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Uses of ICT in Agriculture

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Abstract

The application of Information and Communication Technology (ICT) in agriculture is increasingly important. E-Agriculture is an emerging field focusing on the enhancement of agriculture and rural development through improved information and communication processes. More specifically, e-agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICT) in rural domain, with a primary focus on agriculture. E-Agriculture is a relatively new term. E-Agriculture is one of the action lines identified in the declaration and plan of action of the WORLD SUMMIT ON THE INFORMATION SOCIETY. The Food and Agriculture Organization of United Nations (FAO) has been assigned the responsibility of organizing activities related to the action line C.7 ICT Applications on E-Agriculture. The main phases of the agriculture industry are : Crop Cultivation, Water Management, Fertilizer Application, Fertigation, Pest Management, Harvesting, Post-Harvest Handling, Transporting of Food/Food Products, Packaging, Food Preservation, Food Processing/Value Addition, Food Quality Management, Food Safety, Food Storage, Food marketing. All stakeholders of agriculture industry need information and knowledge about these phases to manage them efficiently. Any system applied for getting information and knowledge for making decisions in any industry should deliver accurate, complete, concise information n time or on time. The information provided by the system must be in user-friendly form, easy to access, cost-effective and well protected from unauthorized access. Information and Communication Technology (ICT) can play a significant role in maintaining the above mentioned properties of information as it consists of three main technologies. They are: Computer Technology, Communication Technology and Information Management Technology. These technologies are applied for processing, exchanging and managing data, information and knowledge.

Keywords

E-Agriculture, Information, Technology, Enhancement of Agriculture, Rural Segment

1. Introduction

ICT in agriculture is an emerging fields focusing on the enhancement of agriculture and rural development. It involves applications of innovative ways to use ICT in rural domain. The advancement in ICT can be utilised for providing accurate, timely, relevant information and services to the farmers, thereby facilitating an environment for more remunerative agriculture. However all the ICT initiatives are not uniform with disparities between regions in the level and quality of telecommunications, information and the effort of individuals, public and private organizations, and differentiated nature of demand of the farmers in different areas? As a result, there have been many successes, failures, lessons learned and experience gained, so far. While these initiatives are intended to address the needs of the farmers through ICT, their actual usage and their ability to bring significant impact on the farm productivity and socio-economic development of the intended beneficiaries actually use the facilities provided for them meaningfully to meet their needs. The common problems in adoption of ICT in rural segments are ICT illiteracy, availability of relevant and localize contents in their own languages, easy and affordable accessibility and other issues as awareness and willingness for adoption of new technologies among the rural peoples etc. One critical aspect in the usage of ICT's for farmers and their groups, as seen in the some of the ICT driven initiatives, is the involvement of the human interface at the last mile indicating that there is human dependency in transmission of Information Knowledge to farmers.

Thus, there is a need to understand as to how far the ICT initiatives are able to address the farmers need so that better solutions can be developed to address those unmet needs. The proposed research aims to study the past and present major ICT initiatives in agriculture.

2. Key Issues of ICT In Agriculture

This Paper discussed on key issues of implementing the ICT in agriculture. Specifics comments and insights were collated under the following groupings:

1. People/Community Issues.
2. Training and Research.
3. Political Issues.
4. Adoption Barriers and their alleviation.

1. People and Community Issues

"People/Community" is the important issue promoting and impeding ICT adoption for agriculture production, agriculture development and all aspects ensuring rural viability. Identification and empowering of agents of change was universally accepted as the critical adoption success factor. Table 1 below shown is an indicative quantification of what farmers think in the main constraint to ICT adoption.

Table.1 what are the major constraints to ICT uptake for Agriculture? (%)

	2002	2005	2006	2008
Cost of technology	19.2	21.3	17.5	10.9
Do not understand the value of ICT, awareness	60.8	41.7	46.4	40.9
Personal impediments (Illiteracy or ICT skills)	70.8	63.9	62.3	67.3

Deliberating how to incorporate "people/community" into the ICT adoption process elicited a long list of success and failures. Closer scrutiny brought to light the following issues and constraints:

a. We have to get the "People/community" and "Process" involves before engaging in efforts to adopt new technologies – ICT adoption is not an exception.
b. ICT are for Communities not just individuals. This dictates a more holistic view of the communities as prerequisite to identify optimal solutions, empower leaders to effectuate them ensure relevant local content.
c. Strong leadership from the community is essential for the success of any ICT project. Undertaking and taking on board the key requirement for users in terms of end user skills, motivation and their realties in terms of access must be factored into the ICT adoption process.
d. ICT will not necessarily change the lifestyles o the rural communities. Rather they will introduce new methods of doing the same traditional activities and/or enable new activities.

2. Training and Research

This point discusses about how to customize ICT to be user friendly (research) and how to link training, education and research. Training and Research focused on the following issues:

a. Research has not devoted sufficient time and resources to identify solutions for effective adoption of technological innovation including ICT.
b. Such complacency in addition to an acceptance of inadequate "computer literacy" emphasizes the urgency to enhance ICT proficiency of Researchers, extension, relevant officials and public at large.
c. Use of simpler technologies may get better results, can take projects forward and trigger learning that leads to adopting more advanced ICT.
d. Fundamental research elaborating local and global digital divides is crucial. At this early evolutionary stage of the Information Society ICT there are dangers yet to be recognized with measures to counter them yet to be evaluated.

