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USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) TO ACHIEVE INFORMATION LITERACY IN AGRICULTURE

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ABSTRACT

Present world belongs to the era of information explosion. With the information edge on hand, the world is getting much competitive. Students are required to develop rigorous digital skills to suit themselves to the multi-faceted world. It is no coincidence that Information and Communication Technology (ICT) tools form the bulwark of this new age digital literacy. ICTs have been establishing themselves for so long as the futuristic tools of teaching and learning. In addition, ICT has become a polynary and systematic concept in the field of education. Thankfully, agricultural education is not left behind and it is getting more and more realized that agricultural information professionals must support agriculture by managing and improving access to a proliferating and increasingly complex array of information. This paper is limited to the usage and effects of ICT tools in the classroom teaching-cum-learning setup of agricultural education. Research studies show that for massive deployment of ICTs, the student community needs to be exposed to various courses of computer usage and application software. Besides, bottlenecks that hinder widespread ICT deployment have also been identified amongst agricultural community. Apart from the poor or inadequate availability of interactive multimedia, self-learning modules and online class courses in agricultural domain, it has been ascertained that poor signal strength of wifi also pose as barrier in inhibiting the adaptability of ICT tools in countries like India. The study suggests that the students should foster information awareness, build their knowledge about ICT, develop competence in ICT, and the teaching faculty should determine methods for how to use ICT to achieve information literacy in agriculture.

Keywords: Agricultural education, bottlenecks, classroom teaching-cum-learning, ICT, India.

INTRODUCTION

Learning is both an active and interactive process in the part of the learner (Ertmer, 2003). Over the decades, it has become more plausible that it is no longer necessary for a learner to be physically present inside a classroom. Even within the fixed boundaries of a classroom, learning has become participative. This phenomenon change has been enabled by the recent strides in information technology and its application. Present world belongs to the era of information explosion to such an extent that even social networking sites with trending data can contribute to the sincerest piece of

academic learning and research. With the information edge on hand, the world is getting much competitive. Students are required to develop rigorous digital skills to find themselves in this 'flattened' world. Digital literacy has become multi-faceted and it is often found synonymous with e-literacy, screen literacy, multimedia literacy, and information literacy among the few. It is no coincidence that Information and Communication Technology (ICT) tools form the bulwark of this new age digital literacy. Research studies attribute that ICT in education has binary meanings reflecting both culture (Li, 2004) and technology (Oduwale, 2004). From a cultural standpoint, ICT in education would help learners improve their information literacy. From a technology standing, ICT in education could help

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learners acquire experience in utilizing ICT and improving their ICT competence. ICT in education is also interpreted from an information culture perspective as a process-oriented approach. With developments taking place both in online and offline education platforms, ICTs have been establishing themselves for so long as the futuristic tools of teaching and learning (Olivero *et al.*, 2004). Thankfully in this technological zeitgeist, agricultural education is not left behind. ICT has combined the advances in agricultural informatics, agricultural development and agri-preneurship opportunities to provide better agricultural services, enhanced technology dissemination, and information delivery through computer based advisory services (off-line), net based services (on-line) and mobile based services (real-time) (Anandaraja *et al.*, 2012). It is getting more and more realized that agricultural information professionals must support agriculture by managing and improving access to a proliferating and increasingly complex array of information in a climate of already shrinking resources worldwide (Smith, 2003). Information is a powerful tool in addressing agricultural needs and if it is used appropriately it can radically change a nation's economy (Tshabalala, 2001). Thus, today's agricultural students will require new abilities to thrive in the future, and information management plays a vital role in this regard.

Spearheading ICT Literacy in Agricultural Education

ICTs have become the essential factor for educational development in the current century (Kozma and Anderson, 2002; Goodison, 2003; Kangro and Kangro, 2004; Hennessy *et al.*, 2005; Kennedy *et al.*, 2006; Bayindir and Inan, 2009). There has been rapid growth and improvement in the diffusion of technologies designed to handle information and suit it to the classroom teaching-cum-learning (CTL) module. Blackboards which were a standard feature in classrooms were then replaced by whiteboard with its marker pens. Now, it has become more common to see classrooms installed with interactive whiteboards, connected to a computer and projector. It is to be noted that the chalk and talk mode of teaching is not eliminated but only modified with the adoption of ICT tools. In taking the usage of ICTs to the next level, mobile devices and Web browsers are becoming increasingly relevant for search of information in the pursuit of teaching-cum-learning (Ye *et al.*, 2008). Apart from powering access to information (Brown, 2002), ICTs are

