different ways. While we might not think of banner advertising, targeted e-mails, sweepstakes, etc. Another hot topic on the Net today is the building of community, and creating sticky applications. The goal is to provide an environment that will entice the site visitor to come back repeatedly. Examples include discussion forums, polls, surveys, chat, etc.

(ii) Customer/Visitor : Here your customer is the cyber surfer who has decided to type in your URL or clicked on a link to visit your website. In business to business sites, the purchaser is another business entity who will need to have various purchasing options, including credit card, purchase card, purchase order, and/or credit account (Net payment).

(iii) Product Browsing : Visitor browses through departments and then products within those departments. As potential customer goes through this shopping experience, he may be attached with products on sale, promotions related or upgraded products, etc.

(iv) Shopping Basket : Shopping basket is a list of products the shopper has selected. Shopping baskets offer options to clear the basket, remove items, add items and update quantities.

(v) Checkout : Here consumer will enter his shipping and billing address information. The shopper might also add additional information for gift greeting, gift wrapping and other information for ancillary services.

(vi) Tax and Shipping : Once the business site knows where the product is going to be shipped and billed, it can execute two important business rule calculation for tax and transport.

(vii) Payment : In customer to business e-commerce, a typical purchase is via a credit card or invoice options may be available. When using online processing, the credit card data is securely transmitted over the net, and a response is sent back indicating whether the card cleared or not.

(viii) Receipt : For business to business e-commerce, the receipt might be a list to attach to purchase order. For customer that might be a print of the order on the screen or a listing e-mailed to the purchaser.

(ix) Process Order : Standard business rules takes over in this phase unless order is processed through process card. Customer can be kept informed of the order status.

(x) Fulfill Order : It is an integration issue between the web server and the backend fulfillment system.

(xi) Transport : The last step in the process is to get the product to the customer.

10.2.4 Marketing, Advertising and Sale

With the introduction of green revolution, agricultural production in general and food grains in particular has substantially increased. Agriculture once looked as a subsistence sector is slowly changing to a surplus and business proposition. Most of the cultivated area (about 76%) is under food grains and pulses. Traditionally, market is place or building where buying and selling of goods takes place. But in modern times with fast and long distance communication facilities like telephone, etc. market is no more restricted place only. It has become wider and has assumed regional, nation and even international status. Buying and selling is finalized on telephones only from distance places with the introduction of computers, e-commerce and Information technology the process has become efficient and fast.

1. Marketing through Web

(i) Producer → Website → Consumer

(ii) Producer → Website → Wholesaler

In private channel, there are many intermediataries, which result into high costs and market margins. Therefore, the commodities become costly for the final consumer and reduces the producer's share in consummer's price. This is a traditional channel and is quite popular with thefarmers. Nearly 60-70% agricultural produce is sold through this channel.

The Co-operative channel is developing in our country. In Maharashtra, this channel is used in important fruit crops like grapes, pomogranate, banana, ber, orange alongwith private channel. It is also used for marketing of milk in Maharashtra, Gujarat,etc. alongwith Government and private sectors.

Government channel is used mainly for fooodgrains like rice, wheat and sugar. In some essential commodities, when the prices are unduly high or low the Govet interferes into market in order to protect the interest of both producer and consumer (eg. Sugar industry, Onion, edible oil, cotton etc). Co-operative channel is nowadays developing for medicinal plants in Maharashtra. Two kinds of channels are possible through internet.

(i) Business to Business (B 2 B) : Here Business demands or supplies commodities to another businessman. Portal is a platform through which one can operate. Number of portals are coming up. Now a days, in this business.

(ii) Business to Consumer (B 2 C) : Consumer can directly demand commodities through portal

2. Decision making in Agri-business

When surplus produce is obtained or created its disposal or marketing advantageously becomes necessary. Following decisions are involved in the marketing of farm produce.

(i) Where to sell ? : This is the important decision because in rural areas big, wholesale and organized markets are limited. Mostly produce is in small quantity, availability of transport facility is limited, there are no good roads to go to distant markets. The farmers has to make choice within limited alternatives.

(ii) Whom to sell ? : There are various types of agencies such as village trader, whole sale cum commission agents, co-operatives, government etc. He has to make choice among them.

(iii) When to sell ? : Immediately after harvest prices are the lowest. So whether to sell goods immediately or wait for better prices? He is also constrained by cash requirement. He has to take decision.

(iv) At what price to sell ? : Here the position of farmer is very vulnerable. He has almost no choice. Price in organized markets (Regulated markets) are fixed by open auction and he has to accept the price quoted by the highest bidder even this price may not be remunerative. In unorganized market, traders fix the prices. Farmers have limited scope for decision making.

Thus agricultural marketing system is a link between the farm and non farm sectors. It plays an important role not only stimulating production and consumption, but accelerating the pace of economic development. The Agricultural marketing system plays a dual role in economic development in countries whose resources are primarily agricultural. It has therefore playing an important role in economic development and stability of a country.

10.3 Glossary

Hard Good : Physical items like food grains, flowers, etc.

Soft Goods : It includes on line books on agriculture, information that can sell about agriculture or other subjects.

Story Board : It is the process of creating an overall plan showing structure, sequence and connections of each logical step.

HTTP : Hyper Text Transfer Protocol; which enables web server to receive requests and transmit replies.

ICS : Inernet Commerce Servers which are rapid application development tool that can help to plan, develop, deploy and manage websites.

10.4 Summary

E-Commerce is nothing but conducting business on Internet. It is estimated that in future most of the business will be conducted via worldwide web. In this unit we have seen what are the different steps to be followed to built e-commerce sites. We have seen how the e-commerce transactions takes place and different ways of handling money transactions. After green revolution agricultural production in general and food grains in particular has substantially increased. Traditionally, marketing was held at a particular place or building through buyers and sellers with personal contacts. Now, it has become wider where buying and selling take place through telephone, e-commerce, etc. from distance places with the help of new technology such as computers, e-mail, video conferencing, etc. Thus information technology plays vital role in agricultural marketing.

10.5 Exercises for Practice

Answer the following questions in 200 words each.

1. What are the steps involved in designing e-commerce website ?
2. How to choose your website development software ?
3. Explain the various payment methods used in e-commerce.
4. Explain e-commerce business chain.

Unit 11 : Agri-Informatics and Agri-Polyclinics

Index

11.1 Introduction

With the dawn of information technology, there has been paradigm shift from simple knowledge based system to Information based system approaches. This paradigm shift is more relevant to the agricultural sector especially due to shift from traditional farming to agri business. The connectivity through Internet has led to access the agricultural information, which is developed as per needs of the farmers.

Due to development of computer based technologies, facilities to provide information to the needy farmers has been realized by policy makers. The 'National Agricultural Technology Projects' (NATP) of Indian Council of Agricultural Research (ICAR) have also considered the importance of establishing Agri-Informatics Centres at District level in each Krishi Vigyan Kendras. Similarly the Agri-Polyclinic facilities are very much required for farmers to solve their day-to-day problems. The diagnostic laboratory system was existing with State Departments of Agriculture and Agriculture Universities, however it is worthwhile to study the role of Agri-Polyclinics in the

advanced and emerging information communication technology to be put to use for agriculture development.

After the study of this unit, you will be able to know and understand :

- The concept of Agri–Informatics and Agri–Polyclinics with their advancements.
- The working and services to be provided by modern Agri-Informatics and Agri-Polyclinics.

11.2 Content

11.2.1 Modern Agri-Informatics

Information is a crucial resource for development. Lack of information is constraint to adopt innovative technologies for higher productivity in agriculture. It is also evident that rural population often has difficulty in obtaining timely information about supply of inputs, cultivation practices and post harvest handling of the crop, etc. Telecommunication, mass media communication like TV and Radio offered many new opportunities for supply of new information. However, with the advancement in agricultural research and new extension methods, the farmer's need based information received much attention. In early seventies although use of computers for agriculture was in experimental stage but a base was founded for development of computers and its application got its momentum. Software has been developed of crop and live stock management. At the same time new multimedia system has been also started for dissemination of information. Thus two basic components of computer application are its use for agricultural operations and for supply of information. In the first component, the use can be to determine how much fertilizer to use, how often and how much to irrigate crops, how much pesticide to use and marketing details. Another popular use is Geographical Information System (GIS) for land use planning and watershed development.

After two decades of use of computer in agriculture in 1990, the systematic approach for dissemination of information was tried at national level. The ICAR

being the apex body at national level launched the Agricultural Research Information System (ARIS) during VIII plan. In order to strengthen ARIS four additional systems in support were introduced namely (i) Agricultural Research Management Information System (ARMIS), (ii) Agricultural Research Personnel Information System (ARPIS), (iii) Agricultural Research Financial Information (ARFIS) and (iv) Agricultural Research Library Information System (ARLIS). This entire system got more fillip due to innovations of the Information Technology (IT) by the beginning of the 21st century, which is being looked at as 'Information Age'. The so-called IT system has opened newer vistas in the field of dissemination of agricultural information.

The entire IT system is Computer Based Emerging Technologies (CBET) which is a system approach of communications with IT tools. However, very remarkable achievements in this CBET area are the use of computer science, information science, communication technology and information technology. When this CBET were put to use to solve complex problems in life sciences and particularly in Biotechnology, totally a new discipline has emerged which is called as Bio-informatics. Since Bio-informatics forms the foundation for Agriculture Informatics, it is worthwhile to study Bio-informatics module and the use of CBET in agriculture in general and agriculture information dissemination in particular. These studies formed basis for the concept of modern agriculture informatics.

1. 'Information System Module' of Bio-Informatics

Due to sudden growth in quantitative data in biotechnology and biological sciences, such as sequence of complete genome of biological species, human genome, protein sequences, protein three-diamensional structures, metabolic pathways databases, cell line and bio diversity etc. The data collection, storage and its retrieving has become major issues for bio-technologists and biological scientists. Bio-Informatics is the multi disciplinary area which has grown so much that it is being grouped into Molecular Bio-Informatics, Organal Bio-Informatics and Species Bio-Informatics.

The encouraging growth of Bio-Informatics is only due to concerted efforts made by the research scientists in establishing Bio-informatics Centres all over the country. The department of Bio-Technology under the Ministry of Science and

Technology, Government of India, New Delhi, has done this commendable network of establishing a national information exchange by starting Distributed Information Centres (DICs) and Distributed Information Sub-Centres (DISCs) under a programme called Bio-Technology Information System (BTIS).

The programme of Bio-technology Information System (BTIS) is worth following as BTIS provided not only information input to various Research Organizations but also provided monitoring and training services through their Bio-informatics Services. In Pune the Bio-informatics Centre was established in the year 1987 at University of Pune as one of the nine Bio-technology Distributed Information System (DIC).

It is important to note here that like this Bio-informatics Centre at Pune other various centres in India also provide information on Bio-technology with a stress on virology, protein, nucleic acid sequences and structures, microbial strain data and provide access to data in other related areas through Internet as an IT tool. Thus it is a good mix of Information Technology (IT) and Bio-Technology (BT). The Pune Bio-informatics Centre has its own centre of Information Technology in collaboration with C-DAC and also has links with Pune Library Network. The feather effect in the cap of this centre is the Advanced Diploma in Bio-informatics. Interestingly there is also a Bio-informatics Centre at Indian Agricultural Research Institute (IARI), New Delhi which is very active computer centre, offering its services for the agricultural scientists. This centre is connected to IARI Library and it is further connected to all other departments and disciplines of IARI through Fiber Optic LAN for CD-ROM database searches and through ERNET for information exchange and communication.

The Bio-informatics Centre forms a model Information system Module for supply of agricultural information through centres to be called as agriculture information as on similar lines. The Agri-Informatics centres can provide agriculture information, has link with libraries of agricultural institutes and organizations and are able to offer training in Agri-Informatics. In fact the NATP with its ARIS has already started projects to establish Agri-Informatics Centres have started functioning at KVK, Pravaranagar and KVK, Nashik. The working of such Agri-Informatics Centres will be studied later on.

The Bio-informatics Model should become a very glaring example of how IT and BT works together, like that Agri-Informatics can become good example of IT and Agricultural Biotechnology (ITABT) working together, considering the Integrated Farming system approach for working of Agri-Informatics, we can say that with the help of Information Technology and Agricultural Biotechnology a new system called as AGRIN Farming System (Agri-Informatics based farming system) is emerging system similar to Precision Farming. Modern Agri-Informatics should form a backbone to this AGRIN Farming System.

2. System Approach for Model Agri-Informatics

The system approach for any Agri-Informatics is to evolve a system in Situation Specific Information Dissemination (SSID). The SSID makes Agri-Informatics as a model. We are aware that farmers need information according to their situation i.e. information on specific crop yield, tips for reducing cost of production, increase in crop yields, eliminating methods to avoid risks of environmental disasters and weather calamities etc. This specific situation orientation is possible through system approach, which can be achieved through IT and Computerization System. ***For a model of Agri-Informatics the SSID System should follow the following steps.***

(i) The first step is to define the goals in clear terms right from the beginning up to the end in detail. This is also like preparing mission statement, keeping vision for future with due consideration of all available natural resources and inputs and of course with due consideration to specific situation.

(ii) Second step is to make a data collection keeping in view the current situation and current practices. Information Specialist has to carefully study and collect the data.

(iii) Next job is to analyze and prepare flow chart.

(iv) The findings are then checked out by system analyst to find out the weaknesses and problems.

(v) Further, it is the job of the system designer to evolve new and alternate system design to create a special custom designed software to suit the need of the end users.

The above five steps should be pre-requisite to well equip the Agri-Informatics ready to serve in SSID System. One thing should be noted here that SSID system should not be just a shift from a manual system to computerized system. In fact we should follow the principles of Management Information System (MIS). Here the MIS approach is more advanced stage of the steps described above as there is one more additional step of creating conceptual design.

The key tasks performed by MIS are :

a) defining the problem in detail, b) refining the management objectives,

c) establishing system constraints, d) determining information sources,

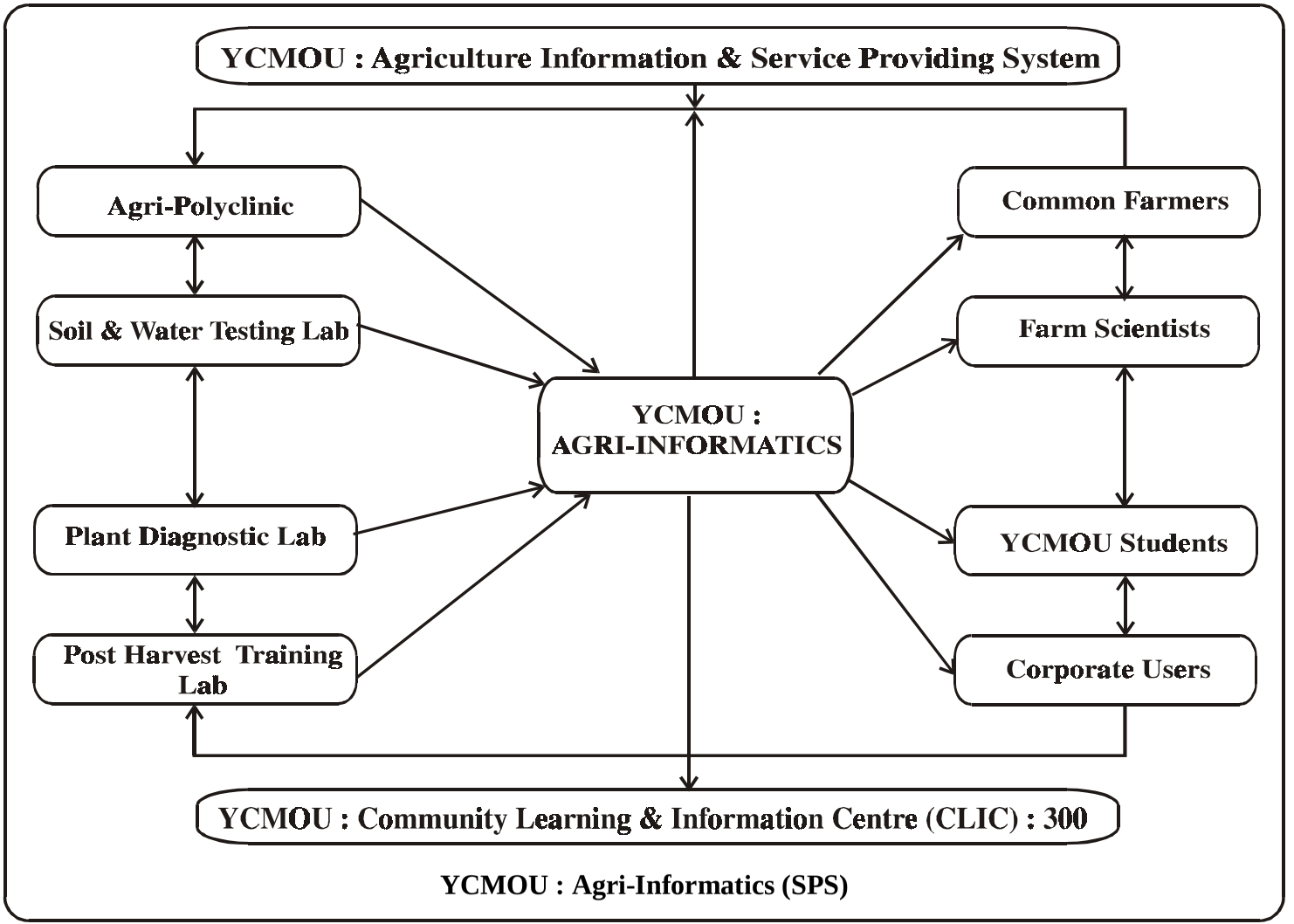
e) developing alternative design and f) documentation of conceptual design.

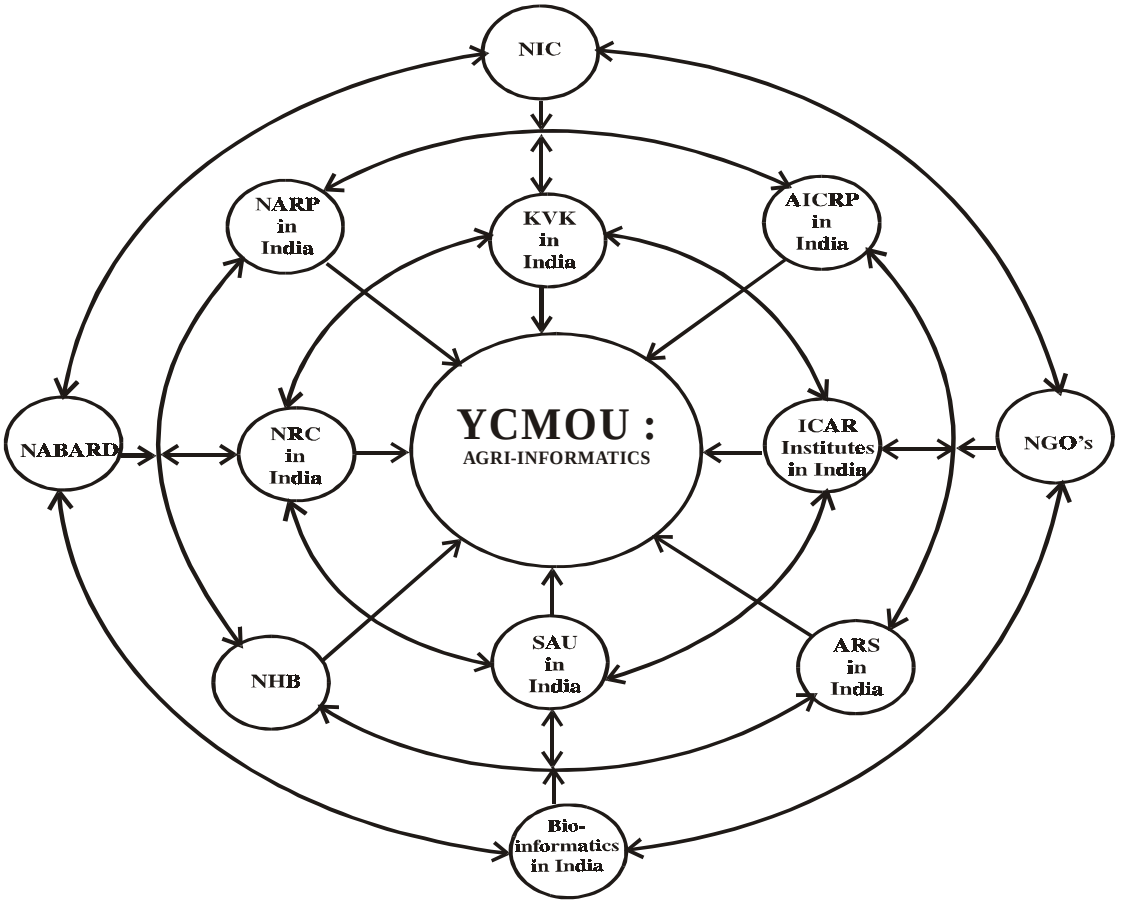
The above described SSID system or MIS, are very much needed for Modern Agri-Informatics or AGRIN Farming System.

The Modern Agri-Informatics Centres (MAICs) form a Service Providing System (SPS). The SPS system of YCMOU Agri-Informatics Center, Nashik is shown in Figure, which includes Service Providers as (i) Agri-Polyclinics, (ii) Soil and Water Testing Laboratory, (iii) Plant Diagnostic Laboratory, (iv) Post Harvest Training Laboratory. They provide services to end users like common farmers, Farm Scientist, YCMOU students, corporate users, etc. Similarly in a larger perspective, on the lines of Bio-Technology Information System (BTIS) programme, the Modern Agri-Informatics Centres (MAICs) should have connectivity to all those with all those who are involved in Agri- Business Management. This connectivity with Agri-Business Organization is depicted in Figure, showing three orbits, the inner most orbit around YCMOU Agri-Informatics shows organizations which form immediate nucleus or as most essential connectivity. The second orbit is related to type of connectivity and the outer orbit is for loose connectivity which is flexible and dynamic in nature.

11.2.2 Model Agri-Polyclinics

It is most heartening to note that the recent policy frame work of Government of India for their Agricultural Extension Programmes has envisaged the promotion of private extension services which mainly include the concept of Agri-Clinics. The


YCMOU : Agriculture Information & Service Providing System
Agri-Polyclinic
Soil & Water Testing Lab
Plant Diagnostic Lab
Post Harvest Training Lab
YCMOU : AGRI-INFORMATICS
Common Farmers
Farm Scientists
YCMOU Students
Corporate Users
YCMOU : Community Learning & Information Centre (CLIC) : 300
YCMOU : Agri-Informatics (SPS)



YCMOU : Connectivity to Agri-Business Organisation

ICAR - Indian Council of Agricultural Research

SAU - State Agricultural Universities

KVK - Krishi Vigyan Kendras

NARP - National Agricultural Research Project

NRC - National Research Centres

NHB - National Horticultural Board

ARS - Agril. Research Stations

AICRP - All India Coordinated Research Project

NABARD - National Bank for Agriculture & Rural Development

NIC - National Informatics Centre

Bioinfo.- Bio-informatics Centre

multifarious usage of Agri-clinics with inclusion of various Integrated Farming System components like dairy, fisheries along with general agriculture had led to form the concept of Agri- Polyclinics.

Similarly the Ministry of Agriculture and Co-operation, Government of India, New Delhi have also announced scheme for setting up of Agri-Clinics for promoting avenues to Agriculture graduates. Agri-clinics are also envisaged to provide expert services and advice to farmers on cropping practices, technology dissemination, crop protection etc.

The Krishi Vigyan Kendra, Nashik and Babhaleshwar (Ahmednagar) in Maharashtra have started a Plant Health Clinic. Farmers from the operational area come with diseased or infected samples to seek advice for control measures. The useful information is given on how to prepare pesticide formulation before spraying on the crops. The KVK Pravaranagar has started Soil-Health Clinic, which gives the soil-health report. Even they have brought in market the Soil Testing Software which prepares Soil-Health Report after the analysis of soil. The private fertilizer companies have also come up with Plant-Nutrient Cards to give information about the requirements based on recommendation as per the crop requirement. Hence there is a need to study some already existing models which are similar to Agri-clinic concept.

As said earlier the concept of Agri- Polyclinics is to provide services as Single Window System. The ATIC Model (Agricultural Technology Information Centre) is very much suitable to Single Window System, it provides diagnostic services for soil testing, plant and livestock health, supply of products etc. In Maharashtra there are five ATICs at Dapoli, Rahuri, Nagpur, Parbhani and Akola all under the respective State Agricultural Universities. The Mahatma Phule Agricultural University has ATIC at Rahuri which provides services and products such as seeds, by-products, bakery products, books and booklets, through Single Window System.

The starting of Internet facilities at such Polyclinics which can supply on line information like that of Department of Agriculture, Government of Maharashtra, on Input and Quality Control wherein Acts and Rules are available like Seeds Act, Fertilizer Control Order, Insecticide Acts and Essential Commodities Act. The KVK, Pravaranagar has a unique system of Video Conferencing in villages having WAN

networking. It provides services such as Bio-control Laboratory facility for provision of Bio-pesticides, soluble fertilizers, Bio-fertilizers etc. If Single Window System Model provides Mobile Van for Soil Plant Problem Diagnostic System, then it can collect the data very quickly by visiting villages and reporting back.

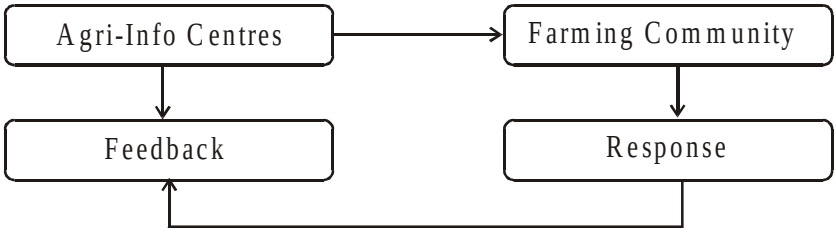
11.2.3 Working of Agri-Informatics and Agri-Polyclinics

The basic objective of Agri-Informatics is the empowerment of farmers through supply of information and through services by way of Agri-Polyclinics. Both play major role in transfer of technology system. In view of diversification in agriculture, High Tech Agriculture and Integrated System of Agriculture, the focus has been provided by Agri-Informatics and Agri-Polyclinics for above mentioned role. As Agri-Polyclinics is one of the components of Agri-Informatics the working of both need to be studied separately.

1. Functioning of Agri-Informatics

Like that of Bio-Informatics the working of Agri-Informatics also operates on computer based system. As per the Agriculture Research Information System (ARIS), the centres of Agri-Informatics have to be attached with KVKs and assisted by one I/C of Agri-Informatics and two of his Technical Assistants. The I/C of Agri-Informatics can be designated as Information Officer. At present under AGRIS-NATP pattern, since Agri-Informatics Centres (Agri-Info Centres) are under KVK, hence the Senior Scientist or Training Organizer looks after Agri-Info Centre. The main function is dissemination of scientific and technology information to all the concerned and the second function is to develop connectivity at all levels and with all organizations for exchange of communication for the benefit of farmers.

Thus basically the Agri-Informatics Centres provide up to date information on agriculture with the stress on situation specific problems and after solving these problems, the solutions have also to be provided. In short instead of calling this as a cycle of information, it is Response – Feed Back – Response Flow :



For this Response – Feedback – Response Flow (RFRF) the Agri-Informatics Centres should be well equipped with the state of art services and facilities in terms of hardware, software, information storage and retrieval facilities. These facilities should always focus Situation Specific Information Dissemination (SSID) System as explained fully in System- Approach of Model Agriculture Informatics.

2. Working Model of Virtual Agri-Informatics

For any well equipped Agri-Informatics Centres, the IT tools like Internet can be used. The working model of a virtual Agri-Informatics Centres is based on the multimedia capabilities of IT tools. The Internet facilitates the development, sharing, retrieval and dissemination of a range of information. All these functions can be done in the form of text, statistics, photographs, diagrams, maps, application etc.

The concept of Virtual Agri-Informatics Centres can be explained by a simple example. A farmer visits a Agri-Informatics Centre with an insect that is causing heavy damage to his crop. The personnel of Agri-Informatics Center, do not take this insect to Plant Protection Laboratory, but instead, sends the scanned photograph to the Plant Protection experts on Internet and discuss the remedy to be taken by this particular farmer with his "Chat Room" facilities on his computer and satisfy the farmer for his insect problem. Not only one farmer but the entire farmers of the village are worried about the said insect by informing the concerned villagers through internet. This movement of information which flows so quickly without any field or laboratory visit is only possible through the "Virtual Concept" provided by Internet facilities. Some of the functions which can be undertaken through this working model of Virtual Agri-Informatics Centres are under:

(i) Collect and disseminate up to date news and information about situation specific agriculture matters including marketing.

(ii) On line message distribution through email.

(iii) Electronic discussions through voice mail or chat room and video conferencing facilities of computers.

(iv) Documents that can be printed on computer printers and keep ready for distribution.

(v) Template preparation for new documents.

(vi) Technical Information to be displayed and presented on the screen of monitor of computers.

(vii) Maps that display different features such as density of crops in general and horticulture crops in particular.

(viii) Exclusive information dissemination on Export Marketing details.

(ix) Video Chips or Audio Files to be supplied for mass media communication for T.V. or Radio.

(x) Question and Answer services where experts reply to queries.

3. Working of Agri-Polyclinics

The concept of Agri-Polyclinics is embodied in efficient agriculture extension services. Before understanding the working of these Agri-Polyclinics, we should clearly understand the new areas of extension methods. The new extension regime recognizes the role of multi agency dispensation. There are three aims of agricultural extension network namely Public Extension Services, Private Extension Services and Mass Media Information Technology. The Public Extension Services include State Government Departments, State Agricultural Universities and ICAR extension service agencies. The Private Extension Services mainly comprised of Agri-Polyclinics . The mass media and Information Technology forms print and electronic media. The role of these three components of extension services can be combined together in one package of Agri-Polyclinics . This is possible because the Agri-Polyclinics can be started at all KVKs and can function for supplying all services related to basic inputs such as seeds, nutrients, pesticides, farming elements etc. All these services can be put to use by farmers with Mass Media Information Technology, the third facet of Agri-Polyclinics.

The Agri-Polyclinics actually function on the similar lines of a veterinary polyclinic system, which involve diagnosis of problem of livestock, give prescriptions with medicines and also gives warning or precautionary measures from future point of view.

This clearly indicates that an ideal Agri-Polyclinic has a well equipped Diagnostic Laboratory for soil – plant health. At the same time experts are available and attached to such diagnostic Laboratory to analyze the diagnostic conclusions, draw inferences and recommend the remedies for immediate situation and also future precautions to be undertaken. Here the role of Agri-Polyclinics is not giving any new information altogether but situation specific and made to order type of solutions to be given with a faster speed. The speed in which the Agri-Polyclinics will work can only speak about their effectiveness. If a farmer comes with a problem, the I/C of Agri-Polyclinics should not say that "we have sent your samples for diagnosis and you wait till we get diagnostic report". This situation can create a absolency of Agri-Polyclinics.

