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Review Article

Usage of Technology in the Agricultural Sector

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Abstract

Agriculture needs effective utilization of technology to accelerate production and employability of individuals. The main purpose of this research paper is to understand, how to make effective use of technologies in the agricultural sector. There are numerous types of technologies that are made use of to enhance productivity. The main areas that have been taken into account are, factors relating to adoption of technologies, types of technologies, technologies used in the agricultural sector, advanced agricultural technologies used in the present existence, areas of information technology and role of information technology in agricultural education management. For efficient growth and development of the agricultural sector, there is a need to familiarize with new technologies, like biotechnology, nanotechnology, high-tech protected cultivation and modern irrigation methods to accelerate production. These technologies, when utilized in an appropriate manner, would prove to be beneficial in improving productivity and profitability. Usage of technology would enhance in sustaining livelihood opportunities for the farmers.

Keywords: Technology; Agricultural Sector; Production; Sustainable Farming Systems; Information Technology

Introduction

Agriculture is regarded as a primary occupation of the individuals in rural areas. To feed the increasing population, it is essential to introduce modern and innovative techniques in the agricultural sector. New technologies are required to encourage the yield frontiers to an advanced stage, make use of the inputs resourcefully and diversify to a more sustainable and higher value cropping patterns. These are all knowledge intensive technologies that require both a strong research and extension system and skilled farmers. In addition, it also requires a strengthened interface, where emphasis is put on communal exchange of information, bringing advantages to all. Making use of resources in an effective manner is stated as the driving force behind the use of agricultural technologies. Several resource conservation technologies are, green manure, crop rotations etc [1].

Improvement in the agricultural growth is an essential aspect for leading to overall growth and development of the country. The reason being, this sector sustains livelihood of 65 percent of the population. However, the contribution of agriculture towards Gross Domestic Product (GDP) is 14 percent. Several revolutions in agriculture have taken place to boost the sector. These include, Green Revolution, Evergreen Revolution, Blue Revolution, White Revolution, Yellow Revolution, Bio-technology Revolution, Information and Communications Technologies (ICT) Revolution. In order to increase productivity, it is essential to make use of technologies and what is required is the extension of these developed systems. Agriculture extension that has been combined with infrastructure is regarded as the key aspect towards agricultural growth. Involvement of the private sector would help in the absorption of technologies in this sector in a rapid way [1].

Factors relating to Adoption of Technologies

Factors relating to adoption of technologies have the potential to contribute to the sustainable farming systems. It is a comprehensive concept and is affected by the development, distribution and application at the farm level of the present and new biological, chemical and mechanical techniques, all of which are incorporated in farm capital and other inputs [2].

The adoption of technologies for sustainable farming systems and other agricultural practices is a challenging and a vigorous issue for the farmers, extension services, agriculture business and policy makers. The agricultural sector needs to employ a wide range of changing technologies and farm practices across many different farming systems and structures to meet a diversity of changing and varied demands from consumers and the public for food, fibre and other goods and services that are provided. Quite often ambiguous outcomes in terms of their effects on sustainability are depicted. The farmers and the agricultural labourers need to obtain adequate understanding of how to make use of technology to yield production.

Demand of the farmers have led to an increase in the adoption of technologies. Farmers have always looked to new technologies as a way to decrease the costs. In addition, higher incomes, enhanced knowledge and improved channels of communication are leading consumers to demand low cost food of high quality, gradually produced through organic methods in many countries, with more variety, consistency and year-round availability. At the same time, consumers are increasingly making a demand that their food be produced, utilizing the techniques that conserve natural resources, limit environmental pressures and pay greater attention to rural practicality and animal welfare. The process of trade liberalisation is broadening the sources of supply and the degree

of competition. The varying demands are reflected in policies and are strongly communicated to the farmers by the media, pressure groups, food retailers and processors.

