

# ***IMPACT OF ICT ON AGRICULTURAL EDUCATION IN INDIA***

(ICAR – Extra Mural Project funded by Education Division, KAB-II, Pusa, New Delhi)



## **Project Report**

*Dr. Surya Rathore*

*Dr. S. Ravichandran*



भाकृअनुप-राष्ट्रीय कृषि अनुसंधान प्रबंध अकादमी  
राजेन्द्रनगर, हैदराबाद-५०००३०, तेलंगाणा, भारत  
**ICAR-National Academy of Agricultural Research Management**  
(ISO 9001:2008 Certified)  
Rajendranagar, Hyderabad-500030, Telangana, India  
<https://naarm.org.in>



**Correct Citation**

S. Rathore and S. Ravichandran. 2017. Impact of ICT on Agricultural Education in India. ICAR – National Academy of Agricultural Research Management, Rajendranagar, Hyderabad – 500030, Telangana, India. P (151).

**Compiled and edited by**

Surya Rathore

S. Ravichandran

**Designed by**

P. Namdev

**Computer Assistance**

A. Santhosh Kumar

**Published by**

R.Kalpana Sastry

Director (Acting), ICAR-NAARM

**Printed at**

Printing Press, NAARM, Hyderabad - 500030

# **IMPACT OF ICT ON AGRICULTURAL EDUCATION IN INDIA**

(Project Ref: File No. Edn 40/20/2016/ EMF/HRD dated 19/01/2016)

## **Project Report**

### **2017**

#### **Project Team:**

**Principal Investigator : Dr. Surya Rathore**  
**Co-Principal Investigator : Dr. S. Ravichandran**  
**Senior Research Fellow : Dr. Poonam**

**Date of Sanction : 19<sup>th</sup> January, 2016**

**Date of Completion : 31<sup>st</sup> March, 2017**



**ICAR-National Academy of Agricultural  
Research Management  
Rajendranagar, Hyderabad -500030**



## ACKNOWLEDGMENTS

---

At the outset, I offer my sincere gratitude to all the Vice Chancellors and Nodal Officers of the various State Agricultural Universities of Madhya Pradesh, Gujarat, Rajasthan and Jammu & Kashmir states for their kind support, administrative facilitation and active participation in the survey. Further, I extend my sincere thanks to the Director, ICAR – National Academy of Agricultural Research Management, Hyderabad for providing institutional support required for implementation of this project. I express my sincere regards to Dr. S. Ravichandran, Principal Scientist, ICAR – NAARM, Hyderabad and Co-Principal Investigator of the project for his continuous support and guidance for preparation of this project document. The financial support for this project provided by the Education Division, Indian Council of Agricultural Research, New Delhi is duly acknowledged. Further the opportunity as well as continuous support given by Dr. N. S. Rathore; Deputy Director General and Dr. M. B Chetti, ADG (HRD) Education Division, ICAR, New Delhi; is highly appreciated and I express my sincere gratitude to all of them. I am also thankful to Dr. Rajendra Rathore, Professor (Agricultural Extension), SKNAU, Jobner; Dr. F. L. Sharma, Professor & Head, Agricultural Extension, MPUA&T, Udaipur; Dr. Dhriti Solanki; Professor (Home Science Extension), MPUA&T, Udaipur, Dr. B. S. Bhimawat, Dean, College of Agriculture, Sumerpur; Dr. M. M. Patel, Professor & Head, Agricultural Extension and Dr. V. S. Jaitawat, Dean, College of Agriculture, Jodhpur for their facilitation and monitoring during data collection work in their respective colleges. The support which I received from the administration and accounts staff of this Academy is highly appreciated. I would like to express my sincere thanks to Senior Research Fellow Dr. Poonam and Mr. A. Santhosh Kumar, Computer Assistant for their hard work in conducting field survey, data compilation and data analysis *etc.* Finally, many-many thanks to all the teachers/students for taking active part in the survey on ICT usage and its impact on teaching and learning. Last but not the least, I also express my gratitude towards my family and colleagues for their kind co-operation and encouragement which helped me in successful completion of this research project.



**Surya Rathore**  
**(Principal Investigator)**

## CONTENTS

<b>S. No.</b>	<b>CHAPTERS</b>	<b>PAGE No.</b>
<i>1.</i>	<i>Introduction</i>	<i>1</i>
<i>2.</i>	<i>Research Methodology</i>	<i>5</i>
<i>3.</i>	<i>Results and Discussion</i>	<i>17</i>
<i>4.</i>	<i>Conclusions</i>	<i>113</i>
<i>5.</i>	<i>Policy Strategies</i>	<i>120</i>
<i>6.</i>	<i>References</i>	<i>122</i>
<i>7.</i>	<i>Annexures</i>	<i>126</i>

## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>	<b>Page No.</b>
1.	List of Agricultural Universities in the four states	7
2.	Data Collection details of the study	13
3.	Total number of Respondents	16
4.	Profile of Teachers	17
5.	Profile of Students	21
6.	Status of ICT in SAUs of Northern States	24
7.	Presence of Educational Technology Cells in different SAUs	35
8.	Information regarding number of faculty members, students & Computers	37
9.	Number of students per faculty / Computer	38
10.	Infrastructural facilities related to ICTs	42
11.	Availability of SMART class rooms and Video Conferencing facilities	44
12.	Availability of e-resources	46
13.	ICT uses for Administrative procedures	48
14.	Use of ICT for Communication purpose	50
15.	Maintenance of ICT Equipments	51
16.	Distribution of Deans according to awareness & usage of ICT tools	52
17.	Distribution of Deans according to usage frequency of ICT tools	54
18.	Impact of ICT in Educational Administration	55
19.	Extent of Improvement in Educational Administration as a result of ICT	56
20.	ICT as an important factor for carrying out Administrative and Academic activities	58
21.	Distribution of Teachers according to awareness & usage of ICT tools	59
22.	Distribution of Teachers according to usage frequency of ICT tools	61
23.	Impact Indicators by teachers	63
24.	Impact Indicators – Time Saving	66
25.	Impact Indicators – Accuracy	67
26.	Impact Indicators – Ease	70

27.	Perception of Teachers regarding extent of improvement in the educational systems as a result of ICT Intervention	<b>71</b>
28.	Negative Impacts of ICT in Teaching – Learning process	<b>72</b>
29.	Possession of Personal ICT resources by students	<b>76</b>
30.	Distribution of students according to awareness and usage of ICT tools	<b>77</b>
31.	Frequency of usage of ICT tools by students	<b>79</b>
32.	Use of Social media in learning	<b>81</b>
33.	Frequency of social media usage in learning	<b>82</b>
34.	Mean scores of the opinion associated with use of ICT resources	<b>84</b>
35.	Extent of agreement regarding usage of ICT resources by students	<b>85</b>
36.	Impact of ICT for various Educational purposes	<b>87</b>
37.	Impact Indicators – Time Saving by Students	<b>88</b>
38.	Impact Indicators – Accuracy by Students	<b>89</b>
39.	Impact Indicators – Ease by Students	<b>90</b>
40.	Extent of improvement	<b>91</b>
41.	ICT has become very important factor for carrying out Administrative and Academic activities	<b>93</b>
42.	Negative Impacts of ICTs as perceived by Students	<b>94</b>
43.	Perception of Deans regarding factors affecting adoption of ICT tools	<b>96</b>
44.	Factors influencing adoption of ICT by the Deans	<b>98</b>
45.	Distribution of Deans on the basis of Constraints in adoption of ICT	<b>98</b>
46.	Perception of Teachers regarding factors affecting adoption of ICT tools	<b>100</b>
47.	Factors influencing adoption of ICT by Teachers	<b>102</b>
48.	Distribution of Teachers on the basis of Constraints in adoption of ICT	<b>102</b>
49.	Perception of Students regarding factors affecting adoption of ICT tools	<b>104</b>
50.	Distribution of Students on the basis of factors affecting adoption of ICT	<b>105</b>
51.	Suggestions given by Teachers	<b>107</b>

## LIST OF FIGURES

<b>Figure No.</b>	<b>Title</b>	<b>Page No.</b>
1.	Selected states of the study	6
2.	Sampling Framework	10
3.	Selected colleges for study	11
4.	Sampling Units from each college	12
5.	General Information of Teachers	19
6.	Background Information of Teachers	20
7.	General Information of Students	22
8.	Background Information of Students	23
9.	Status of ICTs in different colleges	36
10.	Comparison between students/faculty with students/computers	40
11.	Comparison of total no. of computers with Internet facility	43
12.	Frequency of Website updating	47
13.	Use of ICT for Communication purpose	50
14.	Maintenance of ICT Equipments	51
15.	Awareness and Usage of ICT tools by Deans	53
16.	Usage frequency of ICT tools by Deans	54
17.	Impact of ICT in Educational Administration	55
18.	Extent of Improvement in Educational Administration	56
19.	ICT as an important factor for Administrative and Academic activities	58
20.	Awareness and Usage of ICT tools by Teachers	60
21.	Usage frequency of ICT tools by Teachers	62
22.	Impact of ICT for Teaching purpose	64
23.	Impact of ICT as Time Saving for Teaching Purpose	65
24.	Impact of ICT in terms of providing Accurate information for teaching purpose	68
25.	Impact of ICT in terms of ease for teaching purpose	69
26.	Perception of Teachers regarding extent of improvement	71
27.	Negative impacts of ICT in teaching – learning process	75
28.	Possession of personal ICT resources by Students	76
29.	Awareness and Usage of ICT tools by Students	78
30.	Usage frequency of ICT tools by Students	80
31.	Use of Social media in learning by students	82
32.	Frequency of Social media usage in learning	83
33.	Mean scores of the opinion associated with use of ICT resources	84
34.	Extent of Agreement regarding usage of ICT resources	86
35.	Impact of ICT as perceived by Teachers for various Educational purposes	87



36.	Impact Indicator – Time Saving	88
37.	Impact Indicator – Accuracy	90
38.	Impact Indicator– Ease	91
39.	Extent of Improvement	92
40.	ICT as an important factor for carrying out Administrative and Academic activities	93
41.	Negative Impacts of ICT as perceived by Students	94
42.	Perception of Deans regarding factors affecting adoption of ICT tools	97
43.	Distribution of Deans on the basis of constraints in adoption of ICT	99
44.	Perception of Teachers regarding factors affecting adoption of ICT tools	101
45.	Distribution of Teachers on the basis of constraints in adoption of ICT	103
46.	Perception of Students regarding factors affecting adoption of ICT tools	104
47.	Future projection of ICT enabled Agricultural Education	110
48.	ICT Integrated Teaching-Learning situation	112
49.	Policy Strategies for ICT integration	121

## LIST OF PLATES

---

---

<b>Plate No.</b>	<b>Title</b>	<b>Page No.</b>
1.	Data Collection	13
2.	Workshop for Construction of tools for Data Collection	14
3.	Informal Discussion with respondents	15
4.	Few ICTs in SAUs	37
5.	Computer Lab in one of the SAUs	39
6.	ICT usage for Administrative Procedures	49
7.	Interactive white board at one of the SAUs	53

## LIST OF ABBREVIATIONS

<b>AU</b>	<b>Agriculture University, Jodhpur</b>
<b>AAU</b>	<b>Anand Agricultural University, Anand</b>
<b>CCTV</b>	<b>Closed Circuit Television</b>
<b>CeRA</b>	<b>Consortium for e-Resources in Agriculture</b>
<b>FGD</b>	<b>Focused Group Discussion</b>
<b>ICT</b>	<b>Information and Communication Technology</b>
<b>JAU</b>	<b>Junagadh Agricultural University, Junagadh</b>
<b>JNKVV</b>	<b>Jawaharlal Nehru Krishi Viswavidyalaya, Jabalpur</b>
<b>MPUAT</b>	<b>Maharana Pratap University of Agriculture and Technology, Udaipur</b>
<b>NAARM</b>	<b>National Academy of Agricultural Research Management</b>
<b>NAU</b>	<b>Navsari Agricultural University, Navsari</b>
<b>NDVSU</b>	<b>Nanaji Deshmukh Veterinary Science University, Jabalpur</b>
<b>NISAGENET</b>	<b>National Information System on. Agricultural Education Network in India</b>
<b>RVSKVV</b>	<b>Rajmata Vijayraje Sciendia Krishi Vishwa Vidyalaya, Gwalior</b>
<b>SAUs</b>	<b>State Agricultural Universities</b>
<b>SIS</b>	<b>Student information system</b>
<b>SKNAU</b>	<b>Sri Karan Narendra Agriculture University, Jobner</b>
<b>SKUAST</b>	<b>Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu</b>
<b>SMS</b>	<b>Short Message Service</b>
<b>&amp;</b>	<b>And</b>

## EXECUTIVE SUMMARY

*Information and Communication Technology is indispensable part of agricultural higher education. ICTs integration in higher agricultural education have been initiated for many purposes such as for administration of agricultural institutions, record-keeping, research, teaching and learning process etc. Education Division of the Indian Council of Agricultural Research has spent crores of rupees on establishment of e-libraries, SMART classrooms, SMART seminar halls, strengthening of computer laboratories and Educational Technology Cells in State Agricultural Universities of the country apart from developing e-courses, platforms like e-granth etc. In spite of all these efforts, there still exists a gap between the efforts made in the area of ICT at the ICAR level and actual implementation in the teaching – learning process in agricultural education in our universities. Thus, an attempt was made to find out the status of ICT tools and their impact in teaching learning situation. The study also attempted to identify the factors that affect the adoption of ICT tools and thereby develop a future roadmap which would lead to strengthening of ICT integration in agricultural higher education. The study employed ex-post-facto research design conducted in the State Agricultural Universities of northern India (Madhya Pradesh, Jammu & Kashmir, Gujarat and Rajasthan) during 2016-2017. Universities and Colleges were selected through purposive sampling and so were the Deans whereas students and teachers were selected through simple random sampling. Data were collected from 20 Deans, 327 teachers and 1438 students of the selected State Agricultural Universities through on-line and off-line questionnaires, Focused Group Discussions, Informal discussions and observations. Data were also collected through secondary sources like websites of concerned universities, journals etc. The salient results of this study revealed that use of ICTs in administrative procedures was remarkable due to presence of ample infrastructural facilities but its integration in mode of course delivery was not prominent. Educational Technology Cells, SMART classrooms, SMART seminar halls, computer laboratories and e-libraries were an integral part of most universities but internet speed was not up to the mark. All three categories of respondents were aware of computers, Wi-Fi and smart phones and were using them daily for educational purpose whereas e-portfolio was the ICT tool about which least people were aware. The administrators linked ICTs with improvement in governance leading to transparency and accountability whereas teachers said that ICTs bring about improvement in academic development. ICTs were reported to be impacting students in terms of fetching jobs and opportunities for higher*

*education. Deans, teachers and students found the use of ICTs to be time saving and according to them ICTs make the teaching - learning and administrative process easier but were a bit skeptical about the accuracy of its content. The perceived negative impact of ICT on teaching-learning was reported as reluctance of students to attend classes, insufficient use of library, overdependence of teachers and students on ICT leading to plagiarism. Excessive use of social media like WhatsApp and Facebook causing health problems thus reducing personal interaction and physical activity. Infrastructural facilities, internet speed and training were the major factors affecting adoption of ICT in agricultural education. On the basis of the findings, it is suggested that ICT course offered at Under Graduate level should be basic to advance level in subsequent years, presence of SMART classrooms should be ensured in all agricultural universities in true sense, high speed internet facilities with latest ICT gadgets, establishment of Directorate of IT/ICT in all State Agricultural Universities, uniformity in the content of all SAU websites and their periodical updating. There is an urgent need for authentication of e-mail communication in agricultural universities to avoid the double burden of soft as well as hard copy. Development of e-courses and mobile Applications related to agricultural education is the need of the hour. Virtual classrooms are the only pathways to curb the menace of faculty crunch in agricultural universities. Periodic trainings related to Information and Communication Technology applications in education should be organized for teachers, students and administrative staff alike for better integration of ICT into teaching, learning and administrative process of a typical State Agricultural University.*

India is an agro-based country, about 93 million farmers are small farmers and share of agriculture in Indian economy is 15.2 percent in eleventh five-year plan. India is mainly an agricultural country where provision of livelihoods improvement, food security and employment generation opportunities of 1.2 billion populations are directly related to agricultural development. Predominantly, more than half of India's population is significantly reliant on agriculture and allied activities for their livelihood. Agriculture is the main motivating force for Indian economy, growth and development. The economic progress of India is to a great extent reliant on the development of agriculture. However, dependency on agriculture remains rational for rural people but due to increase in population, declining of average farm size, adverse effects of climate change; rural youth are abandoning farming and the development of agriculture in India is now at stake. To cope up with the present challenges of Indian agriculture, there is a need for higher agricultural educational institutions to produce adequate, proficient and skilled manpower who would lead the nation for its future agricultural development. In India, Higher agricultural education is mainly imparted by Indian Council of Agricultural Research which has developed, Indian Agricultural Education System into one of the largest and comprehensive systems in the world. At present, there are 63 Agricultural Universities (AUs), five Deemed Universities (DUs), three Central Agricultural Universities (CAUs) and three Central Universities with agricultural faculty. Apart from this, there are many private agriculture colleges affiliated to several general and Agricultural Universities, which also provide agricultural education. Indian Higher Agricultural Education will have to face new challenges to cope up with new changes in the coming years to provide competent manpower to organizations who are directly involved in agricultural production. India's present higher agricultural educational scenario suffers from low access, not meeting quality standards, low funding, gender inequality, non-contemporary course curricula, delivery methods, inbreeding, lack of faculty-competence in cutting edge technologies *etc.* (NAEP, 2012). Agricultural institutions are represented by their staff or faculty members and these members often fail to see a more global view of the present agricultural situation at the national or regional level. They have a tendency to occupy and satisfy themselves with teaching, learning new technologies and undergoing research, the outcome of which often remains within the four walls of their institutions. They tend to forget that their primary duty as higher agricultural

educators is to serve the rural community which in turn feeds the world. However, this increasing gap between our farmers and the international development might lead to their gradual disappearance, with serious consequences on the food security situation and sustainability of agriculture. The diversity of specialization options in agricultural education and efficient transfer of knowledge are urgent current national needs. One of the most worrying aspects of modern Indian teachers of twenty-first century of agricultural education deals with the problem of application of most effective teaching methodology to teach the high-tech oriented sustainable agricultural technology (Patel and Chauhan, 2011).

At the present time, speedy improvement of technology leads to introducing new forms of teaching and learning process. Introducing technology into teaching and learning has shown to make learning more student centered, encourage cooperative learning and stimulate increased teacher/student interaction. Technology is the main support for the students' learning in order to move towards development. Positive changes in learning can be brought through the Information Communication Technology (ICT). "ICT stands for information and communication technologies and is defined, as a "diverse set of technological tools and resources used to communicate and to create, disseminate, store and manage information." There are numerous types of ICT tools existing and having significance to agricultural education, such as videoconferencing, teleconferencing, email, social media, television, radio broadcasts, interactive radio counseling, interactive voice response system *etc.* In this era of information technology, ICT has projected new modes of communication patterns and knowledge transformation. Absolutely, ICT has impacted on the quality and quantity of teaching-learning and research in agricultural education. ICT can enhance teaching-learning through its collaborative, dynamic and engaging content; and it can offer actual opportunities for effective instruction. Information and Communication Technology has the potential to accelerate, enhance and develop abilities; stimulate teaching-learning situation; helps to relate learning experiences to work performs; supports to form financial sustainability for tomorrow's workforces; contributes to improvement in agriculture and rural people community; strengthens teaching-learning in agricultural educational institute, improve the radical changes in education-research-extension-farmer linkages and provides opportunities for association between the educational institute and the world.

ICT may be considered as the most important opportunity for educational planners in agricultural institutions and the quick expansion in the use of ICT in agricultural education is a significant development. ICT in agricultural education means educational programme that

prepares individuals to effectively and efficiently use technology in teaching-learning, communication and life skills. ICT is indispensable part of agricultural higher education. Now a days, ICT integration in higher agricultural education have been initiated for many purposes such as for administration of agricultural institutions, record-keeping, research, teaching and learning process *etc.* Rathore *et.al.* 2017 reported that, use of ICT is getting more widespread in agricultural education and the faculty members make use of ICT mostly as one way means of communication and for assistance in classroom teaching up to some extent.

ICAR has taken many initiatives to integrate ICT in Agricultural Education.

Some of the initiatives According to Fifth Deans' Committee report are as follows:

- ✚ Information and Communication Technology is included as common course for all disciplines of Agricultural Education.
- ✚ Central Assistance for Strengthening of Higher Agricultural Education
  - In XII plan scheme “Strengthening and Development of Higher Agricultural Education in India” – Grants provided for Infrastructure Developments such as Computers, strengthening of library, e-resources including existing e-courses, *e-granth*, ICT facilities *etc.* Support also includes preparation of quality infrastructural material.
  - Class rooms: There is also a provision to provide a special grant up to a maximum of Rs.20 lakhs per university per year for the establishment of smart class rooms consisting Interactive Board, Touch Screen, Bio-matrix, Visualized, e-kiosks and artificial intelligence (AI) based course modules *etc.*
  - Development of facilities for UG practicals – Computer Labs:  
The grant to a maximum ceiling of Rs.20 lakhs for Agricultural University per year is being provided by the council for the strengthening of laboratories including computers to keep the labs equipped with the latest equipments.
  - Support to Dean: Support in order to introduce Teaching Techniques and carrying out creative activities in the college for overall welfare of staff and students.
  - Support for existing e-resources including National Information System on. Agricultural Education Network in India (NISAGENET) and e-courses.

There is a major difference between the initiatives provided and the present situation in teaching and learning in Agricultural Education. According to Tondeur *et.al.* 2008, a gap exists between the proposed ICT curriculum at the macro-level and the actual use of ICT in the classroom. Number of studies have been carried out regarding the impact of ICT on student



performance in their studies as well as organizational performance in European countries but a very few have been carried out in India but not in Agricultural Higher Education. Keeping in view the indicators of impact assessment studied, there are studies carried out on satisfaction, self-esteem, personality development and confidence of students. Studies have also been found on ICT use and performance in job market. Most of the studies are review studies. Seeing to the incremental use of Information and Communication Technology (ICT) in Agricultural Higher Education, it is deemed important to find out the status and impact of ICT tools as well as the factors that affect the adoption of ICT tools in Agricultural Higher Education in India. Thus, it becomes an area of concern to find out how ICTs are transforming the lives of our Agricultural graduates.

Keeping these facts in mind, a study entitled “**Impact of ICT on Agricultural Education in India**” has been proposed with the following objectives:

**OBJECTIVES:**

1. To document the status of various ICT tools in agricultural education.
2. To study the impact of ICT tools in teaching and learning process.
3. To identify the factors affecting the adoption of ICT tools in Agricultural education.
4. To suggest future road map for strengthening ICT in Agricultural education.

### Conceptual Framework

**Information & Communication Technologies (ICTs):** In the present study, the term ICT includes any communication device or application encompassing: television, cellular phones, computer, tablets, phablets, use of social media, Massive Online Open Courses (MOOCs), interactive white boards, Wi-Fi, video-conferencing, use of internet, biometrics and so on, as well as the various services and applications.

**ICT in Agricultural Education:** It includes those higher educational programmes related to agricultural sciences such as Veterinary, Home Sciences, Dairy technology, Horticulture, Agribusiness, Fisheries, Agricultural Engineering, Agricultural Biotechnology and the like that prepares individuals to effectively and efficiently use ICT in teaching learning, educational administration, communication and life skills.

**Impact of ICT on Agricultural Education:** This refers to the perceived effectiveness of ICT use by the different stakeholders of agricultural education in terms of saving time, getting accurate information and making the teaching learning process easy in the information era. Though, in the present study, there is more emphasis on positive impact of ICT but negative impact too is not overlooked.

**Factors affecting Adoption:** Here, it implies that what are the circumstantial elements that influence the use of ICT in agricultural education such as infrastructural facilities, age, fund availability, budget, trainings on ICT tools *etc.*

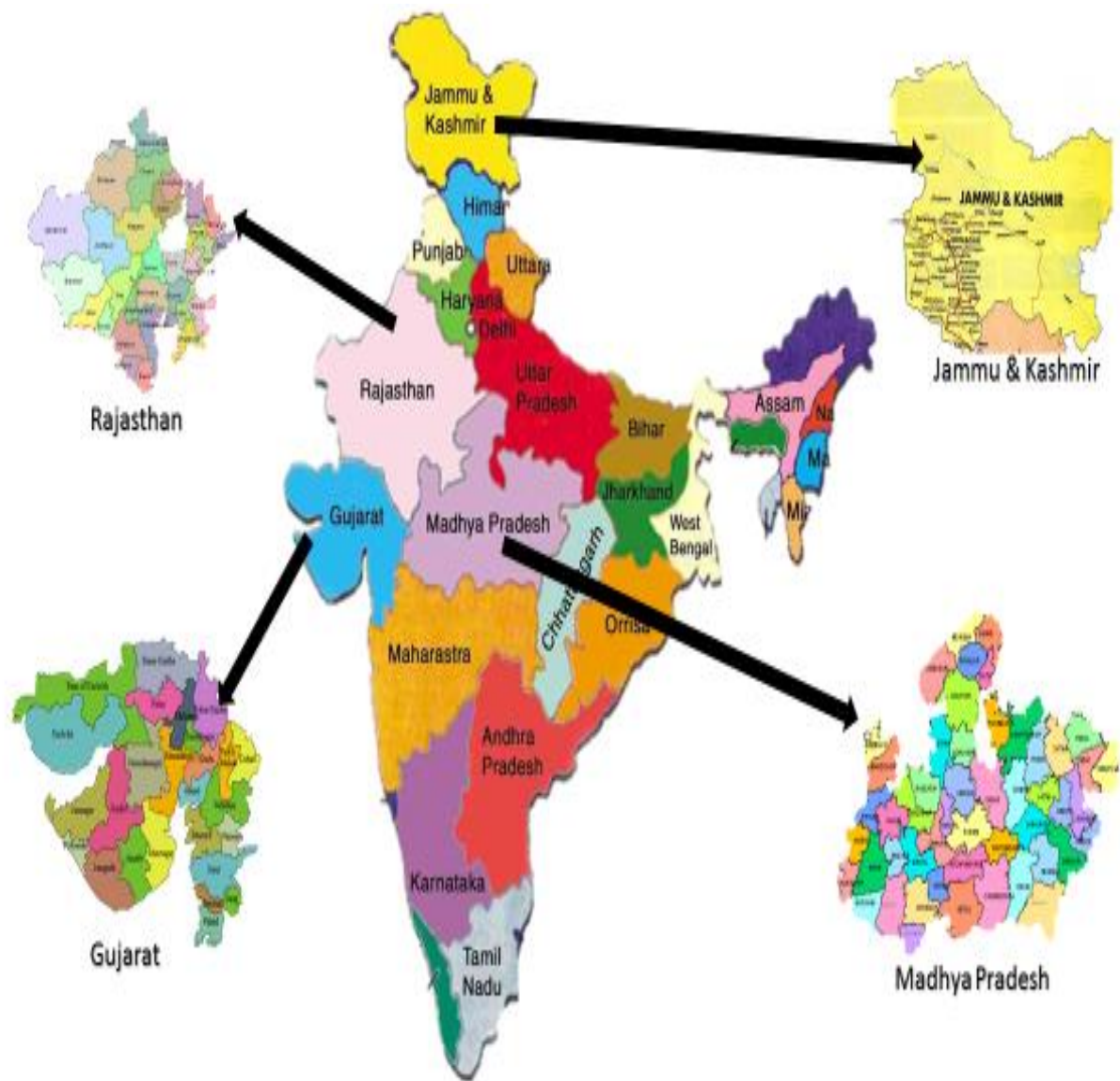
**Future Roadmap:** A pathway to solve the ICT related present day constraints and integrate ICT in Agricultural education to its fullest extent thus transforming the Agricultural Higher Education in India.

### Research Questions

- What are the various areas of ICT use in Agricultural Education in India?
- Does ICT bring significant impact pertaining to time saving, ease and accuracy in agricultural education?
- Are there any notable factors that affect the adoption of ICT in teaching learning process?
- What are the implicative strategies needed to strengthen Agricultural Education?

## Coverage

**Universe of the Study:** All State Agricultural Universities (SAUs) of four Northern States (Madhya Pradesh, Jammu & Kashmir, Gujarat and Rajasthan) of the country constituted the universe of the study. In all, these four states comprise 16 State Agricultural Universities having 90 colleges.