The efficiency of Agri-Polyclinics will reflect the working of Agri-Informatics Centres, as they are directly connected with the supply of information. The Agri-Polyclinics should also prepare small folder type working instructions to be given to those farmers who can read and write e.g. instructions about sprays of pesticides, fertilizer doses etc. As suggested earlier the Agri-Polyclinics should also have facility of Mobile Diagnostic Laboratory for plant and soil health. There are advanced laboratory techniques available for on spot diagnosis of the soil and plant problems. The Mobile Diagnostic Laboratory attached to Agri-Polyclinics can also collect the plant samples affected by diseases, pest or insects, problematic soil samples and send to the full fledged Diagnostic Laboratory of Agri-Polyclinics . This helps in obtaining reliable sample, collection technique required for collecting a representative sample similarly the plant part required for specific analysis.

In view of the latest significance of production of export quality fruits or vegetables, the high-tech agriculture has come up and precision farming has replaced the traditional way of farming. In all such modern practices of farming system for commercial crops or export oriented crops each and every stage of crop cultivation is important. Hence the systematic timely functioning of Agri-Polyclinics will play

important role in producing export quality agricultural produce. The maintenance work of Green Houses, Poly-tunnels, etc. will have to be looked after by Agri-Polyclinics for immediate problems. For example irrigation facility problems need immediate attention. This will emphasis the significance of experts at Agri-Polyclinics who should also be trained in high-tech agriculture or modern techniques of farming systems.

11.2.4 Agri-Informatics Services

As explained earlier the role of Agri-Informatics Centres is disseminating Agricultural Information, has to be modulated in the form of specific system. The services of Agri-Informatics Centres can be described as under :

(a) The Agri-Informatics Centres (AICs) be able to provide services in state of the art in all kinds of networking be WAN or LAN

(b) The Agri-Informatics Centres (AICs) should be able to install software facilities and hardware maintenance facilities to those who require the same.

(c) AICs should be able to collect all relevant information required by end users by keeping connectivity with all those who are Information Generators and Information Providers.

(d) Since video Conferencing is the latest facility available at the AICs, should be able to provide such facilities to all those who are concerned with it.

(e) In order to train all concerned in latest technologies in IT and its use, the training facility and services should be provided by all AICs.

(f) The useful software, CD-ROM should be developed and supplied by AICs to those who need them.

(g) The AICs should be able to prepare full fledged websites for all concerned and should be able to provide all facilities for hosting such websites on World Wide Web.

(h) All AICs must provide adequate multi media technology to assist the training and demonstration activities.

(i) The online services of Integrated Farming System Information should by provided by AICs. For this purpose they should identify the information

requirements and design the software accordingly, to provide situation specific information.

(j) Since computerization has reached in each and every area of discipline, the computing know how for retrieval and dissemination, should reach to all the concerned, so that even a farm manager who is working in the field, should be able to know and understand the computer based system of irrigation or fertigation. He should be able to use MIS for his decision making in farm management.

(k) Since at national level the Agri-Informatics has been introduced under AGRIS, NATP research organization all the Agri-Informatics Centres should serve as main IT facility for developing all types of software to store database and provide information to all the agencies connected with Agriculture Education, Agriculture Extension and Agriculture Research at District, State and National level.

11.2.5 Agri-Polyclinics Services

As we have already discussed in details the model Agri-Polyclinics and importance of their role in providing all assistance for ideal Integrated Farming System. The services which are essential to be provided through Agri-Polyclinics are described as under :

(i) The foremost service is to provide latest diagnostic facilities with prescribing the remedial measures to all agricultural problems which are situation specific.

(ii) In order to facilitate the quick diagnosis the Mobile Diagnostic Laboratory services should be provided.

(iii) All scientific and technical services related to input and output management, including the production process management should be provided along with any information supply required for quality products.

(iv) Agri-Polyclinics should provide all technical assistance to Agri-Informatics Centres to make them able to start their training cum production units.

(v) The present system of Agro Service Centres should be strengthened with the assistance of all practical information of Agri-Polyclinics of input and output management.

(vi) Agri-Polyclinics should become a maintenance service agency for all agricultural activities like high-tech agriculture, commercial farming, integrated nutrient and pest management services, etc.

(vii) Agri-Polyclinics should have such infrastructure facilities and experts who should be able to solve serious soil and water management problems which requires immediate attention.

(viii) Agri-Polyclinics should start services of providing Soil Health Cards for all those farmers who approach these Agri-polyclinics for their soil health problem. The computerized statement for fertilizer application can also be provided.

(ix) The Agri-Polyclinics should have collaboration with Geographical Information System (GIS) so that maps can be stored in computer based system for farm land management, cultivation management and environmental conservation.

(x) The Agri-Polyclinics should focus the attention of their services for small holding farmers, who cannot afford costly diagnostic facilities being provided by any corporate agencies.

11.3 Glossary

G.I.S. Technique : The Geographical Information System technique which is used for preparation of maps and related data with computer based technologies.

ARIS : The Agricultural Research Information System of ICAR under their NATP system which advocates Agri-Informatics.

DIC : Distributed Information Centre established by the Department of Bio-technology, Government of India for their Bio-informatics.

SSID : Situation Specific Information Dissemination System which is used in Agri-Informatics.

Agriclinics : This is the term being coined for providing services for diagnosis of farm problems and prescribing the remedies and solutions.

ATIC : Agricultural Technology Information Centre which is a Single Window System of service for farming community.

Agroinfo Centres : This is the brief name of Agricultural Informatics Centre where the services are provided on the principles of Agriculture Informatics.

Virtual Agrinfo Centres : This is the advanced facility provided at Agri-Informatics Centre, through Internet System, being an indirect approach to problems from distance.

Private Extension Services: These are the services provided by such agencies which deal with agribusiness and use Agri-Informatics tools to provide situation specific information in very less time.

Mobile Diagnostic Lab : This is the mobile van facility provided by Agri-Polyclinics for on spot collection of samples of plants and soil for on spot diagnostic purposes.

11.4 Summary

Agri-Informatics is the new concept developed recently which involves emerging Information Technology and Computer based Information System. The specific situation based information is the crux of these new technologies. Realizing the importance of information and greater investment in electronic networking at National level IT Policy the establishment of Agri-Informatics Centres at district level by AGRIS, NATP of ICAR, is commendable. Considering the experience of working of Bio-informatics under the Department of Bio-technology of Government of India, the Agri-Informatics and Agri-Polyclinics System works smoothly for the benefit of farming community.

Since Agri-Polyclinics is a part of Agri-Informatics System, its proper working and methodology of appropriate services should also consider the experience of systems and models like ATIC i.e. Agricultural Technology Information Centre. The establishment of Agri-Informatics with well-equipped Information Dissemination System through Internet is boon to farming community. Similarly the strengthening

of Agri-Polyclinics Services will also automatically strengthen the working of the Agri-Informatics to provide good services to poor farmers. Considering the future needs of precision farming system or Integrated Farming System and export oriented product needs of the farmers, the Agri-Informatics Centres and Agri-Polyclinics will play important role in modernizing the entire agriculture in India.

11.5 Exercises for Practice

Answer the following questions in 200 words each.

1. What is Agri-Informatics and Bio-Informatics and explain functioning of Agri-Informatics.
2. Describe Service Providing System (SPS) of Agri-Informatics.
3. Define Agri-Polyclinics and explain working of Agri-Polyclinics.
4. Explain the role of Agri-Informatics as a virtual model of diagnosis of farmers' problems with reference to crop production and plant protection.

Unit 12 : Geographical Information System and MIS

Index

12.1 Introduction

Geographical Information System (GIS) and Management Information System (MIS) are the two important information systems for any business which uses geographical information as a main input for decision making process. GIS has been defined in different ways. We will look at some popular definitions separately. Similarly Management Information System (MIS) is one of the most important tool in any organization irrespective of nature of business and product or services it renders and class of customer it caters to. It is also known as Decision Support System, as one cannot think of taking a decision without the existence of information. If any decision without information is merely a chance and not a winning combination.

In agriculture both the systems are important. In Agricultural Production, Research, Education or Extension, information is very crucial. Any piece of information, which is not appropriate in nature, can contribute in loss of irrepiarable nature, as the spread is vast. The main difference between GIS and any other

information system in the business environment is the source of information. Very broadly speaking GIS can be a part of MIS as it supports in Decision Making Process and provides vital input.

After the study of this unit, you will be able to know and understand :

- What is Geographical Information System (GIS) and Management Information System (MIS)
- GIS Applications in Rural Appraisal Process and Watershed Management
- MIS and Decision Making

12.2 Content

12.2.1 Geographical Information System

Geographical Information System (GIS) : It is a systematic integration of Computer Hardware, Software and Spatial Data, for capturing, storing, displaying, updating, manipulating and analysing, in order to solve complex management problems.

In past, we had paper maps, which were very colourful, which we could not modify. Then came the computer revolution, where the maps were digitised and stored in digital format. These were just entities (line, circle, polygon or point) and would not provide any useful information other than the paper maps. What that entity means in geographical terms? Using these digital files we can only modify easily and reproduce it quickly. We cannot use them for any analysis purpose. Then came the GIS, which made these entities intelligent. It attached a value (*attribute*) to these entities, with what it actually means in geographical terms.GIS can be used by any business that utilises geographical information. e.g.

- Exploration and mining companies use GIS information to find out prospective areas for exploration and mining and also to analyse the ore body.
- Power companies use GIS to monitor and analyse the electricity load on the grid network for a particular area.

- Transportation companies use GIS in helping to determine the best route for delivering their goods in less time.
- Retail trade companies using GIS to determine the best location for a new outlet.
- In agriculture it is used for estimation of area under cultivation, extent of damage in case of natural calamities and crop damages.
- GIS is extensively used in crop yield estimate in various countries.
- GIS is used for Watershed planning and planning for Large Dam Command Area.
- GIS data is also used on the Internet for giving graphical representation of the users.

The purpose of a traditional GIS is first and foremost spatial analysis. Therefore, capabilities may have limited data capture and cartographic output. Capabilities of analysis typically support decision making for specific projects and/or limited geographic areas. The map data-base characteristics (accuracy, continuity, completeness, etc.) are typically appropriate for small-scale map output. Vector and faster data interfaces may be available.

A geographic information system is a facility for preparing, presenting, and interpreting facts that pertain to the surface of the earth. In common parlance, a geographic information system or GIS is a configuration of computer hardware and software specifically designed for the acquisition, maintenance, and use of cartographic data.

A geographic information system (GIS) is an information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, a GIS is both a database system with specific capabilities for spatially-reference data, as well as a set of operations for working with data. In a sense, a GIS may be thought of as a higher-order map.

A GIS is an organized collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information.

1. GIS Applications in Agriculture

GIS is widely and extensively used for various agricultural applications in last few years. Following are some of the main application areas in agriculture where GIS applications are used for accurate and reliable information collection.

- Area under cultivation for specific crops
- Land topography for watershed planning, design and development
- Extent of damages to various crops in case of hail storms and heavy rains
- Command area identification for design and construction of dams.
- Yield estimate of various crops
- Identification of vegetative cover and extent of vegetative cover in remote area.
- Soil survey and land use planning
- Sample designing in Agricultural Survey for specific research application.
- Land Records and land inventory system.

2. GIS as an Integrating Tool

An important feature of applying Information Technology to the handling of spatial data is the ability to link data to merge and compose different data for the same location. Integration, in a GIS context, is the synthesis of spatial and non-spatial information within the framework of an application. This makes a Geographic Information System an analytical and decision making tool fundamentally different from a paper map. By performing operations across the two sets of information in tandem, a far richer set of questions can be answered and a far broader range of problems can be solved than in systems that handle just attribute or spatial data alone.

The ability of GIS to integrate maps and databases, using the geography as the common feature among them has been extremely effective in the context of planning and development. The attribute database can be analysed by multiple queries, linked to multiple databases related to different projects to arrive at a comprehensive picture of the current scenario in a given area. Since the data for micro-level planning would be captured from the lowest end of the administrative system normally at block level

- village-wise, the database can be queried for aggregated results at any of the upper administrative levels viz. district, state and national levels.

A GIS, like any Information System normally includes Data Base Management System (DBMS) functions. However, it differs from conventional DBMS in the sense that every data element in a GIS has to be directly or indirectly associated with a map object for a location on the earth's surface expressed as co-ordinates with respect to some predefined co-ordinate system. Typical data in spatial form could be on general resources like topography, geology, geomorphology, climate; administrative boundaries like state, district, village, forest range; data on infrastructure like road network, power lines, water lines, sewage lines, locational data in the form of latitudes and longitudes; as well as models like ground water flow, soil productivity, timber growth and soil erosion which can be applied to geographic units. The data in non-spatial form could be the descriptive attributes associated with spatial features like soil type, land use type or socio-economic data.

A case study on the development of a Micro-watershed, GIS for planners at the grassroot levels can be cited as an example, in this context.

3. Case Study

In a project sponsored by the Ministry of Information Technology (Division of Applications of Electronics to Rural and Social Development), the Systems Research Institute is creating a special-purpose vector-based desktop GIS for use at the grassroot levels, which aims at providing tools that are useful to Micro-watershed planners. This software is basically an integration of five different modules :

(i) ***View :*** The viewing module enables the user to select or deselect different features of a map for viewing, contextually-relevant explanatory text or pictures, or to zoom in and zoom out at different scales on a map, to change colours, to select or deselect information to be displayed on-screen when the cursor lies over a map element, to conduct queries, compute length and area and to print out the map.

(ii) ***Edit :*** This is basically for a sophisticated user skilled in map-editing. The user will be asked to type in a password to allow him an access to the

editing module. This would include map-inputting capability (read-in of a scanned or digitised map); optional input of height information and development of contours, slope and aspect maps; drainage pattern development; volume computation for proposed water storages, land capability classification, creation of proposed landuse maps, etc. The editing capabilities include search - allows one to search for an object on the map, translation of an object in X and Y direction, object creation of different types, object geometry modification, colouring of objects, creation of buffer zones, etc.

(iii) ***Database:*** This module consists of the software that records, retrieves and manipulates data concerning sociological information, resource information, historical data, normative data and reports and graphical output.

(iv) ***Analysis :*** This would enable the user to perform different types of analysis for both spatial and computational, e.g. delineating micro-watersheds from a drainage map, stream ordering, drainage density, calculating maximum basin relief, volume computation for proposed water storages etc. It also includes hydrological models comprising of different engineering structures for soil and moisture conservation, and water harvesting structures.

(v) ***Help:*** The help module contains the user guide, texts, reference documents and tutorials.

This software is being built using the Geo-Concept GIS engine, with Visual Basic. The system will be loaded in a CD along with texts and reference documents, a user guide and tutorials and will be distributed by the Ministry of Information Technology in the public domain i.e. at a very low cost. Special efforts are being made to create an extremely friendly user-interface.

The tool is being developed in collaboration with three other organisations viz. Society for Rural Industrialisation, Ranchi (SRIR), Progress Group, Hyderabad (PROGH) and National Centre for Human Settlements and Environment, Bhopal (NCHSE). The GIS will interface their Foxbase, Access, Excel, etc. files and VB programmes while also providing a general-purpose ODBC database connectivity.

4. Selecting a GIS solution

Apart from its capability to acquire, store, analyse and display geographic data a good GIS should allow for the exchange of map data and attribute data with different applications, the rapid access to underlying information, simple communication with external applications and investigation, interrogation and calculation in the simplest possible ways. Other important properties for a GIS to be used in India are: (a) Cost; (b) User-modifiability through macros; (c) User-friendliness both in the user-interface and in the underlying logic of the system; (d) Smooth transition from one platform to another.

5. GIS Packages

There are a considerable number of GIS packages available in the market. Indigenous GIS packages are finding way into many user applications and separate niche market segments are identifiable for these. However, overseas GIS packages will, for a variety of reasons continue to have the lion's share of the market. Some of the popular ones are:

- ArcInfo GIS
- ArcView
- MapInfo
- WinGIS

12.2.2 Management Information System

Management Information System (MIS) concept came into existence since the evolution of computers and their extensive use in the business environment. It is also known as Decision Support System or Executive Information System. It is defined in many ways. Some of the popular definitions are :

MIS is a system providing information support for decision making in the organization.

MIS is an integrated system of man and machine for providing information to support operations, management and decision making functions in the organization.

Even though MIS is defined in many ways, all the definitions are focusing on its function as a support system for decision-making in the organization. In today's business scenario MIS is a computerised transaction processing system generating information for the people in the organization to meet the information needs for decision making to achieve the corporate objectives of the organization.

In any organization most of the activities are revolving around data collection, processing, documenting and communicating to the concern person. Major portion of the overheads goes into this type of work in an organization. All people in the organization are continuously looking for some information, which they need to perform their task. Therefore, information is people oriented and it varies with the nature of people in the organization. The difficulty in handling this requirement of the people is on account of couple of reasons. The information is a processed product fulfilling the imprecise needs of the people. It takes time to search data and may require difficult processing path. It has a time value and unless processed on time and communicated, it has no value. The scope and quantum of information is person dependent and it is difficult to conceive information as a well-defined product for the entire organization. Since people are instrumental to transact business, human error is possible in conducting the business transactions. The difficulty arises in ensuring hundred percent quality of information in terms of completeness, accuracy, validity, timeliness and meeting the decision-making needs, as human error is difficult to control. In order to get a better grip on this activity, it is necessary to have a formal system, which should take care of the following points:

- Handling of voluminous data.
- Complex processing of data and multidimensional analysis.
- Confirmation of validity of data and transaction
- Quick search, retrieval and mass storage
- Communication with any destination on time.

1. MIS Concept

The concept of MIS is evolved over a period of time comprising of many different facets of the organisational functions. MIS is a necessity of all the organizations.

Initial concept of MIS was to process data from the various departments in the organization and present it in the form of reports at regular intervals. It was more impersonal, requiring each individual to pick and choose the processed data and use it to his needs. This concept was further modified where distinction was made between data and information. The information is a product of analysis of data. It was realised that what is needed is an information and mass of data reported in a neat format. It was therefore demanded that the system concept should be person oriented, as each person may have different orientation towards the information. This concept was further modified, that the system should present this information in such a form and format that it creates impact on the user for the information, provoking decision, action or investigation. It was realised that even though such an impact is welcome modification, some sort of selective approach is necessary in analysis and reporting. Hence, the concept of exception reporting was imbibed in MIS. With the changes in business environment and compulsions of competitions has forced and imbibed the concept of need based exception reporting. This gave rise to the concept of Database and MIS based on Database.

When their conceptual developments were taking place, the concept emerged of end user computing using multiple databases. This concept has brought fundamental change in MIS. The change was from centralised system to decentralised system and the user of information becoming independent of computer professionals. The concept of MIS in today's world is a system that handles databases, provides computing facilities to the end user and gives a variety of decision making tools to the user of the system.

2. Role of MIS

The role of MIS can be compared with the role of heart in human body. The information is the blood and MIS is the heart. The heart plays the role of supplying pure blood to all organs of the body including the brain. The heart works faster when needed and it supplies more blood when it is needed. It regulates and controls incoming blood, processes it and sends it to the destination in quantity as needed. It fulfils all needs of human body in general and also in particular. MIS plays exactly the same

role in the organisation. The system ensures that appropriate data is collected from various sources and processed, and sent further to all needy destinations. The system is expect to fulfil the information need of an individual, group of individuals, management functions, managers and the top management.

The MIS satisfies these needs through a variety of systems such as Query systems, Analysis systems, Modelling systems and Decision support systems. The MIS helps in Strategic Planning, Management control, Operational control and Transaction processing. The MIS helps clerical personnel in transaction processing and answers their queries on the data pertaining to the transaction, status on particular record and references on a variety of documents. MIS helps junior management level by providing operational data for planning, scheduling and control.

MIS helps middle management in short term planning, target setting and controlling the business functions. It is supported by use of management tools of planning and control. MIS helps Top Management in strategic planning, goal setting and evolving business plans. MIS plays the role of information generation, communication, problem identification and helps in solving the problem by decision making or aiding the process of decision making. MIS, therefore, plays a vital role in the management, administration and operations of the organization.

3. Impact of MIS

Since MIS plays a very important role in the organization, it creates positive or negative impact on various systems in the organization depending on the way it is handled. The impact of MIS on the functions is in its management. With good MIS support, management of Marketing, Finance, Production and Personnel becomes more efficient. The tracking and monitoring of the functional targets becomes easy. The functional managers are informed about the progress, achievements and shortfalls in activity and targets. The manager becomes more knowledgeable in details of functions. He is made alert by providing certain information which indicates probable trends in certain aspect of business. This helps in forecasting and long term perspective planning. The manager's attention is brought to a situation which is exceptional in nature, inducing him to take an action in that matter.

A disciplined information reporting system creates a structured data base and knowledge base for all the people in the organization. The information is available in such a form which can be used straight way or by blending and analysis, saving valuable time of the manager. MIS creates another impact in the organization which relates to understanding of the business itself. MIS begins with definitions of data entry and its attributes. It uses dictionary of data entry and attributes respectively designed for information generation in the organization. Since all information systems use the dictionary, there is a common understanding of terms and terminology in the organization bringing clarity in communication and same understanding of an event in the organisation.

MIS works on basic system such as transaction processing and databases, the drudgery of clerical work is transferred to the computerised system, relieving human mind for better work. It creates information based work culture in the organization.

12.2.3 GIS and Participatory Rural Appraisal (PRA)

As seen earlier the GIS provides rational systematic analysis of the situation and aids planners to take quick decisions. Since Participatory Rural Appraisal(PRA) is also an information based planning, the GIS can play an important role in PRA system.

Usually in PRA the extension-workers and Subject Matter Specialists first prepare a rough topographical map of the village along with the participation of a group of farmers after a survey of the village. The Extension worker and Subject Matter Specialist then with the discussions on that survey report with the farmers take decision. The GIS, due to computer assisted database which also attributes for preparing maps, helps in decision making in matters related to resource-management. In fact a GIS goes hand in hand with MIS for Planning based on PRA. In short PRA helps preparing a MIS along with GIS for taking decisions by the concerned persons. With the help of GIS, right from all types of crops to wasteland, all related information will be available for undertaking action plan for land-use planning or any agricultural operation to be undertaken. With the help of GIS, the PRA will be strengthened, thereby MIS for decision making.

12.2.4 GIS and Watershed Management

Micro-watershed planning has been conceived and adopted for holistic development of rainfed farming in recent years. Watershed Management is fast becoming a blue print for agricultural development in most parts of the country today. This programme aims at conserving soil and water, as well as to put the lands to use according to their capabilities to improve the overall productivity of the catchment. The major objective of the programme is to increase and stabilise production of crops, forage, fruits, fuel and timber in rainfed areas by introduction of improved soil and water conservation measures, better crop and grassland management practices, animal husbandry and afforestation.

The ultimate goal of watershed management is to achieve and maintain a balance between resources development to increase the welfare of the population and resource conservation to safeguard resources for future exploitation and to maintain ecological diversity both for ethical reasons and as an assumed prerequisite for the survival of mankind.

Watershed is an area, which collects the water from precipitation and then is drained by a river and its tributaries. It is a "resource region" where the eco-system is closely interconnected around a basic resource water. The watershed or river basin is therefore an ideal management unit. A micro-watershed, as defined by Bali in 1978, ranges between 1-10 sq.km. or 100-1000 hectares in size.

The conservation measures and treatments would vary from watershed to watershed depending upon their characteristics, e.g. geographical locations, climatic conditions, soil types etc. Generally speaking, water, soil and biomass are considered to be the three most important components in a watershed. Conservation and regeneration of these resources would call for the need to concentrate on the following aspects :

- ***Water Resource Development :*** The need for water resource development arises in an attempt to mitigate droughts, moderate floods and harvest the run-off water which otherwise goes as waste. The development of water resources mainly includes water conservation techniques. This involves increasing the recharge from precipitation with the creation of sub-surface and surface storages

which are capable of impounding maximum monsoon rainfall. Storing of harvested run-off water can be accomplished with the help of various water conservation techniques like the construction of masonary weirs, excavation tanks, composite dams etc. This conserved water can be recycled and used at critical stages of crop growth through lifts, open dug wells, bore wells etc.

- ***Soil Conservation:*** Soil conservation is by itself the proper land husbandry, which would preserve the land and its fertility on a sustained basis and at the same time increase yields and achieve maximum benefits from such land. Soil erosion is one major problem in the hilly and undulating terrain resulting in low productivity of agricultural land. In order to check this hazard of soil erosion, various conservation measures can be undertaken ranging from narrow based terracing (contour bunding) to bench terracing which would simultaneously include moisture conservation.
- ***Wastelands Development :*** Lands that have one or more limitations of slope, erosion, stoniness, rockiness, shallow soils, wetness, flooding, dry climate etc. make them generally unsuitable for the cultivation of agricultural crops and limit their use largely to pasture, forest, wildlife and recreation. These lands commonly known as "Wastelands" are the source of maximum sedimentation, run-off and floods.

The denuded forest lands are in fact "Wastelands" as they have a great potential for producing fodder, fuel, fibre, minor fruits and low quality timber. To achieve this, it is necessary to adopt suitable soil and water conservation engineering measures supplemented with proper afforestation techniques, horticultural practices, grassland development etc.

- ***Conservation and Development of Forests and Vegetation :*** Vegetation (perennial or annual trees, or shrubs, climbers or grasses) on the site is one of the factors that govern the run-off water which affects erosion. Vegetative control can be one of the essential anti-erosion measures, since it is under human control, unlike rainfall.

Forests, in general, bring about a long chain of advantages moderating the local climate, preventing floods, regulating stream flow, sustaining off-season discharge,

protecting the soil and enriching it. Thus, an organised maintenance of all perennial vegetation on site is called for.

- ***Animal Husbandry and Livestock Management:*** This includes the population characteristics, type, numbers, quality, distribution, feeding habits of animals as well as birds and marine life. Activities concerning the improvement of livestock management includes pasture and fodder development, improvement of grazing land, stalk feeding and fodder supplies, reduction of grazing pressure on land, improved milk production, other livestock development like sheep, goats, poultry, fishery development.
- ***Human Resource Development:*** Since the ultimate aim of the Watershed Development Programme is to improve the quality of life of the local people, human resource development is one of the most important aspects to be taken care of. It can be approached through awareness and training programmes.

Data regarding population characteristics, professions, socio-economic conditions, land ownership, tenure, employment status, outside jobs etc. are required for any kind of undertaking in this sector.

1. Role of GIS in Micro-Watershed Planning and Management

A GIS is a composite of computer based decision support tools for the integration of spatial data from different sources and for the analysis, manipulation and display of these data. It is therefore, an excellent tool for the management of large bodies of spatially extensive data with all the advantages of a computer environment, precision, consistency and absence of computational error.

This powerful tool holds a very large potential in the field of regional and micro-level spatial planning particularly in micro-watershed planning and management. A GIS can help pull together various types of disparate data such as remote sensing data, census data, records from different administrative bodies, topographical data and field observations to assist researchers, planners, project officers and decision-makers in resource management. Creation of a spatial database is the first step in micro-level planning. This is followed by spatial analysis to help identify problem areas and, finally, the steps towards planning to mitigate problems are taken by marking

out action areas. Taking a watershed as the spatial unit of study, appropriate physiographic and morphometric parameters can be taken into account to enable proper micro-watershed management.

2. Watershed Management is a Three-Tier Management Strategy

(i) a micro-regional planning approach, (ii) the analysis and appraisal of the biophysical and socio-economic environment and (iii) agro-ecological zoning. The necessity for a micro-regional approach to planning arises primarily because the actual conditions of watersheds vary, depending on the local, biophysical conditions, population pressure and natural resource conditions. Information on existing land use and land cover, its spatial distribution and changes are essential prerequisites for planning. Land use or land-cover changes are critically linked to a combination of natural and human impacts. Improved understandings of the dynamics of land-use and land-cover changes provide a means for projecting the impacts of land use. Thus, land-use planning and land management strategies hold the key to development in a region. Geographic Information Systems (GIS) provides an effective tool for analysis of patterns and causes of land-use dynamics and for planning management strategies.

Creating infrastructure to provide support services is a government's responsibility and the government has established norms for use in the planning process to cover geographical areas with these services. Whereas, in the plains, the services can reach a greater number of inhabitants; due to (i) a higher density of population and (ii) easy accessibility with very few geomorphic impediments in hilly regions, the placement of these services in tune with the inhabitants' requirements is more difficult. Sometimes even the geomorphic features create seasonal accessibility. GIS applications have the potential for assessing support service requirements and their placements. This application has advantages over the conventional mechanisms, as multi-criteria analysis is not only feasible but much faster with GIS.

12.2.5 MIS and Decision Making

The word decision is derived from Latin word 'decido' meaning to cut-off. The concept of decision, therefore is settlement, fixed intention bringing to conclusive

results, judgement, and resolution. A decision is a choice made by the decision maker to achieve some objective in a given situation. Business decisions are those, which are made in the process of conducting the business to achieve its objectives in a given environment. The major characteristics of business decision making are: (i) Sequential, (ii) Exceedingly complex, (iii) Involves personal values and (iv) Made in institutional settings.

The decision making in business is sequential in nature and not an isolated event. It has bearing on certain activities in the organization. It may appear that it is a SNAP decision but it is the outcome of a well thought of long chain of activities. The decision making process is complex in nature at higher levels of management as their decisions have wide spread effect on entire organization. The complexity is a result of many factors, such as interrelationship among expert decision makers, job responsibility, question of feasibility, codes of ethics and probable impact on business.

1. Problems in Decision Making

As mentioned earlier that decision making is a complex process and it is out come of well thought-of process and chain of activities. The problem associated with this process are:

(a) Ascertaining the Problem : The most common source of mistakes in management decisions is the emphasis on finding the right answer rather than the right question. The main task is to define the right problem in clear and simple terms. Management may define the problems as "Sales are declining". Actually the declining of sales is symptomatic, real problem being somewhere else.

(b) Insufficient Knowledge : For perfect rationality, total information leading to complete knowledge is necessary. An important function of a manager is to determine whether the dividing line is reached between insufficient knowledge and enough information to make a decision.

(c) Time Constraint : The decision maker is under pressure to make decisions. If time is limited, he may make a hasty decision which may not satisfy the test of rationality.

(d) Environment : Sometimes, the timing of decision is such that one is forced to make a decision but environment is not conducive. The decisions may fail on test of rationality as environmental factors considered in decision making turned out to be untrue. For example, in product pricing the factor of oil and petroleum product price is considered as stable but post decision environment proves the consideration utterly wrong.

(e) Other Limitations : The other limitations are need for compromise among different positions, misjudging motives and values of people, poor communications, misappraisal of uncertainties and risks, inability of human mind to handle available knowledge and human behaviour.

2. Herbert Simon Model of Decision Making

According to Herbert Simon (Noble Laureate – Professor at Mellon University), decisions exist on continuam, with programmed decisions at one end and non-programmed decisions at the other. Programmed decisions are repetitive and routine, to the extent that a definite procedure has been worked out for handling them so that they do not have to be treated new each time they occur. Non-programmed decisions are novel, unstructured and unusually consequential. There is no cut-and-dried method for handling the problem because it has not arisen before, or because it's precise nature and structure are elusive or complex, or because it is so important that it deserves a custom-tailored treatment.

Simon explained that the two decision types are only the black and white ends of the continuam and that the world is mostly grey. However, the concept of programmed and non-programmed decisions is important because each calls for a different technique.