also credited for offering new ways of communication and in serving many online services in the sphere of education (Nachmias *et al.*, 2001). Agricultural education is as much practical as much it is dynamic. Neither its scope nor its extent could be limited to a specific area of study. It is extremely inter-disciplinary and the concept as well approaches of one domain is to be interlinked with the other domain (for instance, pest management cannot be understood without the knowledge of physiology of a crop which goes in hand-in-hand with the cultivation practices and soil fertility which in turn gets determined by the social or economic characteristics of a farmer). Field trials in agricultural education are as important as field visits and field documentations. It is more important that trials in lab get transferred to the field. Though ICTs have been studied for many years by researchers; however, studies focusing on the application of ICT in agricultural education are very limited. In this paper the usage of ICTs in a classroom set-up for agricultural graduates has been approached with an eye for understanding the changes facilitated and qualities enhanced.

Evolutionary Change in Classroom Teaching – Learning (CTL)

In an academic environment, ICT includes any communication device (like radio, telephone, television, internet, mobile phone etc.) or application (like webinar, VOIP, MOOCs, MOODLE, Social Networking sites) that is put to the use of students in both the aspects of teaching and learning alike. This widespread patronage of ICT tools has totally redefined the concept of learning. As shown in Figure 1, from being linear the learning process has transformed to be sequential. A teacher is no longer needed to be the primary receiver or source of information. The role has shifted from knowledge transmitter and primary source of information to learning facilitator, knowledge navigator and co-learner cum adopter. In the same vein, the role of students has also shifted from being a passive recipient of information to active participant in the learning process, producing knowledge and learning collaboratively (Resta, 2010). In the erstwhile setup of CTL process the teacher had to share the information with the students (Figure 1). Depending upon the time constraints, the information may not carry in depth knowledge. From the knowledge delivered the student had to assess the need of obtaining the knowledge or otherwise. If the need is perceived then the student would develop interest and

would learn further. With the advent of ICT tools, the information and the sources of information are in abundance. Depending upon the preference, usage, skill,

access and expertise (Oduwale, 2004) in the usage of ICT the student and the teacher would be in line with various stages of information.

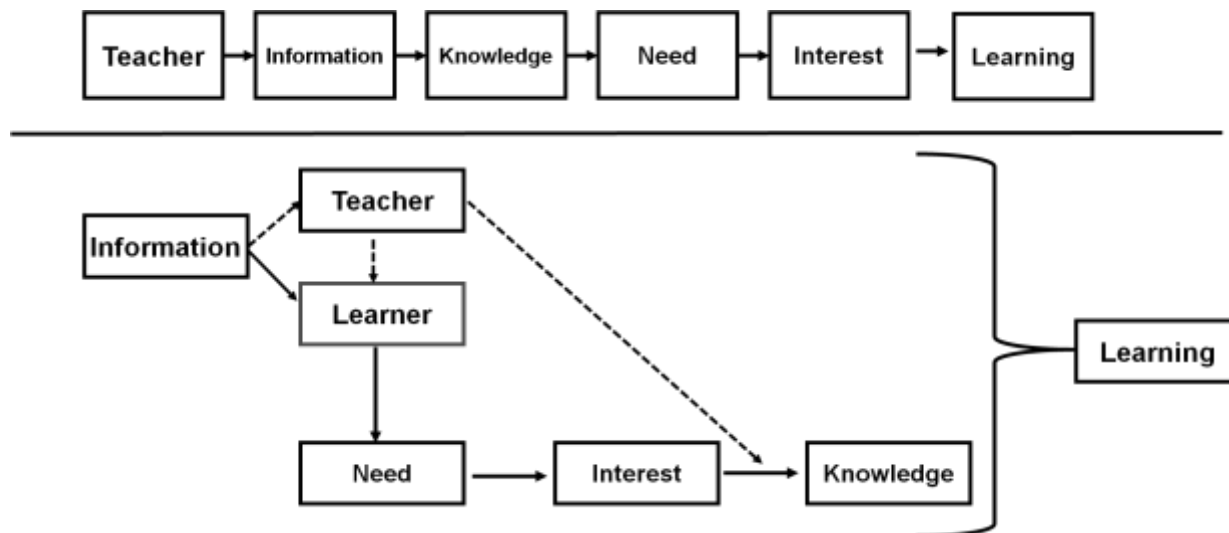


Figure 1. Evolutionary Change in Classroom Teaching and Learning (CTL).