**Fig 1: Selected States of the Study**

**Table 1: List of Agricultural Universities in the four States**

S. No	University Name	College Name
<b>1</b>	<b>Anand Agricultural University</b>	
		1 B. A. College of Agriculture
		2 Seth M.C. College of Dairy Science
		3 College of Veterinary Science & Animal Husbandry
		4 College of Agricultural Information Technology
		5 International Agribusiness Management Institute
		6 College of Food Processing Technology & Bio Energy
		7 College of Agricultural Engineering & Technology
		8 College of Agriculture and Polytechnic in Agriculture
		9 College of Horticulture
		10 College of Agriculture, Jabugam
<b>2</b>	<b>Junagadh Agricultural University</b>	
		1 College of Agriculture, Junagadh
		2 College of Agriculture Mota Bhandariya –Amreli
		3 College of Agricultural Engineering & Technology, Junagadh
		4 College of Fisheries, Veraval
		5 College of Veterinary Science & Animal Husbandry
		6 P.G. Institute of Agri - Business Management
<b>3</b>	<b>Navsari Agricultural University</b>	
		1 N. M. College of Agriculture
		2 ASPEE College of Horticulture
		3 College of Forestry
		4 ASPEE Agribusiness Management Institute
		5 Vanbandhu College of Veterinary Sci. and Animal Husb.
		6 College of Fisheries Science, Navsari
		7 College of Agriculture, Bharuch
		8 College of Agriculture, Waghai
		9 College of Agricultural Engineering Dediapada, Narmada
		10 ASPEE Shakilam Agri. Biotechnology Institute, Surat
<b>4</b>	<b>Sardarkrushinagar-Dantiwada Agricultural University</b>	
		1 Chimanbhai Patel College of Agriculture
		2 Agriculture College , Tharad
		3 Horticulture college, Jagudan
		4 ASPEE college of Home science and nutrition
		5 Dairy College
		6 Basic science and Humanity college,
		7 Veterinary College
		8 College of Renewable Energy and Environmental Engineering (REEE College)
		9 Agri- Business, SDAU

<b>5</b>	<b>Kamdhenu University, Gandhinagar</b>		
		1	College of Dairy Science, Amreli
		2	Mansinhbhai Institute of Dairy & Food Technology, Mahesana
<b>6</b>	<b>SKUAST, Jammu</b>		
		1	Faculty of Basic Sciences, Chatha
		2	Faculty of Agricultural Sciences, Chatha
		3	Faculty of Veterinary Sciences & Animal Husbandry R.S. Pura
		4	School of Biotechnology, Chatha
<b>7</b>	<b>SKUAST, Kashmir</b>		
		1	Shalimar Campus for Agricultural Sciences
		2	Shuhama Campus for Veterinary Sciences
		3	Rangil Campus for Fisheries
		4	Faculty of Forestry
		5	Faculty of Horticulture
		6	Mirgund Campus for Sericulture
<b>8</b>	<b>JNKVV, Jabalpur</b>		
		1	College of Agriculture, Jabalpur
		2	College of Agriculture, Rewa
		3	College of Agriculture, Tikamgarh
		4	College of Agriculture, Ganjbasoda (Vidisha)
		5	College of Agriculture, Waraseoni (Balaghat)
		6	College of Agriculture Engineering, Jabalpur
		7	College of Agriculture, Powerkheda
<b>9</b>	<b>Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior</b>		
		1	College of Agriculture, Gwalior
		2	College of Agriculture, Indore
		3	College of Agriculture, Sehore
		4	College of Horticulture, Mandsaur
		5	College of Agriculture, Khandwa
<b>10</b>	<b>Nanaji Deshmukh Veterinary Science University, Jabalpur</b>		
		1	Animal Biotechnology
		2	Centre for Wildlife Forensic and Health
		3	Veterinary College Jabalpur
		4	Veterinary College Mhow
		5	Veterinary College Rewa
		6	College of Fishery Science, Jabalpur
<b>11</b>	<b>Agriculture University, Jodhpur</b>		
		1	College of Agriculture Mandor, Jodhpur
		2	College of Agriculture Samerpur, Dist: Pali
		3	College of Agriculture, Nagaur
<b>12</b>	<b>Agriculture University, Kota</b>		
		1	College of Horticulture and Forestry, Jhalawar

<b>13</b>	<b>Maharana Pratap University of Agriculture and Technology, Udaipur</b>		
		1	Rajasthan college of agriculture (RCA), Udaipur
		2	College of Dairy and Food Science Technology (CDFST), Udaipur
		3	College of Technology and Engineering (CTAE), Udaipur
		4	College of Fisheries (CF), Udaipur
		5	College of Home Science (CHSC), Udaipur
	6	College of Agriculture (COA), Bhilwara	
<b>14</b>	<b>Rajasthan University of Veterinary and Animal Sciences, Bikaner</b>		
	1	College of Veterinary & Animal Sciences, Bikaner	
	2	College of Veterinary & Animal Sciences, Navania, Vallabhnagar (Udaipur)	
	3	Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur	
	4	Mahatma Jyotiba Fule College of Veterinary & Animal Sciences, Jaipur	
	5	Arawali Veterinary College, Sikar	
	6	Sri Ganganagar Veterinary College, Sri Ganganagar	
	7	M.B. Veterinary College, Dungarpur	
<b>15</b>	<b>Sri Karan Narendra Agriculture University, Jobner</b>		
	1	SKN College of Agriculture, Jobner	
	2	SKN College of Agri-Business Management, Jobner	
	3	College of Agriculture, Lalsot	
	4	College of Agriculture, Bharatpur	
	5	College of Agriculture, Fatehpur	
<b>16</b>	<b>Swami Keshwanand Rajasthan Agricultural University</b>		
	1	College of Agriculture, Bikaner	
	2	College of Home Science, Bikaner	
	3	Institute of Agribusiness Management, Bikaner	

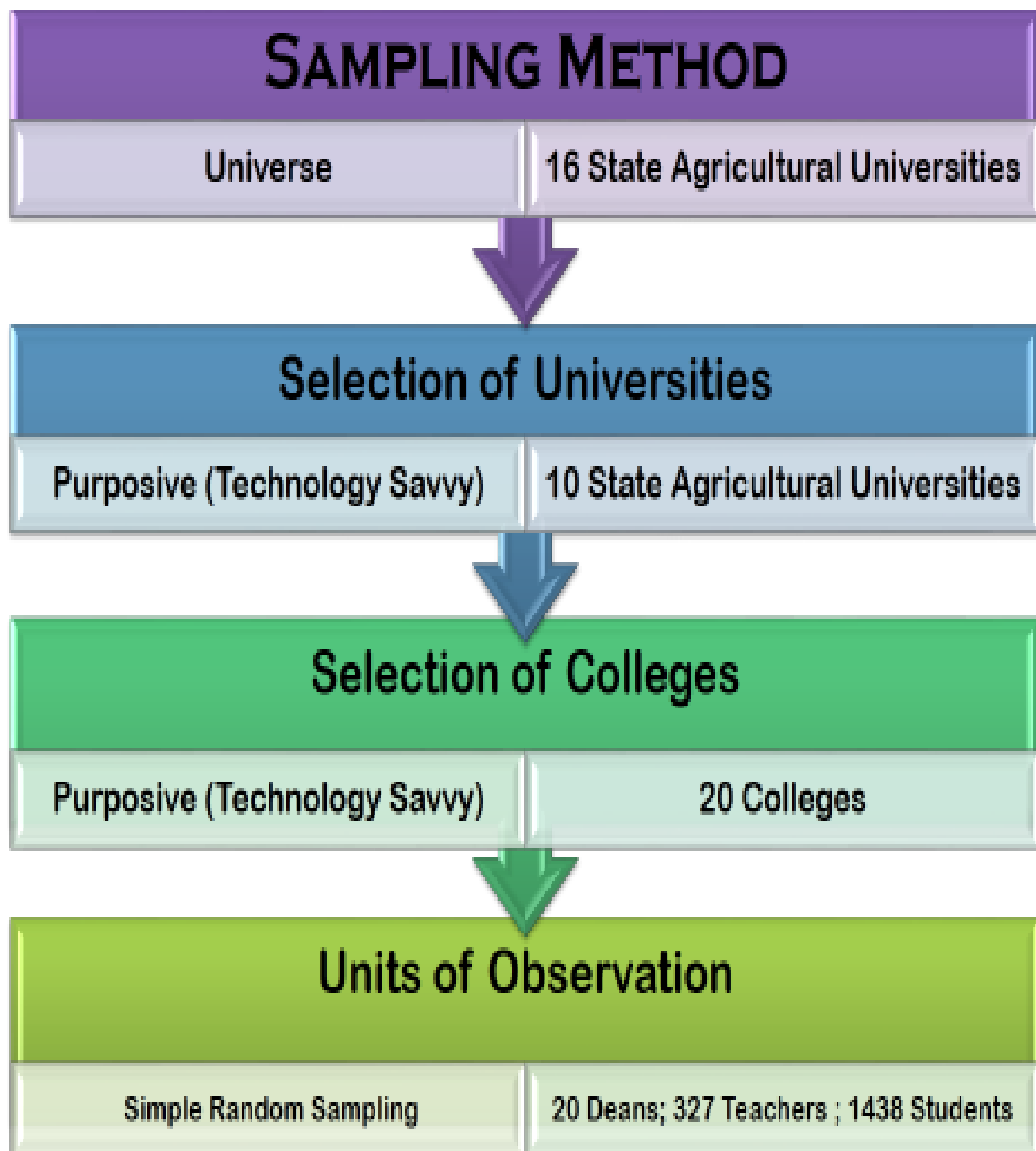
### Sampling frame

**Research Design:** Ex post –facto research design

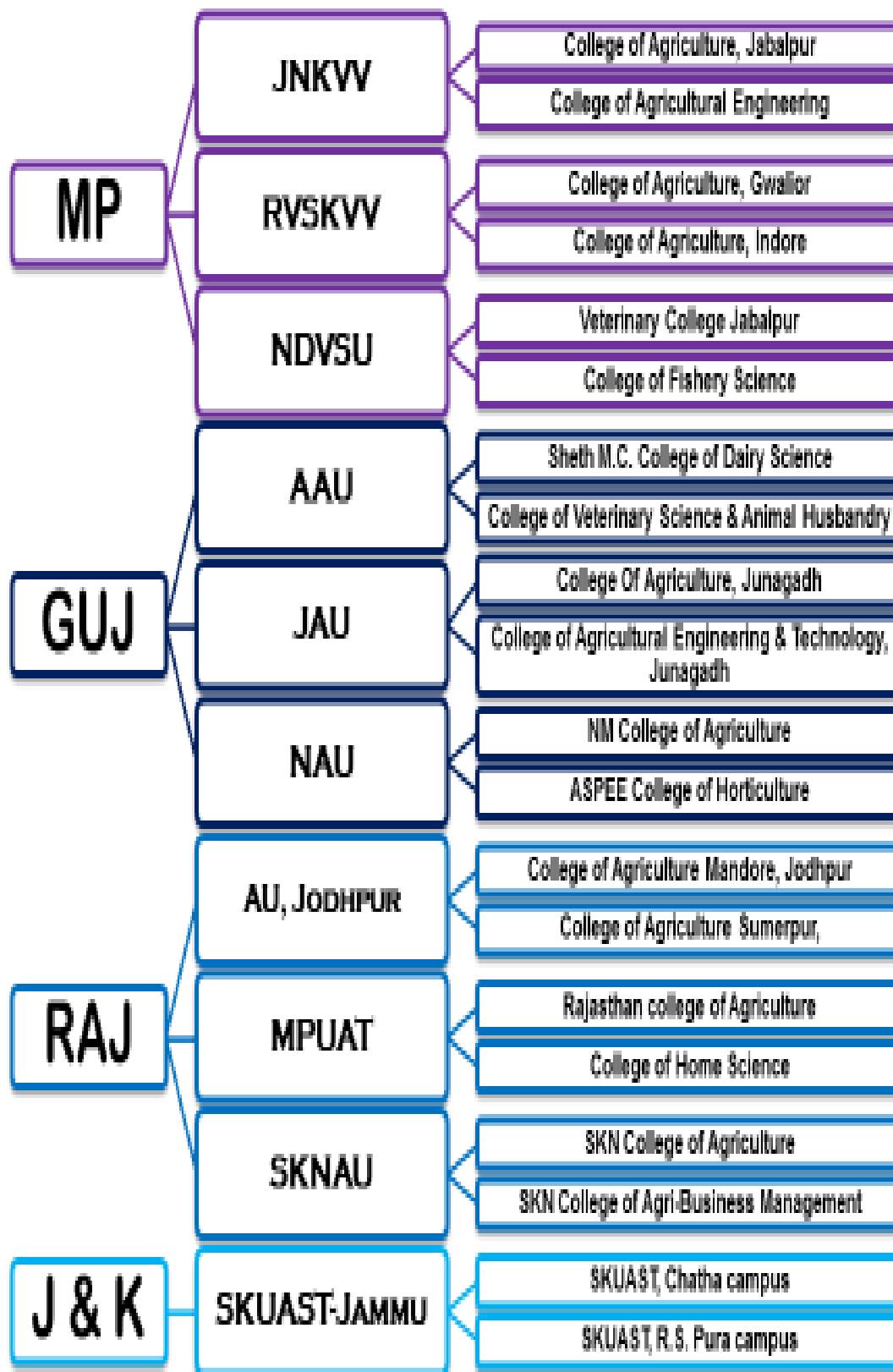
**Locale:** Four Northern States of the country namely; Madhya Pradesh, Jammu & Kashmir, Gujarat and Rajasthan

**Sampling Methods: Selection of Universities** – Purposive (Universities which responded to our online questionnaire hosted on ICAR – National Academy of Agricultural Research Management, Hyderabad within a month). Thus, 10 State Agricultural Universities were selected from the four northern states of Madhya Pradesh (03), Jammu & Kashmir (01) Gujarat (03) and Rajasthan (03).

**Selection of Colleges:** Purposive (Those colleges which responded to our online questionnaire hosted on ICAR – National Academy of Agricultural Research Management, Hyderabad within a month). Thus, 20 Colleges from 10 State Agricultural Universities of northern India constituted the sample of the study.



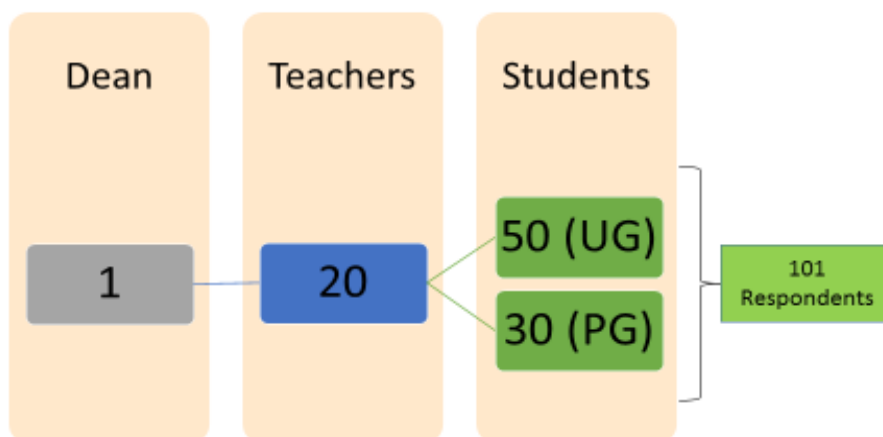
**Fig 2: Sampling Framework**



**Fig 3: Selected colleges for study**



**Units of Observation:** Deans, Teachers and Students (Under Graduate & Post Graduate) of 20 colleges of 10 State Agricultural Universities of northern India. Whereas, 20 teachers and 50 Undergraduate (III year or IV year) and 30 Post Graduate students (II year Masters or PhD) were selected from each college through Simple Random Sampling. In all, 20 Deans of various colleges, 327 teachers and 1438 students (917 UG & 521 PG) constituted the sample of the study.



**Fig 4: Sampling Units from each College**

### **Data Collection**

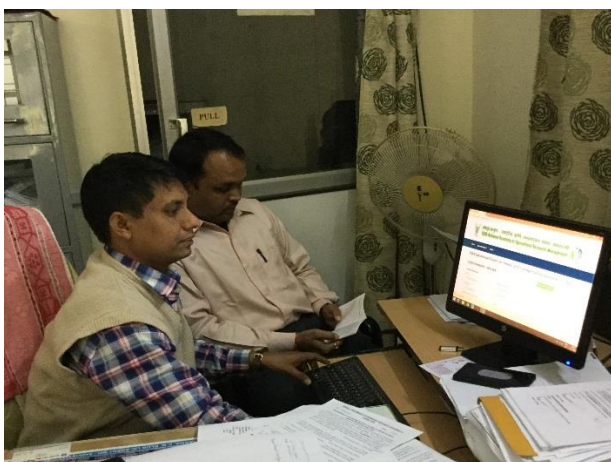
The data collection of the study was done during 2016-2017.

### **Tools for data collection**

Data were collected through various modes; secondary as well as primary which included content analysis of websites of the SAUs under study, review of journals, online/ offline questionnaires hosted on ICAR – NAARM website, sending the links through e-mail, WhatsApp and also personal administration of the questionnaire by the researcher and the hired staff. Also, personal visits were made by the investigators to view the various ICT facilities such as computer laboratories, ARIS cell, e-library, SMART classrooms and regular classrooms to get an overview. Focused Group Discussions have been carried out with students in some of the Universities to know about the status of ICT use. Some photographs have been clicked and video shoots have also been made on the reactions of the various stakeholders in the study area.

**Table 2: Data collection details of the study**

Type of data	Sources of data	Data collection tools	Techniques of data collection
Status of various ICT tools in agricultural education.	Secondary & Primary data Nodal Officers (05), Deans (20)	Websites, Journals, Questionnaire (Enclosed as Annexure I & II)	Content analysis of the websites of Agricultural Universities, Online & Offline Questionnaire
Impact of ICT tools in teaching and learning process.	Teachers (327) Students (1438)	Questionnaire (Enclosed as Annexure III & IV)	Online & Offline Questionnaire, FGD & Informal discussions
Factors affecting the adoption of ICT tools in Agricultural education.	Deans (20) Teachers (327) Students (1438)	Questionnaire (Enclosed as Annexure II, III & IV)	Online & Offline Questionnaire, FGD Informal discussions & Observation



**Plate 1: Data Collection**

## **Construction of tools for data collection**

Four questionnaires for different categories of respondents such as Nodal Officers of Universities, Deans of Colleges, University teachers and Students were designed and finalized during a consultative workshop held at ICAR – National Academy of Agricultural Research Management, Hyderabad during August 8-9, 2016. Later on, it was made into online mode and hosted on ICAR – NAARM website. A content analysis matrix was developed in order to carry out systematic review of the websites of selected State Agricultural Universities under study.



**Plate 2: Workshop for Construction of tools for Data Collection**

### **Method of data collection**

To understand the status of ICT tools in Agricultural Education, secondary data were collected through content analysis of the websites of the concerned Universities, review from journals and personal visits to the selected Universities by the investigators. Also, information was collected from Nodal officers of the Universities designated by ICAR and Deans of respective colleges through online questionnaire hosted on ICAR – NAARM website and also a part of the data were collected through personal distribution of the questionnaire at the designated Universities/Colleges. To assess the impact and factors affecting adoption of ICT tools in teaching and learning process, a questionnaire survey was conducted through online / personal

administered questionnaire among the teachers (327) and students (1438) of the colleges of Agricultural Universities. Data were collected during October 7, 2016 to January 24, 2017. In the beginning, data were collected through online mode during October – November, 2016 for Deans of colleges and teachers. Later on collected data personally during November, 2016 to January, 2017 for students and the other categories who were still left over.



**Plate 3: Informal Discussion with Respondents**

### **Data analysis**

The ICT related information with reference to Agricultural Education on websites was divided into three parts such as “ICTs as mode of Course delivery”, “Infrastructure” and “Administrative support “and the information obtained on visiting the websites of the State Agricultural Universities under study was group under these heads in the content analysis matrix and analyzed. The primary data collected for the study were tabulated and analyzed using statistical tools like frequencies, percentage, mean and standard deviation for data interpretation.

**Table 3: Total number of respondents**

S.N.	University Name	College Name	Dean	Teachers	Students		
					UG	PG	Total
<b>1</b>	<b>Jawaharlal Nehru Krishi Viswavidyalaya (JNKVV), Jabalpur</b>						
		College of Agriculture, Jabalpur (CoA, Jabalpur)	1	20	50	30	80
		College of Agricultural Engineering, Jabalpur (CoAE, Jabalpur)	1	20	50	30	80
<b>2</b>	<b>Rajmata Vijayraje Sciendia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior</b>						
		College of Agriculture, Gwalior (CoA, Gwalior)	1	20	50	30	80
		College of Agriculture, Indore (CoA, Indore)	1	20	50	30	80
<b>3</b>	<b>Nanaji Deshmukh Veterinary Science University (NDVSU), Jabalpur</b>						
		College of Veterinary Science & Animal Husbandry (CVS&AH), Jabalpur	1	20	50	30	80
		College of Fishery Science (CoFSc.), Jabalpur	1	02	50	00	50
<b>4</b>	<b>Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-Jammu)</b>						
		Faculty of Agriculture (FoA), Chatha	1	20	50	30	80
		Faculty of Veterinary Sciences (F.V.Sc.) R.S.Pura	1	20	50	30	80
<b>5</b>	<b>Anand Agricultural University (AAU), Anand</b>						
		Sheth M.C. College of Dairy Science (Dairy Sc.), Anand	1	20	50	30	80
		College of Veterinary Science & Animal Husbandry (CVS&AH)	1	20	50	30	80
<b>6</b>	<b>Junagadh Agricultural University (JAU), Junagadh</b>						
		College Of Agriculture (CoA), Junagadh	1	20	50	30	80
		College of Agricultural Engineering & Technology (CoAE&T), Junagadh	1	20	50	30	80
<b>7</b>	<b>Navsari Agricultural University (NAU), Navsari</b>						
		NM College of Agriculture (CoA), Navsari	1	20	50	30	80
		ASPEE College of Horticulture (CoH), Navsari	1	20	50	30	80
<b>8</b>	<b>Agriculture University (AU), Jodhpur</b>						
		College of Agriculture Mandore, Jodhpur (CoA, Mandore)	1	6	50	11	61
		College of Agriculture Sumerpur, Dist: Pali (CoA, Sumerpur)	1	4	50	--	50
<b>9</b>	<b>Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur</b>						
		Rajasthan College of Agriculture (RCA), Udaipur	1	20	50	30	80
		College of Home Science (CHSc), Udaipur	1	15	17	30	47
<b>10</b>	<b>Sri Karan Narendra Agriculture University (SKNAU), Jobner</b>						
		SKN College of Agriculture (CoA), Jobner	1	20	50	30	80
		SKN College of Agri-Business Management (CABM), Jobner	1	00	--	30	30
		<b>Total Respondents</b>	<b>20</b>	<b>327</b>	<b>917</b>	<b>521</b>	<b>1438</b>

The findings of the study and relevant discussion have been presented in this section. Results have been divided into five parts based on the objectives of the study.

- 3.1 Profile of the respondents
- 3.2 Status of various ICT tools in agricultural education.
- 3.3 Impact of ICT tools in teaching and learning process.
- 3.4 Factors affecting the adoption of ICT tools in Agricultural education.
- 3.5 Future road map for strengthening ICT in Agricultural education.

### 3.1 Profile of the respondents

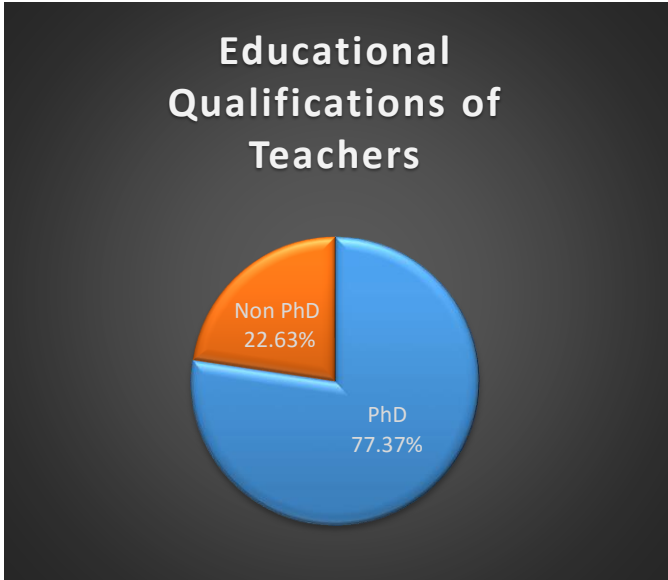
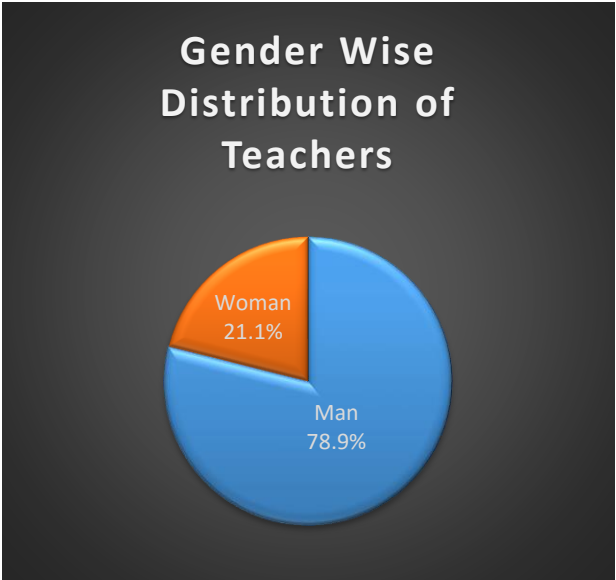
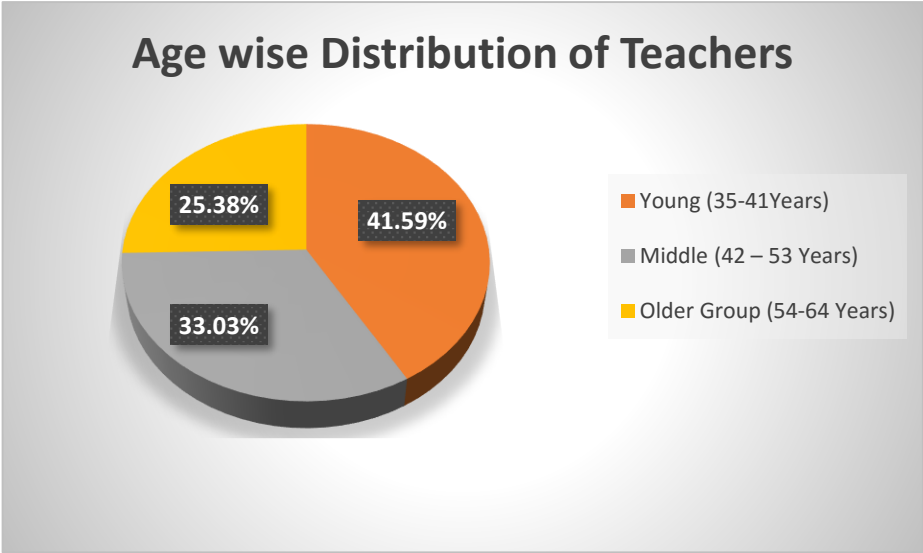
The profile of the teachers has been studied with regard to age, gender, family background, educational qualifications, service experience in years, ICT related training attended whereas for students, an attempt has been made to investigate the age, gender, family background, caste, level of study, scholarship/fellowship and ICT related training attended.

**Table 4: Profile of Teachers**

n= 327

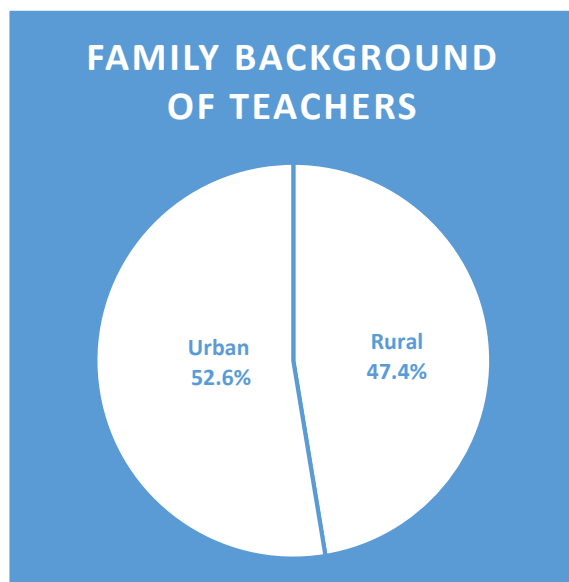
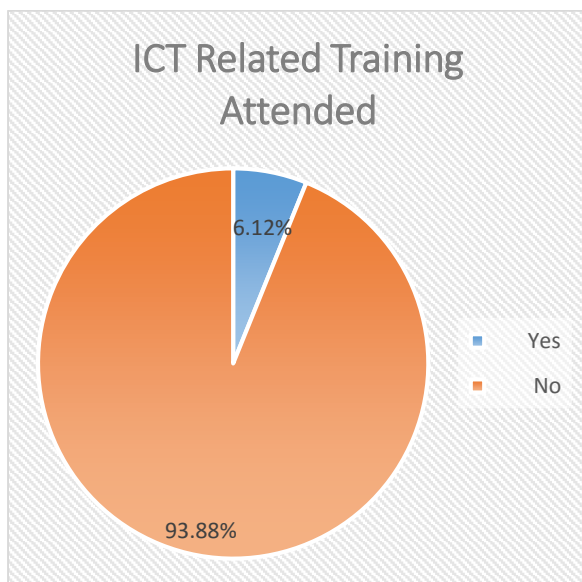
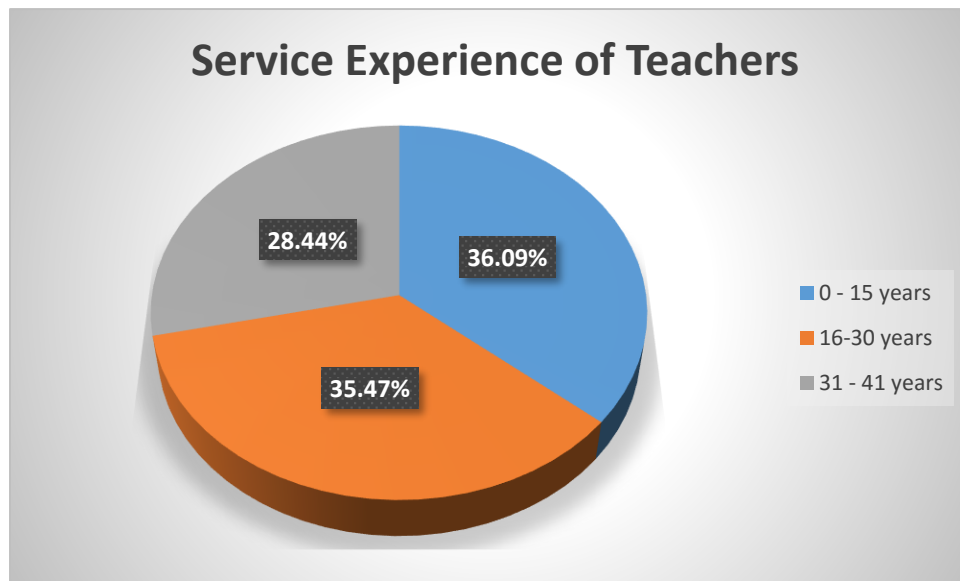
S. No.		Frequency	Percentage
1	<b>Age</b>		
	Young (25-41 Years)	136	41.59
	Middle (42 – 53 Years)	108	33.03
	Older Group (54-64 Years)	83	25.38
2	<b>Gender</b>		
	Man	258	78.90
	Woman	69	21.10
3	<b>Family Background</b>		
	Rural	155	47.40
	Urban	172	52.60
4	<b>Educational qualifications</b>		
	PhD	253	77.37
	Non PhD	74	22.63
5	<b>Service Experience</b>		
	0-15 Years	118	36.09
	16-30 Years	116	35.47
	31-41 Years	93	28.44
6	<b>ICT related Training attended</b>		
	Yes	20	6.12
	No	307	93.88

Table 4 reveals that majority of the University teachers in the ten State Agricultural Universities of northern India were of less than 53 years of age, were men, holding PhD degree and had not undergone any formal training in the area of Information and Communication Technologies (ICTs). As regards years of service experience, more than one third (36.09%) of them had less than 15 years of experience followed by the other one-third (35.47%) which had 16 -30 years of experience. More than half (52.60%) of the teachers of the State Agricultural Universities in the northern part of the country belonged to urban background and the remaining 47.40% were from rural background. There were still 74 University teachers out of 327 under study who were not holding a PhD degree. These University teachers were the ones who were from Veterinary or Engineering background for whom PhD is not compulsory qualification for getting a teaching job in the University. Only 20 University teachers out of 327 had a formal training in ICT. The areas of training attended were on e-waste management & handling, tools and techniques for extension & communication management, ICT in Agriculture and GIS applications in public health. It is recommended that in this era of ICT, more and more faculty members should be trained in different dimensions of ICT to enable them to enhance their skills.