Another major contribution of Simon was his description of the four phases that a manager goes through while solving a problem. Simon's Phases are :

(i) Intelligence Activity : Raw data collection, processed and examined. Identifies a problem calling decision.

(ii) Design Activity : Inventing, developing and analysing different decision alternatives and testing feasibility of implementation

(iii) Choice Activity : Selecting a particular course of action from those available

(iv) Review Activity : Assessing past choices.

3. MIS and Decision Making

IT is necessary to understand these concepts of decision making as they have a relevance to design of MIS. The Simon model provides conceptual design of MIS and Decision Making, wherein the designer is to design the system in such a way that the problem is identified in precise terms. That means Data collection to data analysis should be such that it provides diagnostics and also provides path to bring the problem to surface. In the design phase of the model, designer is to ensure that system provides models for decision-making. These models should provide for generation of decision alternative, test them and pave way for selection of one of them. In a choice phase, designer must help to select the criteria to select one alternative amongst many.

The concept of programmed decision making is the finest tool available to MIS designer, whereby he can transfer the decision making from decision maker to the MIS and still retain the responsibility and accountability with the decision maker or Manager. In case of non-programmed decision, MIS should provide decision support systems to handle variability in decisions conditions. Decision support systems provide generalised model of decision-making.

The concept of decision-making systems, such as closed and open systems helps the designer in providing design flexibility. The closed systems are deterministic and rule based; therefore need to have limited flexibility in design, while in open system the design should be flexible to cope up with changes required from time to time.

Method of decision-making can be used directly in MIS provided you can decide which method can be applied. Number of decision-making problems calls for optimisation, and models are available which can be made part of the system. The optimisation models are static and dynamic, and both can be used in MIS.

The relevance of decision-making concepts is significant in MIS design. The significance arises out of complexity of decision making, human factors in decision making, organisational and behavioural aspects and uncertain environments. The MIS design addressing to these significant factors turns out to be the best design.

12.3 Glossary

Data : Data is a plural of datum. Data are facts, records of an event that has occurred or is about to take place.

Database : A database is a controlled collection of data about the subject, physically organised and stored so as to provide universal availability, share ability among the users.

Spatial Data : It is the collection of the geographical information from the space.

Information : Information is a result of data processing. Information communicates knowledge or meaning.

Value of Information : In decision theory, the value of information is defined as the value of the change in decision behaviour resulted from the information less the cost of obtaining the information. If new information does not result into different decision, then the value of new information is zero.

Watershed : Watershed is an area, which collects the water from precipitation and then is drained by a river and its tributaries. It is a "resource region" where the eco-system is closely interconnected around a basic water resource.

Three-tier Management Strategy : This strategy focuses micro-regional planning, analysis and agro-ecological zoning.

Decision Making : It is a settlement in bringing out conclusive results.

Micro-Watershed : It is the watershed area ranging between 100 to 1000 hectares.

12.4 Summary

Geographical Information System (GIS) and Management Information System (MIS) are the two most important and useful systems for agro-based enterprise irrespective of nature of activities.

Geographical Information System (GIS) will help to ascertain the ground level realities with the help of spatial data obtained from various resources. In GIS one can integrate data from various sources such as Remote Sensing Data and Image with that of data of land records and agricultural census. It would be more advisable

to implement GIS application in case of agro-based enterprise to ascertain the scope of activities.

GIS applications are widely used in western countries for various agricultural purposes. In recent times India is also extensively using GIS application as support system. GIS application gives us accurate results. It would be extremely useful in watershed planning and also in identification of area under cultivation of various crops.

In earlier times businesses were dependent on Knowledge and Wisdom of a single individual. This has led to possibility of more mistakes in business decision making process. With the advent of Management Information System i.e. MIS and subsequent research into it, the decision making has undergone a change.

MIS is defined in many ways. It is also known as Decision Support System or Executive Support System. The nature and method of implementation of MIS varies from organization to organization. In an organization each individual department may have its own MIS and later-on merge into organisational MIS. MIS ensure that any problem in the organization would be solved systematically and scientifically.

It is extremely powerful tool for top management in decision making. It reduces time in decision making process and ensures that the decision addresses the right problem.

12.5 Exercises for Practice

Answer the following questions in about 200 words each.

1. What is MIS and GIS and explain how MIS can be useful in planning of agro-based enterprises ?
2. Describe the role of GIS in Watershed Management.
3. Write note on PRA with reference to Geographical Information System.
4. Describe Herbert Simon model of decision making.

Unit 13 : Farm Information Management

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13.1 Introduction

Farm Management is different from what is commonly confused with the work of a farm manager who manages a private or government farm. His function is normally limited to supervising and handling the day to day routine work of farm. It normally pertains to the existing pattern of the resource use, cropping pattern under which the existing plan is executed and supervised. Here the emphasis is not only to "input and output management" but also on the decision making function of evaluating and choosing between alternative strategies. Here the farming is being considered as business enterprise, we may call it as an Agri-business. This concept requires the application of principles of management in farming. To be an efficient manager one must keep oneself abreast of all the technical and non technical information which is essential for farming as Agriculture Business. Thus the Farm Information Management is a professional approach to farming. Just like any other Subject Matter Specialist

(SMS) of agriculture, the Farm Management Specialist (FMS) has to consider not only the profitability of inputs but also the costs involved in producing each unit of output.

After the study of this unit, you will be able to know and understand :

- The input and output management with due consideration to production process management.
- The significance of data documentation and use of its interpretation for Farm Decision Process
- The utilization of the information on weather forecasting.

13.2 Content

13.2.1 Input Management

For any type of farming the planning on better utilization of inputs such as seeds, fertilizers, pesticides and other agrochemicals is normally termed as input management. The land use and water resource management has been also regarded as pre-requisites for Input Management. However it is important to understand the two important approaches of farming that influences the Input Management. They are (a) Approach to Commercialization and (b) Approach to Integrated Farming System (IFS).

The approach to commercialization requires (i) resource endowed productive environment, (ii) access to high productive inputs, (iii) favorable marketing network, (iv) knowledge and skills to use inputs efficiently, (v) perception change in agriculture from a present living to better living from the resources. The Approach to commercialization has led to undesirable trend of the indiscriminate use of inputs such as water, fertilizers and pesticides. However the Input Management has made it possible to propagate the idea of IFS The IFS is environmentally sound and economically viable system. This is again comprised of two main components i.e. Integrated Nutrient Management (INM) and Integrated Pest Management (IPM)

1. Integrated Nutrient Management (INM)

INM is a flexible approach to minimse the use of chemicals and fertilizers and maximize crop production and farmer's profit use efficiency and farmers profit. Over use of fertilizers harms the biological power of soil. The INM mainly involves supply systems having appropriate combinations of organic manure, green manuring, bio-fertilizers along with Minimum Essential Quantity (MEQ) of inorganic fertilizers and micro nutrients. The MEQ factor of major nutrients like NPK and micronutrients can be easily calculated on the basis of soil analysis of the farm. This information about the nutrients available for plant growth thus forms basic data for calculating MEQ of major nutrients as well as micro-nutrients. The computerized methodology for finding out the recommended doses of fertilizers is also based on soil nutrient status (soil health report). The soil health report is most useful to know the organic matter content of the soil as both are gradually being depleted over a period of time. The INM has to consider this aspect of organic component of soil which is equally important as that of inorganic nutrients content of soil.

2. The Significance of Integrated Pest Management (IPM)

Indiscriminate use of pesticides has adversely affected the ecological balance resulting in pest resurgence and pesticide resistance. The IPM approach includes the Input Managemnt through pest monitoring and promotion of biological control of pests. The simplest example of how the information management can be a very useful tool in promoting IPM is the result carried out by various government agencies on IPM. They have proved with statistical evidence that IPM has reduced 50 to 100 percent use of pesticides and yet nearly 34 per cent increase in yield. The use of pheromones, bio-agents and bio-pesticides are important low cost components of IPM.

Under IPM strategies the plant products that are derived from plants are also being recommended to replace insecticide and pesticides as they have also similar properties to effectively control this menace. Neem derivatives, can be taken as one of the good examples as it has been found most ideal component of IPM. In fact the earlier described Integrated Nutrient Management (INM) and now the IPM clearly

advocates the concept of Ecological Farming.

Ecological Farming = (INM + IPM) x Input Management

3. Water Management: A Cost Effective Approach

Saving of water is most significant aspect of cost effective approach for Water Management through good irrigation practices. Hence Water Management should form an important component of Input Management. For surface irrigation saving of each drop of water can be a right approach in water management. The proper knowledge of cultural practices can save the water which otherwise is being wasted by following old age practice of flooding the fields rather than giving water to certain required depth of irrigation. Such systems can save more than 30 percent of water without affecting the productivity of the crops. The Water Management does not consider only the quantifying of water requirements but also recommends various methodologies to check water losses due to faulty conveyance. The Input Management has to look into alternate methods such as Sprinkler and Drip Irrigation system which should be cost effective tool. Another important aspect of Input Management is how to regulate the use of water in relation to use of fertilizers as water can be regulated to crops to obtain more yield from unit quantity of water and fertilizer.

4. Seed as a Basic Input Management

Seed is the basic input in agriculture and the Input Management in this direction is most important as seed is catalyst for other inputs to be cost effective. The seed plays a vital role in globalization of market. It is now realized that certified seeds perform better than home produced seeds, hence quality control measures are essential.

Keeping the professional approach towards Input Management of seeds one has to know the benefits of genetic mapping and DNA finger print technology, which helps in detecting bad quality seeds. The DNA Market technology is helping to detect plant disease at earlier stages. Hence the bio-technology information is strengthening Input Management process by selecting better quality seed.

The Input Management should include the promotions of hybrid seed production by Government and Private sectors. Building adequate infrastructure and trained

manpower for seed production, processing and supply of quality seed is the need of the hour. The hybrid seed requirement of the country has reached millions of tonnes against very low figure of hectares under hybrid seed production. So far our priorities have focused producing hybrid seeds for domestic purpose, but as agri business has already entered into new era of globalization our strategy should also be directed to produce seed for export purpose also.

13.2.2 Production Process Management

Production is a process of transformation of certain resources or inputs or services. The level of output of a particular commodity depends upon the quantities of input used for its production. The relation between quantities of inputs and outputs can be characterized as production function. Production function is thus a technical and mathematical relationship describing the manner to which a particular product depends upon the quantities of input(s) or service(s) of input used. There are numerous relationships between the resources and farm products. From farm information management point of view, it is necessary to understand these relationships. Major production relationship involves three main categories as (i) Factor product relationship (ii) Factor – factor relationship and (iii) Product – product relationship.

Factor product relationship is very simple as it involves single factor and single product relationships. For example single factor such as fertilizer input vs crop yield or product yield. Here in this case we consider only one output and one variable input, whereas all other input were considered fixed. However, in actual situation the second relationship of Factor - factor relationship exists. Where in there are many resources that are processed for getting one product. In this case with the level of change in the input, the resulting amount of output also changes. The Third relationship is Product – Product relationship, in this instead of considering the allocation of input to an enterprise, we look at combination of products and product mix. This relationship can be explained with the example of a farmer who intends to grow wheat along with crops like gram, barley, sugarcane, etc. in given hectare of land. Under Product – Product relationship the acreage under wheat will be a function of acreage of other crops like gram, barely, sugarcane, etc. Here naturally the question

would be how should the inputs be allocated among given enterprises.

Product – Product relationship involves production of complementary and supplementary enterprises. In most parts of India, farming is diversified because of two distinct i.e. *Kharif* and *Rabbi* seasons. In some countries such as U.S.A. there is only one crop season, farmers generally specialize in one or few crops only. The Input management in this respect of production process, assumes more importance as techniques of production on a farm is important than growing number of crops. Growing of export oriented crops and commercial crops do require specialized information for making the production process more useful by managing inputs of specialized qualities.

13.2.3 Output Management

It is very often said that the production output, is demand driven. However, in actual practice the output is "profit-driven" or influenced by cost effective factor. Hence the output management has to be oriented on financial factors. Here the objective of output can be clashed, whether to obtain highest income to the farmer rather than highest yield. Here in order to avoid any such clash the professional managers play important role. As they use the output management skills to produce highest yield with cost effective methods of cultivation. In fact output management is resultant effect of each and every step looked after in the entire production process management starting form the Input Management. From the farm business point of view day to day operational farm decisions can save the losses and increase the net returns. The output management at one hand always looks at level to which yield per hectare should be pushed to secure maximum profit, at the other hand also considers amount of inputs to be used. This emphasize the importance of management skill or managerial ability to be used facing different principles of variable proportion and different laws governing the increasing, constant and diminishing returns.

With this background, one should look forward to the existing scenario of export oriented output management and also the marketing information influencing the output management, restricting to the knowledge based strategies.

1 Floriculture as Output Management for Exporting Flowers

It has been experienced that the important problems that are being encountered with Floriculture Export Project is that as much as 70% of their total revenue from exporting the flowers goes to meet their freight costs. Suppose the entrepreneur earns about Rs. 10 million by exporting his roses to Europe his freight costs alone Rs. 7 millions. So rest of Rs. 3 millions are left to meet his overheads and loan installments. Floriculture is a typical case study for many new entrepreneurs, who take loans from the Banks and start the floriculture project without much studying the success stories. The typical case, to be mentioned here is how important is the output management. Let us take the example of the required quantities of flowers to be produced on per square meter basis, if one produces half the quantity required, then his revenue is hampered. Similarly the quality of the flowers produced always matters. A reasonably good quality roses fetches at an average about Rs. 13 per stem but in reality because of quality they fetch only Rs. 5 to 6 per stem.

This is happening as the output management is in very disorganized way. There is no marketing research, marketing relationships developed as one day the new entrepreneur send flowers to Dubai, the next day to Holland and after that to Japan. There is also lack of technical know how of the production also. For roses the ideal range of temperature is around 30 degree celsius during day time and at night time it should be about 15 degree celsius. The Bangalore and Pune temperature range matches this requirement, hence these are the ideal places for floriculture projects. The green house technology locally made in the country are cost effective as compared to material and technologies. This is also an important consideration for output management.

2. Output Management for Export Oriented Fruit and Vegetable Crops

In India about 11.6 million hectares of area is allocated to horticultural crops. India shares only 0.9 percent of total export of fruits in the international market. India is the second largest producer of vegetables in the world next to China. Despite the impressive figures of India's status with respect to the vegetable production in the world, India's share in the world trade of vegetables is hardly 1% of the world's total export trade.

The principal agricultural commodities included in the export trade are the traditional commodities e.g. Tea, Coffee, Fabrics, Jute, Spices, etc. However in fruits, mangoes and grapes are getting their due share in export because of updated output management measure, such as production technology for export oriented fruit production. Especially the expertise of export oriented grape is so much developed that the export performance of grapes peaks of over rising trend by leaps and bounds both in quantity and value terms. Availability of almost nine months sunshine in a year has favorable climate to make India as strong supply base of vegetables. Similarly vegetables produced in India enjoy a lower labour cost in the cost of production and hence this situation has made the vegetable production also competitive in export markets.

13.2.4 Data Documentation and Interpretation

In order to make farm analysis, it is essential to maintain suitable record books in which data is recorded in relevant columns. The data need to be summarized, tabulated and analysed. A good system of accounts for any farm is one that enables recording of information that the farmer needs and also permits the desired analysis of the information recorded. Farm records are usually comprised of (i) Farm Inventory (ii) Farm Financial Accounting and (iii) Farm Cost Accounting (Full Cost and Single Enterprise Accounting)

In Farm Financial Management the two main components are Cash Flow Chart and Farm Financial Budget. A cash flow statement is simply a month by month or quarter by quarter comparison of the expected cash income and expected cash expenses alongwith the cash position for each month which is difference between total income and total expenditure. These records are essential to show what is accomplished in the past and where the business currently stands. The Farm Financial Budget is prepared by estimating the expected operating sales, capital sales, operating expenses of different crop inputs, capital expenses and the quarter in which these would occur.

Due to latest development in software developments all these records mentioned above for financial and cost accounting can be easily computerized and data can be made available for suitable inferences and interpretations. The significance of these

interpretations can be seen as very important from the Agri-business point of view. What we are talking of computerization in financial matters in most ideal thing, however the rural India is yet to be trained for maintaining the simple books of accounts. If farm records are not kept properly they cannot be made use for future lessons or operations. Ultimately it is farm business analysis which is important as it is useful to know how does the agri-business fare at a certain time, where are the weaknesses and what improvements are possible.

As most of the farmers take loan, the reliable cash flow projections for a farm business can be of tremendous use to the farmer in estimating how much to borrow and when and also for developing better repayment plan. In any case the farm records are extremely useful for its interpretations especially with regard to (i) profitability of different enterprises, (ii) capital investment pattern, (iii) cost of production, (iv) productive efficiency, (v) physical input requirements and (vi) the family living cost. The summarized classified cash account of farm business provides the basis for simple analysis which helps to make comparisons of efficiency of a farmer with performance of other farmers operating under similar conditions.

13.2.5 Farm Decision Support System

Farm Management is a decision making science. It helps to decide about the basic course of action of the farming business. The basic decisions of the ideal farming business are :

a) What to produce or what combinations of different enterprises to follow ?
b) How much to produce ? What is the most profitable level of production ?
c) What should be the size of an individual enterprise, which in turn, will determine the best overall size of the farm business ?
d) What methods of production and production practices or what type of quality of inputs and their combination should be used ?
e) How and where to market the final product?

The challenge to the Farm Management Specialist (FMS) is to be able to integrate and synthesize the diverse pieces of information from many disciplines and field of specialization. Thus Farm business is a process and always requires support system

to take decisions at various stages of this process. If we consider that we should obtain continuous maximization of net returns, then we need to have farm planning. Thus we can say that farm planning is a process of making decisions regarding organization and operation of a farm business so that it results in maximizing net income. Farm planning helps a farmer to examine carefully this existing resource situation and past experiences as a basis for deciding which of the new alternative enterprises and methods fit his situation the best. We can say that any system that uses farm planning to take farm decision is the Farm Decision Support System (FDSS). The FDSS is developed with the help of information which may be specific (perfect knowledge) or non specific (imperfect knowledge). The specific information needed for FDSS are :

(1) Information on farm situation (topography, drainage, soils, land holding, irrigation potential), labour, farm buildings and working capital.

(2) List of process, farm enterprises and outputs to be produced.

(3) Expected prices of farm products and inputs. The additional information needed for FDSS, which are non-specific include information on price and yield variability, possible sets of events such as possible weather conditions, various credit policies.

Another important component of FDSS is farm budgeting which is a process of estimating costs, returns and net profit of a farm enterprise. A farm plan shows the crops to be grown and the practices to be followed in their production. Thus FDSS is concerned both with planning and budgeting.

Farm Decision Support System(FDSS) = Farm planning (FP)+ Farm Budgeting (FB).

The Farm Budgeting helps us to evaluate alternative plans and select the one that is most suitable. Farmers always need to make both long run and short run or annual farm budgeting. For example in the long run planning one may not be able to anticipate the important changes in the price relationships. Hence the flexibility is required. Flexibility makes it possible to alter the plan as new problems arise or new information becomes available. The partial Farm Budgeting with the help of increase in cost per hectare and decrease in return per hectare on debit and credit side helps in FDSS for taking decisions. Common examples of FDSS are choosing the alternatives

between mechanical versus manual work, soil versus foliar application, split versus single dose of application of fertilizers.

For most of the times the FDSS is based on perfect knowledge and imperfect knowledge. The FDSS can also be tried on the principles of SWOT Analysis i.e. considering the Strengths, Weaknesses, Opportunities and Threats. We may call the group of Strengths(S) and Weaknesses(W) as perfect knowledge group as we know our S and W. However we are not quite sure of our Opportunities(O) and Threats(T) as they are based on Imperfect Knowledge. For any farm management we should know our SW and OT so that based on that information we can utilize the FDSS. The SWOT analysis approach will be useful for FDSS. Whether it is SWOT or FDSS it is mainly a systematic way of approaching towards a problem and finding out its solution. In decision support system which is based on proper planning considering our SWOT Analysis will be useful for managing a small farm or large farms.

13.2.6 Weather Forecasting

Having 17 centres located at different State Capitals of the country, the Indian Meteorological Department (IMD) is the apex organization which mainly deals with weather research and service activities of the country. Each of us know that vagaries of weather are perceived as a threat to our food security. In order to reduce the impact of uncertainties of weather and for taking advance preventive measures to contain weather triggered crop production risks, the agricultural meteorological research plays an important role. The Agricultural Meteorological Division has been located at Pune and is able to render most commendable services of giving district wise weather forecast for next 48 hours through their services of Farmers Weather Bulletin either on Radio or T.V. News Channel. The Agri-met Division also gives crop weather calendar indication at what stage the weather is normal or detrimental to crop based on different varieties of crop and cropping patterns.

Millions of farmers seek information each day for one main reason to help them to make on farm management decisions that may range from the seemingly trivial cutting of grass, to one could lead to crop disasters and pesticidal sprays. The main

links in the chain connecting the national weather system are a sequential sets of meteorological observations. As the weather monitoring and prediction technology is growing fast the complexities of the system linking national weather services to common farmer is also increasing. The Agrimet Division has started Agro meteorological Advisory services to advise farmers on Radio and T.V. for various agricultural operations like scheduling of irrigation, choosing optimum time for pesticide spraying or application of fertilizers.

With the introduction of Internet Services on Computers various Weather Websites are giving very valuable information on Weather forecast directly useful to farmers. These websites not only give day to day weather report but also are able to give agriculture planning tips which are based on extensively analyzed past rainfall data with planning steps to be undertaken for drought prone and dry land farming. The website of Indian Meteorological Department **(www.imd.ernet.in)** is very useful site for common person interested to know weather reports and also for common farmer for field level advise and current weather situations with maps etc.

The above mentioned importance of forecasting of weather and climatic conditions, it is but very clear that we should envisage for establishing centers of information for agro meteorological information and guidance to utilize this information.

1. Agromet Advisory Service Untis (AASU)

The seriousness of Agromet Advisory Service Units (AASU) can be very well understood, if we take typical example of role of weather information in crop growth stages. It has been observed in Rice-Cultivation that the first critical meteorological input is the date of onset of the monsoon season. Each day's delay in transplanting of rice reduces the yield by about 70 kg/ha. Similarly it has been observed that the amount of solar radiation at the reproductive stage of the rice crop is highly significant for the grain yield. Excessive flooding at the grain filling stage together with high wind velocity could damage the rice crop and reduce yield by 20 to 30 percent. Like this many examples can be quoted especially for fruit crops which are more sensitive to the weather changes. Even the fertilizers saving is possible through correct

prediction of high rainfall period which could save some kilogram of nitrogen per hectare, but which amounts to save lakhs of rupees worth nitrogenous fertilizers like urea.

As in 9th plan it is envisaged to have one KVK in each district, it is therefore suggested that Agromet Advisory Service Untis (AASU) should be established at each District preferably at Krishi Vigyan Kendras (KVK's). In brief all these AASU will save the waste of money to all important inputs like fertilizers, pesticides and water, infact the climatic information is invaluable baseline data for rain fed agriculture. All AASU should serve as help line for all type of farming systems. Already some of KVK's have started their Internet Services which include Weather Reports also. With the establishment of AASU weather and climatic conditions based advise to farmers will be very useful.

2. Agro Meteorological Training

The AASU should also become the training center of basics of Agro meteorology to the extension workers and village level social workers, so that after a short duration training they should understand crop weather relationship, disease forecasting, weather relationship with soil nutrient availability, development of crop weather models to devise efficient agricultural production systems and climate aberrations in terms of temperature rise and ozone depletion, weather vagaries, wind erosion and interpretation of weather report data.

13.3 Glossary

IPM : Integrated Pest Management.

DNA Marker : It is a technology which is helping to detect plant diseases at early stages.

Production Function : It is a technical and mathematical relationship describing the manner to which product depends on input.

Export Oriented : The production of agriculture produce or products that possess the qualities which are required as per norms of Export Quality.

Entrepreneur : The person who controls or manages a commercial project or business unit.

Cash Flow Chart : It is a statement which shows monthwise comparison of expected cash income / expenses.

Farm – Business Analysis : The analysis which is useful to know how does the farm agri-business fare at different stages of business.

FDSS : Farm Decision Support System.

FB : Farm Budgeting.

AASU : Agro-meteorology Advisory Service Unit.

13.4 Summary

In the context of the recent technological breakthrough, the farm management today should be viewed as agriculture business process and a forward looking approach. The major component of this process is Input and Output management and the Production Process Unit. The importance of Input Management has been increased due to introduction of Integrated Systems i.e. Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) system. One has to also consider the relationship between quantities of inputs and outputs which is characterized as production function.

Output Management gains more significance in present scenario of export-import agriculture produce and products. Since there is a scope for Floriculture, Horticultural and Vegetable crops for exporting the same, the output management has to be considered seriously.

Similarly the Farm Data Documentation, their Farm Business Analysis is important for its inferences and interpretation to make farm business more profitable enterprise, which is only possible through Farm Decision Support System and proper utilization of Farm Weather and Agro meteorological Advisory Reports.

13.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Describe the significance of Input Management with reference to Integrated Farming System.
2. Explain the role of Output Management in exporting agricultural produce and products.
3. Explain why Farm Management is called as 'Decision Making Science' with the use of Farm Decision Support System (FDSS).
4. Explain why the agro-meteorological information is important in Farm Management.

Unit 14 : Electronic Commerce in Agriculture

Index

14.1 Introduction

A new revolution similar to the industrial revolution that took place at the turn of the last century. Many economists, management experts and futurists agree that the world has entered into the new age of information. What are the drivers of this information age? The primary drivers are technology and markets which are well known. Marketing, enterprise and entrepreneurship are some of the other drivers. The new industrial revolution which surrounding us requires profound change in the way we consider enterprise, develop our businesses, the way we manage and the structure within which we manage. It is not a change in the market but the fundamental change in our economic relationship with various stake holders in the process. In this new order its Information and Information Technology who are in drivers seat.

The continuos stride of businesses to increase productivity and efficiency, reduce the costs of their products and services, and use technology to continually innovate in order to expand and create new markets is not new. It is just that today, competition

is much more fierce than ever before. Technology is an enabler of change and a catalyst, but change itself has to be driven by business drivers that take advantage of the technology. Market is no more local and it becomes globalised. In this changed business environment means of accessing the through national and global information superhighways have given a birth to new concept of Electronic Commerce. Electronic Commerce has unleashed yet another revolution, which is changing the way businesses buy and sell products and services. It is associated with buying and selling of information, products and services over computer communication networks. E-Commerce helps conduct traditional commerce through new ways of transferring and processing information. E-commerce refers to the paperless exchange of business information using Electronic Data Interchange (EDI), Electronic Mail (E-mail), Electronic Bulletin Boards, Electronic Funds Transfer and other network based technologies. It not only automates manual processes and paper transactions but also helps organizations move to a fully electronic environment and change the way they operate.

After the study of this unit, you will be able to know and understand :

- Electronic Marketing and its functions
- Electronic Marketing and Indian Market Conditions
- Impact of E-Commerce on Indian Agriculture
- E-Commerce in World Trade Commerce regime

14.2 Content

14.2.1 Electronic Marketing

E-Commerce refers to the paperless exchange of business information using various tools such as Electronic Data Interchange (EDI), Electronic Mail (E-mail), Payment Gate Way, etc. It is supported by all real business activities, but it reduces time and efforts involved in the business transaction across the globe.

E-Commerce has recently got a fillip with the US Federal Government's announcement that all federal purchases would be made paperless. In last few years,

organisations have started conducting E-Commerce over the Internet. *e.g. M/s. Kirloskar Oil Engines Ltd., Pune is generating half of its total revenue through E-Commerce based business activities by using its own network of dealers.* It is becoming more and more popular because of its low operational cost and speed of business. E-Commerce is still in the process of development. Various tools and standards needed for hassle free business environment are in development phase. The United Nations Standards for EDI for Administration, Commerce and Transport (UN/EDIFACT) standard has already been established as the true international standard for EDI messages. In India too, UN/EDIFACT has been officially announced by the government to be the national EDI standard. The importance of this standard cannot therefore be over-emphasised, as cross-sectoral communication between government, industry and financial institutions, will hinge on the use of UN/EDIFACT for exchange of commercial and regulatory documents.

Information gathering, processing, manipulating and distributing is common to trade and commerce irrespective of nature of business or products offered. Today, it is the velocity of information processing and dissemination which determines the speed of real commerce. Computers and networks, by virtue of their great speed, are creating electronic marketing with the potential to be more efficient in finding and interacting with customers, communicating with trading partners and developing new products and markets.

1. Electronic Data Interchange (EDI)

EDI can be used to electronically transmit documents such as purchase orders, invoices, shipping notices, receiving advices, and other standard business correspondence between trading partners. EDI can also be used to transmit financial information and payments in electronic form. When used for effecting payments, EDI is usually referred to as Financial EDI and Electronic Funds Transfer (EFT)

EDI is a way of substituting electronic transactions for paper ones. However, it is much more than mere substitution. It is a mean to streamline procedures and improve efficiency and productivity. EDI allows a new skill at the processes within an organization, with a view to reengineer them to achieve better efficiency.

2. Benefits of EDI

Computers have speeded up the production of invoices, purchase orders etc. When these documents are produced by high speed printers, however, they must still be detached, inserted, and mailed; copies must also be filed by the originating organization. The originals must be physically transported to the addressee, opened, carried to the appropriate individual within the addressee organization, and processed, which usually means manually keying the data into an MIS.

The use of EDI eliminates many of the problems associated with traditional information flow.

- Document making delay is eliminated
- Data handling and possibilities of error are reduced
- Labour, Cost and time is reduced
- Information flow is streamlined.

The other advantage in the use of EDI is that, it generates functional acknowledgement whenever an EDI message is received, and it is electronically transmitted to the sender. This acknowledgement states that the message is received.

14.2.2 Working of Electronic Marketing

Electronic Commerce, as noted earlier, is a much broader term encompassing not only EDI but also other forms of communication, such as E-mail and Electronic Bulletin Boards. EDI was developed for high volume exchange of commercial documentation, standardised electronic format between the automated business processes of trading partners. E-mail , on the other hand is the exchange of less structured correspondence in electronic format. Since the vendor community is made up of businesses of various sizes and technological capabilities, EC proposes the use of both EDI and E-mail to ensure that the existing barriers for doing business electronically are lowered. EC thus includes any business transacted electronically, whether business to business (B2B) or between Business to Customers directly (B2C). To realise the true benefits, EC is aimed at automating the generation, processing, coordination, distribution, and reconciliation of business transactions. EC is not just

the process of automation of manual business practices but it changes the way you do business.

There are two ways in which Electronic Commerce is being conducted over the Internet. The first is EDI in its present form over the Internet, the Net is used as a free or cheap network for business communication instead of using the more expensive private VANs. The other is the World Wide Web (WWW)

E-Commerce or E-Business is the set of standard business practices in the accepted format and electronically transmitted to the trading partners. EDI is the most widely used standard all across the globe for variety of E-commerce or E-Business Applications.

The most important function before one actually practice E-commerce is the acceptance of certain format. Once accepted, the organization has to follow the same standard in its all business communications related to E-commerce. It is entirely different from sharing the information through network or sending and receiving E-mail or accessing information from bulletin board. In E-commerce all the business documents are sent as data file over electronic messaging service.