Under such scenario based upon the need, the student can solicit information and the teacher could participate in enabling the student to obtain the right kind of information. In contrast to the earlier phase of learning, 'need' drives the 'interest' of the student in obtaining knowledge and not vice-versa.

Teaching-cum-Learning Qualities Enhanced by ICT:

The minimum and basic requirements of employing ICT tools would include the abilities of search, site, scan, sort, navigate, screen, solve, share, organize, manage, create, make multimedia presentations, surf internet and text. But the benefits realized are quite many. Various research studies have pointed that the ICT has enabled

the teaching-learning qualities to newer heights (Table 1). This welcome change of ICT has happened not only in the traditional domain of being a source of knowledge or motivation but has extended its presence in the brand new domains of mobile learning and in nurturing lifelong learning habits. The deployment of ICT tools has also improved the delivery of library services in educational institutions. It is no longer difficult to keep track of a book or to look-out for new arrivals. Placing an order or registering the requirements of learning community has also become a lot easier. ICTs have created a new world of e-books and online databases that it is not only easy to access but also quick to update.

Table 1. Teaching-cum-Learning Qualities enhanced by ICT.

Sl. No.	Quality Enabled by ICT	Source
1	Source of knowledge	Brown, 2002
2	Motivation	Hawkins, 2003
3	Nurturing lifelong learning habits	Schollie, 2001
4	Establishing online learning	Sridhar, 2005
5	Mobile learning	Oliver and Goerke, 2007
6	Offering a tool for research	Oduwale, 2004; Hinson, 2005
7	Offering a means of interaction	Adika, 2003; Oduwale, 2004
8	Improving the delivery of library services	Younis, 2002
9	Offering a source of academic databases and e-books	Petrick, 2004

Factors Influencing ICT usage: ICT has become a polynary and systematic concept for the learning community. The purpose of ICT in education focuses on how to improve the learners' competence for

information culture and communication. Besides, the chief objective of ICT in education is improving students' information literacy (Heysung, 2004). The determinants for ICT usage in a classroom teaching and learning

environment is shown in Table 2. Age was found to be the most important factor in influencing the usage of ICT. Even if the student community may be quick in adopting ICT, an effective ICT deployment in a classroom is not possible unless the teaching community appreciates its relevance. The knowledge of computer skills was also shown as the influencing factor of ICT usage. As the computer skills gets acquainted based upon one's own interest, the appreciation or the requirement of ICT tools is also centric on the individual.

As bulk of the resources is available in English, the language proficiency was also a determining factor in employing ICTs.

Besides the relative advantage of the use of ICTs, demonstration of the results were also seen as influencing factors for the teachers to adopt ICTs in academic field. The advanced research needs of the learning community and perceptions about ICT were too observed as prominent factors for determining the application of ICT.

Table 2. Determinants of ICT usage in a Classroom Teaching-Learning (CTL) Setup.

Sl. No.	Factors Influencing ICT usage	Source
1	Age	Yaghoubi and Shamsayi, 2004
2	Computer skills	Heysung, 2004
3	Access to computers and the Internet	Korgen <i>et al.</i> , 2000
4	English language proficiency	Yaghoubi and Shamsayi, 2004
5	Research activities	Yaghoubi and Shamsayi, 2004
6	Perceptions of ICT	Heysung, 2004
7	Relative advantage	Li, 2004
8	Results demonstrability	Yi <i>et al.</i> , 2006
9	Ease of use	Ma <i>et al.</i> , 2005

Barriers to ICT usage in a Classroom Teaching-Learning (CTL) Setup: The research studies focusing on the barriers of using ICT revealed that the lack of ICT facilities was the major constraint in limiting the experimentation of ICT enabled academic education (Beggs, 2000; Bussey *et al.*, 2000; Butler and Sellbom, 2002).

As it could be seen from Table 3, the attitude of the user whether to deploy the ICTs or not is one of the most notable barrier while empowering the classrooms with ICT usage. In addition, faculties' encouragement to use ICT, access to technical staff knowledgeable of ICT, ICT compatibility with course curriculum and internet acquaintance were also noted as significant barriers.