The ways in which technologies are employed and made use of are different across countries. The different policies and concerns regarding the attainment of sustainable agriculture have resulted in the range of approaches and levels at which they are put into operation. Market signals, voluntary co-operative industry-led approaches guide the development, distribution and adoption of technologies in some countries. There has been large emphasis on the government intervention. Such government involvement ranges from an assisting to a mandatory role, and includes direct funding for research, payments for distribution and implementation, legal restraints, information and assistance. Moreover, the overall framework of agricultural policies and the level of support is a primary factor in defining which technologies are adopted at which locations at the farm level.

Research efforts, farmer's education and training, advice and information are transferring towards balancing economic efficiency with environmental and social sustainability. The main focus of research and suggestions was to lead to an increase in profits, and productivity. Emphasis is put on achieving those objectives in a sustainable manner, which implies usage of technologies and changing farming practices. The technologies that are made use of in the agricultural sector are not always clear regarding profitability. Research has been conducted to determine the technology that would be beneficial to increasing production. These priorities include, biological pest control, biotechnology, information technology, bioremediation, precision farming, integrated and organic farming systems. Other issues, related to the educational and training systems, institutions and the role of public and private research efforts are crucial. Some sustainability issues are not addressed through technological aspects, but by bringing about changes in the types of agricultural production and its locations.

There has been development of technologies in the global market and applied at the farm level but have an impact on the sustainability beyond the farm. Both conventional and newer technologies, in particular related to biotechnology, information and precision farming techniques, are universal industries. The distribution of those technologies is often within the national market, but their use is local. However, the effects on sustainability of farm level adoption spread beyond the farm. With more vertical integration, either through formal ownership structures or contractual relations along the whole food chain, resolutions on the adoption of technologies at the farm level often cannot be detached from the decisions taken elsewhere in the food chain. Adoption of technologies is multidisciplinary, taking into account the objectives related towards sustainable agriculture.

Adoption of technologies involves uncertainty and trade-offs. To generate sustainability, it is vital for the technologies to contribute to an economically efficient farm sector, financial practicality of the farmers and improving environmental performance. Technological developments are progressing at a fast pace and information on the costs and benefits of adopting technologies in agriculture is often inadequate. Thus, the selections on technology adoption are made in a climate of vagueness with a large element of trial and error in its application, and the speediness and amount of adoption varies noticeably amongst farmers. This can have important implications as to the structure of the farms and the number of farmers that are able to secure their financial positions in future.

Research and development efforts, the movement towards better education and training of farmers, the shift in the focus of guidance, rapid and inexpensive means of distributing and sharing information, accessibility of financial resources, pressures from consumers, non-government organisations, the media and the public in general are contributing towards assisting in the implementation of sustainable farm technologies. Many policies, including those relating to agriculture, environment, and research and development, are making provision of a combination of incentives and disincentives to technology adoption. Environmental policies themselves progressively constrain the actions of the farmers, as the regulations, animal welfare standards and public health policies.

Often policies are providing conflicting signals which impede the acceptance of technology. Some agricultural strategies are positive towards the expansion of agriculture on environmentally fragile land, over-exploiting natural resources and not requiring farmers to take account of environmental spill-overs into other sectors. Many sustenance policies get capitalised into the value of land, inspiring a larger intensity of production and persuading the kinds of technologies employed. Some agricultural policies impose environmental restraints on farmers as a condition for getting support, but at levels higher than otherwise to reimburse for environmental damage, caused by other agricultural policies. In some countries, the environmental benefits provided by the farmers are remunerated, in others they are not.

The farmers need to possess appropriate education and information to make use of technologies and farm practices. The farmers will make investments, when they are assured, they will generate profitability. Agricultural policies can change the prices that farmers are facing for inputs and outputs, which in turn will influence their decisions on investment and can lead to unmanageable farming practices. Where the environmental benefits from employing sustainable technologies are not expected to accumulate to farmers, but to people outside the agricultural sector, and where there are no markets for the benefits, levels of adoption could be sub-optimal from a societal perspective. Equally, where the costs of environmental effects of present farming activities are paid by other sectors, farmers will have no incentive to implement environmentally sustainable technologies.