**Fig 5: General information of Teachers**





**Fig 6: Background information of Teachers**

**Table 5: Profile of Students**

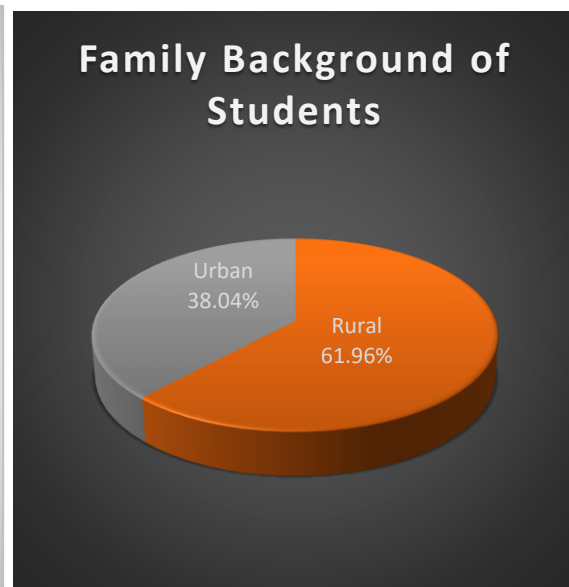
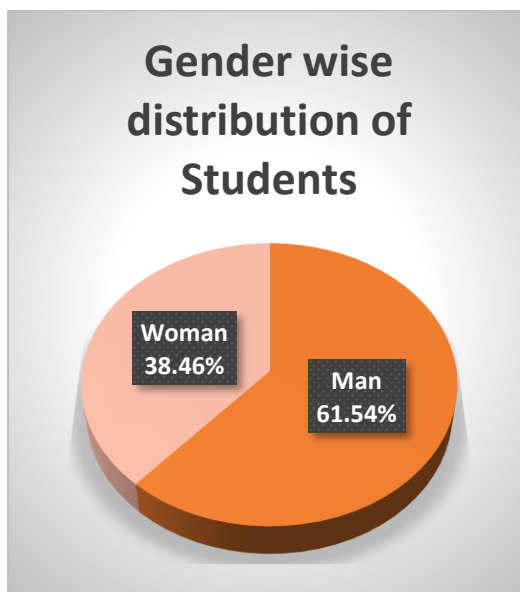
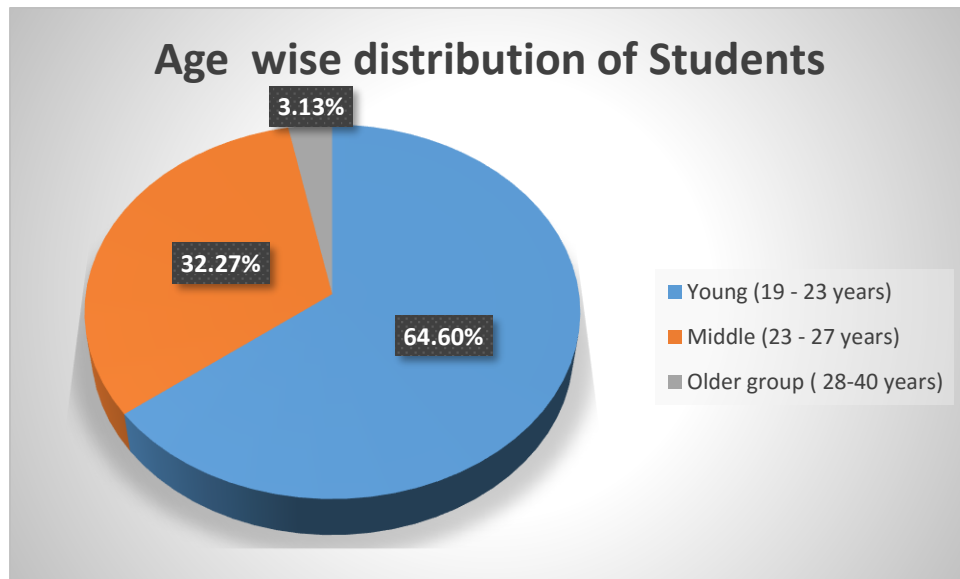
n= 1438

S. No	Attributes	Frequency	Percentage
<b>1.</b>	<b>Age</b>		
	Young (19- 23 Years)	929	64.60
	Middle (23 – 27 Years)	464	32.27
	Older group (28-40 Years)	45	3.13
<b>2</b>	<b>Gender</b>		
	Men	885	61.54
	Women	553	38.46
<b>3</b>	<b>Family Background</b>		
	Rural	891	61.96
	Urban	547	38.04
<b>4</b>	<b>Caste</b>		
	General	625	43.46
	OBC	507	35.26
	SC	183	12.73
	ST	123	8.55
<b>5</b>	<b>Course</b>		
	UG	917	63.77
	PG	521	36.23
<b>6</b>	<b>Scholarship/fellowship</b>		
	Yes	421	29.28
	No	1017	70.72
<b>7</b>	<b>ICT related Training attended</b>		
	Yes	98	6.82
	No	1340	93.18

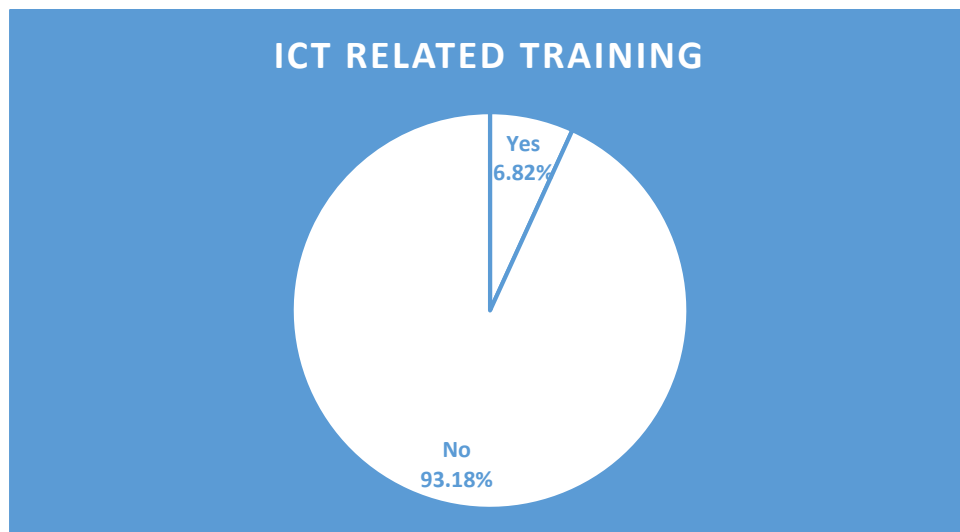
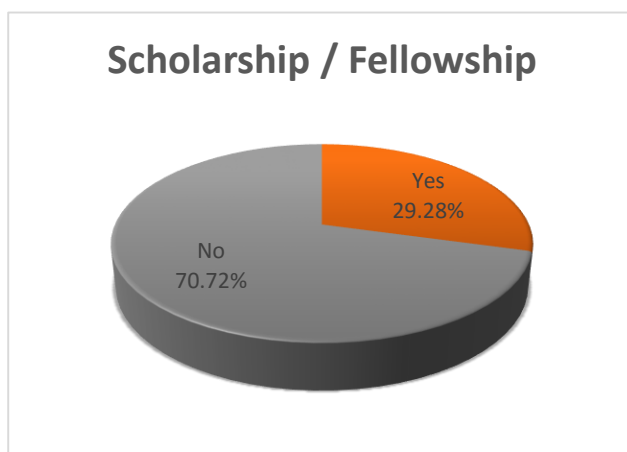
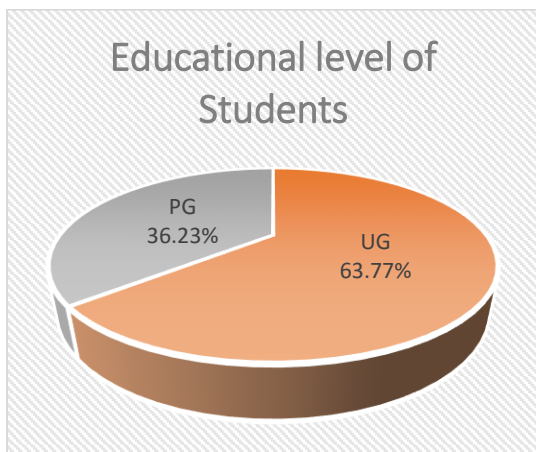
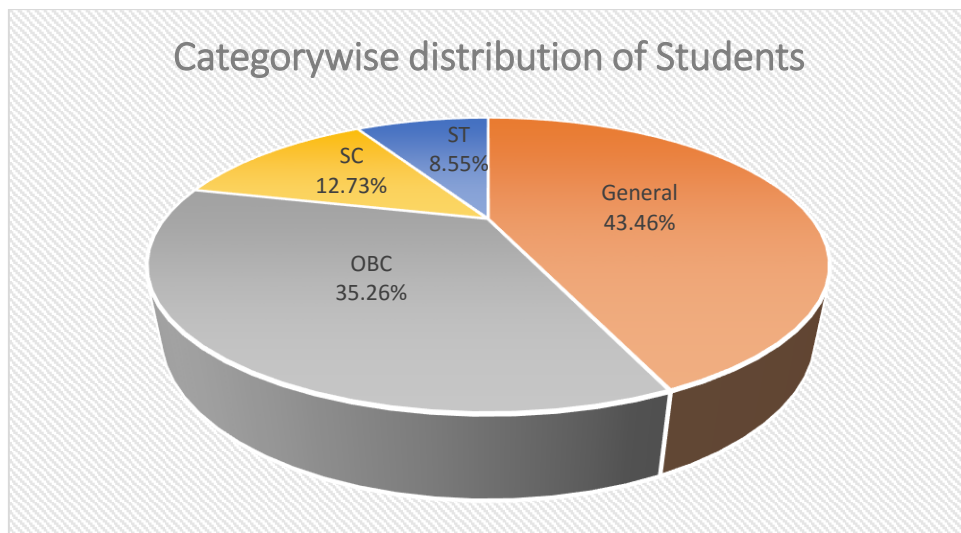
### 3.1.2 Profile of Students

A perusal of Table 5 reveals that majority of the students under study were young men belonging to either General or Other Backward Class (OBC) from rural areas whereas majority

were pursuing their Under Graduate studies without any fellowship and had not undergone any formal training related to ICT. It is very interesting to note that more than one third (38.04 %) students were from urban background. This clearly shows that agriculture being a rural based vocation is also attracting urban youth as well as women students who were also 21.10%. Almost similar findings were reported by National Agricultural Education Project Report (2012) that in higher agricultural education about 50% students are from rural background and on an average 36% are girl students.



**Fig 7: General information of Students**



**Fig 8: Background information of Students**

### 3.2 STATUS OF VARIOUS ICT TOOLS IN AGRICULTURAL EDUCATION

**Table 6: Status of ICT in SAUs of northern states (on the basis of websites)**

S. No.	University Name	Mode of Course Delivery	Infrastructure	Administrative Support
<b>Madhya Pradesh</b>				
1	<b>Jawaharlal Nehru Krishi Viswavidyalaya, Krishi Nagar, Adhartal Jabalpur, Madhya Pradesh (1964)</b>	<p>e-learning through Smart Classrooms teaching Examination Smart classrooms, in simple terms are interactive classrooms or e-classroom facilities have added new dimensions. Classrooms have been augmented by providing computer generated interactive boards, visualizers and multimedia peripherals with internet facilities. 14 classrooms have been developed as smart classrooms, 9 at headquarter, Jabalpur, 2 each at Rewa and Tikamgarh and one at Ganjbasoda.</p> <p><b>Teaching material</b> Teachers of the University are encouraged to prepare Power Point presentations, question banks, videos etc. for effective teaching. Acquaintance and use</p>	<p>Library services: Journals CeRA, e-courses, NISCAIR online periodical repository resources, Online library catalogue-OPAC. Conference and lecture halls with adequate seating capacity equipped with audio-visual aids are available for stimulating teaching environment. College at Jabalpur has sufficient space equipped with audio-visual aids and peripheral facilities. Internet services are being provided with the computer lab in the reference section for the faculty and research students. VSAT is installed for providing ERNET connectivity. High speed internet connectivity (1.0 Gbps) is being provided under National Knowledge Network (NKN) supported by ICAR. CeRA facility and free electronic journals are also made available to the users. Computerized information services using the electronic documents, scanned material and digital resources are available to the users.</p>	<p>Results, Syllabus, Time table, Degree/PDC, Examination Notification, Character certification, Transfer certification, Student registration, and Academic calendar student roll.</p>

		of e-text books and e-content development		
2	<b>Rajmata Vijayraje Sciendia Krishi Vishwa Vidyalaya, Race Course Road, Gwalior, Madhya Pradesh (2008)</b>	** Not available on web site **	Library: Each college has a digital library infrastructure facility viz. computers, OPAC, Internet facility etc. fully integrated into the existing Library. The Library is well equipped with data capturing unit. There are many CD databases on different disciplines of Agriculture and allied subjects available in library for students. Electronic information like e-books, CeRA, <i>Krishiprabha</i> and <i>Vidyanidhi</i> are also available for students to help them with their academic and research programmes.	Result and notification, student registration, student welfare, Time table, Results
3	<b>Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh (2009)</b>	** Not available on web site **	** Not available on web site**	Tenders, Recruitment notifications
<b>Gujarat</b>				
4	<b>Anand Agricultural University (2004)</b>	Every class room equipped with interactive white board, projector, and CCTV. Online Examination conducted in College of Agricultural Information Technology	Computer Lab Facility Wi-Fi Internet Connection LAN connectivity e-library STUDENTS @ AAU: results, attendance, Library Resources, Notice board related information available online on student's corner	Online Admission Process Online Convocation Online Job Application <b>Online Email/Firewall Account:</b> This application used for "online course" at the university including UG/PG/Polytechnic courses. AAU Webmail ( <a href="http://mail.aau.in">http://mail.aau.in</a> ) <b>Online Tour Diary</b>

5	<b>Junagadh Agricultural University (2004)</b>	** Not available on web site **	<p>ICAR e-courses, Internet, e-library, web mail.</p> <p><b>Online Access of Journals:</b></p> <p>University library is privileged with the Online access of Journals through Consortium for e-Resources in Agriculture (CeRA), a Project by ICAR, New Delhi. JAU users can access the website mentioned below for the references of Journals</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Journals of Elsevier Sciences (421)</li> <li><input type="checkbox"/> Journals of Annual Reviews (23)</li> <li><input type="checkbox"/> Journals by Taylor &amp; Francis Ltd. (1253)</li> <li><input type="checkbox"/> Journals by indianjournal.com (87)</li> <li><input type="checkbox"/> Journals by Springer link (127)</li> </ul> <p><b>Cyberary:</b></p> <p>Since last two years, efforts have been made to keep abreast of information technology and introduce modern systems of library management and service. Cyberary in two different well-furnished cells with 40 workstations. Cyberary with 100 mbps LAN connectivity facilitates students with databases like CAB, AGRIS, AGRICOLA, are obtained as CD-ROM version. This has facilitated a tremendous improvement in the usage of library for referencing purposes. Full time internet facility for students, scanning and CD writing facility is also available for the students in the Cyberary. <i>Krishibha</i> online agricultural doctoral theses database and J-Gate is also available online.</p> <p>The internet access through BSNL with 100 mbps connectivity and existing Database facilities and</p>	Jobs, Tenders, circulars, bilingual
---	--	---------------------------------	--	-------------------------------------

			other IT enabled students to update their General Knowledge along with latest information in their respective disciplines. This facility is being extensively utilized by both faculty and students on an average of daily 80 to 100 users for about 12 hours per day. This has facilitated a tremendous improvement in the usage of library for referencing purposes especially by the research students and staff.	
6	<b>Navsari Agricultural University(2004)</b>	** Not available on web site **	Library Services: OPAC Service; Internet Lab; Catalogue Cabinet Card Service; e resources; e-granth;	Examination management system; NAU online tour management system
7	<b>Sardarkrushinagar-Dantiwada Agricultural University (2004)</b>	** Not available on web site **	Centre for Agricultural Information & Communication Technology (CAICT): The centre is dedicated to providing high-quality education to equip the students with knowledge and skills in the area of Agriculture Information Technology & Computer Application. The centre especially aims at dovetailing technical education with proficiency and human values to develop the students into creative, dynamic and globally competent computer technology professionals. High-Speed Internet Service	Tenders, Circulars, News letters
8	<b>Kamdhenu University, Gandhinagar (2009)</b>	** Not available on web site **	** Not available on web site **	Web mail Online application for recruitments
<b>Rajasthan</b>				



9	<b>Agriculture University, Jodhpur (2013)</b>	** Not available on web site **	Wi-Fi enabled campus in University and constituent colleges	Examination notification, Job Opportunities, Tenders and Results are announced on university website.
10	<b>Agriculture University, Kota (2013)</b>	** Not available on web site **	Wi-Fi enabled campus in University and constituent colleges	Examination notification, news, notice and Results are announced on university website.
11	<b>Maharana Pratap University of Agriculture and Technology, Udaipur (1999)</b>	In order to update the subject matter knowledge of teachers, the global knowledge bowl is made accessible to all our teachers on their desk itself through ICT applications.	MPUAT is one amongst the few institutions in the country to deploy a Gigabit campus networking providing 4 Mbps leased line connectivity. Every faculty member has a personal computer on his disk. While all faculty members and students have access to internet connectivity in their Departments as well as college library, all hostels are provided with internet/intranet connectivity either through Wi-Fi network or through optical fibre cable for 24 hours of the day. Around 1000 IT based information outlets are provided in different colleges and hostels of the University. The digital university project, which is an effort to bring e-governance in higher education, is being implemented in collaboration with Maharashtra Knowledge Corporation Ltd, Pune. • Library information system at MPUAT is partially automated, bar-coded and digitized. All bonafide members of the University are provided various facilities and services, such as document alert service to know about the receipt of new publications, off-line databases through Standalone CD-ROM databases, on-line databases through Internet and	Constant monitoring of classes by Heads of department and Deans in person and through CCTV

			Intranet facilities to retrieve and download research information, on-line Journals.	
12	<b>Rajasthan University of Veterinary and Animal Sciences, Bikaner (2010)</b>	** Not available on web site **	e-resources, e-books	Circulation and notification; Admission; Information- fee structure, course / syllabus, e-resources, e-books Academic calendar. Student forum: student activity, time table, results, download for students, student attendance, Alumni login, Re-registered/ cancelled student
13	<b>Sri Karan Narendra Agriculture University, Jobner (2013)</b>	Taught lecture schedules available on website	The library has been modernized with well-equipped CCTV, UPS, AC system, Xerox machine, printer and computers providing Internet Surfing, e journals, e theses and e catalogue (webopac), e books (Open Access) and CDROM databases facilities. The library e resource facilities have been provided to all students and teachers of this college on Internet / Intranet Wi-Fi system. The e resource facilities have been provided to access research information's on Internet, e journals (CeRA), eBooks(free), e theses (Krishi prabha), e	Centre for Information Management and Computer Applications (CIMCA)

			catalogue (webopac) of Theses and Bound Journals ,J Gate Agriculture and Standalone CDROM Agricultural Databases (AGRIS ,AGRICOLA, CABCD ,PGRABST ,FISH BASE ) for informative research studies	
14	<b>Swami Keshwanand Rajasthan Agricultural University (1987)</b>	** Not available on web site **	<p>CIMCA- Centre for Information Management and Computer Applications</p> <p>The SKRAU WAN is poised to support student regulatory functions from admission, registration, fulfilling mandatory schedules, examinations, evaluation and award. Through hybridization with video conferencing the communication shall become interactive. In nutshell, the RAU WAN system has till date proved very effective in e-communication and is ready to transform into e-regulation and e-interactions. Keeping with the pace of Info Communication Technology, RAU also realized the need of providing Internet connectivity to the students in their hostels. Initially, budding managers (IABM Students) have been provided with Internet connectivity using Wi Fi technology in their hostel rooms from 5:00 PM to 10:00 AM.</p> <p>At present the following mentioned database is subscribed by the university: AGRIS; Agricola; Cab CD; Ag. Eco 1797+; Crop CD 1973+; Hort CD 1973+; Soil CD 1973+; Vet CD 1973+; Biotechnology Abstract 1982+ ; FSTA Science Technology Abstract; Review of Cab CD data</p> <p>“Strengthening of Digital Library and Information Management under NARS (e-Granth)” and the work</p>	Latest news, Advertisements, Recruitments, Circulars

			<p>of project has been started software of Library Management (KOHA).</p> <p><b>E-Services</b> Internet Connectivity: Whole library is facilitating through LAN &amp; Wi-Fi for internet browsing. Consortium of e-Resources in Agriculture (CeRA) Online Journals; Online Doctoral Thesis Repository; Online Public Access Catalogue (OPAC); In House Repository.</p>	
<b>Jammu &amp; Kashmir</b>				
<b>15</b>	<b>Sher-E-Kashmir University of Agricultural Sciences &amp; Technology, Jammu (1999)</b>	** Not available on web site **	The University has a central library at main campus Chatha and faculty library at R. S. Pura campus. The university library is Wi-Fi enabled, having access to 2900 online journals through CeRA consortium, other open access databases and Internet services. The Central library also has e-Kiosk facility for accessing the database of literature.	Recruitment, results, Academic calendar. examination Admission notification,
<b>16</b>	<b>Sher-E-Kashmir University of Agricultural Sciences &amp; Technology of Kashmir, Srinagar, Jammu &amp; Kashmir (1982)</b>	** Not available on web site **	E resources of Library system, Web OPAC	News Board, Advertisements, results

### 3.1 Status of ICT tools

In order to document the status of ICT tools in Agricultural Education, the data were collected through visiting the websites of the State Agricultural Universities of the four states and also by collecting first-hand information from the nodal officers of the various Universities as well as the Deans of colleges under study through questionnaires. In Indian Agricultural higher education, ICT integration has been experienced in very limited areas such as course delivery, online course materials, source of information in classrooms, accessing library materials, running distance education courses and administrative support *etc.* Information was collected through the questionnaire from Deans and nodal officers (designated by ICAR) of the Universities under study. Though there were 10 universities under study but nodal officers of only five universities provided the information and rest of them did not provide information due to lack of documentation. Information was collected on presence of Educational Technology Cells, number of students and computers in each college, infrastructure related to ICT, availability of SMART classrooms and video conference facility, ICT usage for administrative purpose and maintenance of ICT equipment and availability of e-resources.

Status of ICT integration in the Universities have been documented and presented in tabular form depicting the facets of ICT integration in Agricultural Higher Education in three different areas namely; Mode of course delivery, Infrastructure and Administrative support. Table 6 very clearly depicts that out of the 16 State Agricultural Universities in the four states of Madhya Pradesh, Gujarat, Rajasthan, and Jammu & Kashmir; only four Universities in their website reported ICT related information for mode of course delivery namely; JNKVV (Madhya Pradesh), Anand Agricultural University (Gujarat), SKNAU, Jobner (Rajasthan) and MPUA&T, Udaipur (Rajasthan). JNKVV, Jabalpur has resources for course delivery such as e-learning through e-content development and AAU, Anand has every class room equipped with interactive white board, projector and CCTV and online examination conducted in College of Agricultural Information Technology, Anand. In order to update the subject matter knowledge of teachers, the global knowledge bowl is made accessible to all the teachers on their desk itself through ICT applications in MPUA&T, Udaipur and SKNAU, Jobner had the schedule of lectures taught on their website.

Coming to infrastructure, 14 Universities had reported the use of ICT on their website except Nanaji Deshmukh Veterinary Science University, Jabalpur and Kamdhenu University, Gandhinagar. The reason for this could be that both are newly formed Veterinary universities which were founded as early as in the year 2009. Though the website of Nanaji Deshmukh Veterinary does not have any information on e-library but on personal visit, it was found that they had a computer laboratory and also had CeRA facility. Almost all the universities reported that e-library facility with CeRA and *Krishiprabha* are available for students to help them with their academic and research programmes. But, it was revealed through personal discussion with the students that majority of them do not know how to use CeRA for information retrieval. Another problem which was observed during data collection was that CeRA is password protected and has a limitation of being used only on university computers. It is thus recommended that students should be trained how to use CeRA facility and be given access to password upon registration. As regards use of ICT for administrative support is concerned, it is given in Table 6 that in almost all the websites of the 16 Universities, they were making use of ICT for recruitment notifications and results displayed in their website, time table as well as for student registration. Apart from all this, universities reported to be using ICT for various other matters such as results, syllabus, Pre – Degree Certificate, examination notification. In AAU, Anand (Gujarat) online admission process, Online Convocation, Online Job Application and Online Email/Firewall Account: Computer application is used for “online course” at the university including UG/PG/Polytechnic courses through AAU Webmail (<http://mail.aau.in>) and Online Tour Diary was also available which manages the entire tour programme and its schedule for state agricultural university. It will store and display all the available information of each tour programme. This web based user interface includes all the activities like starting from create tour programme to recommendation from authorized user. One unique feature found was monitoring of college activities by the authorities by CCTV which was depicted by only MPUA&T, Udaipur website whereas through personal contacts it was found that AAU, Anand, JNKVV (Agriculture College, Jabalpur) and RVSKVV (College of Agriculture, Indore) were also having the same facility in the Dean’s room to keep a track of the activities of students and teachers.

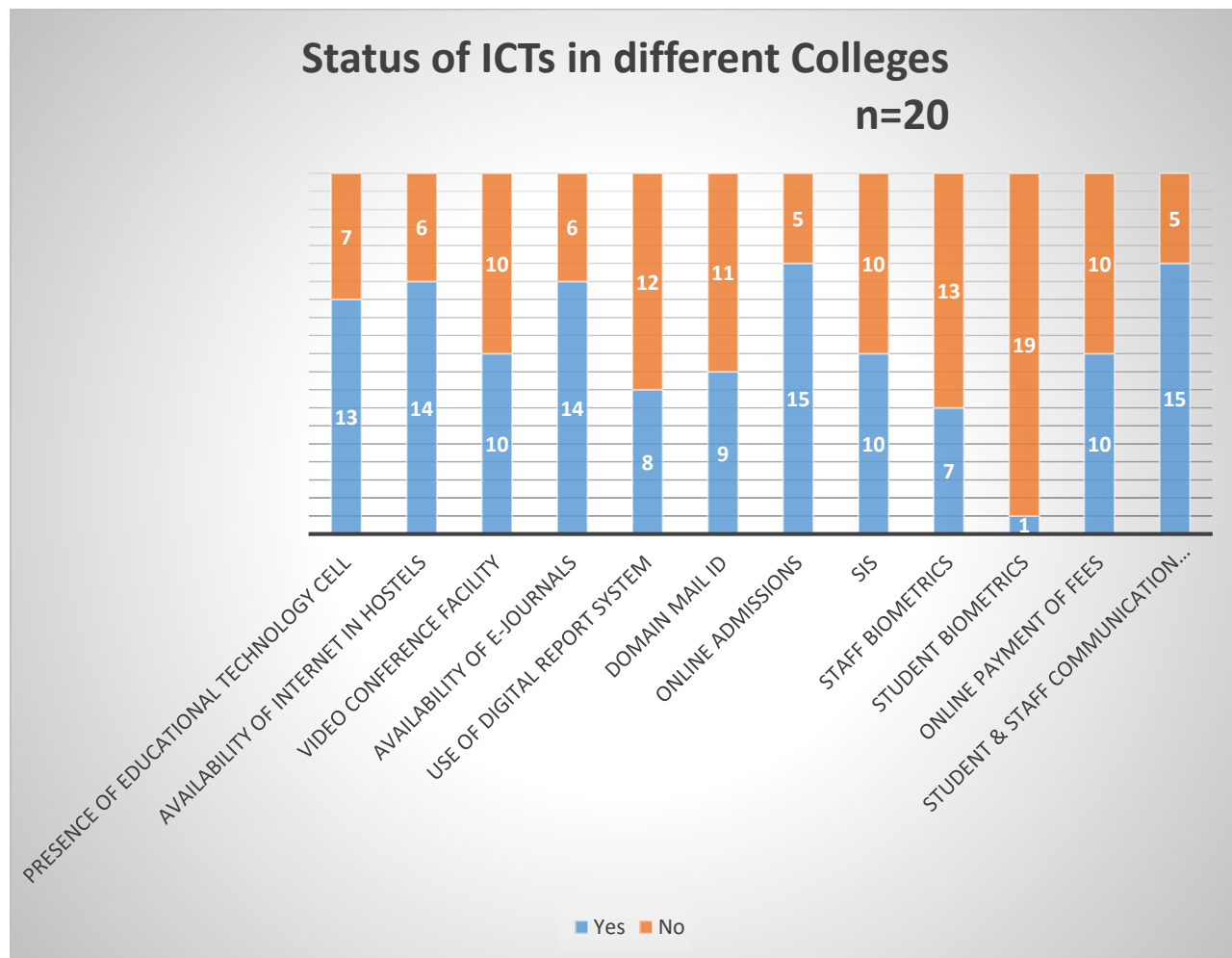
**Table 7: Presence of Educational Technology Cells in different SAUs**

State	University	College	Edu Tech Cell	IT Budget
MP	JNKVV	CoA, Jabalpur	No	0
		CoAE, Jabalpur	Yes	0
	RVSKVV	CoA, Gwalior	No	0
		CoA, Indore	Yes	0
	NDVSU	CVS&AH, Jabalpur	Yes	0
		CoFSc., Jabalpur	Yes	0
J & K	SKUAST	FOA), Chatha	Yes	0
		F.V.Sc. R.S.Pura	Yes	0
Guj	AAU	Dairy Sc., Anand	No	0
		CVS&AH, Anand	Yes	0
	JAU	CoA, Junagadh	Yes	0
		CoAE&T, Junagadh	No	0
	NAU	CoA, Navsari	No	0
		CoH, Navsari	Yes	0
Raj	AU, Jodhpur	CoA, Mandore	Yes	0
		CoA, Sumerpur	Yes	500000
	MPUAT	RCA, Udaipur	Yes	0
		CHSC, Udaipur	No	0
	SKNAU, Jobner	CoA, Jobner	Yes	1000000
		CABM, Jobner	No	0

It was revealed through the responses of the Nodal officers (only 5 universities) and Deans of the 10 SAUs under study that majority of them had no separate budget provided to them as Information Technology budget but SKUAST, Jammu and RVSKVV, Gwalior reported 10 Lakhs IT budget. Both these universities along with JAU, Junagarh had Educational Technology Cells. On seeing college –wise, Table 7 depicts that only two colleges out of 20 colleges under study had

reported to be having IT budget. These colleges were both from the state of Rajasthan namely; College of Agriculture, Sumerpur (5 Lakhs) and SKN College of Agriculture, Jobner (10 Lakhs). Out of 20 colleges under study, 13 had Educational Technology Cells in their colleges. Only seven colleges did not have.