Table 3. Barriers to ICT usage in a Classroom Teaching-Learning (CTL) Setup.

Sl. No.	Barriers to ICT usage	Source
1	Attitude of the user	Watson, 2001; Hartley, 2003; Anandaraja <i>et al.</i> , 2012;
2	Faculties' encouragement	Otero <i>et al.</i> , 2005
3	ICT compatibility to course curriculum	Ertmer, 2003; Anandaraja <i>et al.</i> , 2012
4	Comfort with using ICT tools	Oliovero <i>et al.</i> , 2004
5	Variation among scholars in using ICTs	Wheeler <i>et al.</i> , 2002;
6	Connectivity and speed	Zhao, 2009; Anandaraja <i>et al.</i> , 2012
7	System utility	Hauge, 2006; Anandaraja <i>et al.</i> , 2012
8	Acquaintance with the Internet	Layfield <i>et al.</i> , 2000
9	Access to technical staff	Layfield <i>et al.</i> , 2000

Faculties' encouragement to use ICT refers to the degree to which the faculties encourage their students to use ICT and assign tasks that need ICT usage. Access to technical staff knowledgeable of ICT refers to the degree to which the user can access the expert when they encounter a problem in relation to ICT. Compatibility refers to the degree to which the faculties believe that

using ICT is compatible with their predetermined needs of the course curriculum. Barriers were also associated mostly with variables related to the facilities needed for the application of ICT. Speed connectivity refers to the degree to which the user can access to Internet with high speed. Access to a computer lab with enough capabilities refers to the degree to which the user believes that the

computer lab is sufficiently equipped and they can easily access the computer lab and use the potentials offered by ICT. Feeling comfortable using ICT refers to the degree to which the user believes that using ICT would be without difficulty. Perceived usefulness refers to the degree to which the user believes that using the technology will improve their work performance, while perceived ease of use refers to the degree to which the user believes that using a particular system would be free of effort. Both are considered distinct factors influencing the user's attitude toward using the technology. Attitude describes a person's positive or negative feeling about performing the target behavior. Attitude toward using the technology determines the behavioral intention to use that technology. Thereby, behavioral intention affects the actual use of the technology.

ICT Experimentation at Tamil Nadu Agricultural University (TNAU), India: It has been observed that ICT in education can be an alternative to instructional delivery system as Computer Aided Instruction and use of multimedia and internet have enhanced the learning scenario (Radford et al., 2006). Since 1950s most of the policies in India have consistently favoured the use of multimedia. And ICT initiatives progressed to a great extent with the launch of EDUSAT satellite paving way for the introduction of Digital Library and Information Network (Iype, 2005). Thereby education and ICT were blended in all combinations for developing an effective ICT based learning module. As a result, several unique ICT initiatives were put in place by many motivated agricultural universities across India in the early 2000s. Among them, the Tamil Nadu Agricultural University (TNAU) has cemented its place over the years as a frontrunner by not only updating the interventions periodically but also by devising innovative ways that maximize its scope in the interest of farming community. Thereby, the ICT umbrella in TNAU could be seen reaching out all the four pillars of agricultural education viz. education, research, training and extension. In this connection, TNAU's tryst with ICT tools could be very well used as a model to understand the prevalence of such interventions along with their substantial benefits in the overall Indian agricultural education psyche. It is no coincidence that TNAU has championed the cause of e-mode of education and teaching-learning process.

TNAU has introduced various ICT based initiatives to enhance and enrich the UG, PG and PhD educational cum research programmes. The following are the ways in which the University provides the state of the art facilities using ICT tools:

- Equipping all classrooms with LCD projectors, computers, and document cameras
- Provision of computer centers with adequate computers and internet bandwidth
- Enabling the campus and particularly the student hostels with wi-fi facility
- Establishing digital services in the existing libraries
- Developing online course materials
- Introducing online examinations for the students and providing digital exam pads for scholars during examination.
- Training teaching faculty and scholars to use ICT tools effectively
- Conducting workshops for research faculty and scholars to update themselves with the use of computer aided statistical packages like SPSS, STATA, GAMS, R, GRETEL, LIMDEP, ZTREE.
- Deploying GPS enabled tablets for agricultural field enumerations and surveys.
- Expanding the usage of ICT for Farming Community Development such as;
 - -TNAU AGRI TECH Portal (<http://agritech.tnau.ac.in>)
 - -Multi Video Conferencing (<http://vcon.tnau.ac.in>)
 - -Dynamic Market Information (DMI)-SMS (www.tnau.ac.in)
 - -Domestic & Export Market Intelligence Cell (www.agmark.tn.nic.in)
 - -Automatic Weather Network (<http://tawn.tnau.ac.in>)
 - -Expert System (Off-line)
 - -Instant Agro Advisory System (<http://fcms.tn.gov.in>)
 - -TNAU-IFPRI Knowledge Management Portal (<http://advanceagriculturalpractice.in>)
 - -Students e-learning content (<http://agridr.in/tnauEAgri/>)
 - -Documentation of Agricultural technologies through Video Clipping (agritech.tnau.ac.in/technologivideostnau.html)

From Figure 2 it could be understood that TNAU has established the access to ICT in all the spheres of academic environment. Encompassing effect of ICT is felt in teaching, learning, research, extension, and in general administration. For effective teaching, visual aids and video conferencing facilities were first deployed. Apart from curricular learning, students were also encouraged to explore the opportunities in webinars and Massive Open Online Courses (MOOCs) including Coursera, Saylor Foundation, EdX and World Intellectual Property Organization (WIPO). Digitization of library services was a boon for the research community to expand their scope of research. Dissertations, monographs and working papers have also been made available to the students through Krishiprabha scheme of Indian Council of Agricultural Research, New Delhi. The students have also been expertized to access professional community portals like LinkedIn, Academia, and Research Gate to update themselves with the seminars, conference, workshops in their field of research. Apart from that the students were exposed to the gamut of research articles with the establishment of Consortium of e-Resources in Agriculture (CeRA). The professional community portals along with the social networking sites (like Twitter, Face Book) also enable students to get to know about the academic and research opportunities the world over the moment they get shared. Web tools like Moodle (Modular Object-Oriented Dynamic Learning Environment) were also being used as a way to deliver content to students and assess learning using assignments or quizzes and by the conductance of examinations. In general administration also the influence of ICT was observed. Students could register for their semesters electronically using a registration system. After the examination, they could also view their results by checking the exam results site of TNAU. Besides the students could also pay their semester and boarding fee with the web enabled e-Collect system of Public Sector Banks. Moreover, the e-commerce sites have also enabled the academic community to order books and other educational accessories online. In line with the ICT enabled services extended to the students, TNAU has established an exclusive e-Extension centre wherein the scientists have developed TNAU-AGRITech Portal. This portal provides need based and crop specific technical information for farmers on not only crops and animal husbandry but also on weather forecast, market forecast. Extension has also been invigorated by

providing ICT tools such as touch Screen smartphones and tablets to Extension Officials by the Government of Tamil Nadu, India. Above all, the TNAU portal, expert system and video conferencing have also been integrated over both on-line and off-line modes in the tablets provided for the extension agents towards their extension and extensive usage.

Impact of ICT interventions proliferated by TNAU:

ICT interventions have brought in significant strides in facilitating the research outreach over the years. Now, the lab to land technology has been made easier. With the farm feedback so instantly available, the impact of a technology could very easily be assessed and can be fine-tuned for it to become location-specific. In addition, it has also opened up many vassals for the full-fledged participation of the farming community in the development of a technology. Particularly with TNAU, the deployment of ICT interventions has fulfilled the possibility of offering real-time solutions to the farm problems. With GPS backed devices, the extension scientists are not only able to mark the exact location of the farm but also the exact problem of the farm. And a good connectivity with the research stations ensures that the farm advisories are catered to the intended beneficiaries on real-time basis. This way the farmers are able to plan well their everyday farm-operations throughout the cropping cycle. Besides, the establishment of farmers' call-centre also facilitates fast and easy access of agricultural solutions to the farming community. In this regard, the TNAU agricultural portal serves as a power-house of knowledge to ensure reliability and accuracy in the farm solutions offered. Of late, the e-extension centre of TNAU is getting numerous calls from urban residents who are interested in taking up farming but lack proper guidance. In this way, the ICT services could well groomed up for bringing up not only rural renaissance of agriculture but also urban clusters of agricultural development. But the impact of ICT interventions would come more pronounced during adverse circumstances. For instance, during 2008-2011 the area under turmeric surged up disproportionately in Tamil Nadu on account of the attractive market demand. As a result, the crop was grown heavily even in the non-traditional areas resulting in a possible market glut. Sensing that there would be fall-out in the market prices, TNAU pitched in. With the ICT enabled price-forecasting mechanism, farm advisories were extended on the market behaviour as well as advising farmers when and