Since data is exchanged in standard predefined formats, it becomes possible to exchange business documents irrespective of the computerised business application at either end of communication. e.g. the supplier's Accounts Receivable Application for raising an Invoice for payment could still be implemented on a file system using COBOL while the customer's Accounts Payable may be based on any RDBMS package. Once data is entered into the buyer's computer system and transmitted electronically, the same data gets entered into the seller's computer, without the need for re-keying. This is normally referred to as application-to-application EDI. EDI can be fully integrated with application programs. This allows data to flow electronically between trading partners without the need for re-keying, and between internal applications of each of the trading partners

To take full advantage of EDI, an organization must computerise its basic business applications. Trading partners are individual organizations that agree to exchange EDI transactions. EDI cannot be undertaken unilaterally but requires the cooperation and active participation of trading partners.

14.2.3 Indian Culture and Electronic Business

Electronic Commerce is not mere automation of the manual processes and documentation but it is altogether different way of doing the business in global environment. It calls for change in attitude of the entrepreneurs. In short it is a change in management practices.

Management of change in the wake of induction of EC systems, and re-engineered procedures is an important element in realising the targeted levels of performance, productivity, profitability and efficiency in an organization. Old technology and old procedures may have been in position for decades but one needs to have close relook at the system irrespective of comfort level of peoples with operations. Traditionally organization is a socio-technical system and management is hierarchical in nature with number of departments and divisions. Suddenly, people are asked to convert to teams, organised around business processes, with managers taking on the role of coaches. They are presented with an end-to-end view of a given business process, in its entirety, so that the projected benefits of reduced delivery time, better design, reduced transaction cost etc. actually materialise to justify the use of EC.

Old procedures and old methods of work are usually deeply ingrained in people. They cannot be changed overnight because people do not like sudden change; the power of equilibrium is threatened. However we must remember that change is not an event, it is a process. It does not just happen. Change has to be consciously planned for, and made to happen, to deliver tangible and intangible benefits. It has to be embedded in the work culture. This requires careful strategy on the part of the management, which face with the challenge of managing the complex and dynamic process of change.

Individuals in any organizations resist a change because of a perceived loss of power, threat to skill, end of monopoly of knowledge or power, loss of opportunity, loss of security and status etc. This can be traced to mental setup, which has not changed with time. The change strategy has, therefore, to focus on altering the mental model, which has become frozen because of lack of insight. It has to draw upon behavioural science, since the issues at work relate to human psychology. So the change Management Strategies are as follows :

(i) Education and Communication: This method is often used when lack of information is perceived as the cause of resistance. It is a time consuming process.

(ii) Participation and Involvement: The entire department or unit of an organization is enrolled. More empowerment is given to people. However, it is time consuming and risky.

(iii) Facilitation and Support: This approach is recommended which organization suffers from decline is more. It deals with adjustment problems. This method is expensive.

(iv) Manipulation: This method is used to manage, when time is of the essence. It is reactionary in nature.

(v) Explicit Coercion: If the change agent has the power, and time is of the essence, this method works. It may have long-term consequences.

Generally change methods may be crafted around indirection, and change can be packaged as natural evolution rather than revolution. Decisive change may often require the creation of a pseudo-crisis to shock an organization out of its arrogance or misplaced confidence in its belief systems. Crisis can elevate the change acceptance from a state of extreme doubt and resistance to a state of new beliefs. And a state of belief in the new order is the prerequisite for change.

In Indian work culture, it is extremely important to adopt the changes and therefore change management is order of the day. Because of technological advance, rapid change in the technology (specifically information technology) has to face the changes very often. It also poses the problem of obsolete competencies. This leads to uncertain business environment.

In focus of new environment we need to change the traditional characteristics of our business. Some of the characteristics of our administration are

- It has a highly bureaucratic structure with too much commitment to rules, regulations and precedents. Monopoly or near monopoly service is provided by the bureaucratic set-up.
- Budget allocations are not based on the results and performance of each department. Hence, pressure to perform does not exist.

- Salaries of public employees are not related to their performance. Seniority and not merit determines promotion and recognition. An effective reward or punishment system is absent.
- Political interference in the working of departments is common. Top bureaucrats are not free to effect change. Hence there is no motivation to change.

Changes called for in organization and human arrangements to bring about radical improvements in time, customer satisfaction, service quality or cost effectiveness are extremely difficult to implement. The current mindset has to change from that of control to facilitation. This is extremely difficult because the concept of a customer is hard to define in public administration.

To replanning, concurrent redesign and implementation of administrative process as well as the organizational structure are essential. To overcome all these problems, what needs to be done. How does one manage this change from a paper-based, hierarchical organisational structure to an electronic environment, where departmental boundaries have become thin and structure is more networked and E-Commerce is the order of the day?

- Top management to be fully committed to change.
- Crate a technical plan for E-Commerce and Change Processes.
- Take a small segment of work, such as invoices dealing with a specific product or service related to a particular group, for a pilot project.
- Identify key players in the organization, who act as votaries for change.
- Associate this group of persons with the Change Management Team. Develop the software and workflow based on their perception.
- Identify customer and users for this pilot project, who would use the E-Commerce technology to interact with the organization.
- Implement the pilot project.
- Take the feedback of this team very seriously to modify procedures and software. Consider nothing as perfect; and one is only moving towards better options.
- Now induct people who are neutral to change. Provide instant help to this group, wherever they are, from the core team, whenever they need it. Build their confidence in the new system. Win them over to change.

- The last group, the hostile category, may now be taken on board. Provide instant help to them in case of need. Station core team members in close proximity for this purpose. Be patient with their problems, whether genuine or contrived.
- Expand the pilot project by including another large group of products or services.

It must be noted that introduction of E-Commerce in the organization can lead to lot of resistance as it calls for doing your business differently and intelligently.

E-Commerce is more of management of change than technological innovation.

14.2.4 High-tech Agriculture and E-Commerce

Application of technology for better farm management practices and improved production is now very widely used in the agriculture sector in India. People are shifting their focus from traditional crops to the more high value crops. Most of these crops are in demand all over the world and therefore it commands premium price. This particular segment in Agriculture can afford to have access to information and global linkage for either input or marketing efforts..

1. Agriculture : B2B or B2C Model

The term "Business to Business" (B2B) implies similarities or equal partners in trade. By contrast "Business to Consumer (B2C) suggests a difference between the two parties. This raises questions for agriculture because traditionally farmers have never been equal trading partners with either the upstream input suppliers or with the downstream retailers and distributors.

Across all industries, global B2B E-commerce is valued at US$ 557 billion in 2001. B2B e-commerce is expected to represent close to 80% of global e-commerce in the future. The contrast in the development of B2B e-commerce as compared to B2C may be linked to the ease and cost effectiveness with which offline B2B processes can be replicated online compared to more complex B2C processes.

Another trend is the current domination of B2B developments by large and medium sized firms. According to **www.emarketer.com**, 42% of the medium and large businesses are online by the end of 2002 and 14% of small businesses will be online within a year or two.

However, with many concepts and trends, application to the agricultural industry raises questions. If we look at how e-commerce is evolving in agriculture there appears to be a distinct difference between "Farm Businesses" and Up and Down Stream Businesses".

(i) Farm Businesses: These businesses have limited presence on the web. It is restricted to direct trade.

(ii) Up and Down Stream Businesses: Significant Developments on the websites for buying and selling with a large number of individual businesses, farmers or customers.

Classical farm businesses do not appear to have either the capacitor the necessity to set-up and maintain sites at the same level as for Up and Down Stream Businesses. Businesses upstream and downstream of the Farm Business are generally more consolidated and are more likely to have the capacity and necessity to set-up and maintain a site. In essence, farmers cannot replicate offline behaviour online. In this respect it is perhaps more realistic to classify farmers as consumer in the context of e-commerce.

The agricultural market is very large (size of market, geographical spread and financial transactions involved), fragmented and spatially dispersed. E-commerce may offer solutions by integrating individual actors to improve organisational structures. Many aspects of business, even at the farm level, may be managed through the Internet.

2. Issues in Agriculture E-commerce

The rapid development of Internet technology in the field of agricultural production has the potential to impact on production structures and the viability of individual businesses. This inevitably raises issues of regional, national and international interest, for example in the field of rural development, and may prompt intervention by governing bodies. Policy issues relating specifically to e-commerce in the agriculture and food sector have not been considered seriously in the corridors of power.

(i) Inter-operable Technical Solutions: The internet has developed on open standards that allow both inter operability and competition. This is particularly important for hardware and software applications, which could potentially be used to control access and electronic commerce transactions. In the agriculture and goods sector this may apply e.g. vendor management software is developed, through which trade must be undertaken.

(ii) Market Access and Competition: E-commerce is reinforcing the trend towards globalisation. A transatlantic telephone call now cost just 1.5% of what it did 10 years ago. However, further agreements are required to insure telecommunication costs are not an obstacle for advanced communication service development. This is particularly relevant, for example, when comparing charges in India compared to Sri Lanka, where charges are considerably higher. This may have implications for rural development in these areas.

A recent price comparison for Internet access by the OECD **(www.oecd.org)** indicates that the average cost to users to access the Internet, for 20hrs per month, fell by 60% between 1999 and 2001.

14.2.5 WTO and E-Commerce

World Trade Organization is a rule-based, member driven organization. The member governments make all decisions and the rules are the outcome of negotiations among the members. At present there are 180 countries, which are the members of WTO, having H.Q. at Geneva, Switzerland. This organization was established on 1st January 1995 having a budget of 143 million Swiss francs. The major functions include administering WTO trade agreements, forms for trade negotiations, disputes, national trade policies, technical assistance and training.

1. WTO and Agriculture

The negotiations in agriculture play a very important role. In 2001, Fourth Ministerial Conference was held at Doha (Qatar). This conference provided the mandate for negotiations on a range of subjects, focusing problems in implementing the current WTO- agreements. Besides academic and technical base of these

negotiations sometimes the political influence of developed countries on developing countries and under-developed countries has a negative impact also. The most glaring example is the Technical Barriers to Trade Implication as far as India is concerned, the Indian Dairy Sector is facing a lot of problems from the countries to whom we export milk and milk products. The European countries in their standard for milk and milk products insist that checks should originate from the level of primary production. These include the conditions of maintaining animals, types of feed to be given etc. Imposing standards on the entry point itself is against the spirit and objectives of the WTO trade agreements and developing and under developed countries.

India has always been taking a leading role in formulations of various negotiation of rules on agriculture, which began in early 2000, under Article 20 of WTO Agriculture Agreement. By 2001, about 121 member-countries had submitted a large number of negotiation proposals. This has helped a lot to establish a fair and market-oriented trading system through a program of fundamental reforms. Reflecting their non-trade concerns of food security and rural development as well.

As per WTO, the specific commitments are listed in documents called, "Schedules of concession for agriculture". They include tariff quota, limits on export subsidies and some kinds of domestic support. The tariff schedules follow the format called the Harmonized Commodity Description and Coding System i.e. Harmonized System, established by World Customs Organization, The Harmonized System consists of 21 sections covering 99 chapters on various items of trade. From agricultural point of view, some chapters include animals and animal products, vegetable products, animal or vegetable fats and oil, prepared foodstuffs, beverages, tobacco, etc.

2. E-commerce and WTO

Considering the problems and challenges posed due to WTO Agreements for agriculture, the developing countries have become alert in their response towards WTO. This has definitely helped in their approach towards E-commerce, considering it's new impact on agricultural trades, agri-business etc. That is why as early in 1998 the declaration on global e-commerce adopted by the Ministerial Conference of WTO (Geneva), urged the WTO, General Council to establish a comprehensive work

program to examine all trade related issues arising from global e-commerce. This declaration of e-commerce from Second Ministerial Conference also said that WTO members would continue their practice of not imposing custom-duties on e-transmissions, until Fifth Ministerial Conference to be held during 2003.

Under Indian context although the feasibility and economical viability of e-commerce in agriculture is challenging, however the use of Internet is quite encouraging. The standards, norms and description of any agri-products or produce can be exchanged with the help of E-mail, which otherwise is very ambiguous on telephonic or fax messages. The agricultural marketing in the existing conditions of WTO Agreements has good scope but requires utmost care and vigilance before entering in e-commerce field for any agricultural trade, business and marketing.

14.3 Glossary

EDI : Electronic Data Interchange, which is very useful component of e-commerce especially for electronic transmission of documents.

EBB: Electronic Bulletin Board

B2B : Business to Business type e-commerce

B2C : Business to Customer type e-commerce

Up and Down Stream Business : This indicates the upstream and downstream of farm-business

WTO : World Trade Organization est. 1995

Negotiation : This is the process of deciding terms and conditions of trade or business amongst the member countries of WTO

WTO Agreement : This is the document prepared after successful negotiations of member countries of WTO

14.4 Summary

E-commerce has unleashed yet another revolution which has changed the entire perspective of business and commercial activities. In fact E-commerce has transformed

the traditional commerce to new ways of business. EDI has formed a major component of e-commerce as it has not only re-engineered the business- concept but also achieved the better efficiency. The EDI has many advantages over the traditional ways of performing a business. The electronic marketing involves EDI focusing the use of Internet. The use of e-commerce system for agri-business is one of the newest trend which has its limitation and also its utilities.

The e-commerce, which has it's two main components of B2B and B2C, have added advantages of doing business through Internet facilities. The rapid development of Internet technology in the field of agriculture has the potential impact on agricultural production. However with the introduction of new agreements regarding e-commerce with reference to WTO, it is challenging to undertake agri-business with the help of e-commerce. The Indian agri-business is at the crossroads of e-commerce and WTO. Hence it is advisable to enter into WTO business area first and then step into the e-commerce. For any agri-business, the e-commerce and WTO are interdependent and also have complimentary contribution with each other.

14.5 Exercises for Practice

Answer the following questions in 200 words each

1. Describe the significance of electronic marketing in agriculture.
2. Explain the statement in detail "E-commerce is change in management practices."
3. Explain the role of Internet in B2B type of e-commerce for agri-business.
4. Describe the impact of WTO regime on electronic commerce in agriculture.

Unit 15 : Personal, Legal and Ethical Issues in I.T.

Index

15.1 Introduction

The single and most important change in recent past is the computerization in every walk of life and introduction of information technology. In near future when we say everything will be digital, which means there will be proliferation of digitized content. High speed network connections and internet access will be the norm affecting everything and every one. While there is no question that the new wave of information technology enhances life for many, the man and machine interaction will have new impact on our ethical behaviour also. This time machine is computer and the man's behaviour, attitude and aptitude by new world order and new concept of quality of life.

The computer users are experiencing their health problems by continuous use of computers. There are threats of computer crimes also which have raised legal and

ethical issues for electronic, use of means of telecommunications and computers. Due to globalization in economy and open access on computers new burning issues are also emerging due to new networking systems and free "digital society". It is therefore worthwhile to study personal, legal and ethical issues related to computer usage and IT applications.

After the study of this unit, you will be able to know and understand :

- Computers in relation to health care.
- Relationship of ethical issues with computer crimes, intellectual property rights and networking.
- Significance of Internet Technology in Agriculture.

15.2 Content

15.2.1 Computer and your Health

The health aspect of computer can be studied with three dimensions. The first is the physical effects on human body of a person working long hours on computers, the Second the use of computer for medical therapy or diagnosis and the third the use of computer for medical transcriptions.

1. Ergonomics

Ergonomics is the study of the interaction between man and machine, and use of computer by men and women. Considering the working environment, we very often notice the signs of problems. These systems include headaches, blurred vision, backache, spinal problems of neck etc. some of the common problems are discussed with their remedies.

1. The long hours sittings and working continuously with computer cause considerable strains on eyes. Hence it is always recommended to have a break for some time to relax. Normally 15 minutes break after each two hours of continuous work is recommended. This break time depends on high or low visual demand, work load and repetitive work tasks. For

vision problem the reference material is always required to be kept closer to your eyes, so also the placement of monitor's screen. One should blink often and keep at least 45 cm away from the monitor. Control the lighting in the room and reduce the glare. The screen of the monitor should be dust free and very clean. The monitor top should be at your eye level. Choose screen colours with high contrast. If monitor has glare, attach anti-glare glass or anti-radiation filter glass.

2. If you are going to spend long hours in front of your computer then you have to care of your posture, otherwise you will end up with backaches, neck pains and spinal or stress injuries etc. Hence always sit straight and keep your thighs and lower legs at right angles. Let your feet be flat on the grounded sit close enough to the desk so that you do not have to stretch often. It is therefore recommended to purchase adjustable chairs for computer working. In such chairs the adjustable back rest tilts with sturdy base etc.
3. A computer work station should accommodate the key board on a separate and adjustable surface. The keyboard holder should be long enough to accommodate mouse and directly beside the keyboard and at the same height. With the advancement of technology the mouse with track ball facility are easy and comfortable for use.
4. The copy holders are recommended for individuals who perform input tasks from the source document as they eliminate frequent neck movements. This copy holder should be at the same height as the monitor and as close to the monitor as possible.
5. The lighting arrangement should be such that it should avoid all types of glaring on monitor.
6. It is recognized that computers, along with many other electrical and electronic devices emit electromagnetic fields. The health effects exposure to electromagnetic radiation from sources such as computers are continually under scientific scrutiny, various regulatory authorities have established

limits for exposure to electromagnetic fields. To reduce any such risk, manufacturers have introduced low emission monitors that emit much lower electromagnetic radiations.

2. Health Diagnosis and Treatment

Diagnosis is the largest application area of Computer and Information Technology which has commercial returns also. The X-ray imaging was known from long, but now with computerized topography revolution has come. Recently online computer analysis methods, which can be inbuilt into chemical laboratory equipment with the help of microprocessor, that pinpoint errors. In this manner laboratory data has become much reliable. These are some situations where information processing can help in interpretation of the data. Automated electrocardiogram (ECG) analysis is very useful for diagnostic interpretations. The computerized ECG analysis in now a days very useful for treating cancer patients with help of radio isotope treatment. A computer analysis of electrical distribution pattern in the human limb which is paralyzed can be stimulated by internal electrical sources.

3. Medical Transcription (MT)

A medical transcription is the new concept, where, the expert of Medical Transcription (MT) transfers a doctor's verbal dictation to a written form. The dictation is usually done on cassette tapes or through digital voice system. To understand this, we may take example of U.S.A. and India relationship in this context. The doctors at U.S.A. are so busy that after diagnostic procedure for a patient in U.S.A., these doctors dictate the report or interpretation of diagnostic analysis on digital tape. This voice is then sent to India through voice mail of Internet and the MT experts in India listen to these recorded tapes and type the transcription report and send back to USA via Internet. This entire procedure is called Medical Transcription. On an average MT expert in India can earn sufficient amount for this Medical Transcription work. Medical Transcription requires expertise in voice recognition and medical terminologies. Considering American accent, the MT expert has to understand the voice that too the medical terms dictated and to type simultaneously after listening

the same. In USA, the Indian MT experts are preferred because of geographical distance as they get matter ready the next day and the rates charged are very reasonable to them.

15.2.2 Computer Ethics

The Computer Ethics are basically related to human behavior. As we studied earlier that Ergonomics is the scientific study of interaction of man with computer which develop some health problem with man, in case of Computer Ethics it is the problems created with computer due to unethical or illegal behavior of those who use them. Considering this human behavior problem the Computer Ethics Institutions have set certain Behavior Rules for Computer Ethics. They are as under :

1. one should not use computer to harm others
2. one should not interfere with other people's computer work.
3. one should not snoop around in other people's computer files.
4. one should not use a computer to steal cash or services.
5. one should not use a computer to bear false witness.
6. one should not copy or use propriety software for which he /she has not paid.
7. one should not use other people's computer resources without authorization or proper compensation.
8. one should not use other people's intellectual output.
9. one should not cause social problems by designing a new Computer Programming.
10. one should not harm the respect of fellow human. In spite of establishing such 'Doubts' forming a standard norms for computer ethics, the so called 'anti social users' are still causing problems called 'viruses' and their solutions need to be understood.

1. Computer Viruses

A computer virus is a small computer program either stored on a disc by itself or appended to an existing file. You get virus when you use discs from other users or

download files over internet. To understand in the most simple way, let us study a virus called 'Trojan horse'. We know that in a wooden Trojan horse, inside this horse-model there were soldiers hiding who came out during night hours and started fighting.

Similarly a "Trojan-horse Virus" is the program once it is run, the virus loads itself into the computer's memory. Afterwards it can secretly attach itself to other files or programmes or store itself to any other discs. Like a biological virus, it can infect other files and then spread. It can cause damage on specific date also as per the date programmed for such viruses. The virus can cause damage immediately or afterwards.

New virus appears almost every day. The first virus called 'Jerusalem' was seen in the year 1987 which has new 250 strains (variations). The other viruses are given funny names such as Satan Monkey, Satan Bug, Natas Stonned, Happy Birthday, V-shaped symbol, Michelangelo, Green Caterpillar, Love Bug, Nimbuda, I love you, etc.

2. Prevention from Virus

The instances of virus causing damage are increasing. Earlier introduced viruses were hard to detect and remove. The best-way of defense is the preventive measures. Now a days using a virus scan program helps to detect the presence of virus on your system. Anti-virus programmes have been developed, if run on computer, it can scan the new virus problem, if any.

To prevent viruses from being transferred to your system over the web (internet system) security is being built in Web-browsers. Microsoft's Internet Explorer employs a process called "Authentication code" using this technology the certificate appear on screen indicating the authenticity of the file. As a preventive measure, it is always advisable to store to load files from trusted, authorized or certified sources only. Hence one should never open e-mail or download attachments from an unexpected source. Always make sure your anti-virus software is of latest version and is always set to automatically protect against viruses.

The most common problem occurs with home use of computer is by using downloading matter from floppies which has stored matter from other computer sources. If such floppies have been infected with virus they are immediately transferred to **P.C.** of these users. For institutional usage, where there are many computers or network of computers, there should be regulatory mechanism. In fact here also there is a system called "Quarantining" the problems. In case any of the files, which are affected by certain virus such "Quarantining Mechanism" prevents the spread of virus by the administrator of the network system. In such institutions there is also a need to follow some code of Ethics for computing. Some of these codes are **:-**

1. Computer users must not share accounts (internet facility) with ineligible partners.
2. The transmission or storage of all reproduced, distributed, altered, enhanced and/or manipulated copy righted material must have prior written permission of the copyright holder.
3. Users must not distribute damaging software through e-mail or other means.
4. Account passwords are the primary means of ensuring privacy hence users must not share their passwords .
5. Publishing and posting obscene material in any electronic medium is always forbidden and in case of computer use also the users should adhere to these rules strictly. Similarly making obscene, abusive and harassing remarks should not be forwarded as message to anyone.

The latest advancement by certain agencies such as Norton Internet Security provide many useful information on scan for security risks, and scan for viruses, trace of potential attack and use of Norton Anti Virus System.

15.2.3 Intellectual Property Rights

According to the World Intellectual Property Organization, an agency of the United Nations, there are **two** main branches of Intellectual Property (IP). Firstly the Industrial property, which includes patents trademarks, industrial designs and trade secrets and secondly copyrights which includes literacy, musical, artistic, photographic and audiovisual works. From agricultural development point of view, the IP such as

patent, trademark etc. are significant because of rules of World Trade Organization. Intellectual Property (IP) is not just a 'physical' object,material or thing but it is rules and relationships that society has built up around those objects. These IP rights demand that other people do not enjoy the benefits of your possession unless you have given your permission to do so. The most common thing that makes you understand the IP right phenomenon is the 'plagiarism' i.e. the representation of someone else's work as your own, which has been happening especially for publication of research papers. The research is done by someone and the research paper is published on somebody else's name. There is need to study at least the concept of Patent, Trademark and Copyright .

1. Patent

A 'Patent' provides the patent holder, or 'Patentee' the right to exclude others from making using, selling, offering for sale or importing his invention for 20 years from the date the inventor files his application. In essence, a patent is a government sponsored monopoly, designed to reward the inventor by providing him encouragement to develop new technologies. The right to exclude others gives the inventor the first to market advantage in developing his product, and it allows him to prevent competition in the early stages of his commercialization effort. The procedure to make patent is quite time consuming, as it requires to produce much documentation work. Patent table material includes machines, processes, articles of manufacture, composition of matters and improvements on any of these items.

Besides it also include the design of ornaments and from agricultural point the plant varietal patent are also important patents. Plant varietal patent include new varieties of cultivated plants and any plant related items enlisted above.

In brief we can define Patent is legally enforceable exclusive right of the owner to commercially exploit the invention for the life of the patent. Patent is one of the type of Intellectual Property Rights (IPR). In view of development of I.T. tools such as Internet facilities, a huge information is available on Internet sites which are exclusively for Patents. More than 80% of the technical information is available for a patented material in the form of computerised databases. The most popular sites are

hosted by (i) NIC, New Delhi, (ii) IBM, USA, (iii) U.S. Patent and Trade Mark Office and (iv) World Intellectual Property Organisation. Their portal addresses are (i) www.nic.in (ii) www.patents.ibm.com (iii) www.uspto.com and (iv) http://petgazette.wipo.int., respectively.

In recent past India has to plead for its claim on patent of turmeric which was mistakenly claimed by other party. This has attached a great importance for making all our efforts to patent traditional and indigenous knowledge and technologies which have commercial impact. Even for new varieties of plants Indian plant breeders have to be very particular. Whether it is a rice variety or medicinal plant variety the patenting is important procedure to ensure its legal rights. That is why the Intellectual Property is rightly called as Intellectual Propriety.

2. Trade Mark

Trade marks can be a letter, number, words, symbols, pictures, phrase, sounds, smells, shapes, logo, aspect of packaging or combination of these, to distinguish the goods and services of one trader or those, of another. Mostly we experience trademark as logo, symbol and packaging aspect. This means we have to register a trademark for the exclusive legal right to use license or sell it within the territory. The trademark has a great significance due to modern approach of advertisement. The advertisements on electronic media are playing a vital role in using Trade Mark for the goods and products of respective companies. The hammering effect of advertisement by displaying visible Trade Mark with multimedia has a great impact on business-promotion.

Since T.V. has reached in remote-rural areas also the trade marks of agriculture input items play a crucial role. The trademark of new type of fertilizers, seeds of new varieties, implements, etc are proving effective penetration through the trademarks.

Trade mark issuing authority considers the applications and issues the TradeMark for certain period say ten years and then again it can be renewed. The registration of trademark are helpful to avoid unnecessary market competition. The hammering effect of advertisement of a trademark is so much that it is most difficult to change the

liking trade by copying certain trademark. Two trademarks can be similar but not the same.

3. Copyright (©)

Copyright having symbol is a form of protection provided by the governing laws of the country to the literary, dramatic, musical, artistic and certain other intellectual works. This protection is available to both published and unpublished works. However it authorises others to reproduce the material which is "copyrighted" to them. This clearly means that any unauthorized act to produce, to distribute to perform and to display the items which are registered for their copyright is illegal. However there are some specified exemptions from copyright is the "fair-use" in copying. The copyright law says the fair-use of a copyrighted work is not an 'infringement' of copyright. But this "fair-use" is always attached to a big BUT or IF-factors. This 'fair-use' is only permissible if the purpose of use is non commercial and non-profitable. Copyright does not protect one against independent creation of a similar work. Legal actions against infringement are complicated by the fact that a number of different copyright, may exist in some works particularly films, broadcast, telecast, multimedia, CDs etc.

Any material kept for public use or public domain may not necessarily means that are free to use in any way you see fit. Nowadays this doctrine of public domain or fair-use has made those "Copy-experts" to steal and pirate Software's users usually do not have the right to make copies of software for distribution to others. Such act is called "Software Piracy" and amounts to infringement.

15.2.4 Computer Crimes

The potential extent of computer crime is as broad as the extent of the International communication system. The rapid development of computer telecommunication and other technology has led to the growth of new forms of transnational crime, especially computer related crime. The consequence of computer crime may, therefore, have serious economic impact on social as well as human fabric of the society.

It is interesting to note here that because of the complicated nature of computer crime as yet no global definition of computer crime has been achieved. Instead, in most of the cases functional definitions have been adopted. In fact, early 1990s has noticed computer related crimes and started reacting to it. Computer Crime or Abuse has lately been defined as any illegal, unethical or unauthorized behavior relating to the automatic processing and transmission of data with the help of computer technology. various modes and type of computer crime mainly includes (a) Computer related fraud (b) Computer Forgery (c) Damage to Computer data or programmes (d) Computer Sabotage (e) Unauthorized access (f) Unauthorized interception and (g) The reproduction, distribution or communication to the public without any permission. Considering this background we need to study the ways of computer crime and how to control the same.

1. Common Techniques of Computer Crime

Like any other crime, the motivation of computer crime is financial gain, revenge, vandalism and most common the criminal attitude. The common techniques, ways and mechanism can be narrated as under :

1. The Computer information is changed during input or output. At input stage documents may be forged, valid discs exchanged and data can be falsified.
2. One can gain access to other's personal files by finding the passwords.
3. All kinds of viruses can be regarded as computer crimes.
4. By finding out the master key, a person can access any data on the computer at any time.
5. Most of the computer crimes are carried out by manipulating, creating, wrongly using information with criminal intentions of fraud, cheating etc.

2. Strategies for Prevention of Computer Crime

In the light of proliferation of the Computer technology, it is but very essential to develop strategies for the prevention, suppression and control of the computer crimes, abuses and offences.

1. We should be always on the look out of unauthorized use of computer time, theft of computer software and hardware, damage and access to data and unauthorized possession of computer discs, tapes or printouts etc.
2. It is necessary to develop concepts and guidelines of manual for computer security and implement the guidelines in a serious manner.
3. Network security is also a key factor for protecting a corporate network from raiders. Secured Network is normally implemented to achieve confidentiality and integrity. The paycheck configuration file requires availability when cheques are printed but requires certain kind of security.
4. There is also need of arrangement of National Security Agency for Internet facilities, which should have arrangement to intercept and scan any e-mail message at any time.
5. In view of development of E-commerce, it will be very advisable to establish strategic plan for all financial securities for dealing with E-commerce business and activities.

15.2.5 Burning Issues in Computer Networking

A computer network is a communication system, where a group of computers and other devices like printers are connected by cables and other hardwares. The data is shared between the computers. A very interesting example of sharing of resources is that users on second floor of a building can use the printer on the eleventh floor if their computer and printer are connected to the network. Networks can be classified as LAN (Local Area Network) system and WAN (Wide Area Network) system. LAN is confined to single location, typically on building or complex through a physical mode of connection i.e. cable. Whereas WAN is a network which is spread over areas such as across cities, states or countries via telephones, satellites or microwave links. Having the wider spectrum of networking system of WAN type, it also includes LAN System. This WAN includes several LANs each of which links to the rest of the network through regional servers.

Besides WAN and LAN, another term which one must understand is ISDN i.e. Integrated Service Digital Network. This is a set of standards whose adoption provides additional telephone capabilities without scrapping existing telephone lines. By providing ISDN offers consistent ways to handle voice and computer data in telephone network. However this ISDN is found costly system although it provides faster communication. Hence the corporate organisation afford to use ISDN but the common telecommunication users use normal telephone lines and the telecommunication system.

