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Use of Information and Communications Technologies (ICTs) in Crop Production

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ABSTRACT

The rapid advancement in Information and Communications Technologies (ICTs) has given rise to new applications that were impossible just few years ago. Agriculture is an important sector with the majority of the rural population in developing countries depending on it. ICT or Information and Communications Technology in simple terms, can be defined as the basket of technologies, which assist or support in storage, processing of Data/Information, or in dissemination/ communication of Data/Information, or both. ICT thus includes technologies such as desktop and laptop computers, software, peripherals and connection to the Internet that are intended to fulfill information processing and communication functions. In this paper I analysed how ICTs used to evaluate scenarios of changing demographic, economic, and technological and agro climatic circumstances affecting agricultural production.
Keywords: ICT, Crop, Agricultural Development, Farmers, IT.

I. INTRODUCTION

ICT or Information and Communications Technology in simple terms, can be defined as the basket of technologies, which assist or support in storage, processing of Data/Information, or in dissemination/ communication of Data/Information, or both. ICT thus includes technologies such as desktop and laptop computers, software, peripherals and connection to the Internet that are intended to fulfil information processing and communication functions. According to Wikipedia (2008), the term ICT is the broader term of Information Technology (IT), to explicitly include the field of electronic communication, in addition to IT. The term IT is defined as "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. The relevance of ICTs for Agricultural Development in general and for Agricultural Extension in particular is extremely high for a country like India.

ICTs are most natural allies to facilitate the outreach of Agricultural Extension system in the country. Despite large, well-educated, well-trained and well-organized Agricultural extension manpower, around 60% of farmers in the country still remain un-reached, not served by any extension agency or functionary. Of the 40%, who have some access to Agricultural Information, the major sources of this information are Radio and Television. The telephone has just started to make its presence felt on this scenario. Internet-supporting Information Kiosks are also serving the farming community, in many parts of the country. Hence ICTs are highly relevant for Agricultural Extension scientists, researchers, functionaries and organizations. Climate change is one of the most complex challenges that humankind has to face in the next decades. As the change process seems to be irreversible, it became urgent to develop sound adaptation processes to the current and future shifts in the climate system. In particular, it is likely that the biggest impacts of changes

will be on agricultural and food systems over the next few decades. Several researchers, thanks to the application of crop modelling tools, have pointed out that climate change is likely to reduce food availability because of a reduction in agricultural production. [1]

II. METHODS AND MATERIAL

A. IT Tools:

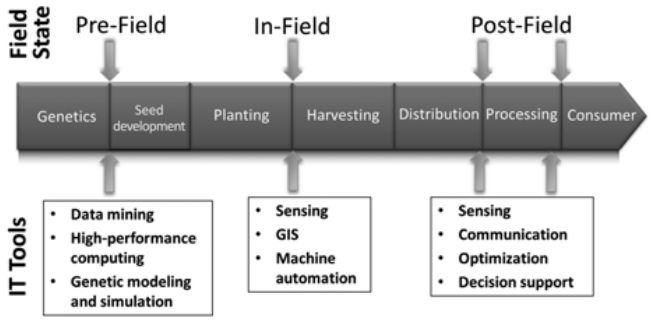

Figure 1: IT tools across the agribusiness cycle facilitate information gathering, information processing, and decision making

Chain of processes for agricultural crops: In the pre-field state, much of the work in crop science and genetics is associated with bio-informatics. In the in-field state, much of the work depends on agricultural mechanization. In the post-field state, logistics, large-scale processing, and supply chain management are key factors.

B. Opportunities Enabled by ICT

The challenges described above also provide significant opportunities for using ICT. Indeed, if agriculture can be seen as a supply chain, then many of the existing paradigms for managing supply chains are already available.

Besides upgrading physical infrastructure, the efficiency of supply chains can be improved by the acquisition and exploitation of information resident in the chain itself. Access to these data makes monitoring of existing processes, rapid responses to changes in the supply chain, and optimal allocation of resources more feasible. These approaches can be summed up as information gathering, information processing, and decision making, the same principles that apply to management of supply chains in other industries.

C. ICT Needs of the Aquaculture Sector

Production Aspects

Commercial aquaculture requires good technical and financial management, where production monitoring and efficiency is a key element. For example, feeds represent one of the major cost items in the business and accurate data on stocks and other parameters are needed in order to manage efficiently and minimize the waste. All farmers are looking for optimal growth at the lowest cost and a number of increasingly-sophisticated computer programmes are currently available for this purpose, allowing much improved operational planning to be achieved.

Analyzing production data to provide accurate harvest forecasting is without doubt one of the keys to operating a successful modern farm. Seasonal demand and price fluctuations are common for many fisheries and aquaculture products but where aquaculture should have the significant advantage of being able to plan production and harvest rather than rely on the variant conditions encountered by capture fisheries

Marketing Aspects

Increasingly sophisticated sales and marketing strategies are required. The absolute need to abide to the consumer safety laws and requirements for food processing has mirrored increased processing activity by many aquaculture companies. Although one often refers to ‘added-value’ products from processing, the absolute need to respond to the consumer’s wishes and desires infers, that packaging and processing have become a means to sell rather than an option.