where to sell their produce. The services were offered utilizing all the available and possible portals of ICT and mass-media including the local newspapers, FM radio stations, community radio services, television programmes and short messaging services (SMS). Alternative cropping patterns were also devised and the farmers were directed to utilize the services of agri-portal as well as the call-centre facility. Accordingly, when the turmeric prices fell down drastically, it was found that the farmers who had followed up the

services of TNAU regularly were benefitted to the tune of 95 - 160 % in farm remuneration than compared to those farmers who happened to stock their produce, anticipating a better price against price-forecast interventions of TNAU. ICT services have not only enabled the vast outreach of farmers but also facilitated in easing out the blow of dwindling market prices. The alternative farm plans popularized via ICT tools also avoided the immediate slack in farm remuneration.

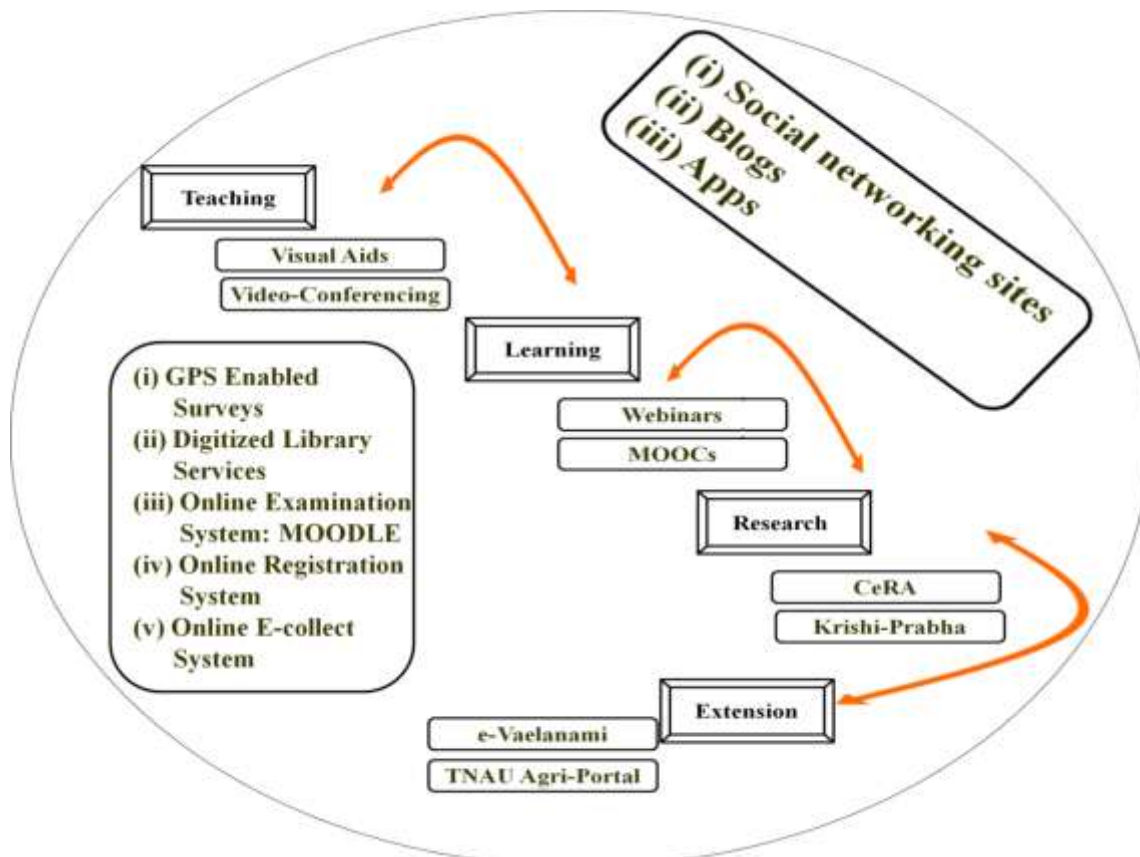


Figure 2. ICT experimentation of ICT at Tamil Nadu Agricultural University, India.