During informal discussions with the teachers of Nanaji Deshmukh Veterinary Science University, Jabalpur it was revealed that a non-computer specialized faculty member was heading the ARIS (Agricultural Research Information Systems) Cell who himself was not well conversant with Information Technology. It is recommended that the persons handling such IT related cells should be computer professionals.



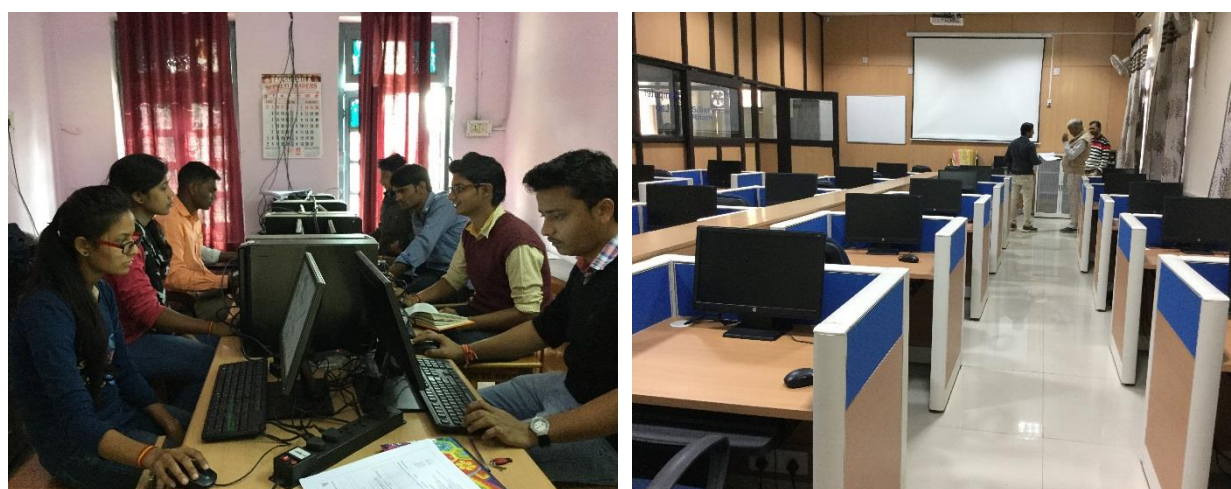
**Fig 9: Status of ICTs in different Colleges**



**Table 8: Information regarding Number of faculty members, Students and Computers**

State	University	College	Faculty Members	No. of students	Desktops/Laptops		
					Desktop	Laptop	Total
MP	JNKVV	CoA, Jabalpur	65	700	150	30	<b>180</b>
		CoAE, Jabalpur	21	380	52	8	<b>60</b>
	RVSKVV	CoA, Gwalior	51	600*	118	10	<b>128</b>
		CoA, Indore	41	453	98	10	<b>108</b>
	NDVSU	CVS&AH, Jabalpur	64	480	92	5	<b>97</b>
CoFSc., Jabalpur		04	91	13	0	<b>13</b>	
J & K	SKUAST	FOA), Chatha	105	600	80	25	<b>105</b>
		F.V.Sc. R.S.Pura	60	458	55	7	<b>62</b>
Guj	AAU	Dairy Sc., Anand	37	280	110	10	<b>120</b>
		CVS&AH, Anand	68	463	88	34	<b>122</b>
	JAU	CoA, Junagadh	84	1193	85	13	<b>98</b>
		CoAE&T, Junagadh	42	200	25	5	<b>30</b>
	NAU	CoA, Navsari	68	802	80	2	<b>82</b>
		CoH, Navsari	58	344	100	10	<b>110</b>
Raj	AU, Jodhpur	CoA, Mandore	06	178	30	2	<b>32</b>
		CoA, Sumerpur	03	164	72	2	<b>74</b>
	MPUAT	RCA, Udaipur	28	760	40	0	<b>40</b>
		CHSC, Udaipur	21	161	113	0	<b>113</b>
	SKNAU, Jobner	CoA, Jobner	54	639	200	50	<b>250</b>
		CABM, Jobner	02	55	0	0	<b>0</b>
		<b>Total</b>	<b>882</b>	<b>8401</b>	<b>1601</b>	<b>223</b>	<b>1824</b>
		<b>Average</b>	<b>44.1</b>	<b>442.15</b>	<b>80.05</b>	<b>11.15</b>	<b>91.2</b>

\*(approx.) No information provided by the authorities



**Plate 4: Few ICTs in SAUs**

**Table 9: Number of Students per Faculty/ Computer**

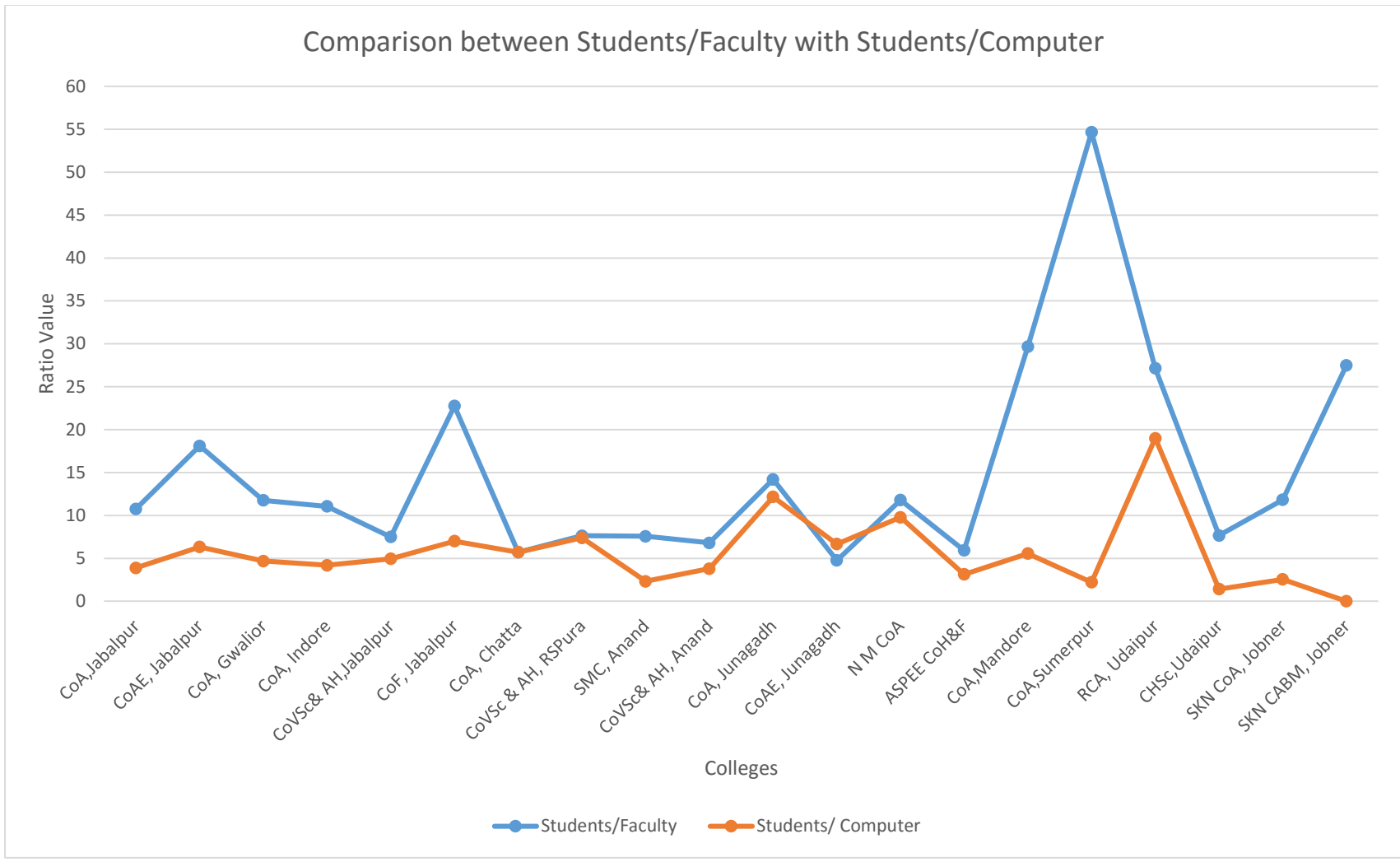
State	University	College	Students/Faculty	Students/ Computer
MP	JNKVV	CoA, Jabalpur	10.77	3.89
		CoAE, Jabalpur	18.10	6.33
	RVSKVV	CoA, Gwalior	11.76	4.69
		CoA, Indore	11.05	4.19
	NDVSU	CVS&AH, Jabalpur	07.50	4.95
		CoFSc., Jabalpur	22.75	7.00
J&K	SKUAST	FOA), Chatha	05.71	5.71
		F.V.Sc. R.S.Pura	07.63	7.39
GUJ	AAU	Dairy Sc., Anand	07.57	2.33
		CVS&AH, Anand	06.81	3.80
	JAU	CoA, Junagadh	14.20	12.17
		CoAE&T, Junagadh	4.76	6.67
	NAU	CoA, Navsari	11.79	9.78
		CoH, Navsari	5.93	3.13
RAJ	AU, Jodhpur	CoA, Mandore	29.67	5.56
		CoA, Sumerpur	54.67	2.22
	MPUAT	RCA, Udaipur	27.14	19.00
		CHSC, Udaipur	7.67	1.42
	SKNAU, Jobner	CoA, Jobner	11.83	2.56
		CABM, Jobner	27.50	0

As per Table 8 and 9 on an average, each college had 442 students and 44 faculty members to teach them and had around 91 computers which includes desktop as well as laptops. In order to have a congenial teaching – learning situation, the teacher student ratio should be not very wide. According to 4<sup>th</sup> Dean’s committee report the desirable student to teacher ratio recommended is 50:1 for theory and 25:1 for practical. Considering this, it was found that the colleges under study in the selected northern states had an ideal student: teacher ratio of 10: 1. While going into the details of student-teacher ratio, as revealed in Table 9, that this ratio was as wide as 55: 1 in College

of Agriculture, Sumerpur which comes under newly formed Agricultural University, Jodhpur which was founded in the year 2013. It was observed that in such colleges, deans as well as Vice Chancellor had to take classes to cope up with the crises of teachers. As far as the student: computer ratio is concerned, it was reported that on an average one computer was available for 5 students but on looking into the details, it was found that in SKN College of Agri Business, Jobner; there were no computers available for students and only two teachers were there for 55 students. It is proposed that in such colleges where there is dearth of teachers, virtual classrooms should be promoted.



**Plate 5: Computer lab in one of the SAUs**



**Fig 10: Comparison between Students/Faculty with Students/Computer**

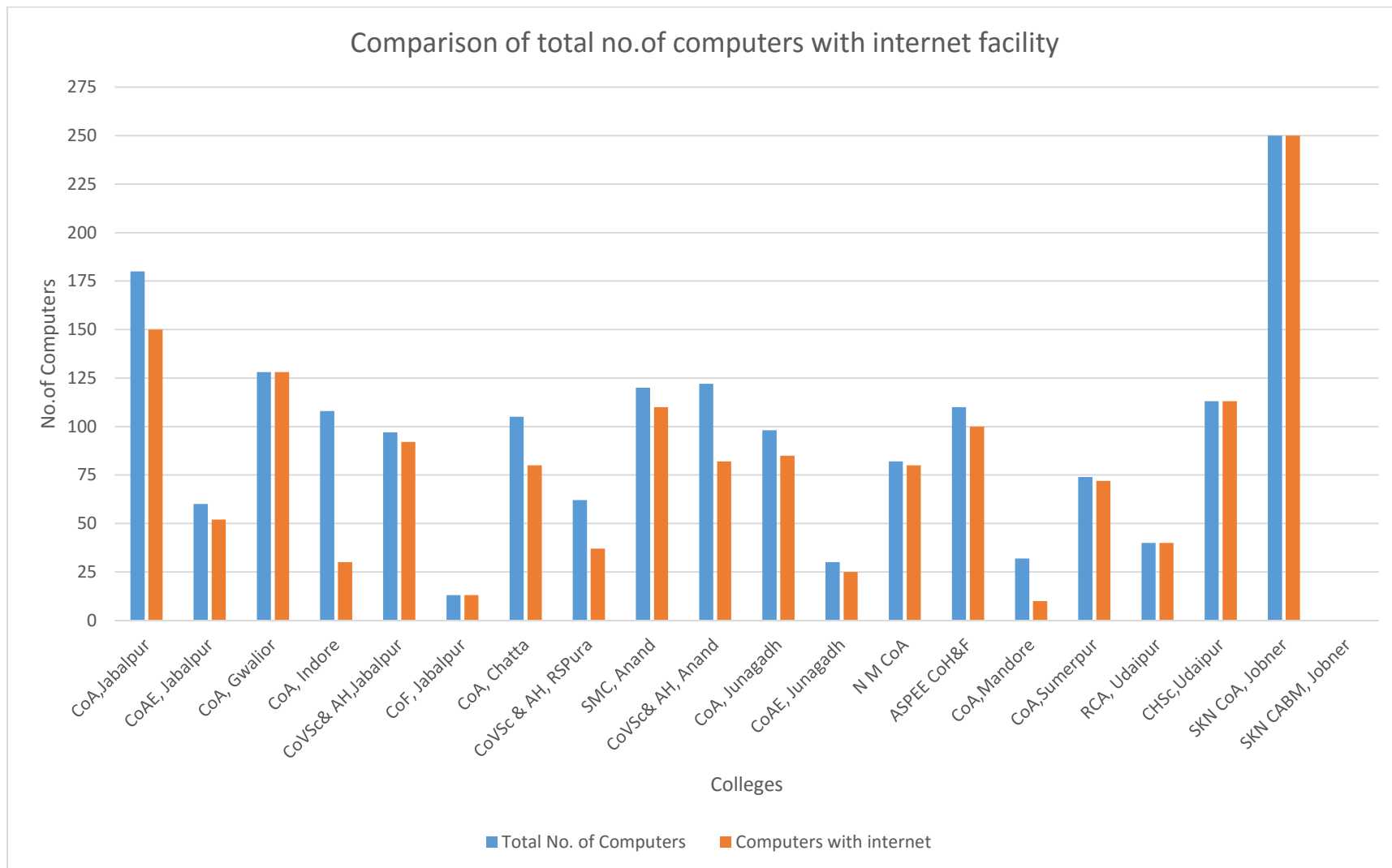
## **Infrastructural facilities related to ICT**

Infrastructural facilities related to ICT includes computers with internet, printers, SMART classrooms in the colleges and facilities of video conferencing and its usage. Cursory of Table 10 reveals that majority of the colleges (10) under study had two computer laboratories, nine of them had one computer laboratory whereas SKN college of Agribusiness Management, Jobner had no computer laboratory at all. On an average, per college; there were 80 computers with internet, 442 students with internet and 32 printers. Majority of the student hostels had internet facility barring a few. If we see state – wise picture, Gujarat was the only state having internet facility in all the hostels, whereas in Madhya Pradesh, except College of Fisheries of NDVSU, all the colleges had internet facility for students in the hostels. No hostels of SKUAST, Jammu had internet facility for students in the hostel. In case of Rajasthan, half of the colleges under study had internet facility in their hostels for the students. It is very interesting to note that in MPUA&T, Udaipur; Home Science hostel had internet facility but Agriculture hostel had no internet facility. Agricultural University, Jodhpur had internet in Sumerpur college but not in Jodhpur college. It is concluded that majority of the students in Home Science Colleges are girl students and in Sumerpur, there was a girl’s hostel in place so they were bothered about the facilities provided to girl students. Regarding the bandwidth which governs the internet speed, it was reported to be very weak which was 2-5 mbps. Only three colleges reported that their bandwidth was between 100-125 mbps. These were: College of Veterinary Science and Animal Husbandry, Anand; College of Agriculture, Jabalpur and NM College of Agriculture, Navsari. It is observed that Gujarat had a higher status than other states in terms of bandwidth of internet availability in the SAUs.

**Table 10: Infrastructural facilities related to ICT**

State	University	College	Computers with internet	No. of students with internet	Computer labs	Printers	Availability of internet in hostels	Bandwidth
MP	JNKV	CoA, Jabalpur	150	700	2	10	Yes	100
		CoAE, Jabalpur	52	380	2	10	Yes	not reported
	RVSKVV	CoA, Gwalior	128	600*	2	16	Yes	2
		CoA, Indore	30	453	2	30	Yes	8
	NDVSU	CVS&AH, Jabalpur	92	1159	1	30	Yes	50
		CoFSc., Jabalpur	13	91	1	3	No	
J & K	SKUAST	FOA), Chatha	80	600	1	85	No	80
		F.V.Sc. R.S.Pura	37	458	2	35	No	2
Guj	AAU	Dairy Sc., Anand	110	280	2	20	Yes	2
		CVS&AH, Anand	82	463	2	84	Yes	125
	JAU	CoA, Junagadh	85	800	1	18	Yes	2
		CoAE&T, Junagadh	25	200	1	25	Yes	2
	NAU	CoA, Navsari	80	802	2	65	Yes	100
		CoH, Navsari	100	117	2	50	Yes	0
Raj	AU, Jodhpur	CoA, Mandore	10	178	1	10	No	0
		CoA, Sumerpur	72	164	1	14	Yes	4
	MPUAT	RCA, Udaipur	40	760	1	1	No	5
		CHSC, Udaipur	113	161	1	39	Yes	5
	SKNAU, Jobner	CoA, Jobner	250	639	2	102	Yes	100
		CABM, Jobner	0	0	0	0	No	0
		<b>Total</b>	1597	8405	29	647		
		<b>Mean Value</b>	79.85	442.36	1.45	32.35		

\*(approx.) No information provided by the authorities



**Fig 11: Comparison of total no. of computers with internet facility**

**Table 11: Availability of SMART Classrooms and Video conferencing facilities**

State	University	College	SMART Seminar halls	SMART classrooms	Video conference facility	Usage of video conference
MP	JNKV	CoA, Jabalpur	02	6	No	never
		CoAE, Jabalpur	03	3	Yes	occasionally
	RVSKVV	CoA, Gwalior	03	7	No	never
		CoA, Indore	10	4	No	never
	NDVSU	CVS&AH, Jabalpur	01	1	Yes	occasionally
		CoFSc., Jabalpur	0	0	No	never
J & K	SKUAST	FoA, Chatha	06	8	Yes	occasionally
		F.V.Sc. R.S.Pura	0	5	Yes	occasionally
Guj	AAU	Dairy Sc., Anand	06	4	Yes	occasionally
		CVS&AH, Anand	02	5	Yes	occasionally
	JAU	CoA, Junagadh	11	4	Yes	daily
		CoAE&T, Junagadh	01	1	No	never
	NAU	CoA, Navsari	02	5	Yes	occasionally
		CoH, Navsari	01	4	Yes	monthly
Raj	AU, Jodhpur	CoA, Mandore	0	0	No	Never
		CoA, Sumerpur	04	1	Yes	occasionally
	MPUAT	RCA, Udaipur	0	0	No	never
		CHSC, Udaipur	01	1	No	never
	SKNAU, Jobner	CoA, Jobner	0	8	No	never
		CABM, Jobner	0	0	No	never
<b>Total</b>			<b>63</b>	<b>67</b>		

Table 11 gives a view of the availability of infrastructural facilities in the Agricultural Colleges of the SAUs of northern India which shows that highest number of SMART classrooms were found in College of Agriculture, Jobner & Faculty of Agriculture Chatta, Jammu (8 each) followed by College of Agriculture, Gwalior but the picture is different for SMART seminar halls which are maximum (11) in College of Agriculture, Junagarh, followed by College of Agriculture, Indore which had 10 SMART seminar halls. Whereas other colleges had 2 or three SMART seminar halls. MPUA&T, Udaipur which is as old as 17 years also had only one SMART seminar hall in College of Home Science but no SMART seminar hall was found in Rajasthan College of Agriculture,



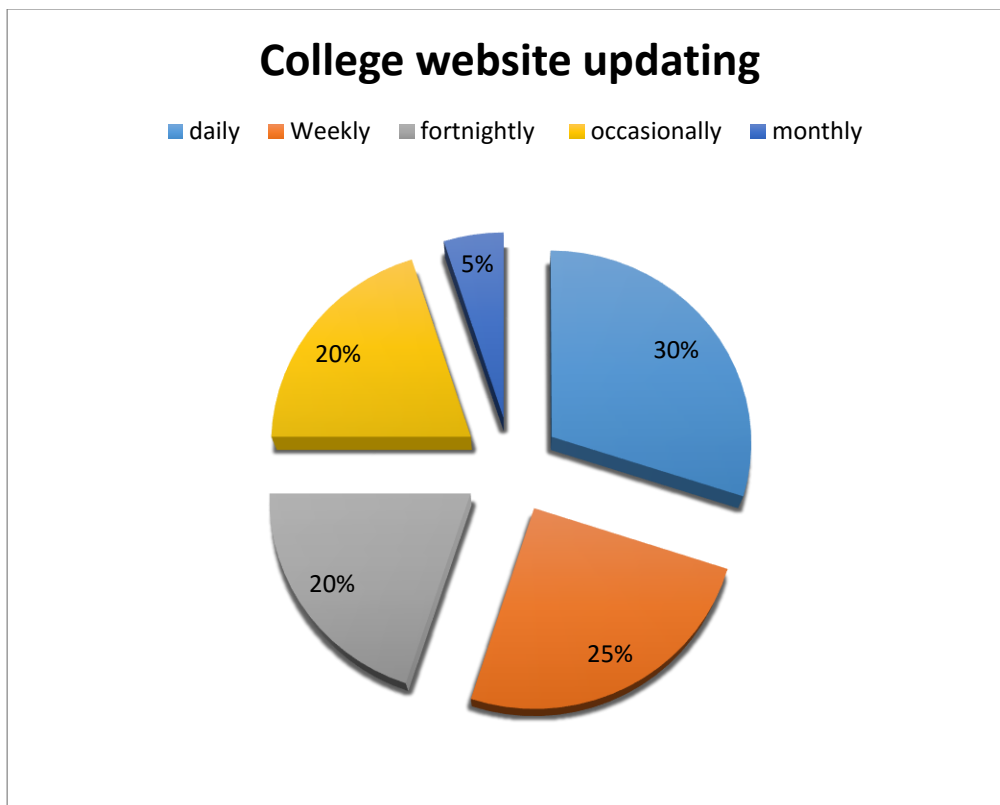
Udaipur. SKNAU, Jobner had no SMART seminar hall at all and Agricultural University, Jodhpur had four SMART seminar halls in Sumerpur but none in Jodhpur campus. Video conference facility is found in half of the colleges out of 20 under study whereas it was used by majority of the colleges occasionally as per need except ASPEE College of Horticulture and Forestry, Navsari which was using monthly and College of Agriculture, Junagadh was using video conferencing daily. Ultimately, it is very clearly depicted in the findings that the status of ICT use was comparatively better in the state of Gujarat in terms of availability of SMART classrooms and video conferencing facility. This can be attributed to Table 10 which clearly mentions that the internet speed was much better in the universities of Gujarat as compared to other states under study.

### **Availability of e – resources**

Table 12 reveals that e- journals were reported to be available in all the universities of Gujarat whereas in Rajasthan also all the agricultural colleges under study had e-journals except College of Agriculture, Mandore under Agricultural University, Jodhpur. In case of SKUAST, Jammu; Chatta campus had the availability of e-journals whereas R. S. Pura Veterinary College did not report. Though ICAR had given the facility of e-journals through CeRA still Universities like RVSKVV and NDVSU, Jabalpur were reporting to have no e-journal facility. It seems the reporting authorities themselves were not aware of the facility that CeRA provides. Regarding e-courses, only two universities out of the 10 under study had developed their own e-courses. College of Agricultural Engineering, Jabalpur and Seth M C college of Dairy had developed e-courses. The engineering college of JNKVV, Jabalpur had developed only one e-course whereas the dairy college at AAU, Anand had developed 19 e-courses. One unique feature to be noted here is that AAU, Anand had Directorate of Information Technology (DIT) which is not commonly found in the SAUs of the country. The practice of digital report system was prevalent in only eight colleges out of 20 under study. On seeing the state –wise situation, it is revealed that in Gujarat, almost all the colleges had digital report card system whereas in Madhya Pradesh, half of the colleges had this digital report card system in practice. The remaining two states; Rajasthan and Jammu & Kashmir had no system of digital report card in their universities.

**Table 12: Availability of e-resources**

State	University	College	Availability of e-journals	No. of e-courses	Use of Digital Report System	Institute website updating	Domain mail id
MP	JNKVV	CoA, Jabalpur	Yes	0	Yes	daily	No
		CoAE, Jabalpur	Yes	1	No	occasionally	No
	RVSKVV	CoA, Gwalior	No	0	Yes	weekly	No
		CoA, Indore	No	0	Yes	fortnight	No
	NDVSU	CVS&AH, Jabalpur	No	0	No	occasionally	No
		CoFSc., Jabalpur	No	0	No	occasionally	No
J&K	SKUAST	FOA), Chatha	Yes	0	No	daily	Yes
		F.V.Sc. R.S.Pura	No	0	No	daily	Yes
Guj	AAU	Dairy Sc., Anand	Yes	19	Yes	daily	Yes
		CVS&AH, Anand	Yes	0	Yes	fortnight	Yes
	JAU	CoA, Junagadh	Yes	0	No	daily	Yes
		CoAE&T, Junagadh	Yes	0	Yes	fortnight	Yes
	NAU	CoA, Navsari	Yes	0	Yes	monthly	Yes
		CoH, Navsari	Yes	0	Yes	weekly	Yes
Raj	AU, Jodhpur	CoA, Mandore	No	0	No	weekly	No
		CoA, Sumerpur	Yes	0	No	daily	No
	MPUAT	RCA, Udaipur	Yes	0	No	weekly	No
		CHSC, Udaipur	Yes	0	No	fortnight	No
	SKNAU	CoA, Jobner	Yes	0	No	weekly	Yes
		CABM, Jobner	Yes	0	No	occasionally	No



**Fig 12: Frequency of website updating**

Thirty percent of the colleges under study were updating their websites daily whereas 25% were updating their websites weekly and equal percentage *i.e.* 20% were updating fortnightly and occasionally whereas only 5% were updating their websites monthly. Out of the three states, all the SAUs of Gujarat and J&K had domain e-mail ids whereas only Agricultural University, Jobner in Rajasthan had domain id. The SAUs of Madhya Pradesh did not possess their university domain id. Almost half of the universities under study did not have their domain mail id, still the teacher and the taught were communicating with each other through e-mails in majority of the universities under study. SKUAST, Jammu in spite of having its own domain id was using Gmail due to less space in their domain id.