With this understanding of simple basic concepts about computer networking system, it is necessary to think about the burning issues of networking from the application of I.T. for various purposes. Some of these issues are described briefly as under :

1. The I.T. policy needs to be modified as per the user needs. For example the user at the remote places is connected with telephone lines with the help of optic fiber cable, how can we widen our telecommunication system.
2. Considering the ethics of computer technology, the security of network should be given top priority. We should take steps to protect the integrity of network information. The first step for security is the risk assessment. Risk assessment is the process of finding out what data you have and how important is it to you. In addition to the importance of the data is the amount of damage you will incur, if it is compromised. Besides risk assessment, one should also look around the vulnerability of networking system. You should also make sure that your servers are in locked and secured position. If someone can gain physical access to the servers, the servers can be compromised. All we need to do is to get a copy of the SAM file on an NT server. All of the passwords on that file can be cracked at the hackers leisure, once he has that file in hand. The same is true of Unix or Linux servers. Physical access to be a Unix or Linux server can mean instant compromise.
3. Another vulnerability is the access to internet system. If someone is using a modem to connect to the internet while also connected to the company

network system, then you have a huge security hole. Passwords are the open doors to your network. Make sure you have good password policy.

4. V-SAT (very Small Aperture Terminal) technology has emerged as an extremely viable option for corporate communication networks. By developing V-SAT Networks customers can expect to save significant amounts on their telecommunication. The ability of V-SAT to support video conference is a useful proposition to tap this technology for networking system.

15.2.6 Internet Technology in Agriculture

Internet is network of computers spread allover the world through which we can share information through World Wide Web (www) internet system. Internet was invented by Pentagon Advanced Research Project Agency (PARPA) of U.S Department of Defence in the year 1969 for reliable communication network for military use. In the late 1980s the U.S. Government through its agency of National Science Foundation, started commercial network system, getting connected to allover the world. Besides Academic Institutions and Research Organization, the corporate world also got connected with the Internet system.

Development of this Internet System has also expanded the horizons for agricultural communication and access to global agricultural information. Again for agricultural information also the U.S. Department of Agriculture took lead and provided easy access to current US and world agriculture and rural development data. Most of the international agricultural information resource centres such as (i) FAO, (ii) World Bank, (iii) USDA, (iv) CABI, and (v} NAL etc. started offering wealth of information on the internet for the whole world. The respective internet and portal address for the websites are (i) www.fao.org (ii) www.worldbank.org (iii) www.usda.org (iv) www.cabi.org (and) (v) NAL i.e. National Agricultural Library: www.nal.usda.gov. In addition to CAB International (CABI) internet website, the most important international website is that of Consultative Group on International Agricultural Research (CGIAR) having its address as www.cgiar.org.

At present there are many websites for agricultural information. However Agriculture Gateway to India is one of the best website on agriculture. It gives direct Internet link to good agriculture websites of national as well International websites such as ICAR, FAO, CGIAR, ISNAR, NAAS, NAL, ICRISAT, WAKCNET, World Bank and so many other websites including different search engines which will help in obtaining any information on agriculture. Agriculture Gateway to India, itself covers all agriculture information on topics like Weather, Animal Sciences, Crop-Sciences, Agribusiness, Agri-Engineering, Agri-Extension, Fisheries, Gender Issues, General Agriculture, Home Science, Horticulture, Human Resources, Information Technology, Issues and Policies, Libraries, Maps and GIS, Natural Resources, Organisations, Programmes, Publications, Sustainable Agriculture etc. The website is produced by National Academy of Agricultural Research Management (NAARM), Hyderabad in collaboration with AIM Lab, Illinois USA. It caters to the needs of all agricultural scientists, extension workers, research workers and farmers. The website address is: **http://web.aces.uiuc.edu/aim/diglib.India.**

The major impact of Internet Technology on agriculture is the dissemination of agricultural information. With the NICNET, all those who are engaged in agri-business research or education, the internet has been making them updated in latest agricultural information. The GIS maps of position and location of different horticultural crops are helping the farmers about their cropping pattern. The agriculture market information has come to the rescue of commercial crop growers. The major contribution is for all those who are engaged in exporting the agricultural produce and farm products. With the help of Internet, the farm automation has started with the concept of Precision Farming. With the help of Geographical Information System (GIS) and Global Positioning System (GPS) the information can be passed on at any remote places through internet for precision farming. The new concepts of 'Cyber farming', 'Cyber Extension', 'Information Village', 'Wired Village', 'Agri-Informatics', and 'Agri -Polyclincs', concepts are booming because of internet technology. With the dawn of Information Technology the new era of precision farming will usher the agricultural production and rural development.

15.3 Glossary

Ergonomics : It is the study of interaction between man and machine, focusing effect of continuous use of machine on human health.

Trojan -Horse Virus : It is the name given to a computer virus which secretly attaches itself like Trojan Wooden Horse and attack afterwards.

Intellectual Property Right (IPR) : It is the right of possession which one enjoys and cannot be used by others without permission.

Plagiarism : It is the representation of someone else's work as your own.

Patentee : This is the person, who files application of patent for his original work for his right which exclude others to use it.

Fair-use : This is the specified exemption or authorized permission for copying any copyrighted matter.

Software Piracy : It is a kind of infringement of copying software for commercial use.

V-SAT : Very Small aperture terminal technology.

CGIAR : Consultative Group of International Agricultural Research.

15.4 Summary

Application of computer and communication technology have revolutionised the way we live. The I.T. application have changed the nature of workplace. However with advancement of all new technologies, we need not forget the impact of these technologies in our day to day life, our working habits and work culture. The continuous work with computer may cause health hazards. The ergonomics take care of common problems that are caused due to continuous work with computers. There are problems like vision problem, spinal stress problems, etc. For all such problems the case has to be taken by way of proper sitting arrangement and proper computer settings of monitors, keyboard position etc. Computers are also helpful for health diagnosis and medical transcription (M.T.)

Computer- ethics are also important from Computer related crimes. The 'computer virus' is major problem and should be tackled by following preventive measures. The types of Intellectual Property Rights which mainly include Patents, Trademark, Copyright etc. have direct bearing on computer related crimes and can be controlled. In view of advanced computer network technologies, the burning issues needs to be considered, especially the security features in a networking system.

The most important aspect is the use of Internet Technology for agriculture. The dissemination of agricultural information related to agriculture operation, GIS mapping, etc, are very useful for agriculture. The future methodology of precision farming has direct relationship with internet-technology put to use for agriculture and rural development activities.

15.5 Exercises for Practice

Answer the following questions in 200 words each.

1. What is mean by 'ergonomics' and explain the use of computer for health diagnosis and medical transcription.
2. Explain the 'computer virus' and their prevention methods.
3. Explain the role of Intellectual Property rights in Patent, Copyright and Trade Mark and its relationship with Computer Crime.
4. What is the role of Internet Technology in agriculture development in India.

Unit 16 : I.T. in Agricultural Production

Index

16.1 Introduction

As per the requirement of traditional farming the factors that affect agricultural production are land, labour, capital and organising of these three factors for the production purpose. However the development and specialization in the field of agricultural research, these factors were modified to Management of Natural Resources and Human Resources, Farm Management of Inputs and Post harvest Technology Management. Subsequently with the development of methodologies for farming systems approach and research planning approach, new strategies were emerged in agricultural production. In this regard the diversification of agriculture play a major role as it includes livestock, fisheries, horticulture, agro forestry and regular crop production. As the entire process of crop production has been influenced due to Agri Business approach, we have to reorient our strategies of agricultural production. The information technology plays important role in Agri Business Component of agricultural production process.

Since Agri Business Management is a new area of critical significance, the commercialisation of agriculture calls for cost effective production.

After the study of this unit, you will be able to know and understand :

- The role of I.T. in land use planning and crop production.
- The role of I.T. in plant nutrition and plant protection.
- The role of I.T. in Post harvest Technology

16.2 Content

16.2.1 I.T. in Land Use Planning

Land use planning has become critical for sustainable agriculture. Land Use Planning is the systematic assessment of physical, technical and socio economic factors that would help in proper land use, aiming at sustainable production system. After assessing the soil, plant, water, vegetation, climatic and socio economic factors; the land use plan has to be drawn around arable farming, forestry, pasture, agro forestry, horticulture and other uses.

There is a gradual reduction in the average size of the farm holdings, this would also require micro level integrated land use planning. Besides this diversification of agriculture has to be considered seriously. This diversification for growing high value crops, horticulture, floriculture, agro forestry require higher investments, hence the recommendations based on land use planning should be based on ground level realities. During the last four decades, India has witnessed an unprecedented increase in agricultural production. This transformation brought much needed food self sufficiency and rural prosperity. All this could be achieved due to appropriate policy decisions and proper land use planning along with expansion of resources such as irrigation, fertilizers and improved seeds. However keeping in mind that is a limited scope for expansion of cultivated area, the future challenge to produce more and more from less of land, is always on top of the agenda for land use planners. Similarly the land use planning has to consider the 9th plan targets of agricultural growth rate of 7.5%, so that the average yield of most crops would have to be increased by 30 to 50 per

cent. The world average of food grain production is 2768 kg per hectare whereas the Indian average is around 1940 kg per hectare. Maharashtra has this foodgrain production average less than 1000 kg per hectare where as the countries like USA, China, Australia and other European countries, this average is more than 4000 kg per hectare.

In India out of the 329 millions hectares of land about 175 million hectares are waste lands, whereas 124 million hectares land is under cultivation. While we are entering the 21st century, in India we need 300 million tonnes of foodgrain per annum. Considering all these statistics one can realise that the systematic land use planning is most essential for our survival. This systematic approach is only possible through tapping the source of Information Technology. With the help of all available information resources we need land use planning. Hence we need to study this topic by different IT Approaches towards the land use planning i.e. from the view point of use of Biotechnology, commercialisation and sustainability in agriculture. These I.T. approaches are discussed as under :

1. I.T. Approach of Agro Tech System

As we know that modernised agriculture includes the use of Biotechnology for agriculture and with the advent of Information Technology we can disseminate all scientific information among all agricultural scientists and they can pass on all the useful findings of Agro-biotechnology to the farmers through IT Tools. In fact there is a need to popularise "Agrobiotech based farming system". With the newly introduced Recombinant DNA Technique (R-DNA) and genetic engineering, there the Transgenic plants have been produced in the crops like Paddy, Maize, Soybean, cotton, Tomato and Tobacco. The Tissue Culture Technology for micro propagation has also been successful in commercial crop production like sugarcane and cotton.

The database, if produced for different crop patterns are very useful in land use planning for commercial production, suitable for larger farm holdings as well as for small land holdings, growing of tissue culture banana, instead of cereal based crop sequence can be useful for commercial approach of farming. With the help of Agrobiotech farming system, seed production can be introduced instead of always

growing crops for grains. The Agrobiotech farming system truly involves the I.T. for developing biotechnological products and also disseminating the useful information to all the concerned for adopting new trends in agricultural production.

2. I.T. Approach for Future Land Use Planning

In order to meet the needs of emerging challenges in the field of agricultural production and to provide scientific support for research activities, the use of application of modern information technology could only be possible through I.T. Tools. This has provided very reliable database for land use planning and implementing agricultural development projects. K.R. Datye, has proposed an Alternative Scenario for 2025, in his book, entitled 'Banking on Biomass' (1997). The scenario envisages India's population of 1200 million by the year 2025 and treated the population as composed of 240 million households. The scenario divides this population and the land use pattern into certain categories as shown in the following table.

Table : Present Land Use Pattern in India

Land Use	Area (million ha.)
Pasture	12.0
Cultivable wastes	16.0
Fallows	25.0
Net sown area	141.0
Arable land	194.0
Forest	67.0
Area considered for the alternative strategy	261.0
Other uses and barren land	68.0
Geographical area	329.0

For comparing the proposed scenario the present Land Use Pattern in India is also given in the following table obtained from the paper presented by G.M. Pillai in "Challenges of Agriculture in the 21st Century". This 'Alternative Scenario for 2025' also focus the utilisation of wastelands to turn into productive resources and commercial production of crops as a new arrangement.

Table : Alternative 2025 scenario of Land Use Pattern

	No. of Families (millions)	Agril. Land (Mha)	Of which Covered by Irrigation (Mha)	Village and Farm Forestry (Mha)
Poorly Endowed Areas				
Large holders	7	15	10	15
Small and marginal farmers	53	30	24	30
Landless	10	1.5	1.5	--
Wasteland and commons				
brought under community				
control and produce sharing	--	--	--	55
Subtotal	70	46.5	36.5	100
Well Endowed Areas				
Farmers	20	30	24	--
Landless	10*	1.5	1.5	--
Subtotal	30	31.5	25.5	--
Commercial Crops				
Commercial crops like				
sugarcane, irrigated cotton., etc	--	5	5	--
Subtotal	--	5	5	--
Town Fringes				--
Urban and Metropolitan poor	90*	7.5	7.5	--
The Rest	50	--	--	--
Subtotal	140	7.5	7.5	--
Forest Area				
Jointly managed forests	--	--	--	42.5
Conservation forestry	--	--	--	24.5
Total	**240**	**85.5**	**68.5**	**167**

* : These lands would be leased out or managed on participative basis by the resource poor.

Source : MCAER Publication (1999), Mha = Million hectares.

The future trend of use of land for agriculture will face limitations. As this resource is already under competitive demand for industrial growth and urban expansion which is resulting into shrinking share of land for agriculture. Further it is estimated that the per capita cultivable land holding, which was 0.14 hectare per head in 2000 will be 0.10 hectare per head in 2020. We will have to make concerted efforts on scientific land use planning as more than 50 per cent of the geographical area is facing land degradation problems (soil erosion, water logging and salinity)

The following factors need immediate attention for land evaluation and land use planning :

a) Resource mapping at the watershed level.
b) Resource Information Management in the GIS frame work.
c) Application of remote sensing technology in monitoring land use, cover changes, degradation of resource base.
d) Sophistication in data processing and analytical techniques of land use monitoring and planning .
e) Enhancing intensity of cropping through sequential and intercropping system.
f) Standardising indicators of land degradation for preparing state of Health Report of the land resource.

16.2.2 I.T. in Crop Cultivar Selection

Information Technology (IT) and Biotechnology (BT) are holding stakes for agricultural production and thereby solving the food problem. However there is need of better coordination of IT with BT. For example the exporters always blame about the quality of agricultural produce in general as they are not meeting the demand of export regulations. This deficiency is due to lack of dissemination of information on export marketing to the agricultural scientists who are directly involved with crop production. The selection of crop varieties will have to be given a new dimension of export oriented crop production. It is true to an extent that several of the high yielding varieties released by different Government organizations and research institutes do not confirm to the stringent quality specifications of the agricultural produce. This

emphasizes the importance of export oriented concern for producing quality of food grains, cash crops, horticultural and floricultural products, spices and condiments, plantation crop, medicinal and aromatic plant produce.

1. Export and Domestic Requirements

Considering the significance of this dimension of Export Quality Agricultural Produce and Product (EQAP) one has to concentrate on all types of I.T. Tools for production of such varieties that are suitable for EQAP. In order to sustain EQAP the following promotional activities are required.

a) Stringent quality control to maintain international standards.
b) Regular market research for assessing the varied quality needs of prospective importing countries.
c) Development of detailed database relating to trade commodities for exporting purpose.

Other than EQAP, the domestic requirement i.e. Indian Consumption Quality of Agricultural Produce and Products (ICQAP) also needs attention. Simple example to understand ICQAP is the wheat varieties required for quality baked bread. A good bread has high loaf volume, good aroma, sponginess, less vacuoles and golden crust. Unless the grain protein is above 12 percent, a good bread cannot be baked. Most of the protein quality traits are genetic in nature. Through varietal improvement, it is possible to develop genotypes with better grain quality suitable for baking. Briefly we can conclude that with IT database, the BT can produce a product having EQAP as well as ICQAP traits.

The tools of Information Technology and Biotechnology are very essential in developing and improving cultivars of crop and selection, thereby as selection depends on EQAP and ICQAP factors. In other words the production of EQAP and ICQAP based varieties are the functions of I.T and B.T. Some of the requirements other than EQAP and ICQAP can be specific need based. For example growing of short duration oil seeds crops varieties can be for specific need of cropping pattern requirement or for inclusion of such varieties of oilseeds crop for rotation with major cereals. Sometimes disease resistant hybrids of pulses offer exciting opportunities.

2. I.T and B.T. Tools for Improvement

The IT-BT approach for EQAP and ICQAP or need based improved varieties, especially in the field of pulses and oilseeds has led to intervene for increasing the productivity of pulses and cross the magic 200 million tonnes production target by the end of Ninth plan.

The dissemination of important scientific information through IT Tools even to the consumers sometimes proves very useful. For example, the millets that are generally produced and consumed at village level are superior to other major foodgrains including rice and wheat in many ways. Ragi Grain is the richest source of calcium among foodgrains besides having high iron and vitamin content. A large number of high yielding varieties and hybrids are available in all millets for selection according to season and situation.

Another important area which needs to be concentrated is the development of cultivars for tropical fruits. India is the second largest producer of fruits in the world. The production and the productivity along with area of fruits in India is given in the following table.

Table : Area and Production under Fruit Crops

Fruits	1994-95		2004-05	
	Area	Production	Area	Production
Mango	2.40	4.08	4.96	22.40
Orange	0.85	6.00	1.94	18.00
Banana	0.65	25.05	0.80	32.00
Pomegranate	0.36	5.32	1.13	5.46
Grapes	0.20	4.00	0.37	6.72
Cashew Nut	0.70	0.25	0.42	1.43

(Area in lakh hectares and Production in Lakh Metric tonnes)

The quality aspect of the production of fruits for EQAP or ICQAP is gaining much significance. Again here also IT+BT plays a major role. Good progress has been made in collection, conservation and documentation of genetic in citrus, grapes, mango and banana have been reported with concern. There is also need to develop

cultivars of tropical fruits which are resistant to biotic and a biotic stress and meet the domestic and exports standards (EQAP and ICQAP).

Comprehensive techno economic surveys for strengthening research, training and extension education are very much needed to develop a database to provide valuable help in identifying appropriate need for intensifying research and training efforts. The Indian Institute of Horticultural Research (I.I.H.R) has contributed a lot in this regard especially for breeding varieties of tropical fruits for desirable traits like high yield, dwarfness, high nutritive value for EQAP and ICQAP.

Another branch untapped for commercial potential is the floriculture. The estimated area under flowers is 6500 hectares of the major states like Karnataka, Tamil Nadu, West Bengal, Andhra Pradesh and Maharashtra. The traditional flowers such as marigold, jasmine, chrysanthemum, China aster, crossandra and tuberose usually marketed loose, occupy nearby two thirds of the area, the rest being under contemporary flowers such as rose, gladiolus, carnation, tuberose and orchids. The production is estimated to be nearly three lakhs tonnes of loose flowers and over 500 million cut flowers with stem.

Setting up of export oriented unit in collaboration with Holland and Israel, have already been emerged. Nearly 75 such projects covering an area of 150 hectares have been setup around Pune, Bangalore, New Delhi. The units have also been simultaneously opened for production of tissue cultured plants, considering export and domestic requirements and standards.

16.2.3 I.T in Plant Nutrition

The remarkable progress in food production has been largely due to wheat and rice, grain on irrigated areas with better agro inputs like fertilizers, seeds and pesticides in general and fertilizers in particular. The impact of cereals was so much that out of every 100 tonnes rise in food production, 91 tonnes were contributed by rice and wheat alone, the remaining 9 tonnes came through coarse cereals, millets, pulses, etc. It is also well known fact that fertilizer in the presence of irrigation and seeds of high yielding varieties have been key input ushering in the green revolution and has great influence on plant nutrition research. With the gradual growth of large scale

public undertaking for fertilizer production in India for major NPK fertilizers and Governmental support base in the form of subsidies supply of imported raw materials for fertilizer industries, the nutrient supply has been in the past very overwhelming. However the unplanned use of fertilizer caused more harm to the development of fertility of soil and the imbalances affected the natural resources for crop production. It is estimated that wheat, rice and sugarcane alone used 80% of the N Fertilizer used in the country. Hence it is required to emphasize Integrated Plant Nutrient Approach and Management (IPNAM).

1. Integrated Plant Nutrient Approach and Management (IPNAM)

The Integrated Plant Nutrient Approach mainly focus the proportionate use of inorganic fertilizers along with the organic manures. The role of I.T comes when we consider the management aspect i.e IPNAM as total system. IPNAM with I.T. tools lead us to precision farming, which is also an emerging technology. It allows farmers to regulate with precision the application of various inputs in terms of time and quantity and for modifying agronomic practices keeping in view the infield variability of the soil attributes and crop nutrient requirements. The management factor of Integrated Plant Nutrient Approach focus low input use efficiency mainly to reduce the cost of agricultural production. At this juncture, I.T. plays a significant role as application of precise inputs through computer aided mechanisms and control systems has become the need of the hour. The computerised system of fertigation, drip irrigation with sensors as electronic use in agriculture. Private companies are coming up to supply electronic systems of irrigation in affordable prices. However, the computerised system of fertilizer application has yet to be cost effective and not easy to operate by non technical persons.

While considering IPNAM, one has to be very clear in certain fundamentals of "Sustainable and Eco-friendly" agriculture. This cannot be practiced using organics and bio fertilizer alone excluding chemical fertilizers. The nutrient needs are so high that no single source can deliver the goods. The IPNAM has to harmoniously integrate the use of fertilizers, organics, bio fertilizer and recycle wastes, as active partners towards sustainable and eco friendly agriculture. The I.T. interventions should make

it InfoTech friendly. Since there is proper use of vermicomposts, biofertilizers; the information dissemination of these technologies need attention. In the name of sophisticated symbol of technologies the farmers cannot be deceived to be supplied with substandard organics. Similarly there is a need to strengthen the collection of database for crops residues and animals dung availability for preparing compost. The List of suppliers of green manures, biofertilizers, vermicompost should be readily available. IPNAM should also arrange to train the farmers in simple techniques of preparing Vermicompost themselves, so that organic farming can be promoted.

2. Soil Health Based Computerized Recommendation

In order to reach the benefits of IPNAM, it is essential that farmers are encouraged to get their soil tested at least for major nutrients like N.P.K. Like 'Ration Card' in every house, there is need to prepare soil health cards for every farmer. Based on the soil health report there are software developed which can give recommendation of doses (quantities) of fertilizers (NPK) commensurating with the soil health. However this computerised system of recommendation is possible only by public undertaking companies which are producing fertilizers. In this case there are drawbacks as the'branded fertilizers' of particular company are only recommended. Hence there is need to develop software for recommendations of nutrient based requirement rather than brand based fertilizer recommendations. Similarly the proposed software development should include principles of IPNAM, so that organic manures can also be included in package of recommendation. For this, database needs to be developed for Inorganic and organic components of nutrients supply.

16.2.4 I.T. in Plant Protection

Due to intensive cropping system the pest menace has also been developed simultaneously. To overcome such losses under pest affected situation there was indiscriminate use of pesticides. Here due to the promotional activities for marketing agro chemicals and pesticides, the farmers were tempted to use these pesticides considering it as the only plant life saving measure. This excessive use of pesticides led to many direct and indirect problems, which mainly included destruction of

beneficial organism, resistance against pesticides, pesticide residue, food chain etc. In order to overcome such adverse effects due to over reliance on synthetic pesticides, the current thrust on promoting Integrated Pest Management (IPM) which is ecologically sound and economically viable.

Since the birth of IPM system in 1985 in India, lot of thrust area of research have focused attention of each and every components of IPM. The IPM systems is based on the synergistic use of resistant varieties, appropriate cultural practices, application of bio pesticides, use of bio control agents, an application of agro bio pesticides, etc. The I.T. Tools i.e. use of computers and dissemination of information to the farmers through training needs immediate attention. There is need to form a national level network of Farmers Field School (FFS) to train farmers in Bio Pesticides and Bio Control measures. All such units of FFS need to be connected through internet and intranet with Subject Matter Specialists (SMS) of agricultural research stations, NGOs and Private agencies, for obtaining guidance for cost effective measures. In fact in eighth plan at National level establishment of at least one FFS in each block was already included under IPM programme.

There is a tremendous scope in utilising computerised system of IPM as the specific dose of pesticides need complicated calculation, which can be done on computers. The software can even give information on time and quantity of insecticide doses. The database of different existing pests should also be useful for obtaining recommendation of bio control measures. Listing of Bio pesticides, agrochemicals on computers can also be helpful to use as ready recknor for deciding suitable IPM System. The IPM system for commercial crops, horticultural crops and floriculture has also to consider the export quality of fruits, agriculture produce or farm produce. This export quality components can only be managed, if we have latest detailed information on our database for IPM systems.

l6.2.5 I.T. in Post Harvest Technology (PHT)

There is an enormous scope for increasing export of processed fruits, vegetable and cut flowers. For export trade, there has been a serious thinking on post harvest

technology. The new terminology coined for post harvest technology is the 'Post Production Technology' which we will refer as PPT. The PPT basically focuses on farm handling and storage systems for different commodities, covering sanitary and phytosanitary measures, packaging, transport, marketing and value addition. The PPT should also exploit the export market of marine flora and fauna for extracting rare chemicals, enzymes and hormones of medicinal importance.

The I.T has major intervention in PPT. This is only because PPT and marketing is very much interrelated areas. Recognizing the vital role of refrigerated storage in the marketing of horticultural produce and other perishable commodities, the Government of India is encouraging cold storage facilities. However there is need to generate more database of all the facilities, statistics as lot of Government and Non Government Agencies are working like National Horticulture Board, APEDA and Maha Grapes etc. for PPT facilities.

The National Horticulture Board has already taken steps to provide the necessary post harvest infrastructure. Assistance is being provided to set up pre cooling facilities to prolong shelf life and maintain quality of grapes. The Agricultural and Processed Food Products Export Development Authority (APEDA) also provide assistance for purchase of refrigerated trucks.

However the major area where computerised system of supplying information for day to day market was very much felt. Number of websites have been launched for obtaining this information on internet. For example the website on portal address of **www.commodityindia.com** is the useful website, which provides exhaustive and comprehensive information about the rates of agricultural commodities. The APEDA has also useful website for giving useful information.

The National Horticulture Board (NHB) has set up a number of centres in different parts of the country to provide market information service. These centres provide information to the growers to enable them to orient their marketing plans. The National Informatics Centre (NIC) is developing connectivity with NHB, State Marketing Boards and respective Agricultural Produce Market Committees (APMCs) in the state.

16.3 Glossary

Agro Biotech Farming : It is a farming system which involves use of principles of Biotechnology for the agricultural production.

Land Degradation : It commonly refers to the deterioration of land due to problems of soil erosion, water logging and salinity etc.

EQAP : Export Quality Agricultural Produce.

ICQAP : Indian Consumption Quality of Agricultural Produce.

IPNAM : Integrated Plant Nutrient Approach and Management.

Infotech Friendly : The use of Information Technology which can be easily operated by end users.

Soil Health Cards : The Soil analysis report of soil properties especially giving NPK nutrient status of soil.

IPM : Integrated Pest Management .

APEDA : Agricultural and Processed Food Products Export Development Authority.

16.4 Summary

The new Agri-Business approach to the agricultural production envisages the interventions of Information Technology for use of agricultural scientists, extension workers and also the farmers. In view of the strong development of the specialisation in Biotechnology (B.T.) the IT- BT approach plays an important role in land use planning system. The use of IT for valuable database on cultivars of different crops, fruits and vegetable for domestic or export quality is very important. The IT Approach for commercial crops, horticultural crops or floriculture has to focus on Integrated System may be for plant nutrition or plant protection. The well established Integrated Plant Nutrition Approach and Management (IPNAM) and Integrated Pest Management (IPM) need to be strengthened with the help of I.T. Tools. The Post Production Technology (PPT) needs to be utilised properly. The end user, beneficiaries and all concerned especially with export of agricultural produce need to be trained to access the Internet facilities available, as one of the most useful I.T. Tools of the computer era.

16.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Explain the role of I.T. in land use planning in India.
2. Describe the role of I.T. for crop cultivar selection for domestic and export oriented agriculture production system.
3. What is the significance of I.T. in managing the Integrated Plant Nutrient Approach System (IPNAM).
4. Explain how Information Technology can be helpful in Integrated Pest Management and Post Production Technology.

Unit 17 : I.T. in Agricultura1 Research Management

Index

17.1 Introduction

The major contribution of agricultural research in India has been reflected in various agricultural revolutions during the post independence period. The result of agricultural research boosted the food production and we could see the Green, White, Blue and Yellow revolutions in the field of cereal crops (wheat), milk, fisheries and the oilseeds witnessing the Golden Revolution of horticulture crop production. However with the advent of new emerging agricultural technologies there was a change in focus from increased production to increased efficiency.

The new areas of concerns for agricultural research included the sustainability in agriculture, food security and demand driven research than merely the supply driven. For this purpose, the findings of laboratory research need to reach the unreached. Further for this dissemination a careful documentation methodology and proper communication media will play a significant role. In this sphere, the Information and technology can be fully utilized for proper transfer of technology to the farming

community and also those living in remote areas of villages. However there is still scope for tapping and harnessing all available resources in areas of application of information technology. Hence it is worthwhile to study the role of I.T. in agricultural research management.

After the study of this unit, you will be able to know and understand :

- The I.T. interventions in agricultural research and development.
- Evolution of agricultural research and identification of thrust areas of research.
- The role of information technology in documenting and disseminating research findings through proper media of communication.

17.2 Content

17.2.1 I.T. in Agriculture Research

The most significant milestones of the pre independence era was the establishment of Imperial Bacteriological Laboratory at Pune (Maharshtra) in the year 1889 and subsequently the Imperial Agricultural Institute at Pusa (Bihar) in the year 1905. The Indian Council of Agricultural Research (I.C.A.R.) established in 1929 has seen a tremendous growth in size and complexity of its activities over the years. The Indian Council of Agricultural Research (I.C.A.R.) was previously known as Imperial Council of Agricultural Research (I.C.A.R.). This clearly indicates that in pre independence period the agricultural research was confined to the establishment of institutions. However the post independence era saw tremendous development in agricultural research, which was need based and result oriented, which led to many agricultural revolutions. In the year 1964, the ICAR became the apex organisation for all agricultural research and education in the country.

Soon after the accelerated research on cereals and high yielding varieties programme, the dryland agriculture research project was initiated to address rainfed agriculture problems. Similarly the livestock research, fisheries, biological control research got a fillip in nineties. However it was during 20th century that the agricultural

business management came in limelight and simultaneously the attention was focused on commercial crops, horticultural crops from agri-business point of view. At this juncture the paradigm shift was made for quality rather than quantity. This new focus on quality aspect was because of globalisation and the advent of information technology.

In past, the I.T. has always played a significant role in rural development. The important post independent scenarios have been in meteorology, seismology and in the field of biotechnology. Since these research developments were being made by Government owned organizations, the impact was slow for want of funds. However in private Research and Development organisations of Fertilizers and Pesticides companies, the agricultural research could progress in field of computerisation and also in application of information technology. A major break through came during 1998 when I.C.A.R. launched its ambitious project called National Agricultural Technology Project (NATP) to enhance the performance and effectiveness of research. Similarly the I.C.A.R. under their NATP project started developing networking of all their research units allover the country.