The Way Forward for Proliferating ICTs in Agricultural Education: As it could be seen from Figure 2, a combination of the instructional technology was required to suit e-learning situations. In this context, the concept of 'Blended learning' needs to be promoted. It comprises of web instructional tools or online courses and traditional teaching methods such as class room lectures, group discussions and Seminars. But in a blended learning approach, teacher's role is important so as to choose the instructional medium for teaching. Tools such as Skype enabled Voice over Internet Protocol (VoIP) computer application can be used to make free telephone calls to other Skype users over the

internet. If a digital camera or webcam is attached to each computer, individuals can see one another and interact. Free social networking sites such as Facebook could also put in to advantage. As it is a free social networking service that enables users to post personal profiles, send messages and exchange it could very well be adopted in e-learning. Twitter is another free social networking service on the internet that enables users to send and read messages known as tweets. Tweets are more precise and could enable one to access information without getting lost in the quagmire. In addition, Youtube video streams could enable a virtual exposure and can ease off difficulties in learning and retaining the

concepts. As such web-tools provide opportunities for enhanced voice communication between users it has become possible for users to construct documents collaboratively. Google Docs is also one of several online collaboration tools which enables users to work on documents and share these with colleagues or fellow students in online as well as in real time. Users can choose who may read and even who may edit documents. After documents are created, they may then be stored online, which means that users are able to edit them at any time wherever they happen to be located. The Google Docs application works on the concept of cloud computing with a three in-one application (word processor, spreadsheet and presentation tool).

From Blended Learning to Ubiquitous Learning: Ubiquitous learning or U-learning refers to the learning from the Personal Digital Assistance, Tablets with net connection. It could very well be done through mobile phones. Already mobile phones are very well used for listening FM music and playing games. Thus the medium has very much potential to deliver content and curriculum to masses in very short span of time

(Swaminathan *et al.*, 2014). M-learn devices like smart mobile phones and other mobile technologies could really widen the scope of e-learning. The mobility of the instruments gives the opportunity for the learners to learn wherever they are. This increased mobility for learners gives rise to yet another term, ubiquitous learning or u-learning, where opportunities for learning are expanded even further.

Challenges for Proliferating ICT: There are two main challenges of e-learning: bridging the digital gap and enabling proper utilization of information available in World Wide Web. Digital gap is the gap between 'haves' and 'have-nots'. There is a rising need to bridge this rift existing between the ones who are fortunate enough to enter the myriads of e-learning and the ones who lack any exposure to the same stuff. The governmental policies matter more in cutting down the price scale of e-learning gadgets or in subsidizing the applications that are required for running the e-learning mode. But this would only result in making such e-tools available but to make them accessible, the magic word required here is: 'integration'.