**Table 13: ICT usage for Administrative procedures**

State	University	College	Online Admissions	SIS	Staff Biometrics	Student Biometrics	Online payment of fees	Student & Staff communication through mail
MP	JNKVV	CoA, Jabalpur	Yes	Yes	No	No	Yes	Yes
		CoAE, Jabalpur	Yes	Yes	No	No	Yes	Yes
	RVSKVV	CoA, Gwalior	Yes	No	Yes	No	Yes	Yes
		CoA, Indore	Yes	No	Yes	Yes	Yes	Yes
	NDVSU	CVS&AH, Jabalpur	Yes	Yes	No	No	Yes	Yes
		CoFSc., Jabalpur	No	No	No	No	No	No
J& K	SKUAST	FOA), Chatha	Yes	No	No	No	No	Yes
		F.V.Sc. R.S.Pura	Yes	No	No	No	No	Yes
Guj	AAU	Dairy Sc., Anand	Yes	Yes	No	No	No	Yes
		CVS&AH, Anand	Yes	Yes	No	No	No	Yes
	JAU	CoA, Junagadh	No	No	No	No	No	No
		CoAE&T, Junagadh	Yes	No	No	No	No	Yes
	NAU	CoA, Navsari	Yes	Yes	No	No	No	Yes
		CoH, Navsari	Yes	Yes	No	No	No	Yes
Raj	AU, Jodhpur	CoA, Mandore	Yes	No	Yes	No	No	Yes
		CoA, Sumerpur	Yes	Yes	Yes	No	Yes	Yes
	MPUAT	RCA, Udaipur	Yes	Yes	Yes	No	Yes	Yes
		CHSC, Udaipur	No	No	Yes	No	Yes	No
	SKNAU, Jobner	CoA, Jobner	No	Yes	Yes	No	Yes	No
		CABM, Jobner	No	No	No	No	Yes	No

## ICT Usage for Administrative Procedures

ICT has truly transformed the Agricultural Education in India which is well depicted in Table 13. Online admissions have become a part and parcel of almost all the State Agricultural Universities under study. Student Information System (SIS) is a management information system to manage student data. It provides capabilities for registering students in courses, documenting, grading, transcript, result of student tests and other assessment scores, building students' time table, tracking student attendance *etc.* SIS was found in 50% of the colleges under study whereas staff biometrics was found only in 7 colleges out of 20 under study. As far as student biometrics attendance is concerned, only one college under study, *i.e.* College of Agriculture, Indore has adopted it. It was observed during University visit that College of Agricultural Information Technology of AAU, Anand had the facility of biometrics for tracking students' attendance. Only two states (Madhya Pradesh and Rajasthan) under study had the facility for students to pay their fees online. College of Fisheries, Jabalpur (M. P.) and College of Agriculture, Jodhpur (Rajasthan) which were budding ones were devoid of this facility.

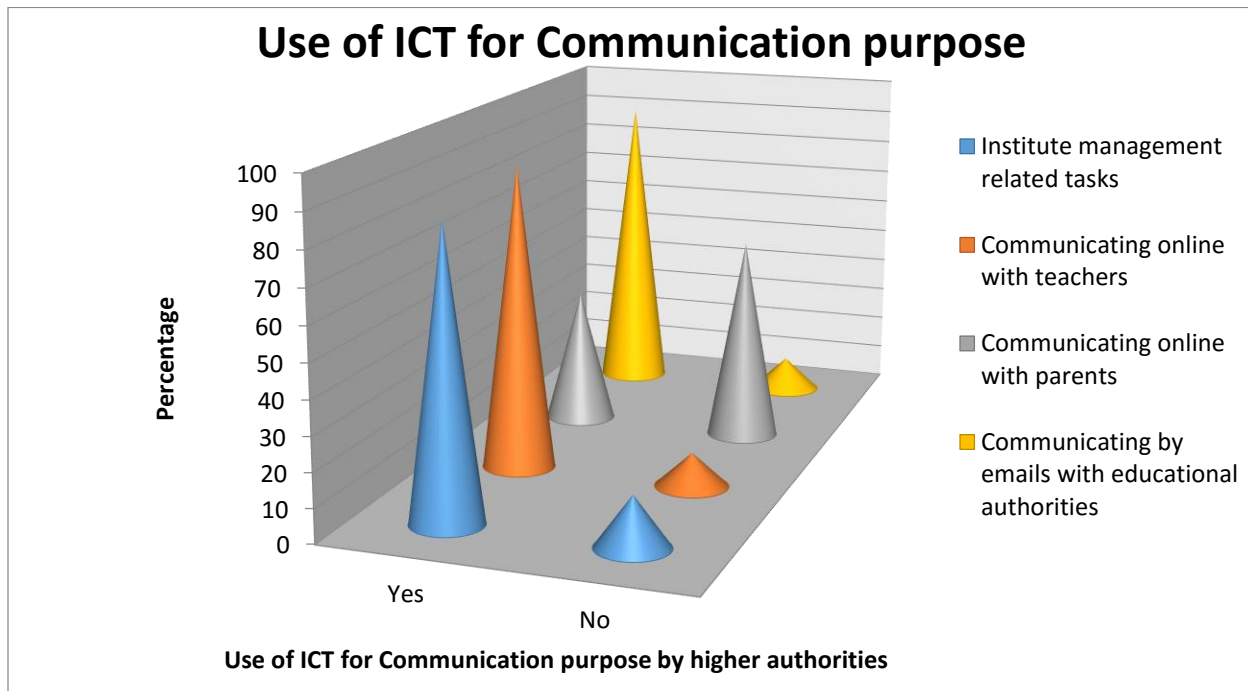


**Plate 6: ICT Usage for Administrative Procedures**

**Table 14: Use of ICT for Communication purpose**

**n=20**

S. No.	Statements	Frequency (Yes)	Percentage	Frequency (No)	Percentage
1	Institute management related tasks	17	85.00	3	15.00
2	Communicating online with teachers	18	90.00	2	10.00
3	Communicating online with parents	8	40.00	12	60.00
4	Communicating by emails with educational authorities	18	90.00	2	10.00



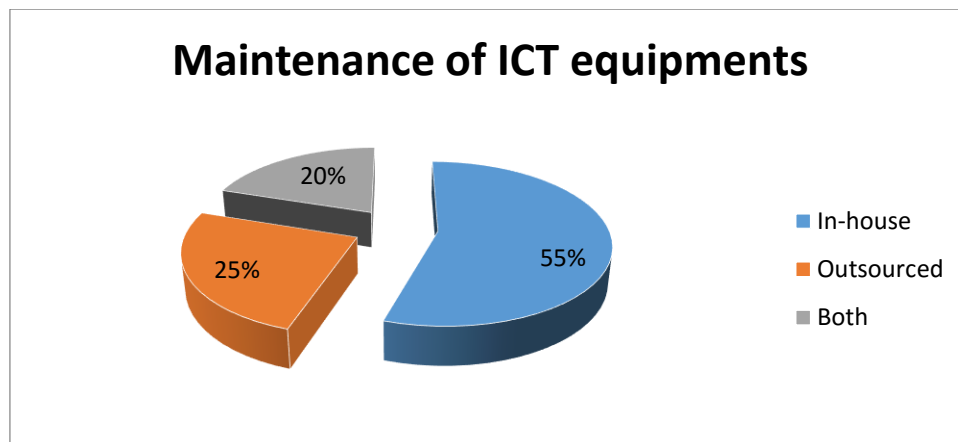
**Fig 13: Use of ICT for Communication purpose**

Table 14 denotes that the Deans of majority of the colleges under study reported that they were using ICT in order to carry out institute management related tasks, were communicating online with teachers and communication by e-mails with educational authorities. Only two Deans were not communicating online with teachers and educational authorities. Whereas 40% of the Deans were communicating online with the wards of students. The number is so less because majority of the

students were from rural background and hopefully their parents cannot communicate through e-mail. One very unique feature observed in the R. S. Pura campus of SKUAST, Jammu is that they make process plans to communicate electronically with faculty as well as outside the university. They have created g-mail group and WhatsApp group of faculty members and a group of CR (Class Representatives). For teachers, Short Message Service (SMS) alerts are sent after every mail to remind them.

**Table 15: Maintenance of ICT equipments**

S.No	Category	Frequency	Percentage
1	In-house	11	55.00
2	Outsourced	5	25.00
3	Both	4	20.00



**Fig 14: Maintenance of ICT equipments**

Maintenance of ICT equipment too is a very important component because if ICT gadgets are not periodically maintained, then technology can be a bane instead of being a boon. Out of 20 colleges, 11 Deans reported that they had in – house maintenance of computers, laptops and other ICT related equipments whereas only five colleges were outsourcing the maintenance work. Still, four of the colleges were having in-house as well as outsourcing of maintenance work. The possible reasons for more than half of the colleges having in-house maintenance could be that it is always better to have in-house maintenance to get quick services.

### 3.3 IMPACT OF ICT TOOLS IN TEACHING AND LEARNING PROCESS

This section deals with the impact that ICT tools have on the teaching learning process in Agricultural higher education. In other words, an inquiry is made into the awareness, usage and frequency of usage of ICT tools and how ICT is impacting the teaching learning process in terms of time saving, accuracy and ease based on the perception of different actors in the Agricultural University system such as Deans of various colleges, University teachers and students. Questions were asked on extent of improvement of various procedures of the university with the use of ICT.

#### DEANS

**Table 16: Distribution of Deans according to awareness and usage of ICT tools**

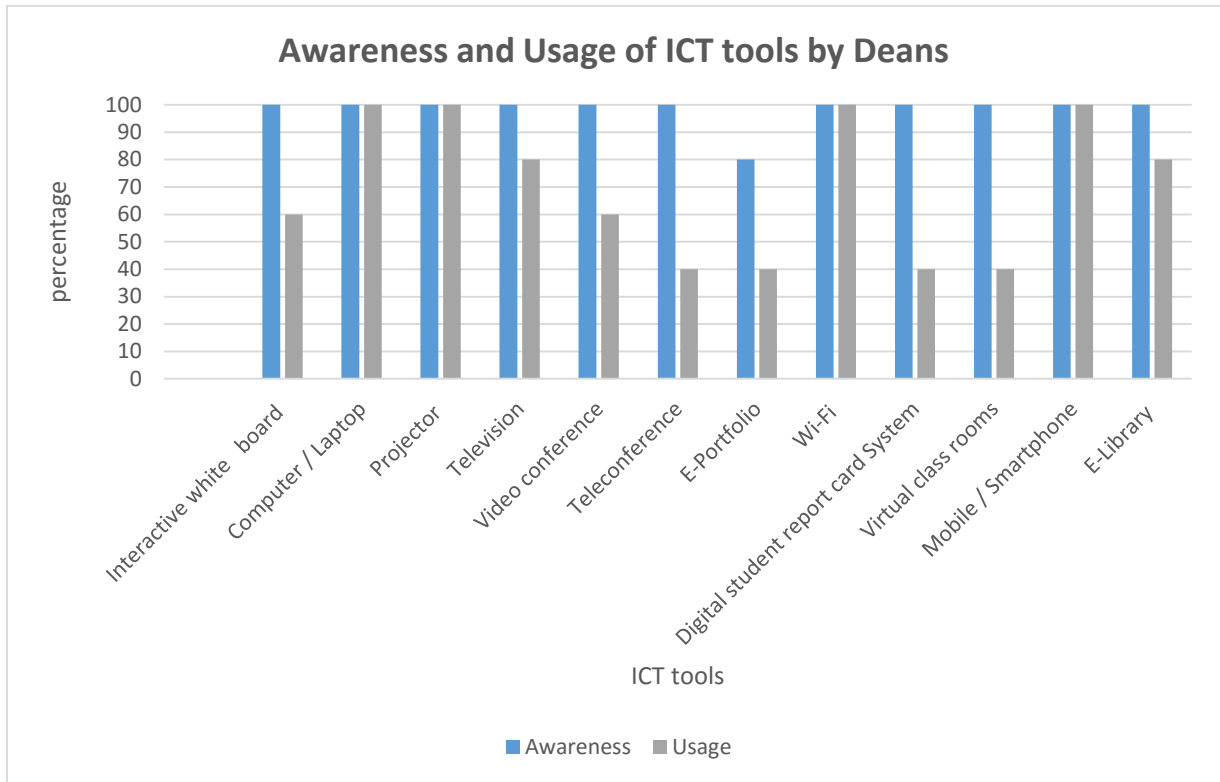
n=20

S. No	Category	Awareness of ICT		Usage of ICT	
		Frequency (Yes)	Percentage	Frequency (Yes)	Percentage
1	Interactive white board	20	100.00	12	60.00
2	Computer / Laptop	20	100.00	20	100.00
3	Projector	20	100.00	20	100.00
4	Television	20	100.00	16	80.00
5	Video conference	20	100.00	12	60.00
6	Teleconference	20	100.00	08	40.00
7	E-Portfolio	16	80.00	08	40.00
8	Wi-Fi	20	100.00	20	100.00
9	Digital student report card System	20	100.00	08	40.00
10	Virtual class rooms	20	100.00	08	40.00
11	Mobile / Smartphone	20	100.00	20	100.00
12	E-Library	20	100.00	16	80.00

Table 16 indicates that all the Deans under study were aware of the usage of various ICT tools except four Deans who were not aware of e-portfolio. Talking about usage, all of them were using computers, Wi-Fi, smart phones and LCD projectors whereas computers, smart phones and



Wi-Fi were used by all the Deans daily. Majority of the Deans of various colleges under study had never used tele-conferencing, e-portfolio, digital student report card system and virtual classrooms for teaching learning process (Table 16 &17).



**Fig 15: Awareness and usage of ICT tools by Deans**

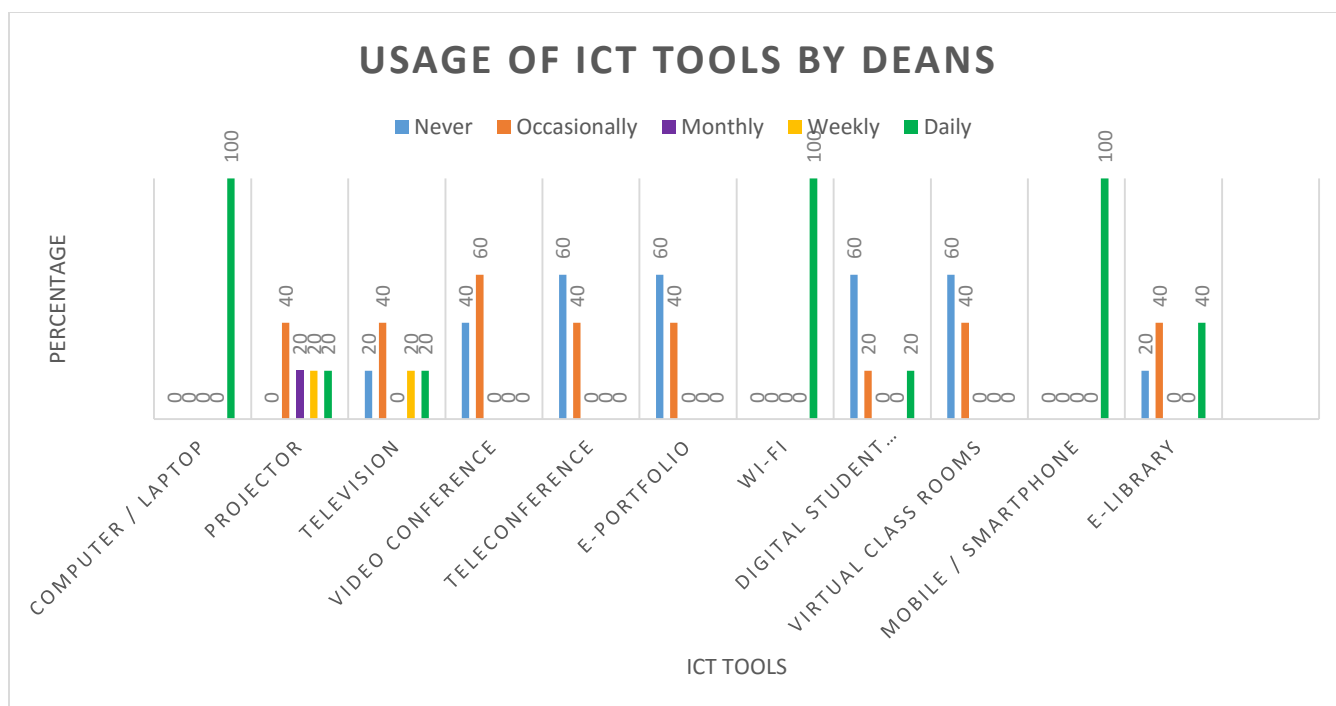


**Plate 7: Interactive white board at one of the SAUs**

**Table 17: Distribution of Deans according to usage frequency of ICT tools**

n=20

S.No	Category	Never	Occasionally	Monthly	Weekly	Daily
1	Interactive white board	40.00	20.00	0.00	20.00	20.00
2	Computer / Laptop	0.00	0.00	0.00	0.00	100.00
3	Projector	0.00	40.00	20.00	20.00	20.00
4	Television	20.00	40.00	0.00	20.00	20.00
5	Video conference	40.00	60.00	0.00	0.00	0.00
6	Teleconference	60.00	40.00	0.00	0.00	0.00
7	E-Portfolio	60.00	40.00	0.00	0.00	0.00
8	Wi-Fi	0.00	0.00	0.00	0.00	100.00
9	Digital student report card System	60.00	20.00	0.00	0.00	20.00
10	Virtual class rooms	60.00	40.00	0.00	0.00	0.00
11	Mobile / Smartphone	0.00	0.00	0.00	0.00	100.00
12	E-Library	20.00	40.00	0.00	0.00	40.00



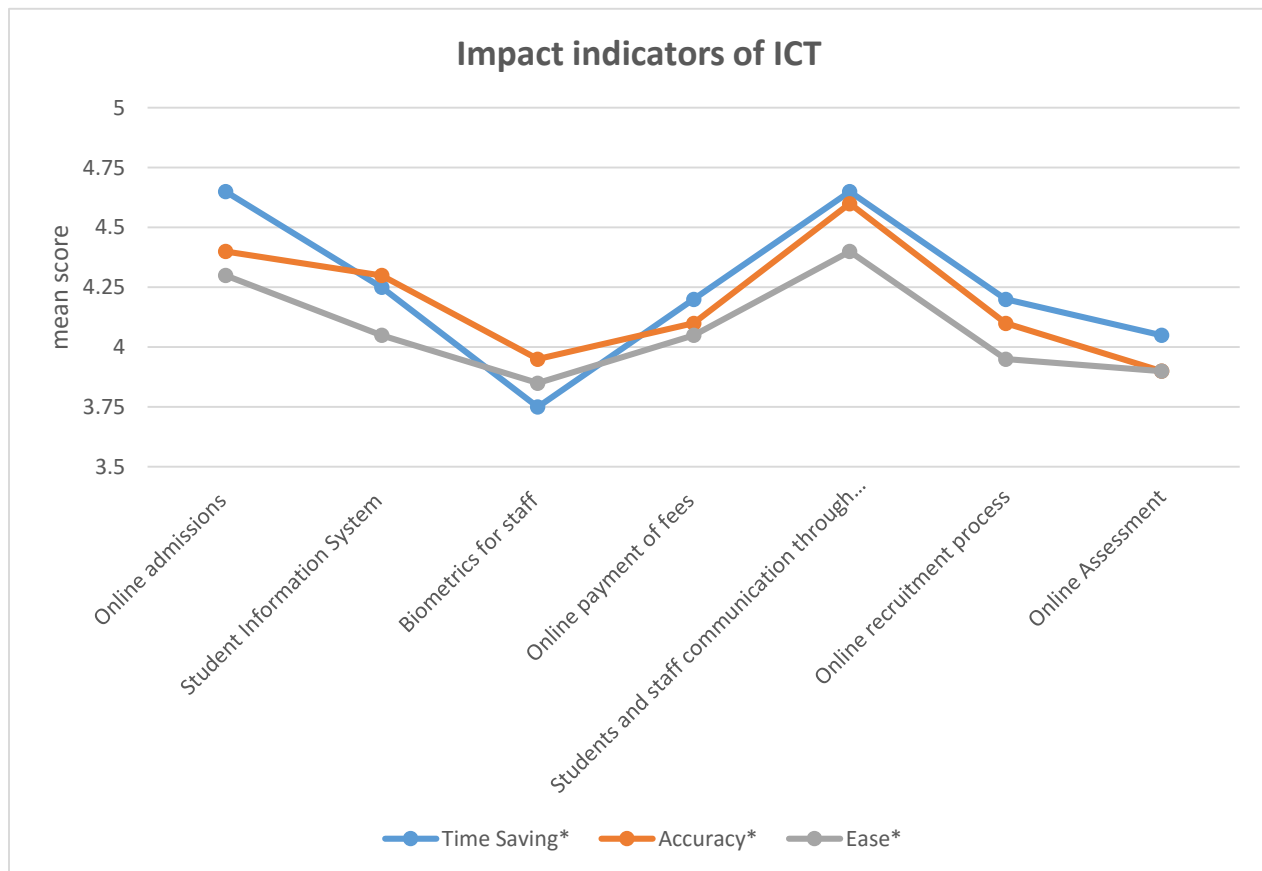
**Fig 16: Usage frequency of ICT tools by Deans**

**Table 18: Impact of ICT in Educational Administration**

n=20

S.No	Category	Time Saving*	Accuracy*	Ease*
1	Online admissions	4.65	4.40	4.30
2	Student Information System	4.25	4.30	4.05
3	Biometrics for staff	3.75	3.95	3.85
4	Online payment of fees	4.20	4.10	4.05
5	Students and staff communication through email	4.65	4.60	4.40
6	Online recruitment process	4.20	4.10	3.95
7	Online Assessment	4.05	3.90	3.90

\*(5- Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree, 1- Strongly Disagree)



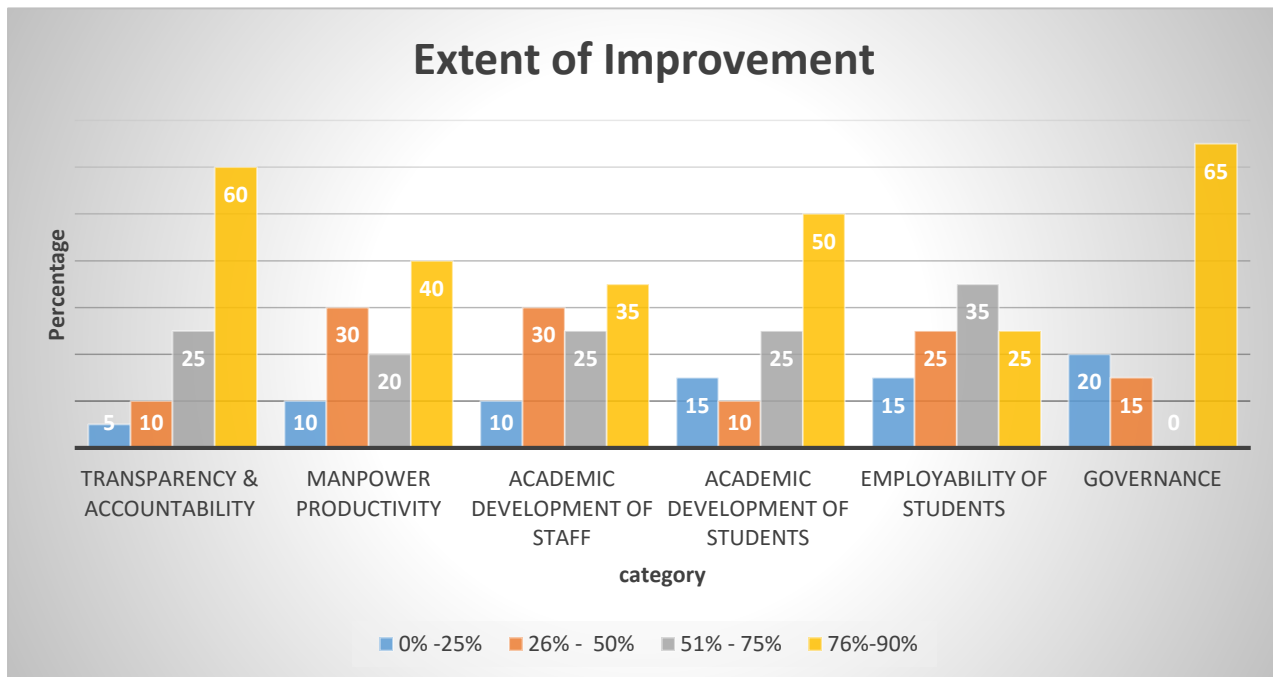
**Fig 17: Impact of ICT in Educational Administration**

Table 18 clearly depicts that all the Deans of different colleges of northern India almost fell in the category of strongly agree regarding considering online admissions and student staff communication through e-mail to be time saving whereas on the basis of mean value, it can be concluded that the responses were somewhere between Strongly Agree and Agree regarding accuracy of online admissions, Student Information System (SIS), Online payment of fees and student-staff communication through e-mail. Regarding how far has ICT eased their lives, all the Deans agreed for all the categories of work except biometrics for staff for which the Deans just agreed. The reason for this could be that University teachers have to take their classes as per schedule, it hardly matters whether biometrics is there or not.

**Table 19: Extent of Improvement in Educational Administration as a result of ICT**

n=20

S.No	Category	0% -25%	26% - 50%	51% - 75%	76%-90%
1	Transparency & Accountability	5.00	10.00	25.00	60.00
2	Manpower Productivity	10.00	30.00	20.00	40.00
3	Academic development of staff	10.00	30.00	25.00	35.00
4	Academic development of students	15.00	10.00	25.00	50.00
5	Employability of students	15.00	25.00	35.00	25.00
6	Governance	20.00	15.00	0.00	65.00



**Fig 18: Extent of Improvement in Educational Administration**

A perusal of Table 19 and Fig 18 reveals that majority of the Deans agreed to the fact that transparency & accountability and governance has improved to an extent of more than 76% to 90% whereas half of the respondents reported that academic development of students has improved to the extent of more than 76%. No doubt computers have made the governance process of universities easier and as a result, lot of improvement has taken place such as online admissions, notices, announcements, tenders *etc.* which can be done at the click of the mouse and saves human as well as non-human resources. More than one third Deans said that academic development of teachers has taken place to the extent of 76-90%. Now they can look for international conferences as well as write quality papers in less time.

### **Negative Impact of ICTs**

In spite of positive impact of ICT, there are some negative impacts which were reported by the Deans of the various SAUs of Madhya Pradesh. According to them, due to more and more dependence on ICT, students and staff both are skipping field work and laboratory classes. ICT has increased the dependency among students which result in low thinking, innovations and creativity. Other impact like e-pollution and misuse/mishandling of ICT (cybercrime) was reported. Whereas, the Deans of the SAUs of Gujarat said that since all ICT tools depend on electricity hence when no electricity is available, work may get delayed. They also said that in spite of ICT, paper work is still there because e-mail communication is not considered at administrative level. ICT may at times be misused unless and until authenticated. The Deans of various colleges in Rajasthan said that ICT is at times more of hassle because in spite of ICT, paper work is just as it was, therefore it demands double the amount of time and work input. They also said that it is difficult to use ICT without training. SKUAST, Jammu Deans said that chances of plagiarism have become more as a result of ICT use and also time killing is too much due to web surfing. One aspect which all the Deans reported is that ICTs have led to lack of physical activity, reduced personal interaction, security & privacy. All the Deans under study felt that as a result of ICT, students and staff were found to be wasting time on irrelevant activities on social media like WhatsApp and Facebook. Also, due to ICT, students were losing their creativity.

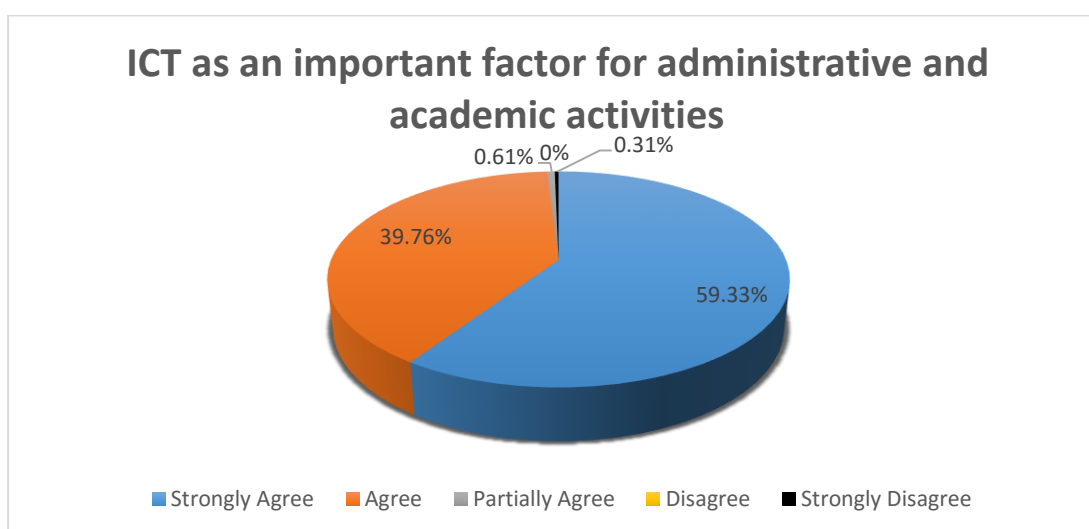
Thus, it is concluded that proper training in ICTs is the need of the hour and students as well as faculty should be trained on how to make judicious use of Information Communication Technologies.