The impact of farm technologies was assessed according to quite few, normally clear and measurable criteria, production, productivity, farm incomes, employment and trade. Assessing sustainability is more multifaceted, when environmental, social and ethical considerations are taken into account. It is often not clear, what relationships are between the various components of sustainability, what should and can be measured, and how the results are to be understood, so that farmers, policy makers and other stakeholders can recognize with rational confidence which sustainable technologies work, which networks can best facilitate their distribution and implementation in different conditions, and at what costs and benefits.

Types of Technologies

Technologies are often classified into three types, these are software, hardware and org-ware. In understanding usage of technology in the agricultural sector, it is important to understand the differences between technology types and their synergies and complementarities. Hardware refers to physical tools, software refers to the processes, skills, knowledge and information required in making use of technologies and org-ware means organizational technologies, it refers to the ownership and institutional arrangements pertaining to technologies. In the agricultural sector, hardware is exemplified by different crop varieties, software by farming practices or research by new farming varieties and org-ware, by the local institutions that assist in the utilization of agricultural adaptation technologies. Hard and soft technologies are often introduced in isolation, it has been recognized that their simultaneous integration with org-ware is essential for achievement in adaptation [3].

An example of technological innovation that has made use of all three types of technologies can be found in the adoption of water harvesting technologies. In the early 1980s, the farmers have developed the methods of rehabilitating degraded land by improving soil quality. This is done by making small holes into the soil, into which farmers put small amounts of manure, plant sorghum and millet. This process is carried out in the traditional planting pits. In these pits, water and nutrients are concentrated in a precise way to where they are needed and retain water for a long time. This helps the plants to better survive the dry spells and rehabilitate the degraded land. The seeds or the trees that are grown in the pits can be considered as hardware. The practices around creating the pits and improving the fertility of the soil can be considered as software, and the farmer to farmer field schools used to share the information with other farmers across the region is referred to as org-ware [3].

In order to lead to growth and development of the agricultural sector, it is essential to make use of all three types of technologies. The area that is of concern is, hard technologies or hardware are often prioritized and made use of in isolation. When farmers are making use of these technologies, it is vital, they should be adequately aware and make use of them in an appropriate manner. There has been development of training centres, which make provision of knowledge and information to the farmers, how to make use of technologies to yield production and profitability. There is a need of encouragement and assistance within the countries in putting into practice, all three types of technologies in a mutually supportive manner. It needs to be ensured, sustainable and operative applications of technologies are made use of in the agricultural sector [3].

Technologies used in the Agricultural Sector

The main purpose of making use of technologies in the agricultural sector is to lead to an increase in production, so that sufficient food is available to the individuals. Various technologies have been stated as follows: [1].

Biotechnology - Use of biotechnological tools in agriculture could make food crops high yielding and more vigorous to biotic and abiotic problems. This could soothe and increase food supplies, which is important against the background of increasing food requirements, climate change and land and water scarcity. In 2012, 170 million hectares, by more than 17 million farmers in around 12 percent of the global arable land were planted with genetically modified crops, such as soybean, corn, cotton, and canola, but most of these crops were not grown primarily for direct use. In India, genetically modified cotton, biotechnology cotton was first commercialized in 2002 and in 2012, over seven million farmers had adopted this technology on 10.8 million area, which is equivalent to 93 percent of the country's total cotton area. Biotechnology cotton has positively increased the profitability of the farmers and simultaneously reduced the use of chemical pesticides in this crop significantly. The introduction of biotechnology has reduced food insecurity by 15 to 20 percent amongst the Indian cotton growers.

Nanotechnology - Nanotechnology can be used in agriculture in numerous ways. It can help in promoting soil fertility and balanced crop nutrition, effective weed control, enhancing seed emergence using carbon nanotubes, delivery of agriculture chemicals, field-sensing systems to scrutinize the environmental stresses and crop conditions and improvement of plant traits against environmental pressures and diseases. Nanotechnology makes available significant opportunities for the development of innovative products and applications for agriculture, water treatment, food production, processing, preservation and packaging. Its use may generate potential benefits to the farmers, food industry and consumers alike. Nanotechnology based food and health food products and food packaging materials are available to the consumers in some countries and additional products and applications are presently in the research and development stage. Nanotechnology has a great potential in revolutionizing the food packaging. Nanoparticles such as, titanium dioxide, zinc oxide and magnesium oxide, as well as a combination of them, once functionalized can be effectual in killing micro-organisms and are less expensive and safer to use than metal-based nanoparticles.