17.2.2 I.T. in Prioritization of Research

The changing scenario under Indian situation and so also under global context will affect the entire process of agricultural research, especially the identification of thrust areas of research. The skill to distinguish between what is urgent and what is important will hold key to the success in deciding priorities.

Just like agricultural revolutions, the information technology revolution is also unfolding. Advances in I.T. offer a wide up gradation of skills, increase of productivity and improvement in the quality of life of the rural community. With the availability of all know-how of information technology, the time is ripe to harness IT more effectively. There are many approaches which should form priorities in research with special reference to I.T. (i) IT Approach (ITA) in the field of research itself i.e. ITA for scientists, scientific laboratories, and research fields etc. (ii) ITA for the farming community (iii) ITA for Modernized Farming and (iv) ITA for Partnership. We may discuss briefly these new I.T. Approaches.

1. I.T.A. Approach for Scientific Community

As mentioned earlier that meteorology and seismology were good examples of ITA for the benefit of researchers, the Biotechnology is one of the most successful story of ITA for scientific community. Globally, biotechnology has emerged as a frontline area of science and technology. This is because Biotechnology provides techniques in increased plant and animal productivity, increase stability of yield and limit adverse environmental impact on production systems.

The I.T. has important role to play in development of biotechnology. By using Recombinant DNA technique for the development of transgenic plants like cotton and tomatoes, a unique opportunity is being offered by this R-DNA technique for introducing desired genes from microbes, plants and even animals into crop plants. The R-DNA is also further useful for production of biochemicals of pharmaceutical value in plants and development of vaccines. The remarkable break through in the field of Biotechnology is only due to collection of huge database and databanks in various research centres of biotechnology.

This is an important landmarks of the use of IT for scientific community which has ITA dimension. Considering the facilities available with our scientific community, who basically carried out research limited to cell and tissue culture technique's, there is need to give emphasis on Biotechnology research for immediate application in Bio fertilizer and Bio control agents' production, microbial fermentation technology, wine production technology, recycling of agricultural waste and cloning of select animals. Another area which is the interaction between IT and BT (Bio technology) is popularly known as Bio informatics. Bio informatics has major role to play for Biotechnology Network (BTNET) which constitute the main repository of information. The entire chain of centres and subcentres of the Department of Biotechnology (Government of India), forms major network and has set a model for ITA for the scientific community. The database and databank available with all Biotechnology centres, are the leaders of producing IT products useful for scientists, policymakers and Government organisations etc. The ITA in BTNET way should be first priority of all disciplines of science and technology in the country.

2. I.T. Approach for Farming Community

This ITA for Farming Community is the second dimension very often referred as Transfer of Technology or Lab-to-Land process. With the help of IT tools, may be internet, teleconferencing and videoconferencing, cable networking for TV channels etc. This needs to be given a high priority as the results of research findings in the form of recommendation of package of agricultural practices must reach to the farming community. The extension agencies and private organisation can play vital role of facilitators to train the farmers to use this simple mechanism to access the information. The Agri-informatics or Agri-Polyclinics Technology Information Centres or Modern Agro Service Centres can become the centres for passing the information received from Research Laboratory. This dimension is very important and should be given immediate attention. This is being said as Participatory Approach for Research Prioritisation (PARP), so that research is developed on farming system based, with due consideration to problems of perspective users and beneficiaries of research result. PARP is bottom up initiative rather than the old practice of top down approach.

3. I.T. Approach for Modernised Farming

As studied earlier, the Information Technology and Biotechnology combined package of practices are giving good results. However under present scenario wherein there are specific binding for adopting organic farming system, so one can say the traditional farming, adopting organic farming techniques with components of high tech agriculture like computerised drip irrigation and fertigation along with IT and BT mixed blend, can be considered as modernised farming.

In early days, Farm Mechanisation used to be considered as modernised farming. However with the advent of Information Technology, the new trend has emerged which is called as Precision Farming. This is also a modernised farming technology which includes interpretation of spatial variability through Global Positioning System (G.P.S.), application of precise inputs through computer aided mechanisms and remote control system. Now the farm manager from his farm office can locate where are his tractors and what field is affected by plant diseases, pests and natural calamities.

4. I.T. Approach for Partnership (ITAP)

With the I.T. expertise we can develop inter institutional collaboration amongst research institutions to avoid duplication of research efforts. In all collaborative research, there is a need to have participatory approach at the planning stage itself. We should give priority for strengthening of inter organisational linkages and constituting multi disciplinary research teams and groups. Various Technology Missions and Task Force Groups formed by Government of India are the good examples to be followed. If I.T. Group joins with Agricultural Scientist Group, this partnership will lead in solving many problems as it will also help in identifying priorities in research.

The private sector research is also swiftly emerging in fields like hybrid seed, horticulture, agro chemicals, machinery, agro processing, livestock feed and livestock health products. However there is no mechanism to tap the private sector capabilities including funding to support problem oriented research in governmental organisations. There is a need to have collaboration with International Research Institutes in the areas like Biotechnology, Post Harvest Technology and Human Resource Development, etc.

5. IT Interventions for some Thrust Areas of Research

The changing scenario under Indian context and so also under global situation is affecting agricultural research strategies. To keep pace with the emerging needs, the I.T. interventions are needed for some of the following thrust areas of research.

(i) There is need to intensify research on application of biotechnology in food security, biodiversity, natural resource management, rainfed agriculture, post harvest technologies, bioenergy alternate resources.

(ii) Immediate attention is required to use I.T. tools for Agri-Business Management in general and Research Market Intelligence and Export Market research in particular.

(iii) The Satellite Communication Applications and I.T. in rural sector should promote the activities for enhancement of productivity.

(iv) I.T. interventions should be explored for sustainable agriculture which is the key to food security.

17.2.3 I.T. in Research Communication

The application of Information Technology in the field of communication is basically through internet facility. The benefits of internet connectivity needs to be utilized for better collaboration amongst scientists for exchange of their views. The agricultural research needs to address this issue with the help of this Internet Technology for Communication (ITC). Before discussing the need of collaborative research let us understand the ITC.

1. Internet Technology for Communication (ITC)

The internet is a general term for a large group of computers allover the world linked to one another so that user and computers themselves can exchange information. To exchange information protocol, such as Hypertext Transport Protocol (HTTP) are used. HTTP can integrate Text, Virtual images and Sound. The WWW (World Wide Web) is hyper media information system which refers to the capacity to present virtual on screen paper that combines Text, Graphics, Audio and Video. The combination of Text, Graphics, Audio and Video is also called the multimedia concept. We can prepare the web page with the help of Hyper Text Markup Language (HTML). These web pages can create a Web Site. For accessing a web site the address of that website has to be typed on computer e.g. (www.kisan.net) the website of Kisan Exhibitors. In this case after www. the domain name i.e abbreviated name or brief name of that organisation (Kisan) is put and at the end the dot com or dot net is put. The website address is called as Universal Resource Locator (URL). The URL of Kisan Exhibitors would be www.kisan.net and such website gives detailed information about the particular institute, organization or business firm, etc.

Besides, through internet we can send letters and receive replies on computer by Electronic Mail system i.e. E-mail. Through E-mail system we can even chat with other persons with sound or without sound. In the advanced version we can see the person also with whom you are talking. This system is called videoconferencing.

With all these advanced ITC facilities, the collaborative approach with agricultural research institutes and organisations can be very effective. Through ITC the database can be exchanged.

(2) Interactive Approach for Linkages in Research (IALR)

In recent times there have been important shifts in approaches to agricultural research. This approach need to be farmer participatory and interactive. This integrating research wherein the farmers' ideas, priorities and objectives are also considered in determining the course of action. Similarly the inter linking with colleague scientists, organisation is also need of the hour. As the expertise of other scientists, laboratories and organisations etc. can also be sought for solving the problems of farmers and other customers.

For this a strong Interactive Approach for Linkages in Research (IALR) is required. The Internet Technology Communication (ITC) system can be fully utilised for this purpose. For the farmers levels, we need to locate facilitators or intermediateries who are well versed with ITC, to pass on the information gathered from the farmers. Sometimes these facilitators can also become trainers to the farmers for training them in fundamentals of ITC, because searching and browsing websites is not very difficult. Nowadays even in regional languages the websites are available.

The IALR should serve as important method in saving the time of research scientists for feedback from the farmers. The continuous feedback should avoid wastage of funds, energy and duplication of research as the farmers can be directed to the sources where they can get the solutions to their problem. The ITC and IALR combined package will usher a new era of agricultural development.

3. Satellite Communication Applications for Rural Development (SCARD)

The Satellite based Communication System is related to computers and allied telecommunication services. However Satellite Communications Application for Rural Development (SCARD) is a challenging proposition for rural poor and marginalised groups. The research communication need to focus SCARD considering the following factors.

(i) There is a need to start Community Tele-service Centres (CTC) catering the rural people. Hence there is need to prepare simple kit of software and hardware suitable for CTC. Research should be done in designing CTC which should be user friendly as it includes features like telephone, fax, E-mail, internet and video conferencing facilities.

(ii) In order to prepare action plans for land and water resource development etc. pilot project studies are needed to integrate other space technologies like Geographical Information System (GIS) alongwith Satellite Communication Technology (SCT).

17.2.4 I.T. in Research Documentation

A document is an object that provides information, based on the nature of subject. These are two categories : Textual and Non textual documents. Textual documents present their information exclusively in the form of written text to be read e.g. books, periodicals, catalogues, statistical compendia, trade publications, patents, etc. Non textual documents may contain some text but the important part is presented in some other form e.g. maps, plans, graphs, diagrams, posters, paintings, photographs, slides, sound tapes, films, videotapes, artistic monuments and magnetic documents for computer processing.

Amongst all above mentioned forms of documents, most frequently used form is 'Periodicals' .These periodicals mostly include journals, magazines, proceedings, bulletins etc. However for these forms of document, the role of I.T. in documentation process is important. The down loaded printout documents of on line research material on internet and so also matter on CD ROMs (Compact Disk Read Only Memory) are the powerful tool for storage and retrieval of large amount of data.

CD ROM is essentially a PC based technology and hence cannot be matched with those of online systems using large mainframes. A single CD ROM disk can store the equivalent of up to 1500 floppy disks. It is fairly inexpensive but virtually indestructible. The CD ROM is very effective since it is combined with text and audio, graphic images and also moving images, giving video cassette effect.

In Agricultural Research the documentation in the form of print media is still very useful. However the abstracting system needs to be developed for the text available on various periodicals. These abstracts information can be stored on CD ROM and made available on websites of respective research organisations. In fact it is suggested that all Research Institutes should have their own websites so that relevant information can be accessed.

The website of I.C.A.R. and that of Agriculture Gateway to India are very useful as they do not only provide links to other agricultural websites but also have strong research material available at their sites. The National Academy of Agricultural Research Management (NAARM) is yet another institution under ICAR which has excellent website and lot of documentation services is available on this site useful for the agricultural scientists.

Whether in corporate field or industrial organisation the research documentation should be helpful for decision making. The decision making has to be meticulously analyzed and documented as per need of the clientele, so that they can interpret and take decision accordingly.

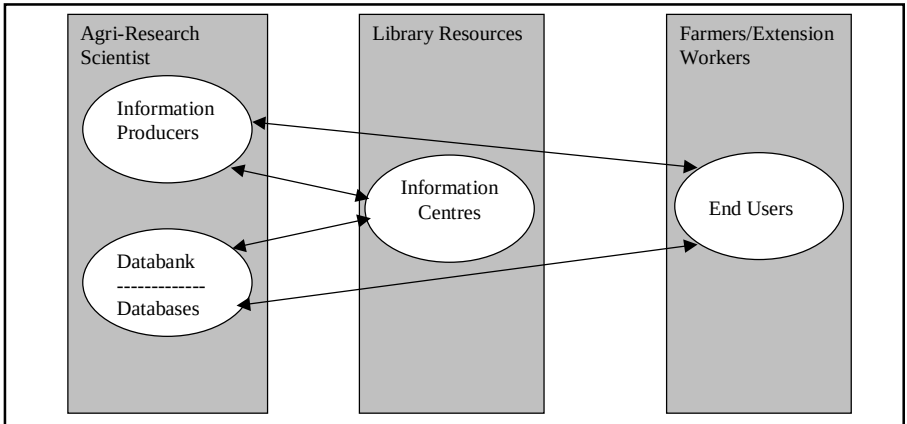
17.2.5 I.T. in Research Dissemination

In terminologies of I.T. the channel of dissemination of information flows from the producer of the information to the users. In context of the Research Dissemination the producers of research information can be the agricultural scientists, database and databank producers based on research and the users can be farmers or private organisation clientele and other agricultural research scientists or orgnisations.

In most of the cases the databank and database producers disseminate the information very selectively and as per requirements of the users. As per the type and quality of user the information is being disseminated. There are certain IT intermediaries such as Data Centres, Information Centres, Libraries etc. to which the producers first disseminate information and subsequently they pass on information to the end users.

1. Technology Dissemination Process (TDP)

At national level of agricultural research the dissemination of agricultural research findings are very often referred to as Technology Dissemination Process (TDP). This has also been termed as Transfer of Technology. However fact remains that what exactly we mean by 'Technology' and similarly 'Dissemination or Transfer'. Here in general the technology means the package of agricultural practices and methodology of operation and process of production which has reached the stage of recommendation to farmers. The transfer means the process of passing this information of package of practices and technology. Here the entire process is mechanical.



Channels of Disseminating Research Information

However the Technology Dissemination is something more than the mere transfer. This Technology Dissemination Process (TDP) needs to be strengthened under two components. First component, would be to target farmers as end users of TDP and second component is to target agricultural scientists, extension workers, intermediaries as end users. This target group of the second component of TDP is also important. Under the pretext of mass-clientele coverage of farmers so called as the real beneficiaries, we need not under estimate the end users such as agricultural scientists, extension workers and agricultural researchers. We should follow the example of the Biotechnology Network (BTNET) managed by the Department of Biotechnology, Government of India under its Biotechnology Information System (BTIS) programme. BTIS play important role in TDP which is most useful dissemination of research

information. On the lines of BTIS the agricultural research needs to be strengthened in the area of database or databank, so that end users will be benefited to the fullest extent.

2. Innovations in Technology Dissemination

The National Agricultural Technology Project (NATP) was initiated by Government of India with the financial assistance of the World Bank. The basic premise of NATP is that research and extension programmes should be farmer centred and demand driven. The purpose of the component of innovations in Technology Dissemination through NATP is to test new approaches to technology transfer. One of the goal is to decentralize decision making to the district level. Besides, it is also intended to increase farmer input into programme planning and resource allocation. The National Institute of Agricultural Extension Management (MANAGE) at Hyderabad has been identified as a lead agency for facilitating innovations in technology dissemination under NATP. The goal of this project component is to develop and test a technology transfer system. One of the important objectives is to help all types of farmers, especially resource poor and disadvantaged groups of farmers to get organised into groups and thereby increase their access to technology and provide feed back to research and extension personnel. MANAGE is making pilot project testing in twenty four districts across six participating states like Andra Pradesh, Bihar, Himachal Pradesh, Maharahstra, Orissa and Punjab.

3. Wired Villages Pilot Project

A unique Wired Villages pilot project has been launched under the aegis of the National Information Technology Task Force on Information Technology at the Warnanagar Co-operative Complex in Kolhapur District in Maharashtra. On similar lines it should be replicated in other parts of Maharashtra State. The research component needs to be given to all those who intend to start similar type of Wired Village Pilot Projects. The research should concentrate on the system that should suit the needs matched with possible infrastructure facilities at village level. The server software at multi sectoral rural convergence points need of wide bandwidth multi

session support, load balancing of high volume rate, information security and both LAN (Local Area Network) and WAN (Wide Area Network) Management. Wired village Pilot Project is mainly for disseminating information to the users. For this purpose current networking, protocols are getting more adaptable with new software. One should also note that in planning rural information technology applications on low budget for rural development therefore needs to be essentially server centric. Since this is basically Intranet system for sharing data, the utility is customer need based hence has its own limitations as it is different from Internet System.

17.3 Glossary

Bio Informatics : This is the area of interaction between the Information Technology (I.T.) and the Biotechnology (B.T.) .

Precision Farming : It is the technology which includes application of precise inputs through computer aided mechanisms and remote control system.

G.P.S. : Global Positioning System.

I.T. and B.T. Mixed Blend : The use of information technology (I.T.) and Biotechnology (B.T.) as mixed blend is termed as modernised farming.

Global Scenario : This indicates the present situation world over, focusing international impact under certain circumstances.

I.T.C. : Internet Technology for Communication.

www : World Wide Web and has relevance with website address.

I.A.L.R. : Interactive Approach for Linkages in Research.

BTNET : Biotechnology Network.

NATP : National Agricultural Technology Projet under I.C.A.R., New Delhi.

17.4 Summary

Although the impact of agricultural research was seen in the form of various agricultural revolutions but the same was to achieve self sufficiency in food production. However the progress of farmers of remote areas of rural India remained a matter of

concern. With the advent of modern agricultural technology, it was the Information Technology and field of research like Biotechnology gave a road map to success and for reaching to the unreached. The prioritization of agricultural research with the intervention of I.T. have to focus I.T. Approach for scientific and farming community, with due emphasis on approach to modernised farming and collaborative approach for agricultural research. The agricultural research needs to give thrust to these approaches.

The agricultural research can get momentum with proper attention to IT Approaches through linkages in research, documentation of research findings and its dissemination to those who are the real beneficiaries with the help of all possible tools of Information Technology.

17.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Describe the role of I.T. in Agricultural Research Management.
2. Describe I.T. Approaches (ITA), for the prioritization of agricultural research for the benefit of farming community.
3. How Internet Technology is useful for interactive approach for linkages in agricultural research.
4. Describe the role of I.T. in documentation and dissemination of agricultural research.

Unit 18 : I.T. in Agricultural Education Management

Index

18.1 Introduction

Any education is often regarded as Human Resource Development activity, as human resource is the greatest asset of a nation. Higher education in agriculture is an important pathway and also needs to respond effectively.

With the rising demand of trained man power for agricultural development activities, I.C.A.R. took over leadership and encouraged the setting up of exclusive State Agricultural Universities (SAUs) with mandates to provide research, education and extension on the lines of Land Grant System of the USA. With the advent of Information Technology the impact of IT has been felt on higher education in India. Since the higher education could not reach to the remote areas of rural India, as it is felt desirable to search for alternative like Open and Distance Learning (ODL) system of education through the Open University concept.

The interventions of IT in Programme planning and development of human resources are possible through reforms in education system. It is worthwhile to study

all latest system of education including the Online education which is complimentary to the Distance education system.

After the study of this unit, you will be able to know and understand :

- The role of I.T. in agricultural education and importance of quality assurance in agricultural education.
- The interventions of I.T. in managing human resources for reforms in Agricultural Education and significance of Online Education.

18.2 Content

18.2.1 I.T. in Agricultural Education

If we study the historical perspective of Agricultural Education in India, we will notice that the progress in agricultural education could be possible only because of establishments of various educational institutions. In pre-independence, British Ruler of India had established three veterinary colleges at Bombay (1886), Calcutta (1893) and Madras (1903). Similarly at Madras, College of Agriculture was also started in 1903; Subsequently in the year 1906, the government of India started Agriculture Colleges at Kanpur, Nagpur, Lyalpur, Coimbafore and later in 1907 at Poona, followed by College of Agriculture at Sabor in the year 1908. During post independence era the agricultural education in India got fillip and again here also it was the Contribution of U.S.A. It was during 1960, on the basis of Land Grant System of USA, the first University of Agriculture and Technology was established at Pantnagar (U.P.) in technical collaboration with the University of Illinois (U.S.A.) named as Govind Ballabh Pant University of Agricultural Sciences and Technology.

The Rajasthan Agricultural University was established in 1962 under an Act which was drafted by Dr. Ralph Cumming, Field Director of Rockfeller Foundation in India. Consequently 14 new agricultural universities were established during 1962-1978. Till 2000 the total number of agricultural universities in India reached the figure of 32. It was the contribution of these agricultural universities that India could

see agriculture revolutions because of agricultural research and the agricultural education imparted by these agricultural universities.

Considering this scenario of agricultural education the enrolment of students in agriculture remained only 1.5% in agriculture and allied field. Since independence, the higher education system has undergone many changes. The number of universities has gone up from 19 in 1947 to 275 in the year 2000. At the same time the number of colleges have increased from 591 to over 10,000 and students strength from 0.2 million to about 7.0 million. Today with over 3,00,000 teachers, the Indian higher education system is the second largest in the world. However the percentages of students studying for professional degrees is extremely low. In Japan more than 30% students are studying for Engineering degrees, whereas in India, it is hardly 5%. Everyday where one college is being opened in India, only 6 % of Indian population in the age groups of 18 to 23 years is getting the benefit of higher education. With this background in view, we can be able to understand, how difficult it is to face the challenges of higher education in 21st Century which is being dominated by the Information Technology. This clearly indicates that all out efforts need to be made in higher education especially in the field of science and technology to harness the youth potential of rural India.

It is estimated that as compared to enrolment of Indian youth (18-23 years), the enrolment is 100% in Canada, 80% in USA, 50% in France and 30% in UK. Even in some of the less developed countries like Thailand, Indonesia, Mexico and Brazil, enrolment ratios are higher than that in India. It is therefore necessary to find out answer to this major problem. This could be only possible through increasing the accessibility of higher education through I.T. and innovative mode of education such as Distance Education or Correspondence Course System. At this stage intervention of IT is required.

While considering the quantity in education system, we will have to see that we are not neglecting the quality aspect of education. This aspect of quality, we will study later in chapter on Reforms in Education System. However at this juncture we will have to bear in mind the two important challenges of this quantity vs quality aspect i.e. the challenges of privatisation and commercialisation of education. Again

this situation will be aggravated in context of globalisation. The Agricultural Education Model being imparted by School of Agricultural Sciences, Y.C.M.O.U., Nashik (Maharashtra) along with I.T. Tools can find answers to the above mentioned problems in higher education in general and agricultural education in particular.

18.2.2 I.T. in Education Planning and Development

There is a broad consensus that IT is shaping our world. IT is becoming increasingly the key to national economic development and well being. A systematic multi layer educational programmes on IT is the need of the hour to build competent human infrastructure. To remain competitive in the emerging global economy, people must become competent in IT. In Agricultural Education also the teaching strategy must integrate with IT. For this purpose in agricultural sciences, we will require to develop software's, CD ROM and digital media repositories. The agriculture curriculum will have to be redesigned which would be IT based agricultural curriculum. In future we must require to agree with IT in Agricultural Education (ITAGE).

From the point of educational programme planning and development for agricultural education, we need to consider important components of ITAGE

a) ITAGE for Teachers and Educational Planners.
b) ITAGE for Learners in Class rooms.
c) ITAGE for Learners in Virtual Class Rooms
d) Importance of Assessing Quality in Agricultural Education.

1. ITAGE for Teachers and Educational Planners

In order to see successful integration of IT in Agricultural Education we need to empower teachers of agricultural schools, colleges and universities and so also administrators and educational planners. For this purpose at the elementary stage, we are required to arrange training of these personnel in fundamentals of Computers and then gradually introduce the advanced modules for Computer applications. Teachers need to be trained to use computer to prepare their lesson plan, presentations on power point, photo scanning and use of LCD. The educational planners and administrators should be trained to prepare Annual Budget Plan, for teaching aids,

resource person and material expenditure, infrastructure budget requirements, time tables to monitor and scheduling the teaching resources, to build up and maintain comprehensive students records and students files etc.

Teacher's role has been changed in ITAGE. Now instead of just information carriers, they have also become information guide or information facilitators to the learners, who have always multiple sources of information.

The Teachers of ITAGE need to be trained to prepare for "Virtual Class Room". For this, they should prepare slides, record their sound of lecture on Computer itself and this recorded lecture is being attended by his learners in 'Virtual Class'. The module courses will have to be designed for virtual Class Studies and 'Network Based Education' or 'Information and Communication Technology (ICT).

ICT alongwith Internet Expertise is boon to the Distance mode of education. Under Open University or School Education pattern, the learners do attend classes by visiting their respective study centres and attend lectures of their teacher counselors. However, with the introduction of ICT the Learner need not come to institutes and study centre but can attend his virtual class at his home. For this purpose teachers are required to train to prepare. 'Training Capsule' for virtual class, which the students or learners can access on their internet facilities. The teachers will have to be trained in E-mail, chatting, surfing, teleconferencing, video conferencing and all latest communication technologies.

2. ITAGE for Learners in Class Rooms

The learners or students in Agricultural School and Colleges need to be well acquainted with 'understanding the lessons projected on the LCD Screen, using power point presentation. Until now the learners of classrooms are in habits of listening lectures with the help of overhead projectors (OHP). Sometimes video films, online internet presentations can also be shown on screen with LCD. The use of CD ROM, on specialized topics on agriculture can also be displayed on computer monitors.

3. ITAGE for Learners in Virtual Classes

With the advent of Internet, Technology, the learners can attend 'Virtual Class'

on the monitor of their computer at their homes or workplace. Here the Learners will have to be trained in using Internet Technology i.e. in this case how to log on, do searching and save the information on computer itself. After attending 'Virtual Class' on Computer, one can appear for 'ON LINE' examination test wherein the student will be required to type answer on computer and he will know his evaluation report on screen immediately. Virtual classes are stepping stones for building future Virtual Colleges and Virtual Universities. The Virtual Colleges and Virtual Universities are equally useful for both thinly and thickly populated countries.

4. Importance of Assessing Quality in Agricultural Education

Assessing quality in higher agricultural education i.e. in Agricultural Universities and Colleges is not new as compared to non agricultural universities as the accreditation of higher education in traditional universities has very recently been introduced. However in the field of Engineering and Medicine, there have been agencies like All India Council of Technical Education (AICTE) and Medical Council of India (MCI) who were performing the assessment in their respective fields. For conventional universities recently a organisation viz. National Assessment and Accreditation Council (NAAC) at Banglore, which is an autonomous institution established by U.G.C. has the mandate for judging 'and assuring quality in Liberal arts, commerce, sciences and other disciplines. While I.C.A.R. discharged the same responsibility for agricultural education in India.

With the establishment of several State Agricultural Universities (SAUs) in mid 1960, the ICAR in 1965 assumed the responsibility of looking after assessment and accreditation of higher agricultural education. This responsibility was bestowed upon Norms and Accreditation Committee (NAC) in the year 1974. However this NAC concentrated on determining the norms for financial assistance by the I.C.A.R. to SAUs, but the implementation of academic norms and standards did not make much headway. Realising this limitations, recently new accreditation process has been started by introducing Accreditation Board by I.C.A.R to further improve and sustain the quality of agricultural education.

With this background in view, it is very clear that in Agricultural Education

Programme planning, the requirements of such accreditation needs to be given emphasis. This assumes more significance, when there will be interventions of information technology in Agricultural Education. As we are talking of ITAGE for virtual Class Rooms the quality assurance of Agricultural Education will gain more significance to access the quality of training material being given to the learners through virtual class room. The future process of accreditation will be required to include all these in their list of' criteria of accreditations. The indicators for assessing the effectiveness of institutions involved in agricultural education will have to assess not only the quality of teaching and learning process but its impacts on overall agricultural development.

5. New Dimensions of Agricultural Education in India

The Agricultural Education needs to be strengthened considering three dimensions (A) Academic Dimension (Degree Programmes in State Agricultural Universities) (B) Human Resource Development (Programmes for Manpower Development) (C) Empowerment Dimension (Strengthening the disadvantaged group of persons). According to the suggestions made in the Dr. M. S. Swaminathan Committee Report on Agricultural Education (1999), the following recommendations are given considering above three dimensions. The original recommendations of Dr. M.S. Swaminathan Committee Report has been published in ICAR Publication (1999) on 50 years of Agricultural Education in India.

(a) Academic Dimension

(i) In order to prepare the agricultural graduates for the new millennium, the farm graduates should be given course on International Agriculture, World Trade Organization (WTO), Trade Related Intellectual Property Rights (TRIPs), Global Conventions on Climate, Biodiversity and Desertification, Computer Technology, Patent and Trade Literacy, International ISO 9000 Standards.

(ii) There is a need to introduce vocational subjects of agriculture at 10+2 level, so that it will help the students to select further Degree Courses in

the field of Agriculture, Horticulture, Veterinary Sciences, Fisheries, Forestry or Dairying etc.

(iii) There is need to grant the status of Autonomous Colleges especially in the field of Veterinary and Fisheries Sciences. In states where separate Animal Sciences and Veterinary Universities have been established, suitable Memorandum of Understanding (MOU) should be developed between them and State Agricultural Universities (SAUs) to provide training jointly in the Farming Systems Management. To realize a proper impact to Integrated Farming System Approach (IFSA) it should be made mandatory to include at graduate level agriculture, horticulture, animal husbandry and fisheries courses along with the major course as the case may be. The 'IFSA' is necessary to promote sustainable agricultural practices.

(iv) Agricultural Universities should set up Agriculture Technology Parks (ATPs). These ATPs could promote technology incubation, dissemination and marketing which should help to enhance self confidence of farm graduates and stimulate them to take a career of self employment.

(b) Human Resource Dimension

(i) In order to harness the frontier sciences, there is a need to train the agricultural scientists and personnel in the new areas of Biotechnology, Space Technology, Information Technology, Renewable Energy Management and Agricultural Economics and Agri-Business Management. In fact there is need to start Post Graduate Degree Course like MBA to be called as Agri-Business Management and Administration (ABMA).

(ii) Since sustainable agriculture is highly knowledge intensive, it is important that in the long term, all *Gram Panchayats, Mandal Panchayats , Zilla Parishads and Nagar Palikas* should have at least one Agricultural Graduate as Multi Purpose Agricultural Consultant on a regular basis.

(iii) The Personnel Policy Package for those scientists and agriculture graduates who are working in remote and hilly areas should be given attractive benefit

package, so that they should be encouraged to work under adversed conditions.

(c) Empowerment Dimension

(i) Home Science Education given to women needs to be totally reorganised. The training during first years can deal with general topics in science and nutrition, however the final year should provide a number of elective courses such as Management of Biodiversity and Biotechnology, Seed Technology, Food Technology, Renewable Energy Management, Information Technology and GIS Mapping. There is a need to change the name of 'Degree in Home Sciences' to the 'Degree in Agricultural Technology and Nutrition' , so that scope of women's education is widened and should reflect as women's technological empowerment.

(ii) There are a large number of drop outs in rural schools and a major segment of the rural population is still unreachable. Every SAU should establish independent cells for Distance Education for training these dropouts and rural youth for imparting short term courses in newer skills in agriculture and allied sciences to improve farming.

18.2.3 I.T. in Human Resource Management

Realising its importance, the agricultural educational planners have been paying special attention on establishing an effective educational system for developing human resources in agriculture sector. In spite of a vast diversities in the specialisation of agriculture, today we have a large band of well informed agricultural scientists and professionals, who are trained in this country. In all the organisations, motivation of human resources to perform well, is the key to success. Motivation promotes competence and also a good role in performance. Motivation is usually achieved by applying favorable employment conditions. Human Resource Management mainly include manpower planning, recruitment retention, motivation, development and training. For all these components, the use of computers and softwares for human resource development can enhance our process of human resource management.