## TEACHERS

**Table 20: ICT as an important factor for carrying out administrative and academic activities**

**n=327**

S. No.	Categories	Frequency	Percentage
1	Strongly Agree	194	59.33
2	Agree	130	39.76
3	Partially Agree	2	0.61
4	Disagree	0	0.00
5	Strongly Disagree	1	0.31



**Fig 19: ICT as an important factor for administrative and academic activities**

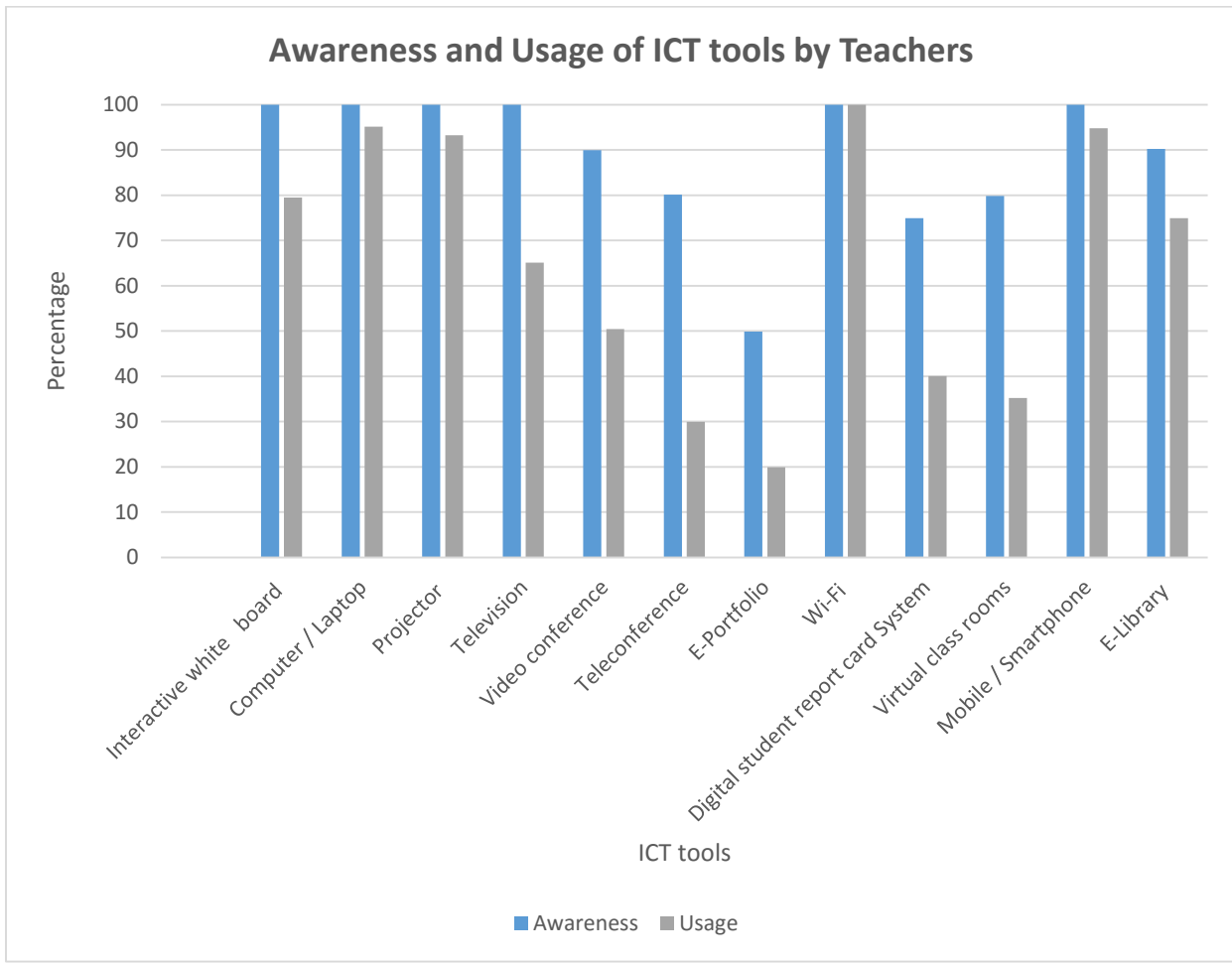
Table 20 shows that almost 60 percent of the teachers of State Agricultural Universities strongly agreed that ICT has become a very important factor for carrying out Administrative and academic activities of the colleges whereas the remaining 39.76 % just agreed to this statement. Only two University teachers partially agreed to this statement. Rathore *et. al* (2017) found that majority of the agricultural universities use ICT only for result declaration, admission and exam notification as far as administrative and academic activities are concerned. For constant monitoring of teaching – leaning activities of the Universities, Closed Circuit Television (CCTV) were an integral part of universities like JNKVV, Jabalpur and RVSKVV, Gwalior in Madhya Pradesh and Anand Agricultural University, Anand (Gujarat).

**Table 21: Distribution of Teachers according to awareness and usage of ICT tools****n=327**

S. No	Category	Awareness of ICT		Usage of ICT	
		Frequency (Yes)	Percentage	Frequency (Yes)	Percentage
1	Interactive white board	327	100.00	260	79.51
2	Computer / Laptop	327	100.00	311	95.11
3	Projector	327	100.00	305	93.27
4	Television	327	100.00	213	65.13
5	Video conference	294	89.91	165	50.46
6	Teleconference	262	80.12	98	29.97
7	E-Portfolio	163	49.85	65	19.88
8	Wi-Fi	327	100.00	327	100.00
9	Digital student report card System	245	74.92	131	40.06
10	Virtual class rooms	261	79.82	115	35.17
11	Mobile / Smartphone	327	100.00	310	94.80
12	E-Library	295	90.21	245	74.92

It is evident from Table 21 that cent percent university teachers under study were aware of interactive white board, computer/laptop, LCD projector, television, Wi-Fi and mobile/smartphone but as far as the usage is concerned, only Wi-Fi was being used by all the teachers under study whereas majority of the teachers reported to have been using interactive white board, computer/laptop, projector, television, mobile/smart phone and e-library for teaching- learning. ICT has enabled the teaching – cum- learning qualities to newer heights *i.e.* source of knowledge, motivation, nurturing lifelong learning habits, establishing online learning, as a tool for research, means of interaction, improving the delivery of library services, offering a source of academic databases and e-books (Nallusamy *et. al.*). Mendhe and Dhandore (2014) conducted a study on knowledge and use of e-resources among the awareness of agriculture and agricultural engineering faculty and scientists of India stated that the majority of faculty and scientists preferred to use e-journals and use of e-mails followed by e-books, e-database and e-research report. An e-portfolio is an electronic collection of evidence that shows one's learning journey. Portfolios can relate to a

specific academic field or one’s lifelong learning. Evidence may include writing samples, photos, videos, research projects, observation by mentors and peers and/or reflective thinking. In the present study, it was found that only 49.85% respondents were aware of e-portfolio and still very less (19.88%) were using it. The possible reason could be that e-portfolio is not very commonly used by majority of the agriculture faculty and more than half were not even aware of the very term, “e-portfolio”.



**Fig 20: Awareness and Usage of ICT tools by Teachers**

It is concluded from Table 22 that Wi-Fi was the only technology which was used by all the teachers under study but as far as the frequency of usage was concerned, computer/laptop, Wi-Fi and mobile/smartphones were used by more than 90% of the respondents daily whereas 80% had never used e-portfolio. There were majority of the teachers under study who had never used teleconferencing, digital report card and virtual class rooms. It is well known that virtual classroom

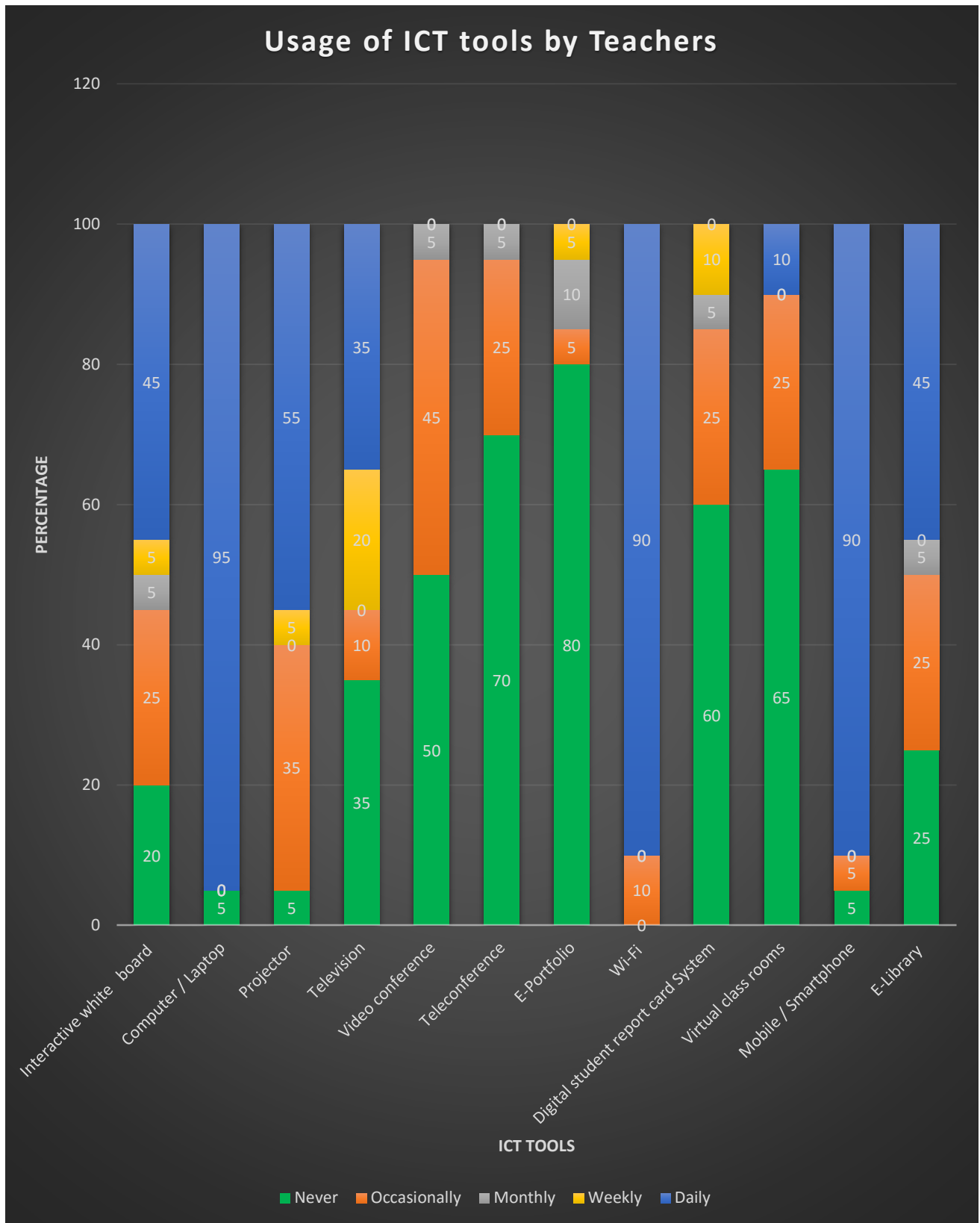


is an online real world learning environment. This is a synchronous method of teaching learning especially meant for those universities which have less number of teachers to teach the courses. It is recommended that newly formed universities like Jodhpur Agricultural University and NDVSU, Jabalpur who were facing problem of faculty crunch should be tech savvy and make use of virtual classrooms. A very good example is that of Professor Jayashankar Telangana State Agricultural University, Hyderabad which is on with its journey to virtual classrooms.

**Table 22: Distribution of Teachers according to usage frequency of ICT tools**

**n=327**

S. No	Category	Never	Occasionally	Monthly	Weekly	Daily
1	Interactive white board	20.00	25.00	5.00	5.00	45.00
2	Computer / Laptop	5.00	0.00	0.00	0.00	95.00
3	Projector	5.00	35.00	0.00	5.00	55.00
4	Television	35.00	10.00	0.00	20.00	35.00
5	Video conference	50.00	45.00	5.00	0.00	0.00
6	Teleconference	70.00	25.00	5.00	0.00	0.00
7	E-Portfolio	80.00	5.00	10.00	5.00	0.00
8	Wi-Fi	0.00	10.00	0.00	0.00	90.00
9	Digital student report card System	60.00	25.00	5.00	10.00	0.00
10	Virtual class rooms	65.00	25.00	0.00	0.00	10.00
11	Mobile / Smartphone	5.00	5.00	0.00	0.00	90.00
12	E-Library	25.00	25.00	5.00	0.00	45.00



**Fig 21: Usage frequency of ICT tools by Teachers**

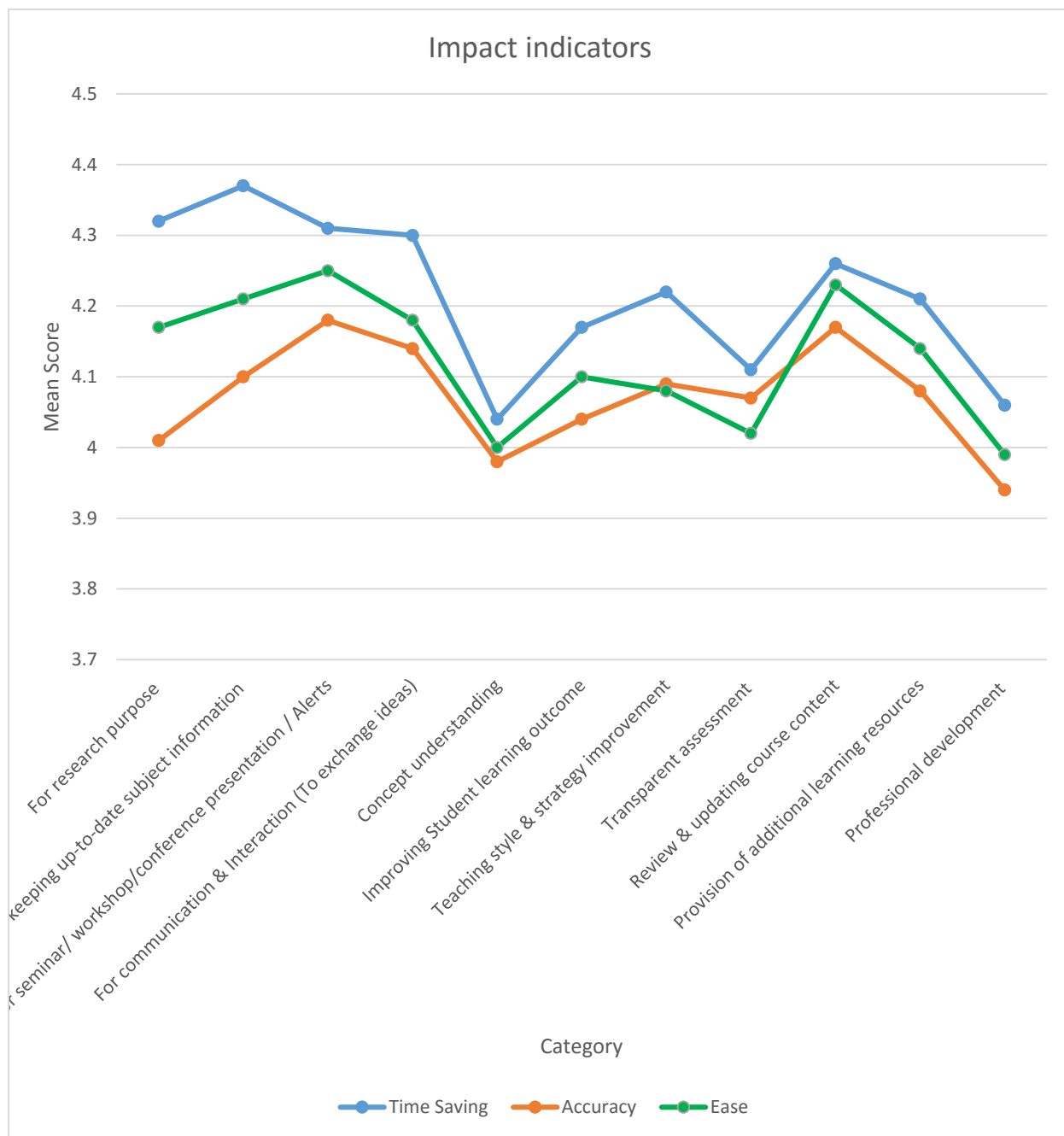
**Table 23: Impact indicators by Teachers**

n=327

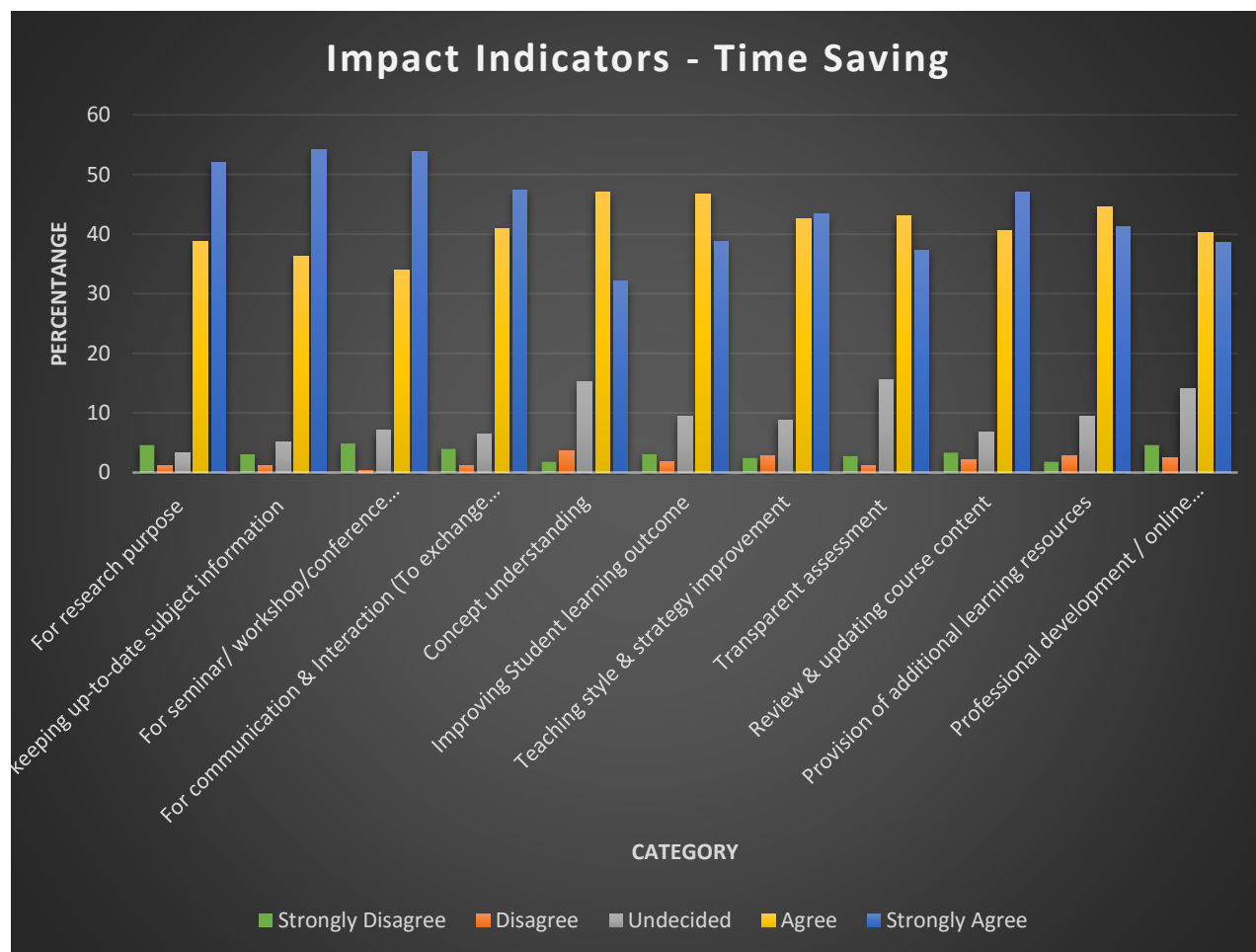
S.No	Category	Time Saving*	Accuracy*	Ease*
1	For research purpose	4.32	4.01	4.17
2	For keeping up-to-date subject information	4.37	4.10	4.21
3	For seminar/ workshop/conference presentation / Alerts	4.31	4.18	4.25
4	For communication & Interaction (To exchange ideas)	4.30	4.14	4.18
5	Concept understanding	4.04	3.98	4.00
6	Improving Student learning outcome	4.17	4.04	4.10
7	Teaching style & strategy improvement	4.22	4.09	4.08
8	Transparent assessment	4.11	4.07	4.02
9	Review & updating course content	4.26	4.17	4.23
10	Provision of additional learning resources	4.21	4.08	4.14
11	Professional development	4.06	3.94	3.99

\*(5- Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree, 1- Strongly Disagree)

It is very interesting to note in Table 23 that all the teachers agreed that ICTs are time saving, provide accurate information and can be accessed with ease for research purpose, help in maintaining up-to-date subject information, for seminars/workshops/conference/presentation/ alerts, for communication and interaction, improve student learning outcome, concept understanding, teaching style and strategy improvement, transparent assessment, review and update of course content, provision of additional learning resources and professional development. As far as accuracy was concerned, the mean value was less for concept understanding, research purpose and improving student learning outcome. This infers that though ICT is time saving and easy but for some aspects, it lacks accuracy because different sources give different data and some of the sources are also not authentic such as blogs, Wikipedia, you-tube videos *etc.*



**Fig 22: Impact of ICT for Teaching purpose**



**Fig 23: Impact of ICT as Time Saving for Teaching purpose**

On viewing the minor details of impact of ICT in saving time as reported by the teachers, more than half of them strongly agreed that ICTs save time for keeping up-to-date subject information, for keeping a track of seminars/workshops/conference/presentation/ alerts and for research purpose such as getting review of the various research studies and information on projects *etc.* There were only six teachers who strongly disagreed to the fact that ICTs are time saving for concept understanding and also make provision for additional learning resources. Also, 2.45% teachers under study disagreed that ICTs would save time for teaching style and strategy improvement. They said that teaching style and strategy can only be improved through practice and ICTs cannot bring about change overnight. On personal interaction with the agricultural university teachers, it was revealed that few of them were not aware of the very concept of Massive Online Open Courses (MOOCs).

**Table 24: Impact Indicator - Time Saving**

n=327

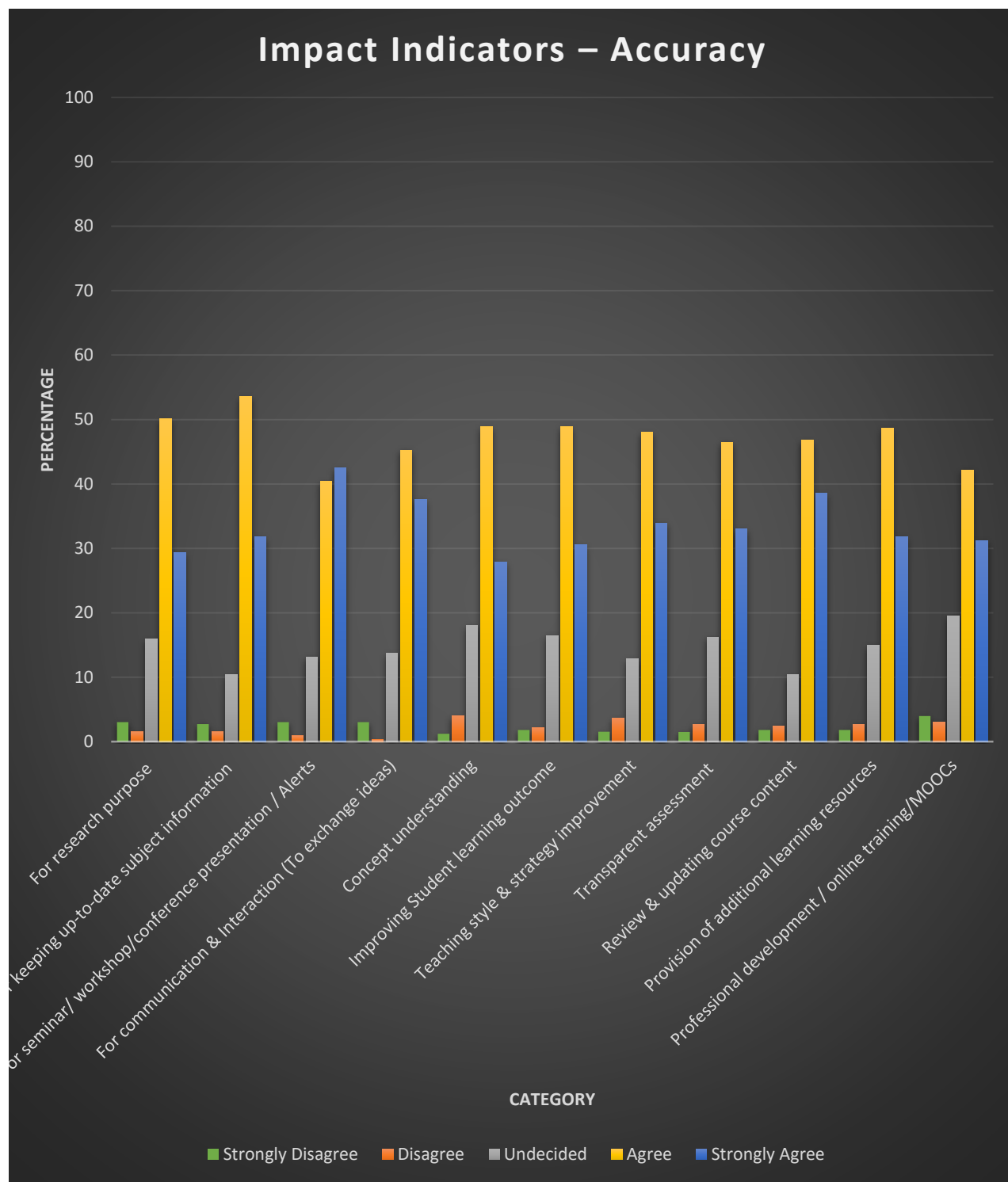
S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	For research purpose	4.59	1.22	3.36	38.84	51.99
2	For keeping up-to-date subject information	3.06	1.22	5.20	36.39	54.13
3	For seminar/ workshop/conference presentation / Alerts	4.89	0.31	7.03	33.94	53.82
4	For communication & Interaction (To exchange ideas)	3.98	1.22	6.42	40.98	47.40
5	Concept understanding	1.83	3.67	15.29	47.09	32.11
6	Improving Student learning outcome	3.06	1.83	9.48	46.79	38.84
7	Teaching style & strategy improvement	2.45	2.75	8.87	42.51	43.43
8	Transparent assessment	2.75	1.22	15.60	43.12	37.31
9	Review & updating course content	3.36	2.14	6.73	40.67	47.09
10	Provision of additional learning resources	1.83	2.75	9.48	44.65	41.28
11	Professional development / online training/MOOCs	4.59	2.45	14.07	40.37	38.53

A perusal of Table 25 shows that more than half of the teachers under study agreed to the fact that ICTs provide accurate information for research purpose and for keeping up-to-date subject information. Yet, a little less than half of the teachers of the SAUs of northern India agreed that ICTs seem to be accurate for improving student learning outcome, concept understanding, for communication & interaction, transparent assessment, provision of additional learning resources, giving accurate information for improving student learning outcome, teaching style & strategy improvement, review & updating course content. More than 40% of the teachers strongly agreed only for one item that ICTs provide accurate information for seminar/ conference/ workshops/ presentation alerts. The fact that ICTs are providing accurate information for professional development such as online trainings/ MOOCs, 42.2% agreed and 31.19% strongly agreed for the same statement.

**Table 25: Impact Indicator – Accuracy**

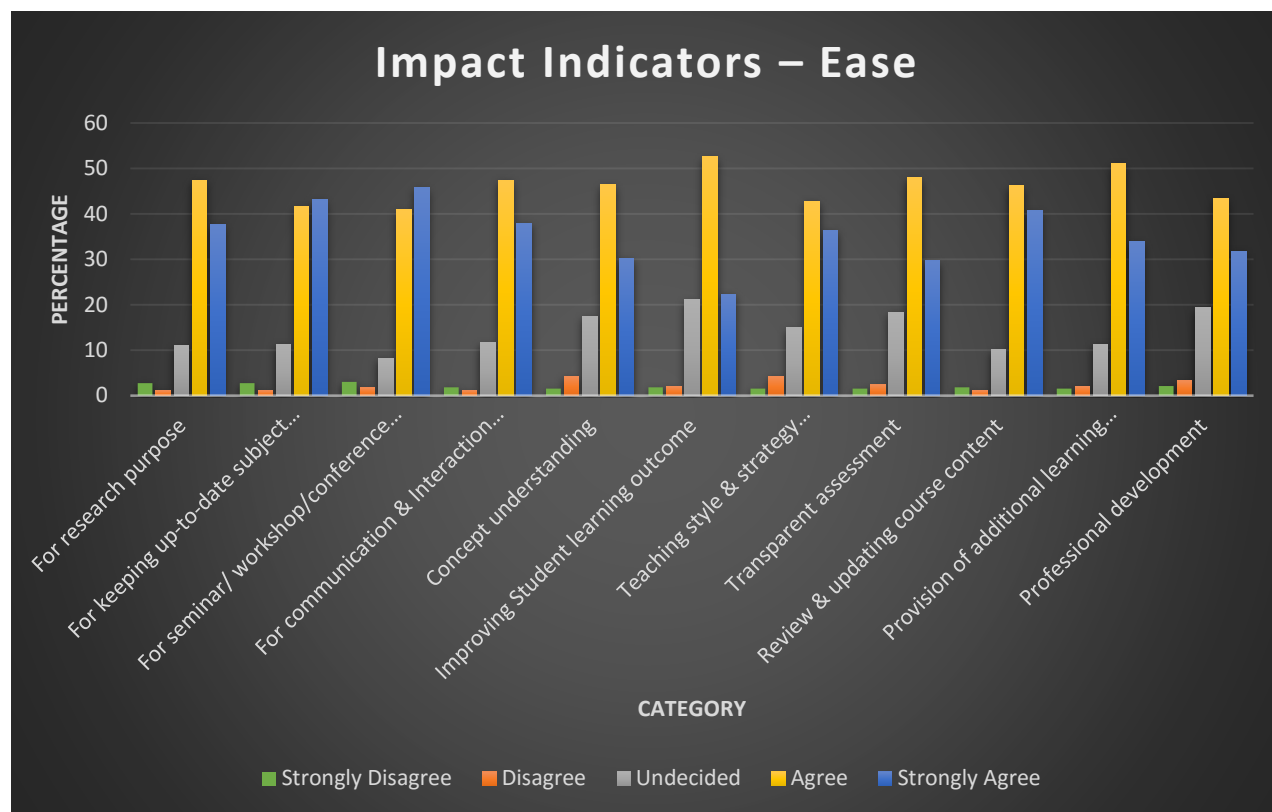
n=327

S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	For research purpose	3.06	1.53	15.90	50.15	29.36
2	For keeping up-to-date subject information	2.75	1.53	10.40	53.52	31.80
3	For seminar/ workshop/conference presentation / Alerts	3.06	0.92	13.15	40.37	42.50
4	For communication & Interaction (To exchange ideas)	3.06	0.31	13.76	45.26	37.61
5	Concept understanding	1.22	3.98	18.04	48.93	27.83
6	Improving Student learning outcome	1.84	2.14	16.51	48.93	30.58
7	Teaching style & strategy improvement	1.54	3.67	12.84	48.01	33.94
8	Transparent assessment	1.53	2.75	16.21	46.48	33.03
9	Review & updating course content	1.83	2.45	10.40	46.79	38.53
10	Provision of additional learning resources	1.83	2.75	14.98	48.64	31.80
11	Professional development / online training/MOOCs	3.98	3.06	19.57	42.20	31.19



**Fig 24: Impact of ICT in terms of providing accurate information for Teaching purpose**





**Fig 25: Impact of ICT in terms of ease for Teaching purpose**

As already discussed that based on the mean scores regarding considering ICTs as making teaching learning process easy, all the 11 items in Table 23 had mean scores between 3.99 – 4.25 which indicates that ICTs had made an impact in terms of making teaching learning process easier. When we observe the details of Table 25; it is seen that the more than half of the respondents agreed for six items namely; for research purpose, for seminars/workshop/conference *etc*, to exchange information with students, concept understanding, improving student learning outcome and transparent assessment. More than one –third of the teachers strongly agreed that all the eleven components of Table 26 are making the teaching learning process easy. Only five persons strongly disagreed that ICTs are easy pathways to improving student learning outcome, ICTs making the teaching learning process easy by providing additional learning resources and make the professional development of faculty members easier. It is inferred that these particular faculty members might not be IT savvy and doesn't find ICT easing the teaching learning process in this regard. Still, 18-1% respondents were undecided about ICT easing the various functions that are performed in teaching learning situation of an agricultural university system. Relevant findings were reported by Pouratashi and Mokhtarnia (2009) in a study on “Analysis of factors influencing application of ICT

by agricultural graduate students” that agricultural faculty had positive opinion towards internet use. Respondents identified that advantages of using internet in education and research activities, predominantly, as ease access to information and communication resources, increase the level of knowledge, enhance communication and interaction between colleges, within faculties and between faculties and students. The main purposes of respondents for searching internet were doing research activities and updating professional information.