Protected Cultivation - Protected cultivation or greenhouse cultivation is the area where production of horticultural crops has improved qualitatively and quantitatively. In India, the area under protected cultivation is presently 25,000 hectares. While the greenhouse vegetable cultivation area is about 2000 hectares. Having restraints of land holdings, rapid urbanization, decreasing crop production, decreasing biodiversity and ever-increasing population, demand for food, specifically vegetables has increased multiple and protected cultivation. These factors have offered a new dimension to produce more in a limited area. Poly-houses can also be utilized for rain water harvesting. The irregular annual demand for a 175 square metre poly-house is of the order of 52,000 litres. The semi-annual demand for a crop of six months duration is 26,000 litres of water. In a region with an annual rainfall of 400 mm, the rainwater falling on the roof of the poly-house is of the order of 70,000 litres. Assuming a collection productivity of 80 percent, 56,000 litres of rainwater can be harvested, which is more than the annual demand.

Farm Mechanization - India has a high share of labour (55%) with lesser contribution to farm mechanisation (40%). Making farming techniques less remunerative leads to an increase in the poverty of the farmers. One of the major blockages in farm mechanization in India is 138 million land holdings, which are large in comparison to only two to three percent of the population having landholdings in the United States of America. Farm mechanization and use of modern gadgets, machines, equipment and tools for well-timed and effective completion of operations in agricultural field is one of the most important factors for maximizing productivity. Small machines, suitable for horticultural operations in the hills and mountains will improve operation usefulness and farm income. Farm mechanization will help to improve the overall productivity with lowest cost. Farm mechanization can help in 15 to 20 percent savings in seeds, 15 to 20 percent savings in fertilizers, 5 to 20 percent increase in cropping intensity, 20 to 30 percent savings in time, 20 to 30 percent reduction in manual labour and 10 to 15 percent overall increase in farm productivity.

Use of Modern Irrigation Methods - Availability of water is regarded as the most essential aspect for increasing productivity in agriculture. In India, around 78 percent water is utilized in the agricultural sector and the remaining is made use of, for industry, drinking and other purposes. Therefore, it is essential to increase the water storage facilities. Dry land agriculture should be the main focus, as more than 60 percent of the cultivated area within the country is without proper irrigation methods. The water use efficiency under conventional flood methods of irrigation, which is primarily practised in Indian agriculture, is low due to substantial conveyance and distribution losses. Recognizing the rapid decline of irrigation water potential and increasing demand for water from different sectors, a number of demand management strategies and programmes have been introduced to save water and increase the water usage efficiency in Indian agriculture. Irrigation is vital to the global food supply as 18 percent of the world's irrigated farmland yields 40 percent of the world's food. Less than four percent of the world's irrigated land is equipped with micro-irrigation systems.

Modernize Technology Transfer Tools - Technology transfer in agriculture needs to put emphasis upon main involvements at different stages of the crop from sowing of seeds, crop protection, harvesting, and post-harvest management to marketing. Technology transfer needs operative collaborating groups like Self Help Groups and Farmers Clubs, which should become tools of distributing information about various government sponsored schemes. These entities will help in co-ordinating with various government departments for developmental activities. As central government has an aspiring programme of connecting every Gram Panchayat of the country with internet facilities. These Gram Panchayats should become technology transfer hubs to the farmers. Internet and mobile phones are important tools to impart knowledge on new developments, improved methods of cultivation and technologies in the field of agriculture. These tools can be beneficial in distribution of weather data, agro climatic conditions, and latest information on prices of agriculture produce to farmers. Krishi Vighyan Kendras (KVKs) have been established in each district of the country and now these are the pillars of technology distribution within the country.

Advanced Agricultural Technologies used in the Present Existence

Advanced agricultural technologies used in the present existence have been stated as follows [1].