1. I.T. Interventions in Functions of Human Resource Management

For effective Human Resource Management (HRM) the following functions have been identified

a) Man power planning and relevant information.

b) Recruiting and hiring staff.

c) Determining employment working conditions.

d) Developing career and promotion schemes and welfare services.

e) Developing staff training programmes.

The above mentioned functions can be very well done with perfect planning, if we develop software of required database of staff and their status as on the day of employment. Based on future planning, the schedule of above functions can be prepared. The MIS can also be used for better implementation of HRM. Since Agricultural activities have three dimensional approach i.e. Education, Research and Extension, the HRM can be planned with I.T. in accordance with these three dimension approach.

2. I.T. in Human Resource Policy

Once upon, it was told that for assessing the standard of a nation, people used to judge by knowing how many colleges are there in that country, but now the time has come to assess the standard by knowing how many "computer expert trainers" are there in that country which will indicate the strength of computer literate people. In short it has become most important to train the trainers in computer based education and the information technology. It should be the foremost duty of agricultural educational planners to introduce mandatory courses of Information Technology for all the teachers of Agriculture School, Colleges and Universities. The objective of these courses is to create awareness about the use of Information and Communication Technologies (ICT) in Agricultural Education and to develop skills in utilisation of different software packages in education. This course curriculum should include (i)

Introduction to Computers (ii) Application of Software (iii) Data Base Management Systems (iv) Preparing Slides through PowerPoint (v) Drawing Software (vi) Computer Programming (vii) Development of Educational Software (Multimedia) (viii) Internet and Intranet (ix) Contribution of TV in ICT and (x) Role of Radio in ICT.

The Library personnel of the agricultural universities and colleges also require training in latest computerisation process of libraries with newly introduced I.T. Tools for storing and retrieving the documents. The establishment of databank in libraries facilitate not only researchers and teachers but also very useful for students as a future researchers. The Human Resource Management for agricultural education has also assumed an extra ordinary significance as the I.T. intervention has added a new dimension of virtual classrooms, accessibility of information through Internet etc. In this context the entire policy of Human Resource Planning (HRP) needs an overhauling for creating wealth of human resource in terms of enlightened personnel. The HRP in agricultural education needs following factors to be considered in future planning of agricultural education.

(i) For opening of new institutions and academic courses, an appraisal must be done by a joint team of policy makers and faculty members.

(ii) The Accreditation Board, should review academic performance of institution and categorise them through well structured performance appraisal system. This will encourage institutions of agricultural education to develop into centres of excellence.

(iii) The staff of SAUs normally have academic distinction in their subject, but not in the area of pedagogy. To be effective teacher, it would be desirable to prescribe training in pedagogy. This may not necessarily be like B.Ed. or NET or SET examination of conventional university pattern. However this can be like attending a Compulsory Refresher Teachers Training Programme of Agricultural Education. This training programme should focus on curriculum development, lesson plans, teaching methods, student evaluation and Networking Education through TCT.

(iv) Personnel policies of the SAUs would need to be suitably modified to attract, retain and reward competent persons for academic activities. For academic quality improvement, it is essential to value equally to profession of teaching similar to that of research and attach a high degree prestige to the teaching profession.

(v) Considering the IT Action Plan prepared by the National Task Force on IT aiming at I.T. for all by 2008, must include the agricultural education, wherever they are meant for science and technology. Due to open access system of education the I.T. education policy should consider the Agricultural Education component also. Hence it is suggested to include Agricultural Educational Experts to be members of proposed National Council for IT (NCIT).

18.2.4 I.T. in Reforms in Education System

A great majority of the people in most of the less developed countries do not have the opportunity of higher education for a variety of reasons. Recognising the need to provide them vistas of higher education, many universities have offered correspondence courses. Although the correspondence education system is modified system or extended education system, it has its limitations also. The system of education through Correspondence can be regarded as first approach towards it's reforms, which was started in the year 1962 by Delhi University, followed by many more universities which actually opened new Department of Correspondence Courses in their respective universities. However the appraisal made from time to time for this system of Correspondence Education, has limitation of poor quality of self study material and lack of understanding in contact lecture system. However a step further was taken in the year 1982 when the first of its kind, The Open University was established at Hyderabad, Andhra Pradesh. The Distance mode of education through the Open University needs to be studied as an important milestone in reforms of educational system.

1. Distance Education through Open University

The concept of open university has been conceived to state with as supplementary as well as complimentary to the Formal System of Education and in the recent years, it looks as though as it is alternate system of education to the formal system of higher education. Till this date twelve Open Universities have been started functioning in the country with encouraging enrolment with different number of courses. The Distance Education is not merely a new mode of education but also a new paradigm. The essential dimensions of this new paradigm are :

a) This system is learner centered and learner personalized.

c) This system provides connectivity through the use of modern communication technologies especially the ICT.

c) The learners are given printed self study learning material well in advance.

d) Wherever possible the Video Programmes of training are either telecast or broadcast through TV or Radio.

e) Through network of study centres the learners can visit their library for referring Text and Reference books, watch and listen to video and audio cassettes.

f) The distance education system also provides the week end counseling and teaching sessions, so that personal interactions can be made in case the learning material is not understood.

g) In future tele-conferencing and video conferencing is contemplated to make the teaching and learning process most interactive.

2. YCMOU's Model for Agricultural Education

Amongst the twelve Open Universities of the country, YCMOU has unique features of imparting agricultural education from certificate-diploma level to post graduate and doctorate level programmes. This can serve as a role model for higher education in the field of agriculture. Since 1990, 50 thousand students have undergone training in different agricultural courses. With the introduction of a latest Diploma Course in Agri-Business Management, the entire system got a fillip in the academic

output process of imparting agricultural education as these courses are led to further B.Sc. (Agri.), B.Sc. (Hort.) M.Sc. and Ph.D. in Agricultural Communication, Extension and Development. The Diploma Course after the Foundation Course, mainly include Diploma in Fruit Production, Vegetable Production, Floriculture and Landscape Gardening and Agri-Business Management and also B.Sc. Agriculture and Horticulture Courses. The YCMOU pattern of agricultural education can be considered as remarkable reforms in system of agricultural education.

In the process of training of Agricultural courses the YCMOU has a good impact of Information Technology. The study centres are well equipped with computers for contact lectures. The video cassettes of specialised subjects are shown to the students, regular practical are conducted inside the laboratories also on demonstration fields. Regular interactions with subject matter specialists are arranged to strengthen the technical know how of the subject. CDs are also being prepared on specialised topics and made available at different study centres.

The course curriculum is also so designed that the I.T. component is added wherever it is necessary for the candidates to study. In a course like Agri Business Managements, the topics on use of computers in agriculture, agri-informatics and Internet for Agri Business Management have been introduced. Similarly the topics of use of Information Technology in Agriculture have been included in M.Sc. and Ph.D. syllabus. In this way the Y.C.M.O.U. agricultural courses can serve as Role Model for reformatic approach in agricultural education. In fact, in near future the harnessing of tools of I.T. for Distance Education in the field of agriculture should be given top priorities. The SAUs should establish independent cells for Distance Education for training the school drop outs and disadvantaged rural youth. The YCMOU Role Model should serve purpose in this direction.

18.2.5 I.T. in Online Education

'Online Education' basically refers to the education through Internet or Universities and Institutions that offer Online Courses on their Websites. In this case the students perform all the activities online with the help of Internet right from

taking admission, attending virtual class rooms, downloading study material through E-mail and sending feed back through chat on E-mail or videoconferencing on computer etc. This entire process of online education has been made possible only through advancement made in Information and Communication Technologies (ICTs). The Online Component of teaching and learning is so meticulous that students are never burdened as very comprehensive study material are posted online. Similarly for making it interactive, chat room schedule is also given so that students can chat with their "Electronic Tutors" (virtual teachers) and also get instruction through Bulletin Boards on websites. Bulletin Boards are used to give guidelines also. Suppose an assignment is given for a lesson and if it is asked to prepare summary, the students can send the summary on Bulletin Board. For Online Education the Teachers should be well prepared to answer for most Frequently Asked Questions commonly called as FAQ. This system of FAQ has become so common that readymade answers are being displayed just below the FAQ, so that such FAQ should not be asked again and again through E-mail.

1. Online Teaching and Evaluation

Usually for Online Teaching, a Special Teaching Methodology has to be adopted. Usually posting a Power Point Presentation of slides is not just sufficient, it must include audio recording with text passage, to make it alive. Each lesson has to be presented separately on separate page, each having a separate key point. One has to use graphics. For this purpose the Teachers have to be thorough in Graphic and Animation presentation and computer programming languages required for effective and attractive presentation of lessons. Teachers have to make visual diagrams that show the connections and relationships between ideas. This is easily done with Power Point presentation, by using bullet points. The lessons should be well prepared so that these pages can be quickly scanned. For this, one has to maintain a consistent informational structure and page layout for lesson pages.

The conduct of online quizzes or tests firstly include lots of short drill exercises for quizzes that give a chance to students to practice. A Teacher has to be well

equipped with all techniques of conducting quizzes out of the question banks and should be able to assess the answers submitted online from the Answer Banks. A programming needs to be done to assess the given answers which should automatically tally the answers available in Answer Bank.

2. Online Learning Websites

The Online Learning through special websites are also being called as "e learning". The learning company called Smart Force of California has its websites (www.cbtlive.com) which is pioneer in this online based educational technology. In May 2000, Kaplan Inc. of Washington launched KaplanCollege.com, a site offering nearly 500 online courses. Recently School Net India Ltd. has set up pilot project at Banglore and Mumbai for Network learning. Aptech Ltd. has also started its Online Varsity, wherein students can chat and discuss online with experienced online Tutors. Another Indian site, Career Launcher, New Delhi has a wide spectrum of vocational courses. In USA the Distance Learning offers 90,000 courses online. Indira Gandhi National Open University (IGNOU), New Delhi has offered online MBA Course, where as Y.C.M.O.U. has also launched pilot project of Diploma in Electronics online.

18.3 Glossary

Innovative Mode of Education : The new pattern or system of education which is innovative and different from the traditional system.

ITAGE : Information Technology for Agricultural Education.

ICT : Information and Communication Technology.

Virtual Class Room : The Class Room Lectures delivered on Website which can be attended through Internet facility on Computers.

NAAC : National Assessment and Accreditation Council.

Pedagogy : It is a science of teaching or training in methodology of teaching.

Accreditation : It is the procedure of assessing the quality of education following certain norms and standards.

Distance Education : It is the system of imparting education through open and distance learning system or by use of modern communication technologies.

Open University Concept : This is the university education imparted through distance ode of teaching and learning. The learners get print material for self study and also receive personal counseling for their studies with regular intervals at the study centres managed by the Open University.

Virtual University Education : This is the Online education system imparting higher education in which the instructions are given through Internet in the form of virtual class room. The entire studies, feedback and examination are carried out on online system of communication technology through websites of the educational institute.

18.4 Summary

The growth of various educational institutes contributed much in development of higher education in agriculture. The contribution of the organisation like Indian Council of Agricultural Research (I.C.A.R.) is most commendable. As not only in the field of agricultural research but also in the agricultural education, ICAR developed a well organised system of education through State Agricultural Universities. I.C.A.R. was also instrumental in introducing quality assurance in agricultural education system by constituting Accreditation Board. Considering the low enrollment of higher education in agriculture it is but necessary to find out alternate mode of education like the concept of open university. With the advent of Information Technology the innovative approach to train and develop man power requirement of agricultural education can be planned. The Online Education can serve as most useful system of education as there are many technologies available for modern ways of communications through Internet facilities or new I.T. tools developed for the Distance mode of education. The entire agricultural education pattern needs overhauling in the context of latest developments in Information Communication Technology available for educational system.

18.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Describe the possible role of Information Technology in strengthening higher agricultural education in India.
2. What is the significance of assessing quality in Agricultural Education in India?
3. What are the important factors considered for a future Human Resource Planning in India?
4. Describe the teaching learning component of Online Education System.

Unit 19 : I.T. in Agricultural Extension Management

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19.1 Introduction

We are noticing a great transformation in agricultural extension approach in dissemination of knowledge. This change is due to more diversified farming system rather than the earlier accent of yield enhancement. Even at earlier stages of agriculture extension development, the methodology was information supply oriented rather than farmers' demands driven.

The progress made in Information Technology is so fast that every sphere of living has to be well prepared to harness this technology. We observed that mostly of the benefits of information technology have remained confined primarily to the urban areas. This is only because of lack of awareness about the new I.T. However due to new approach of strengthening the centres like Krishi Vigyan Kendras, the entire agriculture extension system has been reinforced again. In order to understand the impact of I.T. Application in dissemination of transfer of agricultural technology, the

resource documentation and it's utilization play important role as the agriculture extension methodologies are changing day by day.

In recent past, the Government of India through its Department of Agriculture and Co-operation has given due focus to develop a built in character in entire Agriculture Extension System. The I.C.A.R. is the main source for implementing the task of giving new face lift to the Agricultural Extension activities.

After the study of this unit, you will be able to know and understand :

- The role of I.T. Application in Resource Documentation, Resource Planning and Resource Utilization in effective manner.
- The role of I.T. application in strengthening Technical knowledge Backup and farming system based approach of Agricultural Extension System.

19.2 Content

19.2.1 I.T. in Resource Documentation

It is widely acknowledged that agricultural extension system, further to be referred as AES has a positive effect on agricultural productivity. In the new emerging and fast growing sector of information age, it is viewed that future agricultural growth would be information driven. The AES has tremendous scope to use all its resources of new information to reach to the ultimate user at the fastest speed. This is only possible through Information and Communication Technology Tools to harness the potential benefits of the end users.

The I.T. Tools play an important role in Mass Communication which is the most cost effective means of disseminating new information. However the present mass media communication system lacks professionalism, and does not attract the target clients. To make the mass communication programmes more effectively, they should be organised more strategically and should have a strong database support. In order to Strengthen the I.T. based Resource Documentation and Planning, the entire working of AES has to be oriented in this direction. The Resource documentation and planning for the purpose of AES has to be analyzed and studied thoroughly.

1. I.T. based Strong Documentation Support

The Agricultural Extension System (AES) has five important pre requisites, which are very critical to the agricultural sector.

1. Regular training and retaining of extension workers and functionaries at various levels in the specific knowledge and skills.
2. Monitoring the AES and understanding the constraints.
3. Strong information, documentation and publication support.
4. Effective institutional network for synergetic support.
5. Develop national and international linkages.

For all the above mentioned five important pre-requisites of AES the third pre-requisite of having strong information, documentation and publication support is very pivotal for all the other pre-requisites. In view of Desk Top Publication (DTP) System developed on Computer, with newly introduced PageMaker in different languages, all the typing, storing of information on computer has become more easy and having quality output.

Traditionally the documents included publications such as weekly, monthly, quarterly, bulletins and magazines, monthly or biannually journals, periodicals etc. The latest approach is to bring out small booklet size Digests a summarized version of conclusions and recommendations of detailed report, seminar or workshop proceedings. The Annual Reports of various NGOs, Banks, Private Organization and Export Houses are also useful in contribution with this regard.

The latest addition to this process of documentation is the On Line Printing of the Text available on various Websties through Internet. In fact these printout copies of text material on computer is developed so much that it is working like an alternate printing machinery as we can get as many copies as we need and also Xerox copies can be obtained on laser printers. The text received on Internet is that of extremely good quality and can be printed on offset and xeroxed is most economical. Since Internet has storing and retrieval facilities, the text can be stored, used and accessed at any point of time. On computer files the information can be ‘saved’ in classified way by giving suitable title or names to those documents.

The above mentioned system of obtaining xeroxed or printout copies of documents which is being termed as 'reprographic facility' should be provided in each organisation. In fact each and every library of any organisation and department should have Reprographic cell which should do this service. One more activity of this Reprographic Cell can perform is 're packing of information' in the form of a 'Digest' to suit the user's need. In fact the National Institute of Agricultural Extension Management (MANAGE), Hyderabad is one of the leading organisation in the country, which has started publications of small printed bulletins of 20 to 30 pages each, called 'Extension Digest' on specific topics. Extension Digest is a quarterly publication from MANAGE, Hydrabad.

With the help of I.T. Tools the information like that of "Extension Digest" need to be brought down on various websites of Agricultural Organisation so that they can become the centres of disseminating the information. At present all these organisations only provide another Agricultural Links on internet for 'matching information' and do not provide the detailed information about their activities. The Packing of Information Technology ('Digest' form) will prove to be not only cost effective but provider of specific information.

2. Planning for Future Resource Documentation.

Keeping in mind the present status of I.T. Tools, the Agricultural Extension System (AES) need such resource documentation which would be directly useful to the extension workers of AES and also agricultural scientists and research workers. The earlier described 'Digest' type of documents can be used in preparing CD ROM which includes audio video multimedia text. The production of CD ROM on special topics has to be meticulously planned and prepared. The production of CDs is a complex and intricate affair. Many types of specialists are necessary like screen script writers, design and development experts, production experts and marketing specialists. The future planning needs to concentrate on the production of document by Information Generators, Gatherers, Compilers and Producers, which satisfy the need of Information Retrievers, Searchers and Users. The first category of Information Generators have to be expert in database, designing and should know the needs of

users in details. In fact they should have database on types of users and their different needs. The software programming expertise has to be developed accordingly.

19.2.2 I.T. in Methods of Extension

Harnessing Information Technology for AES has been receiving high priority in the new policy agenda. Extensive use of modern I.T. is being promoted between searchers and extension workers and so also wherever possible with the farmers. Here again there is distinction between individual, group and mass contact methods. These methods of extension also include farm and home visits, result demonstrations and group discussions, etc. However if we look back to the historical developments in changing role of agricultural extension, we find that with the introduction of National Extension Service in 1953, the focus of extension was on Community development. During mid 1960s the extension was restricted to Intensive Agriculture Area Programme. In the mid 1970s Training and visit (T & V) extension management system was introduced. Indeed this T & V Extension Programme played important role in ushering the further reconciliation and recognized role of the Green Revolution. However the Post Green Revolution period saw a set back to T and V Extension System as it was not suitable to rainfed farming system, hence there was paradigm shift in approach of extension methods.

1. I.T. Application in Agricultural Extension System

In past, it was Training and visit system which is one of the extension tools used but with the advent of modern research cable technologies and advanced telecommunication facilities where, the Computer Approach and Television System will play major role in AES. The future AES will be always with Computer Approach and Television System (CATS).

The use of Computer Approach and Television System (CATS) has to be followed phase wise. Firstly at National Level there is need to establish separate channel for Agricultural Extension activities. For example, we may start a separate TV Channel such as *'Krishi Jagat'* (*Krishi world*), wherein all information about AES can be given for which there is a wide access. Simultaneously through building an inbuilt

internet facility system the *'Krishi Jagat'* website can be launched. Incidentally already there is one website, entitled '*Krishi world*'. The CATS should form a simple base for I.T. Application in AES. While adopting this method of transfer of technology through CATS, farmers should be kept centre stage. The upgradation their skills and knowledge is therefore a crucial part of the process. The entire AES should be geared up around him. His feedback should be highlighted on CATS.

Another important area for AES to pay attention is the agricultural marketing which requires connectivity between the market and growers as the farmers need day to day information with regard to commodity arrivals and prevailing rates etc. In this case AES should arrange for training programmes for the benefit of farmers. These training programmes should include topics such as exporting of agricultural produce, packaging and storage, leading to national and international marketing and on line marketing system.

2. I.T. Application in Innovative Methods of Extension

The Tamil Nadu Agriculture University in collaboration with the State Department of Agriculture has started a new approach where farmers become focal point by starting 'Model Farm'. In this model farm all the appropriate technologies generated by research organisation are tried. All other technologies of NGOs are also tested for its compatibility, feasibility, profitability and eco friendliness etc. On this Model Farm by blending the experiences of farmers themselves. The Model Farm is serving as a training ground for farmers, extension functionaries and researchers. This approach has been given name as 'Satellite Farm' approach as the model farm acts like satellite. However considering the I.T. Approach it is worthwhile if we introduce in reality the use of satellite based communication system in this 'Satellite Farming' approach. We can introduce Computer Approach and Television System (CATS) in this 'Satellite Farming' Approach.

The I.C.A.R. has also introduced new concept of Front Line Demonstration (F.L.D.). The main objective of FLD Programme is to demonstrate the newly released production technologies at the farmers' fields under different agro-climatic regions. All FLDs are conducted under close supervision of Krishi Vigyan Kendras, are being

guided systematically. Hence there is a tremendous scope to introduce computer facilities at all KVKs to closely monitor these FLDs. Already the I.C.A.R. has introduced computerized reporting system. Since exhaustive Technical Reports have also to be prepared the Computer Programming can help to prepare the required report by feeding any related data on computer. In near future the Farmer led Extension will be modified to "I.T. led Extension" or "E-extension". The MANAGE of Hyderabad has already started calling it "Cyber Extension".

19.2.3 I.T. in Farming Systems

In a recently published draft report by the Directorate of Extension, Ministry of Agriculture, Government of India, on “Policy Framework, for Agricultural Extension, the challenging role of Agricultural Extension has been very well described. At the end of the report it is remarked that "the task of extension will become more challenging in the wake of post WTO era, which demands a system of market led extension with specific focus on diversification, post harvest management and export orientation”. This naturally places AES in a more complex role requiring approach which is farming system oriented. This can also be described that there is a need of paradigm shift of the philosophy of extension from technology transfer mode to technology application. This paradigm shift has direct relevance to the application of information and technology, which is need of the hour.

Present day agriculture is defined by key concept of stability, sustainability, diversification and commercialization. There is need for reorientation of extension approach. Previously the AES was limited to crop yield stage (sowing to harvesting stage) only but now the AES has to go beyond that stage and should take care of post production technologies.

This ‘Farming system Approach’ is being advocated by most of the renowned agricultural experts and they advise to follow Integrated Intensive Farming System (IIFS). According IIFS, the farmers are firstly advised to conserve natural resource endowments of farm and then they are exposed to new opportunities. Hybrid Seeds, improved planting material of fruit trees and high yielding cows or poultry or small

ruminants. Considering IIFS as ideal farming system then Farming System Approach of Extension has real task to perform. Here the I.T. application can come to the rescue of extension workers for this Farming System Approach. As there is direct involvement of scientists with extension workers, the farmers' quick feedback has to be answered quickly hence there is need of collection of database and print material to be handed over to the farmers. The farmers participatory approach, right from planning (via PRA) any problem solving project to the end of such project is very useful in this Farming System Approach. In a diversification of agriculture and commercial farming system, the extension workers have to guide farmers with the help of marketing information available in any print media or on internet source.

19.2.4 I.T. in Technical Knowledge Backup

The old Agricultural extension System, till last four decades after independence was involved with one to one linkage i.e. Research Scientist linked to Extension worker and another link of Extension Worker with the farmers. There was seldom any link with Research Scientist and Farmers. Again, the Linkage of Extension worker to farmers was also one way communication or the “top down” approach. Because of this linkage between the Research, Extension and Farmer (REF) which was weak, it lacked focus on location specific needs of the regions, disadvantaged area, target groups etc. The REF linkage weakness has increased due to different categories of farmers as their problem started deferring as per their farming system and new market demands. The REF Linkage of technology dissemination was more supply driven and the extension agenda was preset based. However the extension agenda could not become farmer’s demand driven as there was no feedback mechanism reaching back to extension workers and thereby from extension worker back to the Research Scientist. We can say that the Technical Knowledge Backup (TKB) can now be said as a stage where the TKB is at ready to launch disseminating stage from Research Scientists to the Extension worker then further to farmers. However this TKB has to be re-designed, re-moduled, re-defined, re-engineered and refined based on the Feed Back from the Extension workers and Farmer. This TKB process can be described in following equations.

a) Loose Linkage = Research Scientist and Extension Worker Link + Only Extension Worker and Farmers' Link

b) Appropriate Linkage = Research Scientist and Extension Worker's Link + Farmers' Link

c) Strong Technical Knowledge Backup (TKB) = Appropriate Linkage + Feedback From Farmers

Further it can be said that a strong TKB is only possible after re- designing of research based and feedback from farmers. In this entire process the AES should serve as a catalytic agent to enhance the TKB. The Technical Knowledge Backup (TKB) can also be understood well by taking a day to day familar example of Specialist Doctor, Family Doctor and Patients. When Family Doctor used to give medicine based on advise of specialist Doctor at that time family doctor has to know the feedback from patients. But if the specialist Doctor also knows the feedback from the patients, his advise to Family Doctor will always be very useful for the patients. The Research Scientists play a role of Specialist Doctor, the extension worker as family doctor and the patients as farmers.

Here again the I.T. application can help the Research Scientists to prepare data bank of his research finding and should prepare programming on computer so that matching the feedback (demands) from farmers he can obtain the recommendations to the farmers for their problems. The Research wing may be equipped with computer facilities, however this facility may not be available with extension agency or with farmers. The Agricultural Extension System (AES) has to focus on providing facilities of Information Technologies with extension agencies at least as they can become a pick up centres for any feedback from the farmers and send this feedback to the Research Wing immediately through Internet (e-mail).

19.2.5 I.T. in Resource Uti1isation and Management

The Information Philosophy has been playing vital role since inception of agricultural extension. In fact in 1952 when Community Development Projects were started, it was only through the methodology of extension education. The philosophy of dissemination of useful and practical information to the farmers was later on called

as full fledged discipline of Agricultural Extension. Amongst various methods of agricultural extension, the use of audio visual aids, radio and television had very significant role to play. However with the change in farmers needs and challenging farming systems, the innovations were started in different methods of extension.

Although the primary mandate of Indian Council of Agricultural Research was research, this national level organisation never overlooked the agricultural extension activity. On the contrary with the establishment of 300 KVKs in the country, working under the able governance of I.C.A.R., the research is being reinforced to make it farmer demand driven rather than farmer centric. Currently I.C.A.R. is concentrating its research components on marketing and need based packages in consonance with changing agricultural marketing scenario, which can be called as "demand driven" research activities. The available technologies, agricultural experts and the infrastructure can form a great resource for undertaking agriculture extension activities.

1. I.T.Ap1ication of Strengthening Resource Uti1isation

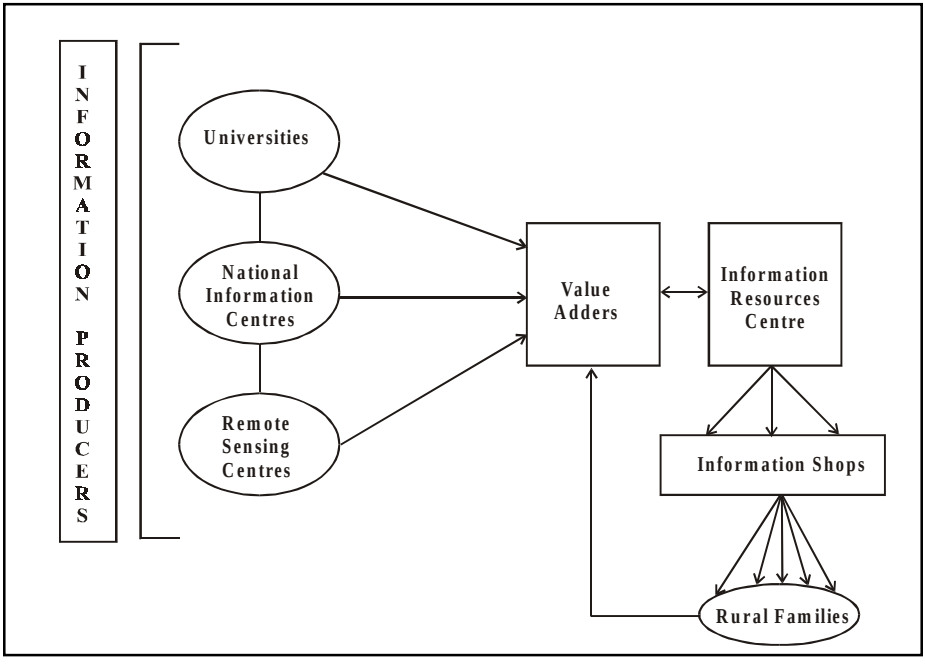
The first and foremost resource in any activity is the human resource. Similarly in extension activity also the personnel research, extension, administration and the farming community play important role. A major training programme for developing capacity and skill for I.T. usage needs to be planned and executed. Already in this regards the I.C.A.R. has made a headway by way of provision of computer facilities. Thus we can see that the strengthening of human resources needs simultaneous development of I.T. Infrastructure.

The infrastructure facilities of telecommunication, T.V. and Radio were already in existence, however with the advent of new technologies in information technology, the computer peripherals and networking support system material was required. This is being provided and the supply position is being improved.

From the point of efficient use of any technology, it is very essential to consider judicious use of these technologies. Increased number of computers at various centres may not necessarily reflect sudden improvement in usage of information technology. The utility should be judged on the basis of how many persons and clients are benefited out of one instrument, machine or computer. When one computer and printer can

work for all the computer terminals, there is no need to have computer and printer for each and every person. In terms of computer technology, "resource" include the "storage capacity" of hard disc of computer, capacity of information highway for networking, printing machines, etc. Here again the increase in quantity of "computer resource" is sometimes waste of funds, if we do not know the maximum utilisation of available equipments. The I.T. application, for training resource personnel has to be looked in similarly for optimum utilisation.