**Table 26: Impact Indicator – Ease**

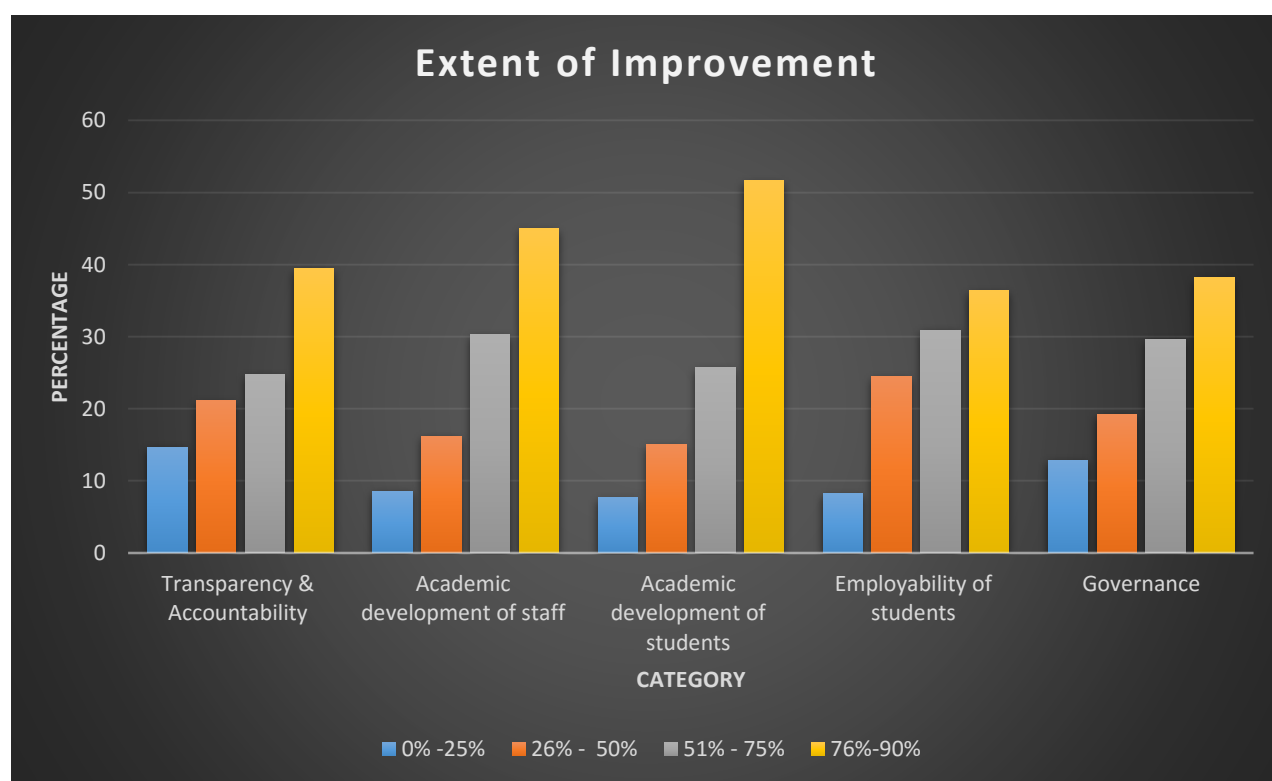
**n=327**

S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	For research purpose	2.75	1.22	11.01	47.40	37.62
2	For keeping up-to-date subject information	2.75	1.22	11.31	41.59	43.13
3	For seminar/workshop/conference presentation / Alerts	3.06	1.83	8.26	40.98	45.87
4	For communication & Interaction (To exchange ideas)	1.83	1.22	11.62	47.40	37.93
5	Concept understanding	1.53	4.28	17.43	46.48	30.28
6	Improving Student learning outcome	1.83	2.14	21.10	52.60	22.33
7	Teaching style & strategy improvement	1.53	4.28	14.98	42.82	36.39
8	Transparent assessment	1.53	2.45	18.35	48.01	29.66
9	Review & updating course content	1.83	1.23	10.09	46.18	40.67
10	Provision of additional learning resources	1.54	2.14	11.31	51.07	33.94
11	Professional development	2.14	3.36	19.27	43.43	31.80

**Table 27: Perception of teachers regarding Extent of Improvement in the educational systems as a result of ICT intervention**

n=327

S.No	Category	0% -25%	26% - 50%	51% - 75%	76%-90%
1	Transparency & Accountability	14.68	21.10	24.77	39.45
2	Academic development of staff	8.56	16.21	30.28	44.95
3	Academic development of students	7.65	14.98	25.69	51.68
4	Employability of students	8.26	24.46	30.89	36.39
5	Governance	12.84	19.27	29.66	38.23



**Fig 26: Perception of teachers regarding Extent of Improvement**

Table 27 demonstrates that almost half of the teachers of State Agricultural Universities of northern India consider ICTs to be impacting the agricultural higher education in terms of academic development of students and staff to the extent of 76 -90 %, whereas only 24.46% teachers said that

ICTs have made 26-50% improvement in employability of students and almost equal percentage of respondents (29.66%) gave credit to ICTs for improvement in governance in the teaching learning process of agricultural university system in the range of 51-75%. The findings are supported with that of Prestridge (2012) who also stated that teachers are acknowledging the role of ICT as a knowledge construction tool through collaborative activity, the relevancy of ICT to society and future employability and the orientation towards authentic problem based approaches to teaching and learning.

**Table 28: Negative impacts of ICT in Teaching-Learning process**

**n=327**

<b>S. No.</b>	<b>Negative Impacts</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Ranking</b>
<b>1</b>	Students reluctant to attend classes	302	92.35	<b>I</b>
<b>2</b>	Insufficient use of library by students	298	91.13	<b>II</b>
<b>3</b>	Wastage of time in net surfing	288	88.07	<b>III</b>
<b>4</b>	Over dependence on ICT	275	84.09	<b>IV</b>
<b>5</b>	Plagiarism problem	263	80.42	<b>V</b>
<b>6</b>	Social media distraction	243	74.31	<b>VI</b>
<b>7</b>	Spurious information	230	70.33	<b>VII</b>
<b>8</b>	Duplication of research	227	69.42	<b>VIII</b>
<b>9</b>	Diminishing reading & writing skills of students	218	66.67	<b>IX</b>
<b>10</b>	Virus problem	189	57.79	<b>X</b>
<b>11</b>	Privacy problems	114	34.86	<b>XI</b>
<b>12</b>	Time consumption for preparation of ICT tools for teaching	59	18.04	<b>XII</b>

However good a technology is, there are always good and bad points associated with its adoption. Information and Communication Technologies are no exception. Table 28 shows some of the negative impacts of ICT that were reported by teachers of the State Agricultural Universities of northern India. Based on the responses received, the negative impact of ICT has been ranked to understand the intensity of the negative impact as perceived by the teachers in teaching learning process that takes place in Universities. The negative impacts of ICT which were reported by majority of the teachers under study were students reluctant to attend classes, insufficient use of library by students, wastage of time in net surfing, over dependence on ICT, plagiarism problem, social media distraction, spurious information, duplication of research and diminishing reading and writing skills of students. It is seen that as a result of ICT, students are reluctant to attend classes

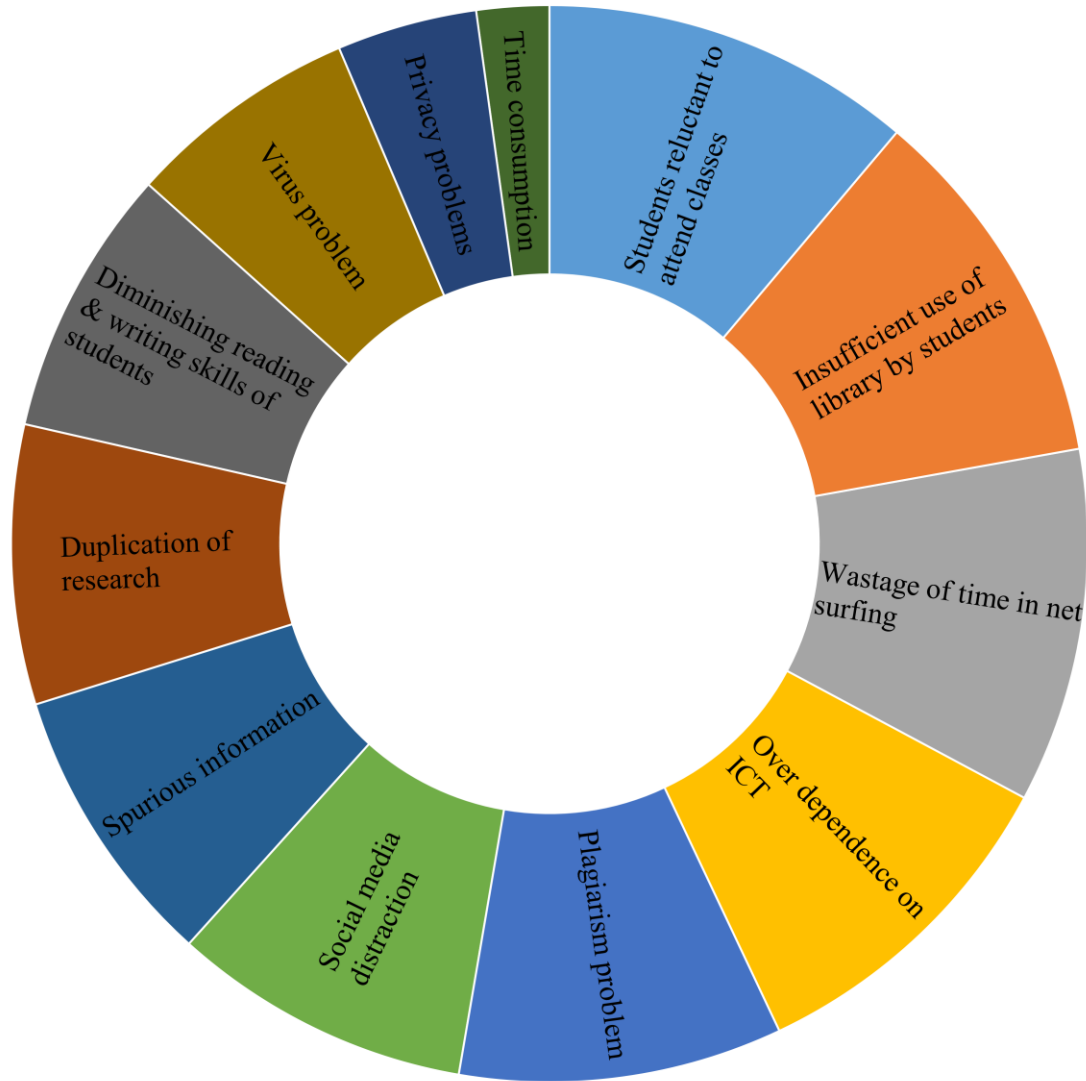
thinking that they will manage to learn from internet or Power point presentation. Hence, students don't want to attend the classes and are not interested in the way teachers teach, especially when they just run the slide show without much of explanation. Sometimes ICT is mistaken as a replacement of face-to-face learning. The art of professional teacher by chalk and talk is losing the ground. Thus, it would be no anomaly if we say, "PPT has become stronger and Teacher weaker". The faculty in remote colleges away from headquarter are involved in other activities thus obtaining electronic notes from college at the headquarter and course coverage will remain as a ritual and marking in mid-term and practical is observed to be higher; this practice deprives good students to gain knowledge and reduce opportunity for them to obtain admission in higher education and competitive examinations.

Another serious problem associated with ICT which was reported by majority is over dependence on ICT. There is overdependence on ICT than on inherent capability. Most of the time people are hooked to computer rather than going to field in agricultural sciences. Over dependency of some teachers on ICT tools have badly affected their teaching ability to generate positive situation for teaching. Overuse of ICT has restricted teachers to apply the practical approaches to teaching in real life situation. Field research and survey have got diluted. Hard working abilities and use of creativity is declining. Due to learners' overdependence on ICT, problem of copy –paste is very much prominent. It has resulted into plagiarism and fabrication in research resulting in widespread research misconduct. Besides, students have become habitual of copy and paste when writing review of literature for their theses and dissertations. Students are just completing their assignments without understanding the content as they have the liberty to get material from online sources without using their innovative ideas and lateral thinking skills. Visits to library are occasional and almost nil as all information is available on the click of a mouse. Due to diminishing library visits, book reading habits are dying and so is the case with writing skills. Students attempt short cut as a result they give less time to their books by which their basic concept regarding subjects are not cleared. As a result, depth of knowledge of the students may weaken.

More than 70% of the university teachers said that the information provided on internet is at times spurious as most of the websites do not give very authentic information or information is not regularly updated. Too much of information on a single topic creates chaos and confusion; sometimes accuracy and trustworthiness the of information is doubtful. Wastage of time in net

surfing was reported by more than 80% of the teachers under study. It is true that excess of everything is bad so ICT is no exception. Excess use of ICT can distract the students in achieving their main goal. For example, it reduces social interaction, physical activity and unproductive engagement in social media. Around two third of the teachers reported that social media distraction was one of the greatest negative impacts of ICTs. It is often seen that sometimes students use Facebook and WhatsApp even during classes which distracts their attention and are not able to concentrate in their studies. Social media no doubt makes one addicted; all the time engaged. Another negative aspect of social media that was felt by the respondents is related to privacy. Similar results were obtained by Olaore (2014) in a study conducted in Nigeria which stated that students and sometimes teachers can get hooked on the technology aspect rather than the subject content. Facebook, twitter, YouTube, Instagram and other social media networking sites can be a distraction to living and learning in the real world. Advertisements take advantage of the big data that exist in the interface of users of these networking sites and market their various goods and services to the user. Educational institutions are not exempted from these marketing efforts of the big data houses such as Google, Microsoft, Yahoo *etc.*

### Negative impacts of ICT in Teaching-Learning process



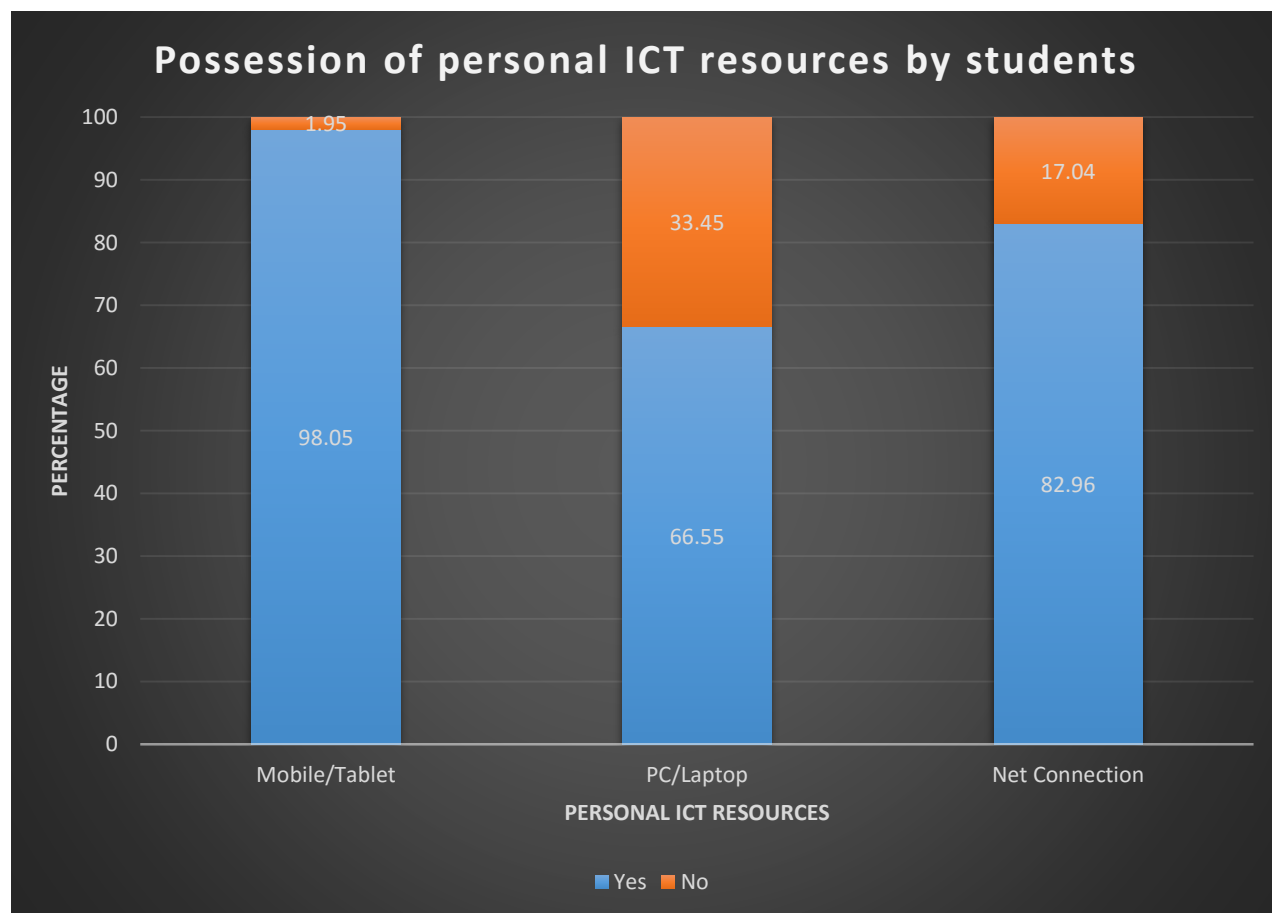
**Fig 27: Negative impacts of ICT in Teaching-Learning Process**

# Students

**Table 29: Possession of personal ICT resources by students**

**n=1438**

S.No	Category	Frequency (Yes)	Percentage	Frequency (No)	Percentage
1	Mobile/Tablet	1410	98.05	28	1.95
2	PC/Laptop	957	66.55	481	33.45
3	Net Connection	1193	82.96	245	17.04



**Fig 28: Possession of personal ICT resources by students**

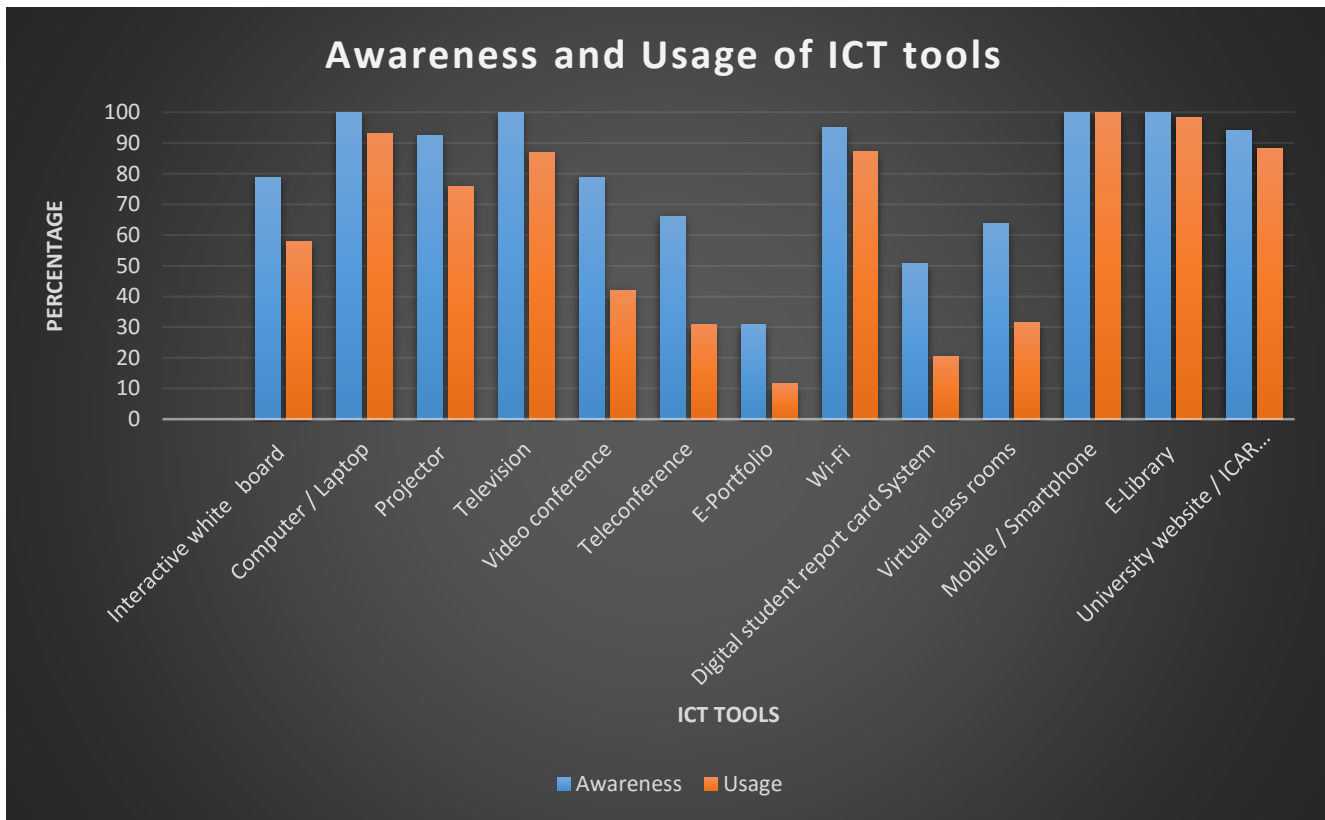


To use ICTs to its fullest extent, it is deemed important to have possession of different ICT gadgets such as mobiles, tablets, personal computers, laptops, internet connections *etc.* In the present study, it was revealed that (Table 29) majority of the students of the agricultural universities of northern India had their own mobiles/tablets, laptops and internet connections. Though it is evident from Table 10 that majority of the students' hostels had internet facility barring a few such as J&K (all colleges) and Rajasthan (50%), still students preferred to have personal internet connections in their smart phones in the form of data packs and internet dongles. The reasons given by students for having their personal connection is that the internet speed provided by the university authorities in the hostel was very slow so to keep pace with the technological revolution, it was deemed important to have a personal internet connection. Findings are in support of Rhoades *et. al.* (2008) who also indicated that almost all the students enrolled in College of Agriculture courses at University of Florida found that 98.8% owns a computer. While at home, majority of students are connecting to the internet using high speed (55.3%) and Wi-Fi (37.5%) and at college, almost half (49.8%) of the respondents indicated using a computer lab to go online. Similar findings were reported by Pouratashi and Rezvanfar (2010) that all agricultural graduate students of University of Tehran had a personal computer and about 73.6% were connected to internet.

**Table 30: Distribution of students according to awareness and usage of ICT tools**

**n=1438**

S.No	Category	Awareness		Usage	
		Frequency (Aware)	Percentage	Frequency (Yes)	Percentage
1	Interactive white board	1131	78.65	832	57.86
2	Computer / Laptop	1438	100.00	1338	93.05
3	Projector	1332	92.63	1092	75.94
4	Television	1438	100.00	1250	86.93
5	Video conference	1134	78.86	605	42.07
6	Teleconference	951	66.13	444	30.88
7	E-Portfolio	442	30.73	165	11.47
8	Wi-Fi	1367	95.06	1256	87.34
9	Digital student report card System	727	50.56	295	20.51
10	Virtual class rooms	918	63.84	451	31.36
11	Mobile / Smartphone	1438	100.00	1438	100.00
12	E-Library	1435	99.79	1415	98.40
13	University website / ICAR website / other academic related websites	1355	94.23	1271	88.39



**Fig 29: Awareness and usage of ICT tools by Students**

Table 30 indicates that cent percent students under study were aware of computer, television and mobile/smart phone whereas all of them were using a mobile/smartphone. Majority of the students were using computer/laptop, projector, television, Wi-Fi, e-library and academic websites. Still more than 80% students were aware of LCD projector, Wi-Fi, e-library and academic websites and majority were using these ICT gadgets except projector (70.89%) where there was a difference of about 17%. This difference between awareness and usage of LCD projector can be linked to the number of Undergraduate students which were more in the sample (63.77%). The practice followed by the Universities of northern India for UG students does not involve much of presentations so except classrooms, there is no scope for using LCD projectors for students. Same is the case with interactive white boards where the difference between awareness (78.65%) and usage (57.86%) was around 21%. It was observed at the time of data collection that majority of the faculty members were using interactive white boards as ordinary white boards so the students were not aware of the term interactive white board as well as its use. It is a very sorry picture that the interactive white boards were not used for the purpose they were meant for. Digital report card system was another technology which was known by only half of the students under study and only 20.51% were in the

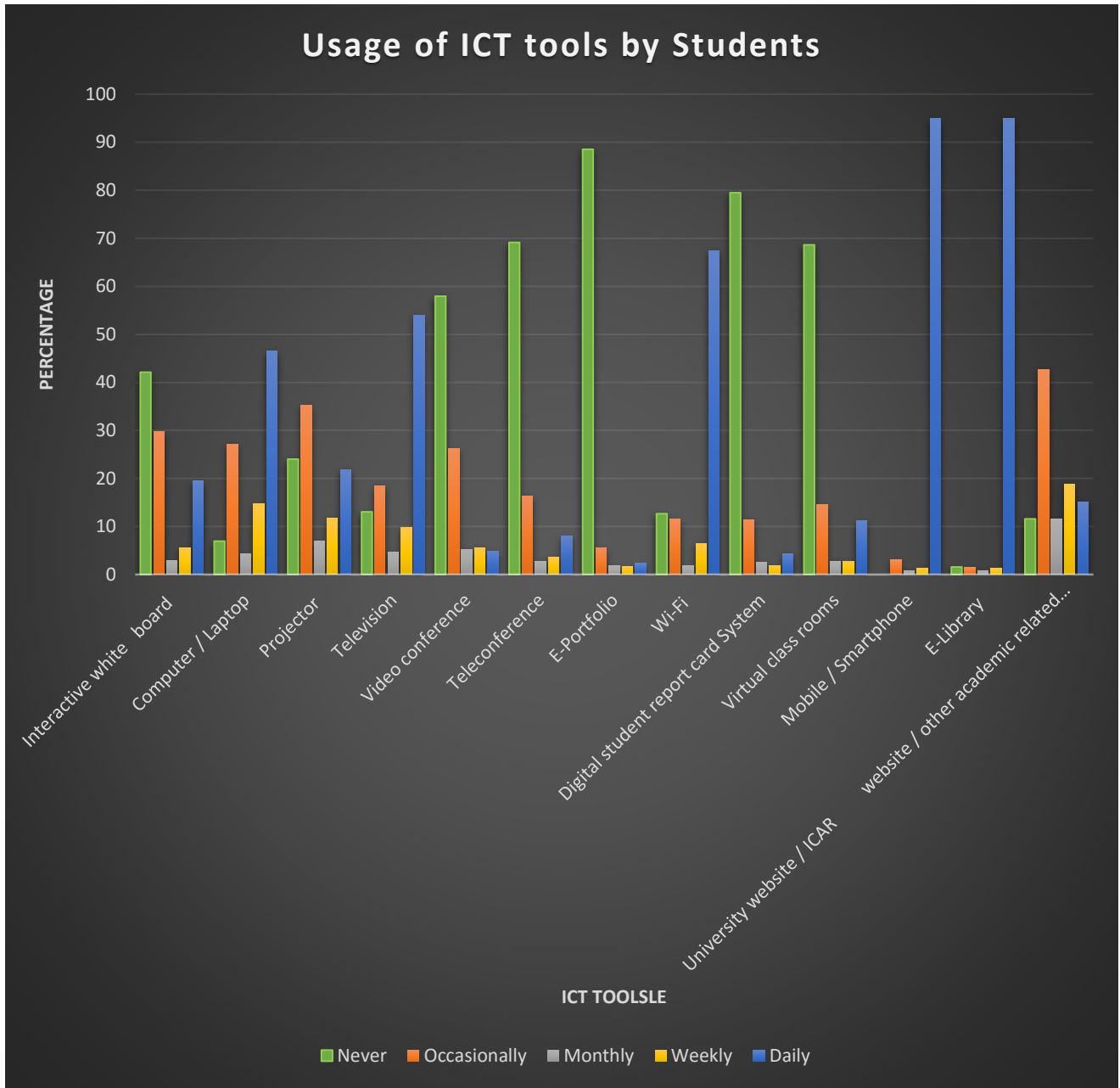
practice of using this technology. This can be attributed to the findings of Table 12 that only 8 colleges out of 20 under study were issuing digital report card to their students. It was revealed through discussion with the students that some of them even though they were using it were not aware of the very term, “Digital Report Card System”.