Tractors on Autopilot: GPS tractors, combines, sprayers and more can precisely drive themselves through the field. After the user has told the on-board computer system how wide a pathway a given piece of equipment will cover, he will drive a short distance setting A and B points to make a line. Then the GPS system will have a track to follow and it extrapolates that line into parallel lines set separately by the width of the tool in use. These systems are capable of tracking curved lines as well. The tractor system is tied to the steering, assisting in keeping it on the track.

Swath Control and Variable Rate Technology: Building on GPS technology is swath control and variable rate technology (VRT). This is where direction really begins to show a return on investment. The farmer is controlling the size of the swath, a given piece of equipment takes through the field. This point is a visual representation of how swath control works. The savings come from utilizing fewer inputs like seeds, fertilizers, insecticides, pesticides, herbicides, etc. Since the size and shapes of fields are asymmetrical, one gets bound to overlap to some extent in every application.

Telematics: This technology is the equipment to talk to the farmers, equipment dealers and even other equipment. When one has to bring work to a halt, due to some problem within the equipment, with telematics, the deal can access the on-board diagnostic system of the tractor. On the basis of the problem, equipment can be fixed right from the dealer. In this way, the farmers get back to work and their time of visiting the dealer also gets saved. Farmers are able to keep track of what field equipment is, fuel consumption, operating hours and much more. This technology also facilitates communication between tractors.

Livestock: Livestock has been contributing to generate productivity in the agricultural sector to a major extent. Therefore, it is important to take care of their needs. Collars developed for livestock are helping the individuals to keep track of their herds. Sensors in the collars send information to a rancher's smartphone giving the rancher a heads up on where his cattle might be, or maybe they are in some problem. The individuals are able to keep track of in what positions and situations their herds are. It is a kind of telematics for the herds. In rural areas, rearing of livestock is an important area and when farmers and agricultural labourers are engaged in their occupations, it is vital to keep track of livestock.

Mobile Technology: In the present existence, the use of mobile technology has become productive to a major extent. It is playing an imperative part in monitoring and controlling crop irrigation systems. With using proper equipment, a farmer is able to control his irrigation systems, instead of driving to each field. Mobiles and computers are facilitating these processes to a large extent. Moisture censures in the ground are able to communicate information about the levels of moisture present at certain depths in the soil. This leads to more precise control over the water and other inputs like usage of fertilizers, insecticides, pesticides that are applied by the irrigation pivots.

Crop Production: In order to improve crop production, there are number of areas that need to be taken into consideration. The farmers need to ensure the seeds, equipment and other materials that are made use of are of good quality, the tasks and functions are performed in an appropriate manner and they possess the required skills and abilities. They need to possess adequate knowledge and awareness to utilize technology in an appropriate manner. Weather modification is a technique that is necessary to create a suitable climate for crops. When perfect climate for crops is created, it leads to an increase in production. For this technology to succeed, it needs to be applied for a long term [4].

Field Documentation: The on-board monitors and the GPS systems, the ability to document yields, application rates, and tillage practices is becoming manageable and more specific every year. In fact, farmers are getting familiar with the concepts, where they have valuable and useful data, that it can be overwhelming to figure out how to implement it in an effectual manner. As harvesting equipment moves through the field, it calculates yield and moisture, as it goes tying it in with GPS co-ordinates. Upon completion, printing takes place of the map of the field and these are often referred to as heat maps.

Biotechnology: Biotech or genetic engineering (GE) is not a new technique, but it is an important tool with much more potential, yet to be unleashed. The form of GE most people have possibly heard of is herbicide resistance. The other would possibly be insect resistant traits. The use of insecticides and pesticides are made use of to control pests that may damage the crops. In most cases, biotechnology toxins are made use of that is the same toxin found in some organic pesticides. Insecticides and pesticides should be of good quality that crops can easily adapt to and help in augmenting productivity.

Weather Modification: Weather modification is the conscious modification or manipulation of the environment, with the main purpose of bringing about changes in the weather conditions. A recognized technology is known as cloud observation, to increase the chance of rain or snow to regulate the local water supply. In the distant future, with advancements, there will be climate engineering, intervening directly in the climate system. Two main technologies that are made use of to counter global warming are the removal of carbon dioxide and the regulation of sun radiation [4].