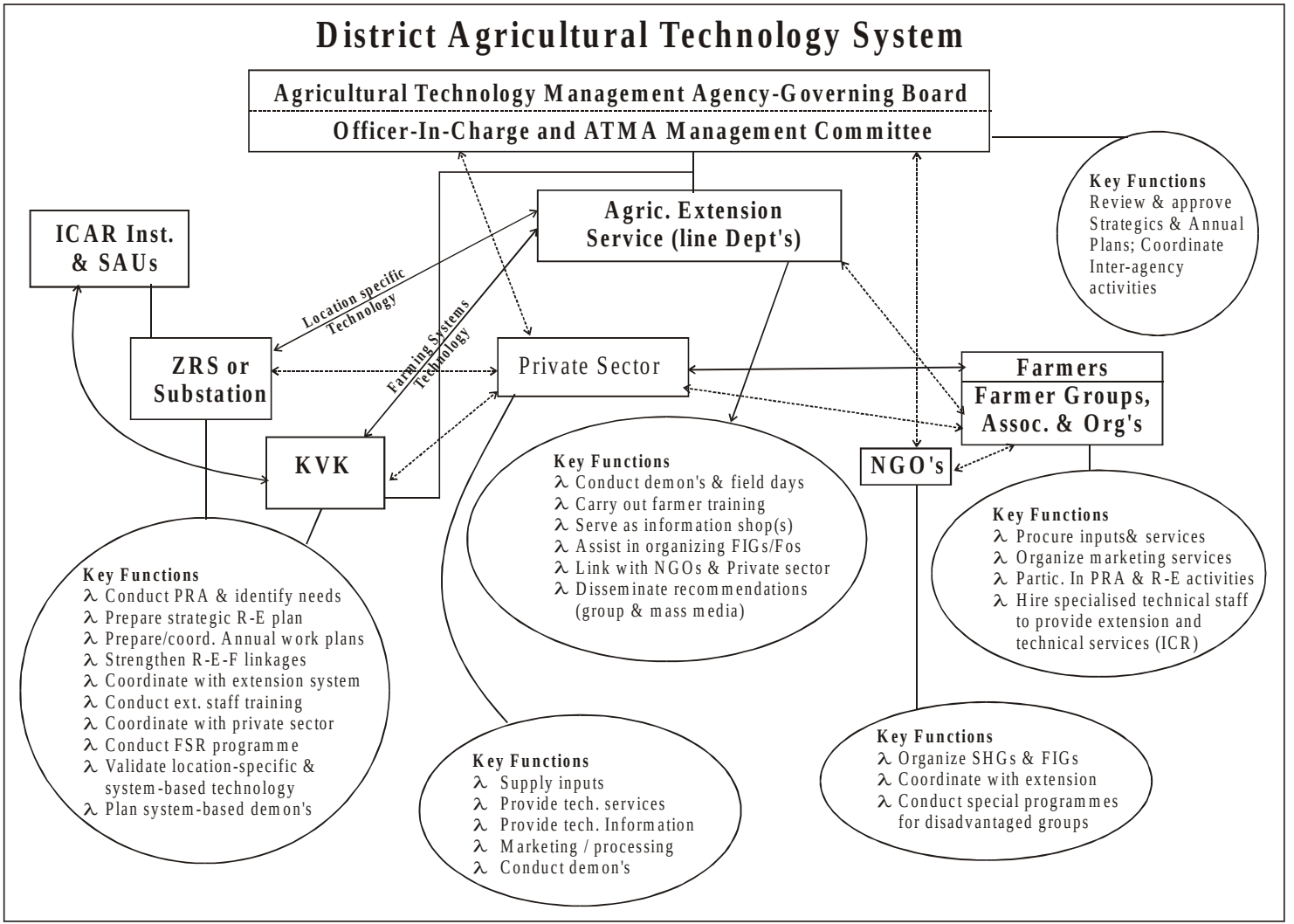
It is most heartening to note that Government of India has granted permission for credit facilities for purchase of equipment for setting up "Information Shop", a new concept being introduced just like starting of PCO and STD Booth. These private "Information Shops" at Block, Mandal and Village level should form a major development in agricultural extension services. "Information Shops" are equipped with computer and Local Area Networking (LAN) and Wide Area Networking (WAN) facilities, so that farmer can access to any of the required persons of agricultural extension system. The placement of "Information Shop" in flow chart of information at different points of information generation and information utilization is shown in following figure.



2. Role of I.T. In Resource Management

As mentioned earlier the resources include the human resource, extension agencies, technologies, input facilities and the farmers as recipients. In order to mobilise all these resources, a well reconceived Management set up is required. At national level, Government of India took serious consideration to this aspect of management of extension activities. Since Dissemination of Information about new technologies formulated by Research personnel has been the prime objective of extension system and the concept of decentralizing the decision making process from National and State Level head quarter to district level. The creation of Agriculture Technology Management Agency (ATMA) as a registered society is the most innovative approach towards the technology dissemination. This ATMA model is being tried at 24 district places of the country as pilot Projects. They would serve as management tool for various thrusts such as farming system based extension activities and marketing and agro processing linkages between farmers' groups and market. The linkage between Researchers, Extension Workers and farmers should form the base of any management function in Agricultural Extension System. For this, application of Information Technology has already been envisaged. Now with the establishments of ATMA at district level, Block Technology Centres (BTC) at Block level and Information Shops at village level, it will be essential to link all such centres with already established KVKs. This is only possible through I.T. approach for managing linkages of these centres of extension activities. The key functions within a district related to ATMA is described in following figure.

The objective of efficient management is to strengthen these linkages. This is required to ensure close interaction between farmers, extension workers, production system and researchers. The close interaction should help in diagnosing problems together and working out specific recommendations. The entire well managed system with most appropriate linkage should ultimately help in technology generation, assessment, refinement transfer and again producing new technologies based on feed back. The continuous process requires a proper linkage which is only possible through effective management.


District Agricultural Technology System
Agricultural Technology Management Agency-Governing Board
Officer-In-Charge and ATMA Management Committee
Key Functions
Review & approve Strategics & Annual Plans; Coordinate Inter-agency activities
ICAR Inst. & SAUs
Agric. Extension Service (line Dept's)
Location specific Technology
Farming Systems Technology
ZRS or Substation
Private Sector
Farmers
Farmer Groups, Assoc. & Org's
KVK
NGO's
Key Functions
λ Conduct demon's & field days
λ Carry out farmer training
λ Serve as information shop(s)
λ Assist in organizing FIGs/Fos
λ Link with NGOs & Private sector
λ Disseminate recommendations (group & mass media)
Key Functions
λ Procure inputs& services
λ Organize marketing services
λ Partic. In PRA & R-E activities
λ Hire specialised technical staff to provide extension and technical services (ICR)
Key Functions
λ Conduct PRA & identify needs
λ Prepare strategic R-E plan
λ Prepare/coord. Annual work plans
λ Strengthen R-E-F linkages
λ Coordinate with extension system
λ Conduct ext. staff training
λ Coordinate with private sector
λ Conduct FSR programme
λ Validate location-specific & system-based technology
λ Plan system-based demon's
Key Functions
λ Supply inputs
λ Provide tech. services
λ Provide tech. Information
λ Marketing / processing
λ Conduct demon's
Key Functions
λ Organize SHGs & FIGs
λ Coordinate with extension
λ Conduct special programmes for disadvantaged groups

Another encouraging event which has taken place is establishment of National Information Centre (NIC) with its own Networking System (NICNET). Under the National Agriculture Technology Project (NATP), it has been already planned to link electronically the district, state and national institutions. Any step in strengthening linkages in any form will be stepping stone for effective management in Agricultural Extension System (AES).

19.3 Glossary

MANAGE : National Institute of Agricultural Extension Management, Hyderabad.

Packing of Information : Sometime the detailed information is summarised, prepared in nutshell form or in synopsis form like Digest Publication.

T and V System : It is the Training and Visit System of Agricultural Extension started in mid 1970s.

CATS : Computer Approach and Television System, which involves I.T. application for mass communication.

E-Extension : This a new term coined for electronic extension approach, which is otherwise can be called as I.T. oriented Extension.

Technology Transfer Mode : This is an approach of dissemination of information on any technology and does not involve any implementing application and execution part.

I.I.F.S. : Integrated Intensive Farming System.

REF Linkage : This is a linkage between Research, Extension and Farmers which is usually one way track.

Information Shop (Kiosk) : This is like a STD Booth shop located at village level providing I.T. Tools for day to day use.

ATMA : Agricultural Technology Management Agency.

19.4 Summary

In the context of meeting the holistic needs of increasing agricultural production, yet to do so in a sustainable manner, agricultural extension has a critical role to play. The new look in the Agricultural Extension System in the "Information Age" or "I.T. Era" the system has to envisage an extension service more farmers need based and holistic by involving all the agencies struggling for agricultural development. The I.T. Application for reinforcing entire Agricultural Extension System has to be re-designed, so that extension methods should develop the farming system approach rather than just disseminating and transferring technology. For this the Back up technology, proper linkage has to be re-engineered. The network of different agencies like KVK's, BTC, ATMA, Information Shops has to be developed for useful linkage and proper utilisation of available resources. The human resources will have to be trained in usage of I.T. Tools and all infrastructure facilities required to be provided to strengthen the Agricultural extension System and Services.

In view of the significant role of Information Technology to change the face of Agricultural Education System, efforts should be made to transfer the extension into E-extension (i.e. Electronic Extension).

19.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Describe the significance of I.T. based Resource Documentation and Planning?
2. Explain the role of I.T. Application in the Innovative Methods of Agricultural Extension.
3. Explain the contribution of I.T. Application in strengthening the Technical Knowledge Back up.
4. Write note on District Agricultural Technology System of ATMA model of Agricultural Extension.

Unit 20 : I.T. in Agro-based Rural Development

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20.1 Introduction

Information Technology (I.T.) is perhaps one of the influential of the present technologies, because of its mass impact. There is no aspect of life or no section of industry or services which cannot benefit by the application of I.T. This I.T. being the powerful combination of computers and communication has emerged as an instrument for improving the performance of any field and activity. Due to mass influence and impact, the role of I.T. was clearly noticed in the rural communication system and rural industries.

On account of agricultural production being the main source of raw material for the agro-based industries, the entire rural development is influenced on the development of agro-based industries. In view of research and developments in the field of Remote Sensing and Geographical Information System the role of I.T. application got fillip for overall rural development. The watershed and wasteland management are very much benefited due to I.T. tools. The diversification of

agriculture also influenced the agribusiness due to various agri product mix. The export potential of Indian agricultural produce also can be enhanced due to introduction of I.T. facilities for improving agro marketing services and there by improving rural development. It is therefore worthwhile to study role of I.T. application that influences the rural development.

After the study of this unit, you will be able to know and understand :

- The I.T. Applications for Agro based industries.
- Facilities of I.T. Tools, for Watershed and Wasteland Management along with Rural Reconstruction Enterprises.
- Increasing effectiveness in Agro marketing system due to I.T. applications.

20.2 Content

20.2.1 I.T. in Agrobased Industries

The Information Technology is the emerging technology that includes computer and communication technology together. The real challenge comes in delivering quality information that people really need and often need quickly. The era of I.T. has started since 1984 when Government of India introduced Computer Policy and subsequently it was followed by Electronic Policy and Software Policy of 1985 and 1986 respectively. However the I.T. services got real momentum in the year 1987 when National Informatics Policy was introduced and National Informatics Centre Network (NICNET) started working by linking all the District Head Quarters, States and Union Territory capitals and the National Capital. NICNET is a satellite based computer communication network.

With the development of NICNET and other Computer Communication Networks, firstly the public administration was facilitated with database development for decision making. Later on Banking Computerization and computerized reservations of railways and airways utilized this I.T. facilities. However the encouraging factor was the use of I.T. tools for rural development. NICNET provides the facilities like (a) Remote Database Access (b) File Transfer Facility (c) Internet Access (including

E-mail) and (d) Video Conferencing. Thus NICNET is helpful for development of computerised information systems and databases for planning to improve the rural conditions and reaching at the grass root level.

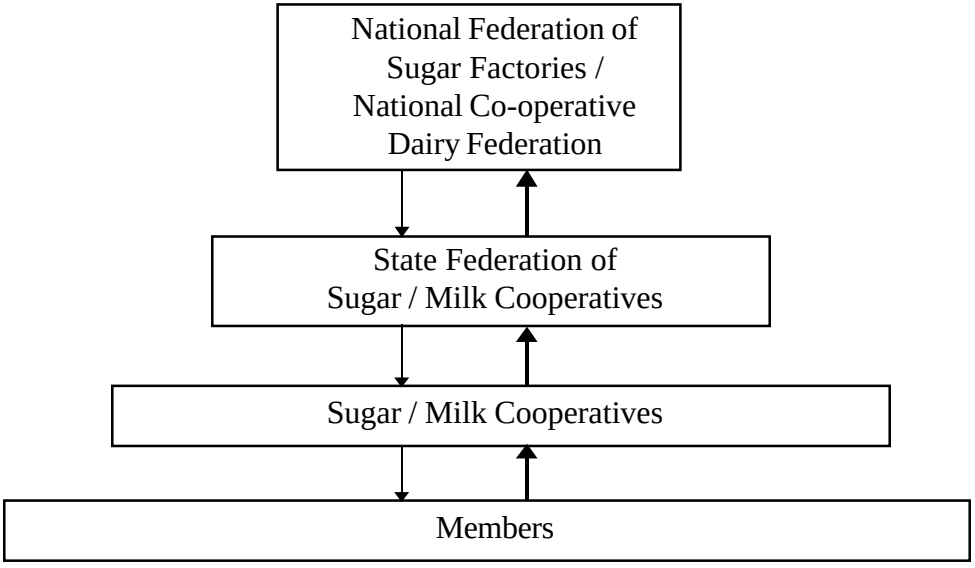
With this preliminary background of I.T. facilities let us study the area of Agro-based Industry, wherein the improvement has already been started and are envisaged in near future.

Under Indian conditions approximately 60% and 85% of the household consumption belongs to agricultural products and products based on agriculture respectively. In general, agriculture plays important role in industrial development, as it provides raw materials to industries like cotton textiles, jute, sugar, tobacco, edible and non edible oils, leather, plantation industries etc. The entire range of the food processing industries are also dependent on agriculture. The most common examples are that of processing and preservation of fruits and vegetables, dal milling, rice husking, gur making, oil crushing, handloom weaving etc. There is a wide area of potential for agro-based industries. Besides fruits and vegetables processing, the spice processing is very important field which fetches lot of export in European and Gulf countries. Dairy products play a vital role in domestic market like that of Oilseeds processed products. Another area which is being catered are medicinal plants and plants material used for medicines like castor seeds and their derivatives, herbal medicines and herbal cosmetics and essential oil extracted from flowers or leaves with aroma. In all such agro -based industries, the role of application of information technology needs to be studied as the agro based potential is very much neglected.

1. Application of I.T. for Improving Linkages of Agro -based Industry

We are aware that there are several advantages that have been identified for the setting up of systematic Agro-based Industry linkages as they play important role in the rural development. These linkages are useful (i) for the mobilisation of the local capital for productive purposes in the rural areas (ii) developing human resources and (iii) reinforcing the composite nature of rural planning especially with regard to input and output management.

Considering anyone of the agro-based Industry as an Anchor Activity, it has direct link with producers and the marketing of the produce. Besides these two important components, there are other factors that are around the Anchor Activity like Welfare Activities sponsored by the Anchor Activity and linkages with the financial and government institutions and agencies involved in input management especially the raw material. The latest I.T. Tools are very useful in creating effective linkages in agrobased industry activities. These linkages are concerning dissemination of useful information. The co-operative movement established in Sugar and Dairy industries are typical examples of these linkages which is presented in the following figure.



Linkages of typical Agro-based industries (Sugar and Dairy)

These linkages are with the producers like Sugarcane cultivators and milk producer with State Federations and National Federation and Board. These Co-operatives have also linkages with NABARD and Finance Corporation. The use of latest communication technologies are very useful for taking appropriate decisions at the required time. The wired villages of Warna Sugar (Kolhapur, Maharashtra) and Amul Industry of Co-operative Milk, Anand are the success stories of the effective

linkages kept with the help of latest computerised system and communication technologies of WAN System and also Internet facilities.

The other typical example is Fisheries industry. The export potential of fish and fish products have attracted the attention of all those involved in encouraging Fisheries industry. The linkage has to be strengthened as the export linkage is with countries like Japan (46% Export), Western Europe (29% Export) and U.S.A. (11% Export). Considering the requirements of these advanced linkage have to be very effective and I.T. has to play a significant role. Similarly the Industrial application of fish oil needs strong database to be exchanged with all those industries who need the fish oil (like Paint, Pharmaceutical and Rubber Industries etc.). Similarly Government agencies need to be contacted for Brackish Water Fisheries Development Schemes and Marine Product Export Agencies.

2. Database on Value Addition in Agro-based Industry

The value addition agro-based industries such as Horticulture, Floriculture, Poultry and Cotton Industry are very important. Value addition to horticultural produce through preservation and processing is necessary. There are different methods like physical and chemical methods used for preservation of horticultural produce. Similarly there are very stringent rules and regulations for food processing industry. The bakery products and flour production units have their own special requirements for value addition. Considering the need of each and every value addition of each food item, the up to date information by preparing database will be most useful in deciding the profit oriented and quality based agro industries. Due to the impact of fast food culture and entries of multinational companies in food products, beverages etc. the Database on value addition is very essential for facing the competition. The floricultural industry needs to be well equipped with database having latest information on export marketing research and production methodology of export quality flowers. The use of flower extractants also needs latest information. Perfume industry linkage International collaborations for the technical know how as well as the buy back arrangements in marketing will definitely lead to better prices being received for the produce, thus bringing about the required value addition.

The poultry processing can lead to the production of a number of by -products which have tremendous demand in the international markets. Egg powder, poultry manures and dressed poultry meal has got a tremendous overseas market. This market again can be very well established with available database of product wise information on poultry products with comprising data of competing nations of the world. The database on input poultry management is most necessary with latest information on feed mills, veterinary pharmaceuticals and equipment manufacturers, since around 600 hatcheries exist currently in the entire country.

The cotton industry next to dairy and sugar industry forms anchor activity, for the development of an industrial complex working towards the integrated rural development. Similarly the Oilseed Industry is also important considering the industrial application of oil for soaps, lubricants, pharmaceuticals, paints and manures etc. Both these agro-based industries need a strong database for its utilisation of data to upgrade the value addition on strategy required respectively for these industries.

20.2.2 I.T. in Watershed Management

Conservation of rain water and optimization of soil and water resources are the key attributes of any watershed management. The Watershed Management System (WMS) to be referred hence forth as WMS has direct relevance to rain fed farming or dryland agriculture. The dryland farming mainly focuses appropriate water harvesting technologies to improve the collection of runoff water. At the national level also WMS approach has been accepted as the most rational way in overall productivity improvement in dryland areas.

In WMS mechanical or vegetative structures are installed across gullies and alongwith contour lines and areas are earmarked for particular land use, based on their land use classification. The cultivable areas are put under crops according to principles of land use classification. The Government of India has rightly launched National Watershed Development Project for Rainfed Areas (NWDPRA) during 1990 although there existed Watershed Development Council (1983). This project is being implemented in 25 states and two union territories during Eighth Plan. The statistics can reveal the fact that the system approach for WMS can make these projects

successful. In order to cover an area of about 4.6 million hectares, comprising 115 agro-climatic zones, during Eighth Plan, NWDPRA implemented the project in 2554 micro watersheds. The micro watersheds management is also important in reducing regional disparity between irrigated and vast rainfed areas, which need huge data collection for which I.T. application can play important role. Wide array of data required for this purpose cannot be acquired and analyzed with traditional tools and procedures. Data need is generated on modern methods using satellite imageries, simulation modeling systems analysis and informatics for developing WMS. The WMS with exact information has good impact on on-farm water harvesting, diversification of crops and land use, precision farming technologies and use of appropriate irrigation systems.

The significance of WMS is clear from the fact that Government of India has envisaged an investment of Rs.76,000 crores, over next 25 years to treat 63 million hectares of rainfed land through WMS. In spite of the success in WMS for sustainable agriculture development in both potential and problematic rainfed areas, these Watershed Development Projects are still confronted with several challenges. The two major constraints are peoples' participation and another the use of low cost traditional technologies. The I.T. application, especially the communication technology and GIS can help in strengthening the institutional arrangement for active participation of users through NGOS and *Pachayats* in planning, execution and monitoring of WMS. A perfect database of indigenous or traditional knowledge of water harvesting in rainfed areas for location specific strategies of WMS will be helpful in finding out compromised and appropriate technology.

20.2.3 I.T. in Wasteland Management

Out of 329 million hectares of land in India, the uncultivable area occupies 175 million hectares of land. Out of this, 67 million hectares are under forest and 15 million hectares are permanent pasture and grass lands etc. out of this about 60 million hectares are under wasteland category having 20 million hectares of Barren and uncultivated land and equal area is cultivable wastelands. The fallow lands are also 20 million hectares. The Government as well as several Non-Governmental

Organisations are actively involved in the development of unutilised lands for the growing of fodder, fuel, fruit and timber trees. The National Wastelands Development Board was established in 1985 with the principal aim to bring under the productive use of wastelands in the country.

For all such huge area the I.T. applications are useful through Geographical Information System (GIS) planning and decision making system. The information required by the decision makers and planners are spatial distribution of wasteland and types of wasteland and its location. For this information needs the GIS provide the decision support by way of providing information on wasteland categories and their area wise spatial distribution and integrated analysis to generate reclamation package. It is better to understand the standard definition of various categories of land use terms used as waste lands: for the purpose of its clarity.

a) Barren and unculture land, is the category that covers all lands that include mountains, deserts etc. which cannot be brought under cultivation except at a high cost.

b) Culturable wastelands are all lands available for cultivation. Such lands may be either fallow or covered with shrubs and jungles which are not put to any use.

The above two categories clearly indicate that 20 million hectares of land which are culturable waste lands needs to be tapped for bringing them under cultivation. The Government and Non Government Organisations need basic information about such Wastelands which can be improved through their rural upliftment programmes. NICNET can come to the rescue of all those who want to improve the wasteland, by way of providing relevant information.

Incidentally the improvement programme of watseland is a part of Watershed Management also. Hence we can say Wasteland management is being looked after by Watershed Management System itself. The GIS again will be useful tool for this purpose. For NICNET facility, if it is strengthened with MIS for water sector, the wasteland management will be improved, as proper planning is needed for bringing the wasteland under cultivable condition. Although at present perfect MIS for water sector does not exist, there is need to develop such MIS of water sector which should also consider wasteland problems.

The Wasteland management should always consider the objective originally set up by the National Wasteland Development Board (1985) These objectives include (i) to increase tree and other cover on waste lands, (ii) to prevent good land from becoming wasteland, (iii) to develop a proper management for afforestation and (iv) to promote fuel wood and fodder needs of the people. All these objectives need statistical information at village, district and block level to design a proper plan for afforestation and tree planting. The National Remote Sensing Agency, Hyderabad had prepared wastelands maps of states (on 1:1 million scale). The extent of wasteland in different states has been shown in following Table

Table : Area Under Wastelands

Sr. No.	State and Union Territory	Total Wasteland area (sq.km.)	Total Geographical area (sq.km.)	Wasteland area to Total Geographical area in Percentage
1	Andhra Pradesh	24673	276820	8.91
2	Assam	1912	78520	2.43
3	Bihar	10077	173880	5.79
4	Gujarat	33098	195980	16.89
5	Haryana	3334	44220	7.54
6	Himachal Pradesh	20417	55670	36.67
7	Jammu & Kashmir	133659	222240	60.10
8	Karnataka	16437	191770	8.57
9	Kerala	2264	38870	5.82
10	Madhya Pradesh	29119	442840	6.57
11	Maharashtra	29815	307760	9.69
12	Manipur 3209	22360	14.35	
13	Meghalaya	1679	22490	7.46
14	Nagaland	1586	16530	9.59
15	Orisa	11541	155780	7.41
16	Punjab	3521	50360	6.99
17	Rajasthan	129401	342210	37.81
18	Sikkim	2697	7300	36.94

(Continue....

19	Tamil Nadu	10113	130070	7.77
20	Tripura	937	10480	8.94
21	Uttar Pradesh	43180	294410	14.67
22	West Bengal	5639	87850	6.42
23	Andaman and Nicobar Islands	153	8290	1.84
24	Arunachal Pradesh	12107	83580	14.48
25	Chandigarh	--	11	1.63
26	Dadra and Nagar Haveli	8	490	9.60
27	Delhi	143	1490	3.20
28	Goa, Daman and Diu	122	3810	9.98
29	Mizoram	2106	21090	11.67
30	Pondicherry	56	480	--
31	Lakshadweep	--	36	--
	Total	533003	3287790	16.21

Reclamation measures for salt affected soils and alkali soils also form important component in wasteland management as the cultivable lands are becoming wasteland because of indiscriminate use of irrigation water. In Maharashtra considerable 20 % of the soils have been affected due to over irrigating the land especially in the sugarcane growing areas of state. The Remote sensing equipments helped in finding out these problems of salt affected soils. Where it is biological reclamation or organic residue, recycling of affected soils or amelioration of acid soils, a huge amount of input is being used for correcting the soil problems. All such matters need up to date information so that the computerised system can give out remedial measures with all details, for carrying out soil improvement programmes on a very large scale for proper wasteland management.

20.2.4 I.T. in Rural Production Enterprises

Under a rural context, the combination of different enterprises for example crop and livestock enterprises depend upon the level of resources available and land use

capabilities, in addition to existence of complimentary and supplementary relationships. Level of each enterprise is decided on labour availability, use of by-product, distribution of income, overtime and efficiency in the use of power, machinery and buildings etc. The diversification is very much influencing the enterprise selection. In case of farm production a crop calender is must for input level, to be decided for different crop enterprises. Substitution of different enterprises also depend on inputs required and degree of risk involved. Once the combination of major enterprises has been selected, supplementary enterprises can be adjusted until an optimum combination is reached, where returns are maximized and the labour is employed optimally. The tailor made software for deciding proper selection of enterprise will be very useful in finalising the appropriate combination of enterprises which are 'compatible'. The labour problem based on peak and slack period has to be solved for various enterprise combination of dairy and poultry etc. The crop combination of horticultural crops or floriculture has to be very well planned as it should be meticulously organised.

The diversification in agriculture has to be looked in from the District level micro planning point of view. Diversified Agriculture include enterprises such as livestock, fisheries, horticulture and agro forestry etc. It involves and also emphasizes the scientific land use planning for resource optimisation in context with value addition, post harvest technology and agri-business aspects. The role of I.T. application for Land Use Planning is very well known because of GIS. The GIS helps in land use planning to focus arable farming, forestry, pasture, horticulture etc. I.T. can help for creating better linkage with the industry and trade sectors. Livestock extension efforts are very weak and need substantial strengthening. In fact the whole linkages of all involved agencies must orient around the plant, animal and man chain by appropriate integration of various enterprise activities.

Like that of Bio-informatics the Agri-Informatics can play a role in another diversified field of Fisheries. The databases on inland and coastal aquaculture, breeding and production of improved fish, feed formulation and fisheries, value addition and export related management is very useful in micro planning. The horticulture is another sector that has attained considerable importance in the context of diversification. Computer programming for landscape gardening is also a new enterprise which needs

attention. The export marketing research should also serve the purpose of horticulture enterprise.

20.2.5 I.T. in Agro -Marketing Systems

In modern marketing, the agricultural produce has to undergo a series of transfers or exchanges from one hand to another, before it finally reaches to the consumer. This is achieved through three important marketing functions namely (i) Assembling (field to common collectling area) (ii) Processing (produce to be cleared, graded, processed and packed) (iii) Storing and distributing (selling and retailing). The transfer of produce or goods takes place through a chain of middlemen or functionaries or agencies. This is the simple way of glancing the agro-marketing related events which involves so many stages, agencies and channels. Considering the wider spectrum of agro-marketing features, the difficulties faced by agro -marketing systems (Agmars) are also many. However they are classified as difficulties in Physical distribution, Channel management, Sales force management and promotion and communication. In short Agmars can be effectively managed, if we have strong Agro Market Research. For all these components of Agmars the database and use of I.T. Tools will be useful in ushering a new era of development in agriculture economy. The success of future Agmars will depend on Export Market and Market Research, which mainly depends upon dissemination of Market information.With this background, one can realise the significance of agro marketing, which has also been considered by Government of India at national level.

The Directorate of Marketing and Inspection (DMI) and National Institute of Agricultural Marketing (NIAM), Jaipur are the two organisations already established by Department of Agriculture and Co- operation, New Delhi. The DMI had initiated 27 Research studies on various commodities during the year 1999. The Marketing Planning and Design Centre (MPDC) of DMI prepares state master plan for the development of agricultural produce market. Recently during 2002, a report relating to study on Post Harvest Management Practices of cut flowers in India has been published. So far DMI has brought out 341 reports on market surveys for various agricultural and allied commodities.

The DMI is also implementing a Plan Scheme “Agricultural Marketing Information Network" through NIC with the objective to establish a nation wide network for speedy collection and dissemination of market data for its efficient and timely utilisation. The Scheme was approved during March 2000. Around 660 important agricultural produce markets and 50 State Agricultural Marketing Boards, Departments and Federation have been provided with computer facilities and connected them with NICNET for internet services. V-SAT and SERVER were installed at Faridabad. The NIC is in process to provide computer facilities to another 500 important agricultural markets. The State of the art I.T. technologies has been established at NIAM, Jaipur in collaboration with MANAGE, Hyderabad. NIAM has its own website http://www.niamonline.com

Considering the importance of Institutional linkages in agro marketing, the use of I.T. tools has a significant contribution. The institution needs perfect communication system and computerisation wherever necessary. The first and foremost linkage is with Agricultural Marketing Officer to the Government of India who grant certificate of AGMARK. A network of AGMARK laboratories have been set up all over the nation to facilitate the testing and the grading of several agricultural commodities. Grading may be compulsory for export or voluntary for internal consumption. Another important linkages are for Quality Controls. There are lot of Acts and Orders for Food and Food Products. The Export Act 1973 for example requires that quality control and pre shipment inspection is necessary for practically all agricultural commodities meant for export. In one of the interesting case in textile goods was the certificate required by European importing countries that no child labour was used for preparing these textile goods. The Institutional linkages for storage, pricing, regulated markets and co-operative market, has a great involvement of communication technologies for supply of right information at right time. For co-operative market, the items of import and export are very important as these market are managed by members or stockholders, who are particular about all such details of marketing situation.

20.3 Glossary

NICNET : National Information Centre Network which was established in the year 1987.

Agro Based Potential : This is the capacity of raw materials on which agro based industries are established.

Anchor Activity : This is the activity of agro based industry which holds manyfold activities such as welfare activities, export marketing, input supply agencies, bye product units etc.

NWDPRA : National Watershed Development Project for Rainfed Areas, which was established during 1990.

Diversification : For sustainable agriculture there is change in enterprise, other than main farming such as dairying, poultry etc.

Agmars : Agro-based marketing system.

DMI : Directorate of Marketing and Inspection, which initiated many research studies.

NIAM : National Institute of Agricultural Marketing, Jaipur

Value Addition : This is additional quality attribute added to any of the enterprise which gives additional advantage.

AGMARK : This is the official certification of Agricultural Marketing Officer of Government of India which is given after grading and testing of agricultural commodities.

20.4 Summary

It is experienced that Information Technology can be used substantially in every walk of life. Under Indian context, it was the National Informatics Policy which gave fillip to use of I.T. for common people. National Informatics Centre Network (NICNET) emerged as principal and nodal agency for providing I.T. facilities. Telecommunications and I.T. are witnessing rapid progress in both capabilities and capacities. Satellite communication application and I.T. in the rural sector started addressing all problems related to agriculture and rural development.

With the available infrastructure facilities of I.T. at rural level the strengthening of linkages of agro based industries has already commenced. The anchor activity of agro-based industry has not only improved the diversified agriculture position but also simultaneously increased the quality of life of the rural people. However due to huge area and population, the progress has yet to be made in all spheres of rural life. The value addition for all types of agricultural produce and products to make it export oriented material has increased the profits or rural people.

As regards the rural development, the most burning issue has been improvedt in dryland farming in which watershed management play a vital role. The use of GIS for watershed management and for the land use capabilities especially in wasteland management, is most useful tool. The basic objectives of National Boards for Watershed and Wastelands is to help the upliftment process of rural areas. The use of NICNET for micro planning of Watershed and Wasteland management or rural production is important landmark for I.T. applications in rural development.

In case of agro-marketing the I.T. Tools have been doing a pioneering function of dissemination of information for decision makers and planners. The Agricultural Marketing Information Network by Directorate of Marketing and Inspection through NIC is a commendable work in this regard. In a nutshell, the development of computerised information systems and databases and the utilisation of I.T. resources should be a matter of strategic importance for the effective rural development.

20.5 Exercises for Practice

Answer the following questions in 200 words each.

1. Describe the scope of improvement of Agro-based industries with the help of I.T. applications.
2. Explain the role of Watershed Management in rural development and how it can be improved with the help of I.T. tools.
3. How computerised system and communication technology can assist in Wasteland Management?
4. Write note on application of Information Technology for Agro-marketing system.

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