Consequently, part of the production sector has moved towards processing in order to get ‘closer’ to the consumer by manufacturing a product that can be sold to a retailer, the chain of intermediaries has been reduced. Companies investing in this part of the business no longer need to pass through the lines of

1. Wholesale
2. to Processing (optional)
3. to Market

thus reducing the Distribution logistics and costs associated with these sectors. This concept has not been possible for those in the sector who do not possess the capacity, in terms of production or finance, to make the jump towards processing, noting that ready-to-eat meals are one of the fastest growing sector in the food business in India. The further complications of small company size in addition to geographic and product dispersion have already been mentioned. Individual or co-operative investments in this sector are now responsible for a large part of the sales of aquaculture's products, adapting to and evolving with the modern market's requirements. Evidently, traditional IT products for business management are considered essential within such an environment.

Information Requirements

In summary, the aquaculture characteristics include:

1. wide geographic dispersion
2. production specialization (mono or very few species)
3. production limitations (site licenses limiting production)
4. distance from major markets

The traditional producer response to counter falling prices is increased production. In many cases, farms have exceeded the capacity of their local market and the economies of scale required for increasing efficiency have put particular pressure on both inter and intra-company communications. This phenomenon is changing and modernizing the way in which the aquaculture industry operates. There is a recognized need for accurate, trustworthy and readily available market information since this is required for both short and medium term planning of production, harvesting, processing and sales. Consequently, the real and potential facilities accorded by information technology and electronic communication are being integrated into the sector, albeit slowly. Around 2% of aquaculture businesses use the Internet and that most of these are relatively large companies. The evident cost benefits of using the Internet for information communication has moved on from being technically led, in the same way that aquaculture was, to being market-led and answering to consumer demand. Simpler user technology and immediate results are the most convincing argument to attract those involved in the production sector.

D. Bioinformatics Tools for improving agricultural productivity

Bioinformatics is conceptualizing biology in terms of molecules and applying informatics techniques to understand and organize the information associated with these molecules, on a large scale. In biology/ agriculture, bioinformatics is being useful in the following aspects.

1. Overwhelming amount of data are being collected and stored and analyzed using highly efficient, fast and productive technology of genomics
2. The primary genomic data types are DNA and Protein sequence, genetic mapping data and data resulting from functional analysis. Most of them are freely available to public via internet and World Wide Web.
3. Information technology support systems are used for management of molecular experimental bibliographic and other biological and environmental data.
4. There is a Need to share data among researchers, policymakers and the general public, which is made possible by Internet, www and digital library technology

Given the challenges, the arrival of information communication technology (ICT) is well timed. The benefits of the green revolution greatly improved agricultural productivity. However, there is a demonstrable need for a new revolution that will bring lower prices for consumers (through reduced waste and more-efficient supply chain management), contribute to "smart" agriculture, and incentivize farmers (for example, through higher income) to increase their production. Public and private sector actors have long been on the search for effective solutions to address both the long- and short-term challenges in agriculture, including how to answer the abundant information needs of farmers. ICT is one of these solutions, and has recently unleashed incredible potential to improve agriculture in developing countries specifically. Technology has taken an enormous leap beyond the costly, bulky, energy-consuming equipment once available to the very few to store and analyze agricultural and scientific data. With the booming mobile, wireless, and Internet industries, ICT has found a foothold even in poor smallholder farms and in their

activities. The ability of ICTs to bring refreshed momentum to agriculture appears even more compelling in light of rising investments in agricultural research, the private sector's strong interest in the development and spread of ICTs, and the upsurge of organizations committed to the agricultural development agenda.

But what exactly are ICTs? And can they really be useful and cost-effective for poor farmers with restricted access to capital, electricity, and infrastructure? First, an ICT is any device, tool, or application that permits the exchange or collection of data through interaction or transmission. ICT is an umbrella term that includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers. Second, these ICTs and others have gained traction even in impoverished regions. The increases in their affordability, accessibility, and adaptability have resulted in their use even within rural homesteads relying on agriculture. New, small devices (such as multifunctional mobile phones and nanotechnology for food safety), infrastructure (such as mobile telecommunications networks and cloud computing facilities), and especially applications (for example, that transfer money or track an item moving through a global supply chain) have proliferated. Many of the questions asked by farmers (including questions on how to increase yields, access markets, and adapt to weather conditions) can now be answered faster, with greater ease, and increased accuracy. Many of the questions can also be answered with a dialogue where farmers, experts, and government can select best solutions based on a diverse set of expertise and experience.

III. CONCLUSION

Innovation in Information and Communication Technology is expanding rapidly and touches almost all areas of human activity. Induction of IT as a strategic tool for agricultural development can helps in crops production. There are many identifiable subjects that are appropriate for ICT and from which the production in aquaculture sector could increases but if these projects are to succeed, the following criteria should be respected:

1) Clear and focused services, 2) Simple and user-friendly 3) Accurate information 4) Well organized and easy to find

Presently, agriculture is at cross roads with higher production envisaged to meet the growing demand for food commodities and emphasis on consuming the natural resources in order to keep the earth green and healthy.

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