Smart Materials: The term smart materials are used as a collective term for materials that are able to change their shape through the external influences, including pressure, temperature, humidity, acidity, and electric and magnetic fields. Examples of these materials include, piezoelectric materials or piezo-crystals, shape memory metal, electric and magnetic-rheological (ER/MR) liquids, conductive polymers, colour changing materials and light emitting materials. The use of smart materials has proven to be beneficial, they are used to clean up hazardous materials, add up functional performance, have an impact on packaging and so forth [4].

Renewable Energy: The importance of renewable energy such as, wind and solar energy primarily is made use of in the production of electrical energy. The change to this form of energy, requires the electrification of a large number of activities that are now based on fossil fuels, such as, heating and rapid movements. Biofuels may be part of the solution, if there will not be any fossil fuels left. Renewable energy is an important aspect within the agricultural sector. There are numerous reasons, why agricultural sector has played an important role in the production of renewable energy [4].

Bio-refinery and Biofuels: Bio-refinery aims to process the biomass in an efficient manner for the optimal use of components and minimal waste. The complete utilization of biomass does not require additional agricultural land. It is also possible to exchange the residual flows of biomass between different value chains to attain optimum use and to avoid competition between food, fodder and fuels. Biofuels is a co-operative term for fuels made from biomass. It is normally not possible to replace petrol or diesel with biofuel without adapting the engine. The first-generation biofuels lead to a reduction in carbon dioxide emissions by 50% and the second generation by 90% [4].

Areas of Information Technology

The use of information technology in the agricultural sector is making available online services for information, education and training, monitoring and consultation, diagnosis and monitoring, and transaction and processing. E-commerce is primarily used for direct connections between local producers, traders, retailers and suppliers. The facilitation of communication amongst researchers, extension knowledge workers, and farmers is important. Question and answer services, where experts reply to the questions on particular subject's ICT services to block and district level developmental officials for improved efficiency in delivering services for complete agricultural development. Current information needs to be supplied to the farmers early, about subjects such as, packages of practices, market information, weather forecasting, input supplies, credit availability and so forth. Databases should be created with the details of the resources of the local villagers, site-specific information systems, expert systems and so forth [5].

Provision of the early warning systems about the diseases, pest problems, information regarding the rural development programs, crop insurances, post-harvest technology and so forth. It is vital for the farmers to facilitate the land records and online registration systems. Recording of information is considered essential even in the long term, to identify the improvements that have taken place in various areas. Recording information about productivity in the past and then recording information making use of information technology, enables individuals to find out its benefits. Rearing of livestock, producing milk and milk products is regarded vital to generate a source of income in rural areas. Individuals are involved in the marketing of milk and milk products. Services providing information to the farmers regarding farm business and management. Increased proficiency and output of co-operative societies through the computer communication network and the latest database technology [5].

Tele-education for farmers, websites created by the agricultural research institutes, making the latest information available to the extension knowledge workers and obtaining their feedback have rendered a significant contribution in the development of the agricultural sector. There have been some initiatives in India, making use of ICT in the agricultural sector. Despite the enormous potential to connect ICT for agricultural development, only a few projects have been initiated in India and a few in other parts of the world. Stimulatingly, many of these projects were started by the non-government organizations, private organisations, co-operative bodies and governmental organisations other than agricultural departments. This shows the unconcern of agricultural development departments towards incorporating ICT into their daily functions. To frame an approach for complete agricultural development, the isolated ICT projects need to be researched upon and the familiarities created must be recognized to form instructions for the future [5].

Role of Information Technology in Agricultural Education Management

The areas that highlight the role of information technology (IT) in agricultural education management have been stated as follows [6].

IT for Agricultural Teachers and Educational Planners: Teachers working in agricultural schools, colleges and universities need to be empowered to successfully make use of IT. IT in the present existence is of utmost significance to facilitate learning amongst individuals. It is vital to arrange training of these individuals in the fundamentals of computers and then gradually familiarize them with the advanced modules of computer applications. Teachers need to make use of technology to impart training to the individuals. The educational planners and administrators should be trained to prepare Annual Budget Plan, for teaching aids, resource persons and material expenses, infrastructure budget requirements, time tables to monitor and scheduling the teaching resources, to create and maintain comprehensive student's records, files and so forth.