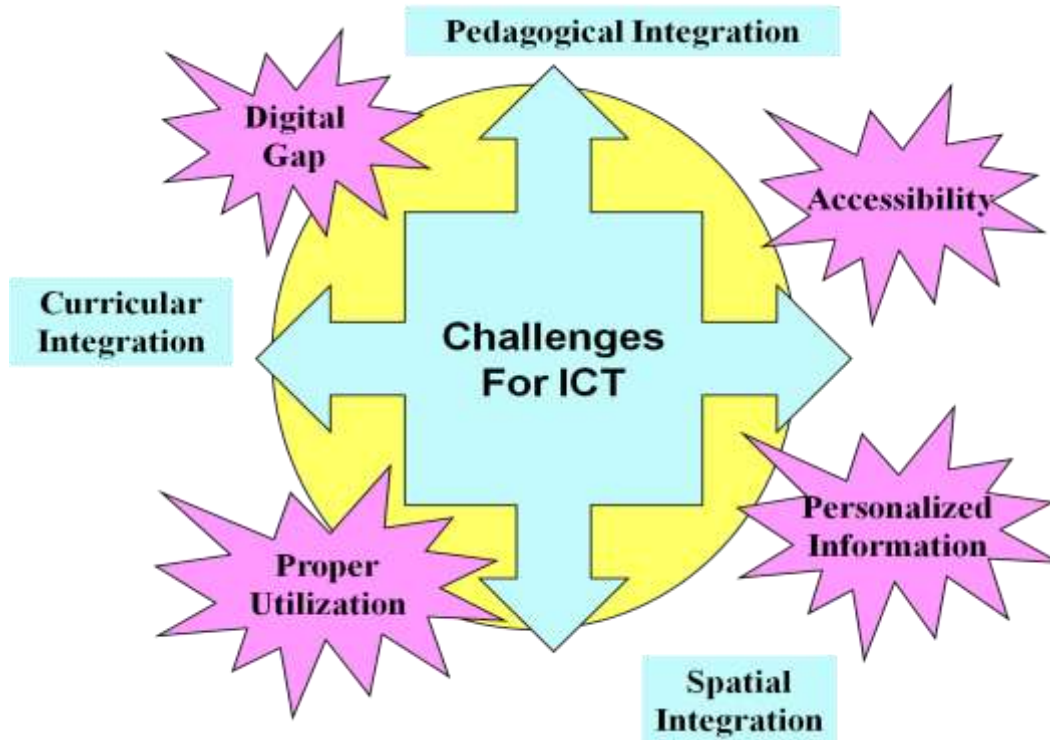


Figure 3. Challenges for widespread deployment of ICT tools.

As shown in Figure 3, the integration of ICT tools should be done in the academic institutes before providing online or e-courses. The various levels of integrations

are (i) curricular integration - the extent to which, an ICT activity relates directly to appropriate curriculum goals or complementary curriculum content or skills activities

in a given unit of work or sequence of lessons; (ii) Spatial integration - the extent to which the use of ICT is separate in place or location from other learning activities in a unit of work; and (iii) Pedagogical integration- the extent to which the choice of particular ICT, and the ways in which they are used in classes, are consistent with and between the pedagogical philosophies, orientations and intentions of the teacher, and the learning styles, abilities and motivations of the students (Ham *et al.*, 2002).

Accessibility vs Affordability debate: Some suggestions: Though the ICT services can ensure a vast outreach (accessibility), the ICT services themselves are not vastly available (affordability). It is often been discussed among the academic circles that the well-endowed institutes bag most of the funded initiatives and incentives thereby aggravating the quality gap. On the contrary, the existing-lack of motivation (with lack of awareness on the backdrop) creeps up to be the major reason for felt-lack of affordability. This conundrum can be very well tackled with the creation of an ICT consortium in which all the state agricultural universities and research centres of both private and public domain are the stakeholders. All the ICT interventions delivered across India should be documented and their impact should be assessed. In this way, existing interventions could be funded and perpetuated with suitable modifications. The impact assessments may reveal the gaps to be addressed, thereby strengthening the utilization of ICTs. As the resources get pooled, the duplications and redundancy can be avoided thereby improving the authenticity. Besides, this will also create awareness among agricultural fraternity about the existing authentic and reliable sources of information. The inter-connectivity between all the stakeholders could facilitate resource sharing apart from the sharing of ideas. The exposure can also motivate (apart from getting benefitted) the stakeholders to come up with location specific fresh interventions. And on the side of farming community, the affordability of ICT can be improved by devising interventions over short messaging services in local languages as well as by dispatching regular weekly crop specific newsletters to all the registered users on the basis of their crop choice. Besides, community centres may also be established in every revenue village whereby the crop-specific and location-specific

interventions (on both production and marketing aspects) can be offered periodically on real-time basis with suitable connectivity to the nearby research stations.

CONCLUSION

In this age of technological explosion, information has become the most valuable asset, putting education sector under pressure to deliver according to demand. Indian agricultural varsities have acknowledged the importance ICT in building a modern educational system able to cope with the new developments of information society. The globally academic competitive situation mandates students to pay rigorous attention to develop necessary digital skills. Hence the curriculum of the agricultural college level education should be suitably transformed with ICT integration. The teachers in turn should be endowed with proper orientation and training to teach students with latest, modern communication and educational gadgets. It is also imperative to recommend that agricultural varsities should enhance the computer and internet skills of students by infusing instructional strategies that require students to work with ICTs for academic and research purposes. Developing interactive multimedia course materials will also improve student's efficiency in using ICT tools. Steps should be taken for introducing a large number of MOOCs in agricultural domain. In addition, validating and updating the ICT course materials and technical components should be considered through proper feedback and training mechanism. Establishment of ICT community centres in every revenue village will apart from increasing the accessibility and affordability of ICT interventions also will set in a virtuous cycle whereby the valuable feedback of the farming community may get channelized towards building up new frontier areas in agricultural education and research.

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