3. Political Issues

Discussions were immediate in understanding that ICT adoption issues cannot be isolated from the wide range of issues and considerations involved in agriculture development and rural viability. Political issues recognized that governments today have no choice but to prioritize agriculture and rural viability as the only sustainable solution to the current, explosive rural migration, the need for ensured food security, food quality and urgency to minimize environmental abuse. With that noted the following were outlined for consideration and action:

a. ICT infrastructure for rural areas must be part and parcel of all national infrastructure planning and programs.
b. Utilization of ICT for strengthening the linkages between agriculture policy, research and extension institutions, communities and individuals is a political issue as well as an organizational option.

c. Encompassing digital inclusion can have tangible benefits including a favourable ICT impact on productivity, GDP and quality of life. This is especially important for rural communities during the current generational and technological transition.
d. The need for Public Private Partnership (PPP) to alleviate funding and resource scarcities for investments in physical and human capital.
e. It is governmental responsibility to ensure embedding of ICT adoption in -

- National policies, long term strategies and universal involvement.
- Mainstream thinking concerning digital inclusions.
- Professional bodies, NGOs, private initiatives, international collaborations, community responsibilities influencing thinking.

4. ICT Adoption Barriers and Their Alleviation

There were continued references to the multitude of barriers to ICT adoption throughout the workshop discussions. The following lists several – not necessarily specific to agriculture or rural communities. They include –

a. The lack of physical and human resource infrastructure which was repeatedly cited as a major impediment. Comments identifying wireless connectivity as an alleviating factor for example did not contribute to the understanding of this issue since wireless facilities need infrastructure as well. Infrastructure was related to technology in general.
b. Too much innovation can be an obstacle by blocking the use of older technologies which can often be more effective and/or by imposing an unacceptable cost.
c. ICT adoption based on working within communities takes longer in many cases because of the lack of understanding and awareness of the needs and challenges of small-scale farmers, lack of understanding what ICT can do including unexpected deviations from initials farmer and community expectations.
d. Ensuring leadership within the political and governmental environment.
e. Developing leadership and agents of change at all levels including communities.
f. Sharing ICT adoption funding including public/private partnership.
g. Sharing details of successful projects including business opportunities and their benefits.

3. AgriNet

Agriculture Network Information Centre has to be formed for providing internet access to quality, authoritative agriculture information, and specialized reference services.In this we can use technologies like satellite remote sensing (SRS) which will help in mapping and monitoring features and processes on earth's surface while Geographical Information System (GIS) stores, retrieves, analyses, and displays spatial a non-spatial attribute data in a computer to support decision-making. Seamless integration of GIS, SRS, GPS etc. Holds the key for effective utilization of spatial technologies to solve agriculture problem. Unlike most science and technology disciplines, agriculture has a mechanism for distilling and distributing research to those who need it.

Following objective can be made by this AgriNet:-

a. It can strengthen agriculture research and accelerate technology transfer through establishing regional network on agriculture and allied disciplines, particularly among agriculture research and extensions centres, professionals, policy advisors and stakeholders.
b. To provide inputs for developing regional policies, strategies and programmers, primarily through developing networks in the crop, livestock and fisheries sectors and for efficient utilization/management of soil, water and other resources.
c. To promote new and innovative techniques and systems in agriculture include production, post-harvest and food processing.
d. To facilitate collaborative studies on agriculture marketing and distribution systems, harmonization of agriculture related standards, promotion of agricultural trade, food security, and risk and disaster management agriculture.
e. To facilitate and undertake collaborative capacity building programmers in agriculture and allied sectors with focus on skill development and research in frontier areas.
f. To collate and disseminate information for agricultural advancement in the region.

4. Recommendations

The recommendations of the adoption of ICT enabled Information Systems for Agriculture Development is straightforward. They were concentrated mainly on the need to

- Focus and consolidate all national and public ICT policies, budgets and investments for agriculture and rural sector.
- Involve all ICT stake holders in setting of the ICT R&D priorities and the measures needed to attain the successful transfer of these technologies.
- Strengthen the "Agriculture ICT" curriculums in the formal and informal educational and training programs.
- Focus ICT training for teachers/researchers/extension and farmers on practical implementations.
- Link village knowledge centres and agri-clinics to farmer's needs. Where possible involve unemployed university graduates in this activity.

5. Summary

Adoption of ICT enabled information systems for agriculture development and rural viability is a strategic issue part and parcel of agriculture and rural policies. This paper attempted to try and better understand the ICT adoption issues involved and the barriers to effective ICT uptake for agriculture, agriculture development and rural viability. The composition of participant proficiencies provided a successful mix of competences for this task. These enabled attainment of the professed paper goal namely to provide participants with take home ideas and recommendations. The recommendations focused on ICT policy priorities for agriculture and rural development including the research specifically necessary to support them. The results of the paper majorly focus on feasible priorities and measures to alleviate ICT adoption constraints and contribute to ensuring sustainable rural viability. In conclusion the following were considered the core issues for effective ICT adoption for agriculture development and rural viability:

- Increased and improved investment in ICT infrastructure and capacity development.
- ICT training and content development.
- Involvement of end users in ICT development.
- ICT compatibility with stakeholders needs.
- Public involvement in providing ICT services for farmers.
- Collaboration between relevant entities in sharing ICT adoption experience.

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