IT in Agricultural Learners in Classrooms: The learners or the students in agricultural school and colleges need to be well acquainted with how to make use of different forms of technologies. For instance, making use of Power Points in giving presentations is an important area that individuals need to be aware of. Before, the usage of technology within the classrooms, individuals primarily learned through listening to lectures. With the advent of technology, there have been improvements taking place within the teaching-learning methods. Video films, online internet presentations are shown on screen with LCD. The use of CD ROM, on specialized topics on agriculture are displayed on computer monitors to improve learning and understanding.

IT for Agricultural Learners in Virtual Classes: With the advent of internet, the learners can attend a virtual class on the monitor of their computer at their homes or the workplaces. This is apparent, before, one is making use of technology, one should be adequately trained. After one has attended the virtual class on the computer, one is able to appear for an online examination. In this, he will be required to type on the computer and know his evaluation report immediately. Virtual classes are stepping stones for the establishment of future virtual colleges and virtual universities. These have proved to be beneficial for densely as well as sparsely populated countries.

New IT Dimensions for Agricultural Education in India: To generate capability, skills and aptitude amongst the agricultural graduates to meet the challenges and demands of the new millennium, they are required to pursue a course on international agriculture, WTO, Trade Related Intellectual Property Rights (TRIPs), global conventions on climate, biodiversity and desertification, computer technology, patent and trade literacy, and international standards. For this purpose, IT contributes an important role. Therefore, generation of information regarding computers, application of software, Data Base Management Systems, PowerPoint, drawing software, computer programming, multimedia, internet, role of TV and radio in Information Communications Technologies should be part of the course curriculum.

IT for Agricultural Empowerment Dimension: There are considerable number of students or learners, who drop out from schools and training centres in rural areas. In the present existence, there are individuals in rural areas, who are residing in the conditions of poverty and backwardness. It is important that every State Agricultural Department should establish independent areas for Distance Education for imparting training to the drop-out individuals and rural youth. Imparting short term courses in new and modern skills in agriculture and allied sciences have the primary objective to make improvements in the farming practices. For achieving this purpose, IT can contribute an important part.

IT to connect Agricultural Colleges of India: In the present existence, connection between the agricultural colleges can be facilitated through the use of IT. Appropriate connections with the other institutions, enables to generate awareness regarding academic development and compare work with them. This helps in identifying the flaws and inconsistencies and make necessary changes. Exchange of useful information, like collection of question papers, recent trends, modern and innovative techniques, information on seminars, symposiums, workshops, trainings and any other academic developmental activity can be familiarized with through the use of IT. It should be the primary duty of Indian agricultural educational planners to introduce IT in all the agricultural colleges of India and establish a connection between them to make use of the libraries of agricultural colleges and faculties. Computerization process of the libraries with newly introduced IT has facilitated learning.

Conclusion

The significance of usage of technology in the agricultural sector has been recognized with the main purpose of meeting the food requirements of the individuals. India has made progress in agriculture, but productivity of the major agricultural and horticultural crops is low in comparison to other countries. There are still deficits in the usage of technology. Yields per hectare of food grains, fruits and vegetables within the country are far the below global averages. Even India's most productive states are behind the global average. Similarly, the productivity of pulses and oilseeds can be increased, through giving consideration to the seeds, soil health, pest management, crop life-saving irrigation methods and post-harvest technology.

India's population is expected to reach 1.5 billion by 2025, making food security most important social issue and food production will have to be increased substantially, to meet the requirements of an increasing population. In rural areas, there are number of people who are residing in the conditions of poverty and backwardness. Agriculture is the primary occupation of the individuals in rural areas, hence, usage of technology and modern and innovative techniques and methods will prove to be advantageous for improvement in the living conditions of the individuals and in alleviating the problems of poverty. There are numerous technologies and individuals employed in the agricultural sector and farming practices need to possess knowledge and information, how to make best use of them.

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