**Table 31: Frequency of usage of ICT tools by Students**

**n=1438**

S. No	Category	Never	Occasionally	Monthly	Weekly	Daily
1	Interactive white board	42.14	29.77	2.99	5.63	19.47
2	Computer / Laptop	6.96	27.19	4.45	14.81	46.59
3	Projector	24.06	35.26	7.02	11.75	21.91
4	Television	13.07	18.50	4.66	9.74	54.03
5	Video conference	57.93	26.22	5.29	5.70	4.86
6	Teleconference	69.12	16.27	2.85	3.69	8.07
7	E-Portfolio	88.53	5.49	1.88	1.74	2.36
8	Wi-Fi	12.66	11.54	1.87	6.54	67.39
9	Digital student report card System	79.49	11.47	2.64	1.95	4.45
10	Virtual class rooms	68.64	14.53	2.85	2.85	11.13
11	Mobile / Smartphone	0.00	3.07	0.76	1.25	94.92
12	E-Library	1.60	1.47	0.76	1.25	94.92
13	University website / ICAR website / other academic related websites	11.61	42.70	11.61	18.92	15.16

A perusal of Table 31 gives an insight into the frequency of usage of various ICT tools by the students such as interactive white board, computer/laptop, projector, video & teleconferencing, e-portfolio, Wi-Fi, digital report card system, virtual classrooms, mobile/smartphone, e-library and academic websites. It was reported that only three tools were used daily by majority of students, namely; Wi-Fi, mobile/smartphone and e-library whereas majority had never used teleconferencing, e-portfolio, digital report card system and virtual classrooms. Koshy and Kumar (2015) in a study on Kerala Agricultural University students found that 93.3% of post graduate students of KAU use internet as a source for retrieving information and this may be because this is the medium that can be easily accessed anytime.



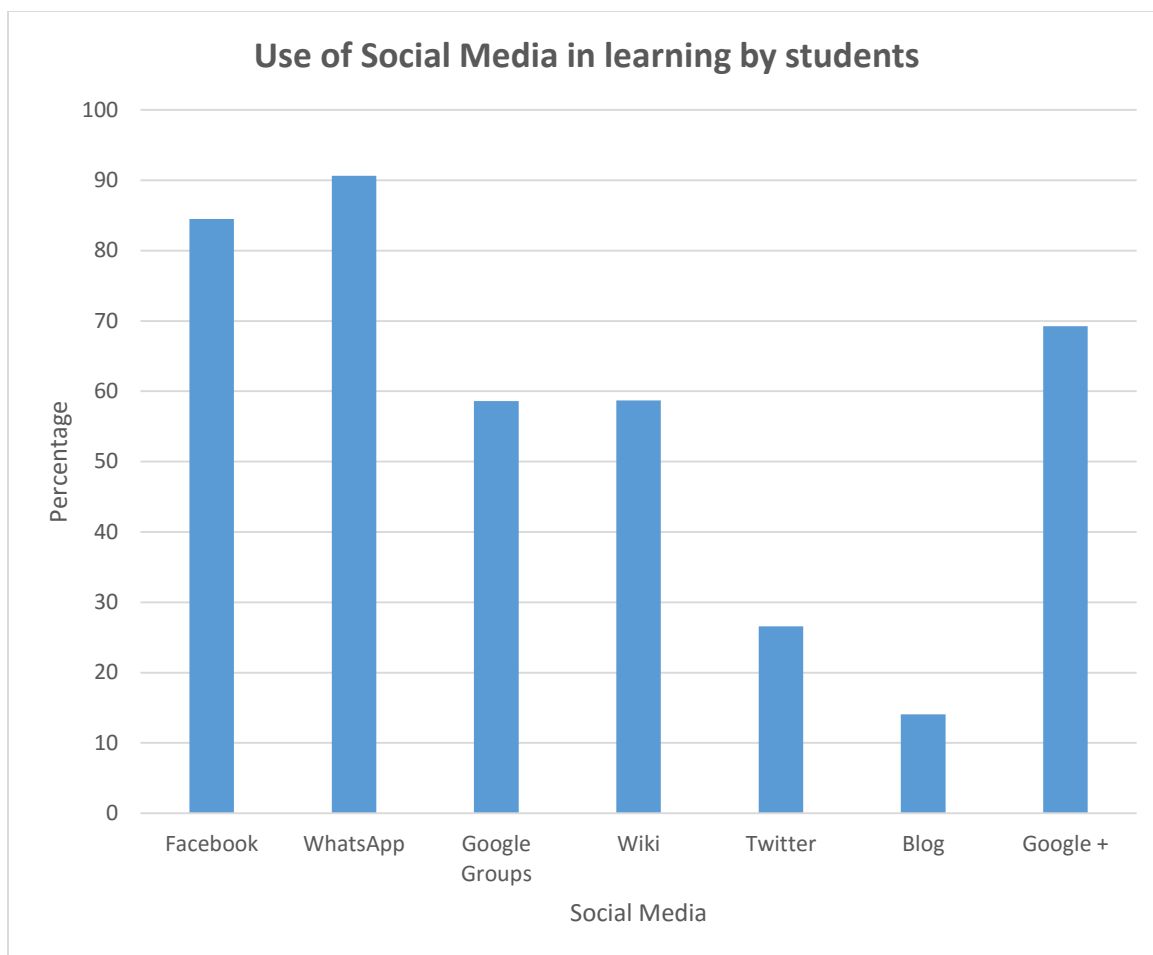
**Fig 30: Usage frequency of ICT tools by Students**

**Table 32: Use of Social Media in learning****n=1438**

S.No	Category	Frequency (Yes)	Percentage	Frequency (No)	Percentage
1	Facebook	1215	84.49	223	15.51
2	WhatsApp	1303	90.61	135	9.39
3	Google Groups	843	58.62	595	41.38
4	Wiki	844	58.69	594	41.31
5	Twitter	382	26.56	1056	73.44
6	Blog	202	14.05	1236	85.95
7	Google +	996	69.26	442	30.74

These days' Social media has become a panacea for the youth. In order to know how social media has impacted the teaching learning, it is important to investigate into the use of various social media in learning and also their frequency of use. Table 32 reveals that majority of the students were using WhatsApp (90.61%), Facebook (84.49%) and Google+ (69.26%) whereas only 14.05% of them were using Blogs. Still almost equal percent were using Google Groups (58.62%) and Wiki (58.69%). It was reported by students that apart from this, they were using you- tube, Instagram and Linked –in. This makes it very clear that the students of the State Agricultural Universities were IT savvy. Rhoades *et. al* (2008) reported that among the students enrolled in college of agriculture courses of University of Florida, many did not have a web page or a blog, 85.2% indicate using social networking sites like Face book. Emerging sites like wikis and social networking sites like Second Life are being explored by educators and may also offer new avenues to take the classroom outside of the classrooms.

One very interesting observation was made during data collection that College of Agriculture, Indore has made a Learner's Activity Group on WhatsApp in which UG, PG students of the college and Dean are the group members and the subjects dealt with are JRF previous years' questions and general agriculture current updates are posted. Another effort made by the same college is that in case some students have any doubts, they can clarify through a "Learners Group" made for the purpose. This group comprises 10 UG toppers, PG (one boy + one girl topper) and all those interested. This group was constituted in the month of October 2016 and every day the group members meet in the conference hall of the college at 4.00 pm where the doubts are cleared by means of face-to-face interaction and presentations.



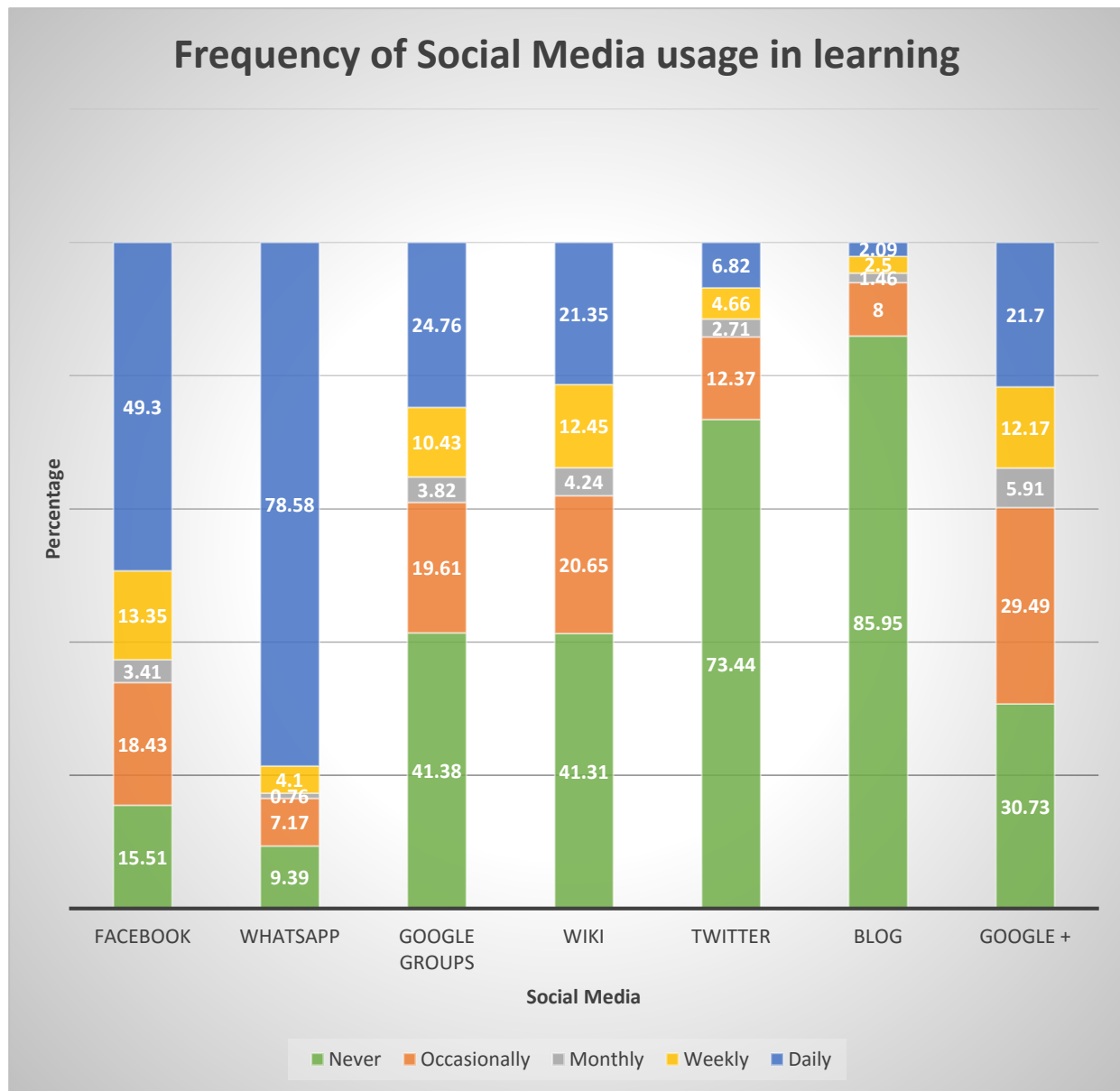
**Fig 31: Use of Social Media in learning by students**

**Table 33: Frequency of Social Media usage in learning**

**n=1438**

S.No	Category	Never	Occasionally	Monthly	Weekly	Daily
1	Facebook	15.51	18.43	3.41	13.35	49.30
2	WhatsApp	9.39	7.17	0.76	4.10	78.58
3	Google Groups	41.38	19.61	3.82	10.43	24.76
4	Wiki	41.31	20.65	4.24	12.45	21.35
5	Twitter	73.44	12.37	2.71	4.66	6.82
6	Blog	85.95	8.00	1.46	2.50	2.09
7	Google +	30.73	29.49	5.91	12.17	21.70

Table 33 depicts that majority of the students were not using Blogs (85.95%) and Twitter (73.44%) and WhatsApp was the only social media being used daily by majority (78.58%) of the respondents and almost half (49.30%) were using Facebook daily. The reason for this could be WhatsApp and Facebook are the kind of social media which can be used in smart phones and tablets which are easily accessible.



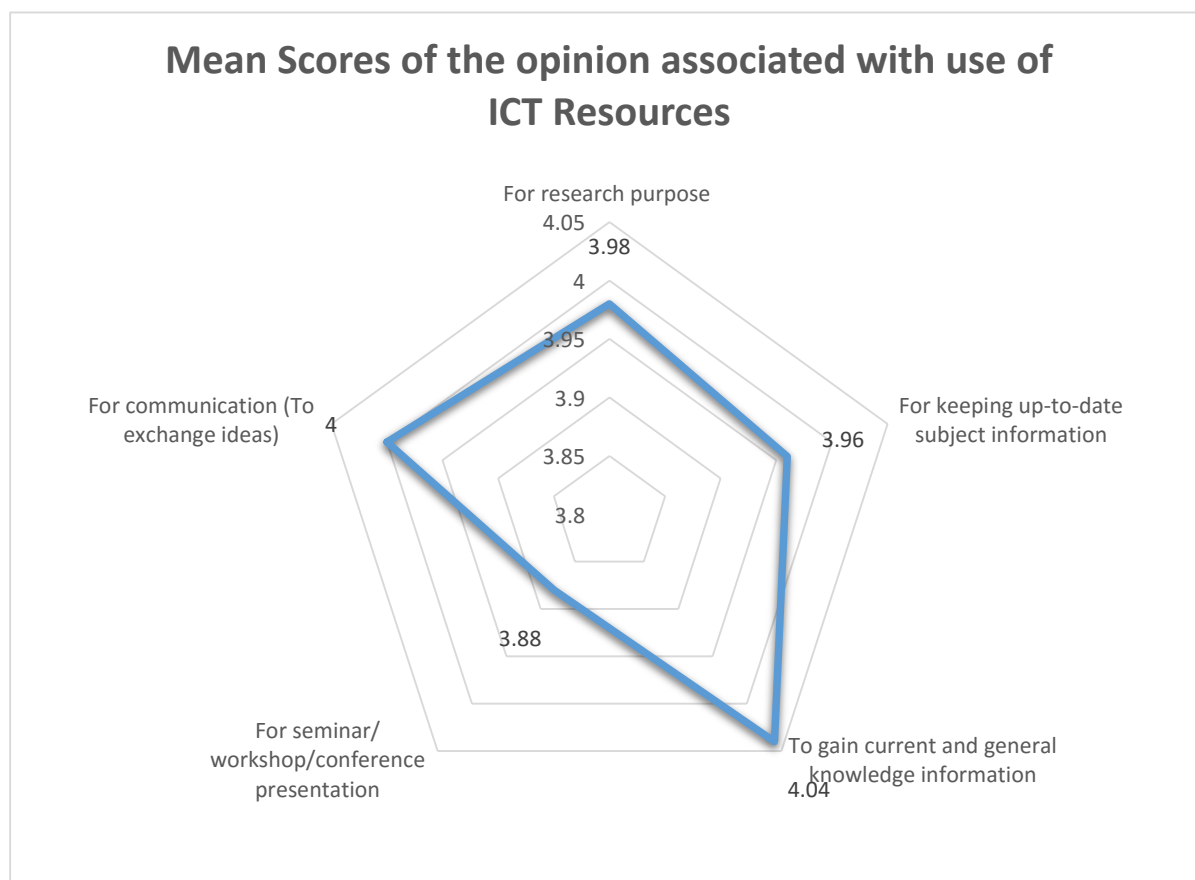
**Fig 32: Frequency of Social Media usage in learning**

**Table 34: Mean Scores of the opinion associated with use of ICT Resources**

**n=1438**

S. No	Category	Mean (Five –point scale)*
1	For research purpose	3.98
2	For keeping up-to-date subject information	3.96
3	To gain current and general knowledge information	4.04
4	For seminar/ workshop/conference presentation	3.88
5	For communication (To exchange ideas)	4.00

**\*(5- Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree, 1- Strongly Disagree)**



**Fig 33: Mean Scores of the opinion associated with use of ICT Resources**

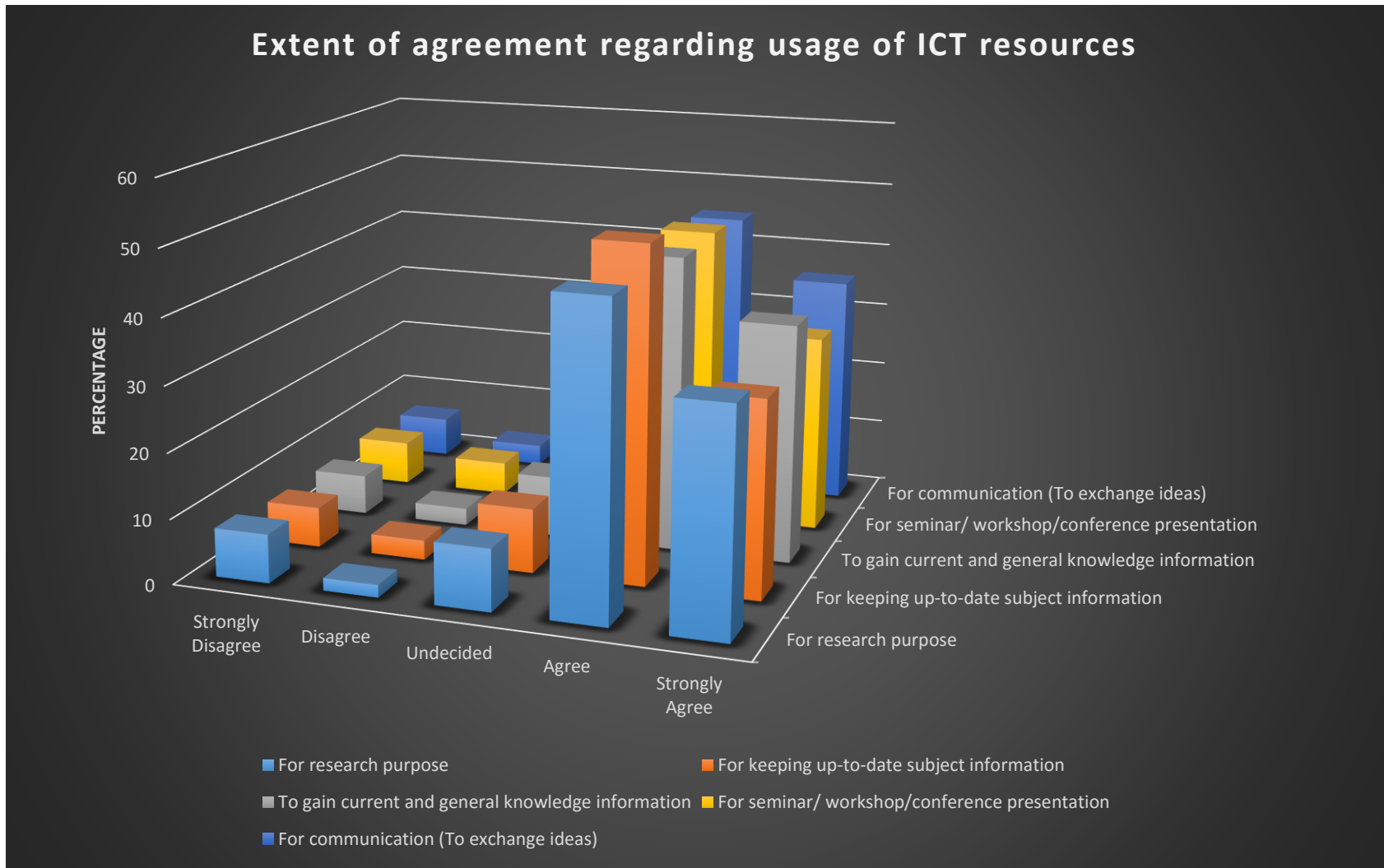


Cursory of Table 34 and 35 clearly shows that ICTs have been used for various academic pursuits by the students of the SAUs under study such as research purpose, for keeping up-to-date subject information, to gain current and general information, for seminar/workshop/conference presentation and for communication in order to exchange ideas with each other or with teachers. Mean scores in Table 34 shows that the students under study agreed that ICTs can be used for all the purposes mentioned but the degree of agreement differs. The mean scores indicate that the students agreed at a higher degree for gaining current and general knowledge information and for exchange of ideas whereas the mean scores are comparatively low for ICT use for research purpose, keeping up to-date information and seminar/workshop/conference *etc.* On seeing the extent to which the students have agreed regarding use of ICT for different purposes, half of the respondents or close to half agreed for all the purposes given in Table 35 whereas one third of them had strongly agreed that ICTs can be used for various purposes mentioned. 7.5% students under study strongly disagreed that ICT can be used for research purpose. The possible reason for this could be that major proportion of the sample was undergraduate students who are not engaged in research.

**Table 35: Extent of agreement regarding usage of ICT resources by students**

**n=1438**

<b>S.No</b>	<b>Category</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Undecided</b>	<b>Agree</b>	<b>Strongly Agree</b>
1	For research purpose	7.51	1.94	9.53	47.08	33.94
2	For keeping up-to-date subject information	6.19	2.99	9.88	50.90	30.04
3	To gain current and general knowledge information	6.12	2.64	9.32	45.41	36.51
4	For seminar/workshop/conference presentation	6.75	5.07	11.89	45.90	30.39
5	For communication (To exchange ideas)	6.19	3.20	10.29	44.78	35.54



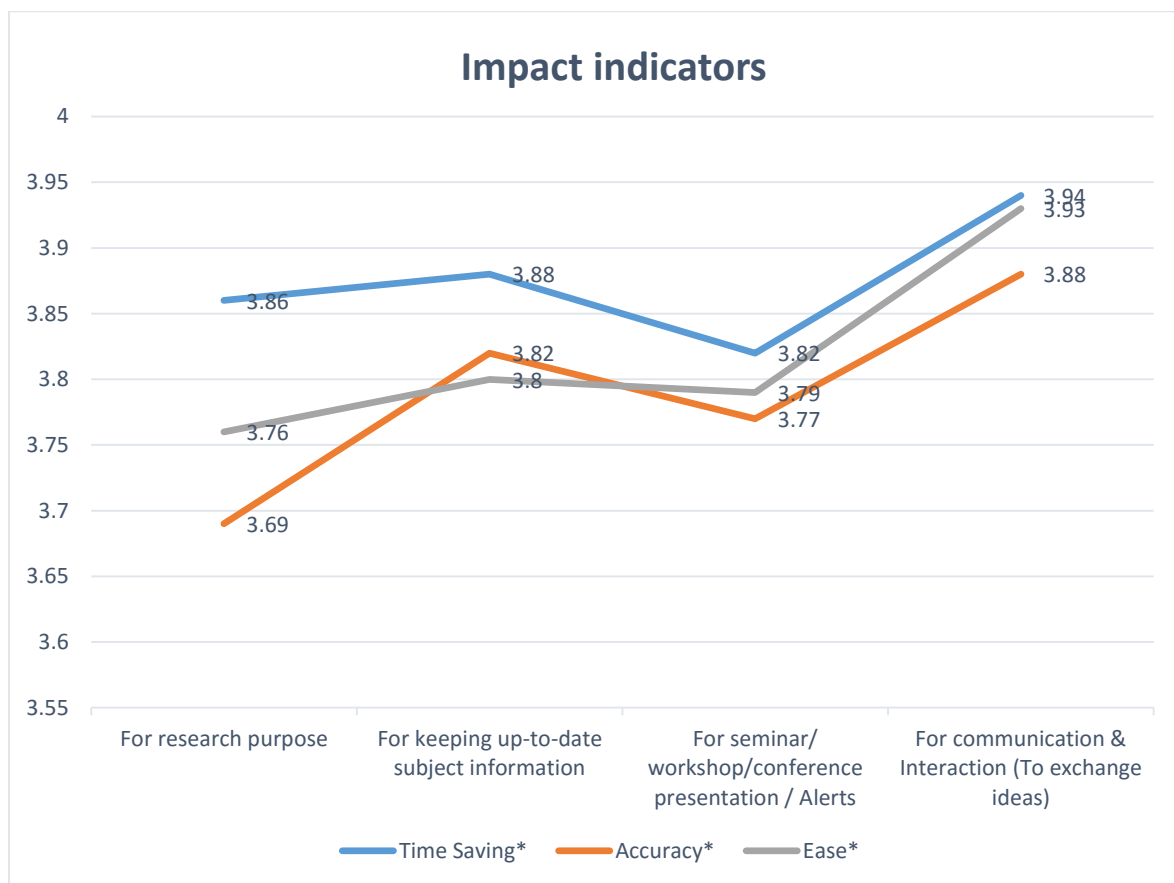
**Fig 34: Extent of agreement regarding usage of ICT resources**

**Table 36: Impact of ICT for various educational purposes**

**n=1438**

S. No	Category	Time Saving*	Accuracy*	Ease*
1	For research purpose	3.86	3.69	3.76
2	For keeping up-to-date subject information	3.88	3.82	3.80
3	For seminar/ workshop/conference presentation / Alerts	3.82	3.77	3.79
4	For communication & Interaction (To exchange ideas)	3.94	3.88	3.93

**\*(5- Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree, 1- Strongly Disagree)**



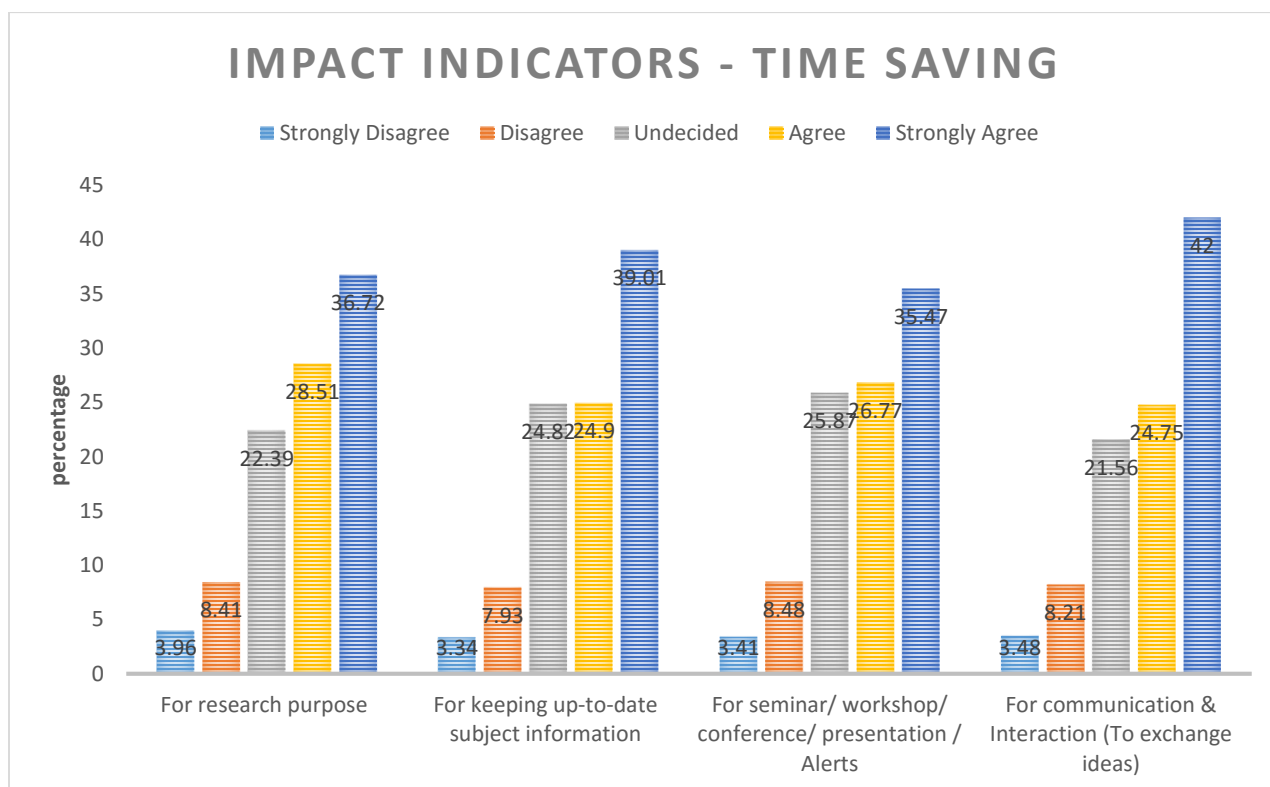
**Fig 35: Impact of ICT as perceived by teachers for various educational purposes**

Considering the impact of ICTs in terms of time saving, accuracy and ease, the mean scores shown in Table 36 indicate that the students under study agreed to the impact of ICTs in terms of saving time, giving accurate information and easing the process of exchange of ideas and for keeping up-to-date information. All the mean scores indicate that the responses were almost near to agree for time saving, accuracy and ease (3.76 – 3.88)

**Table 37: Impact Indicators - Time Saving**

**n=1438**

S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	For research purpose	3.96	8.41	22.39	28.51	36.72
2	For keeping up-to-date subject information	3.34	7.93	24.82	24.90	39.01
3	For seminar/ workshop/ conference/ presentation / Alerts	3.41	8.48	25.87	26.77	35.47
4	For communication & Interaction (To exchange ideas)	3.48	8.21	21.56	24.75	42.00



**Fig 36: Impact Indicators - Time Saving**

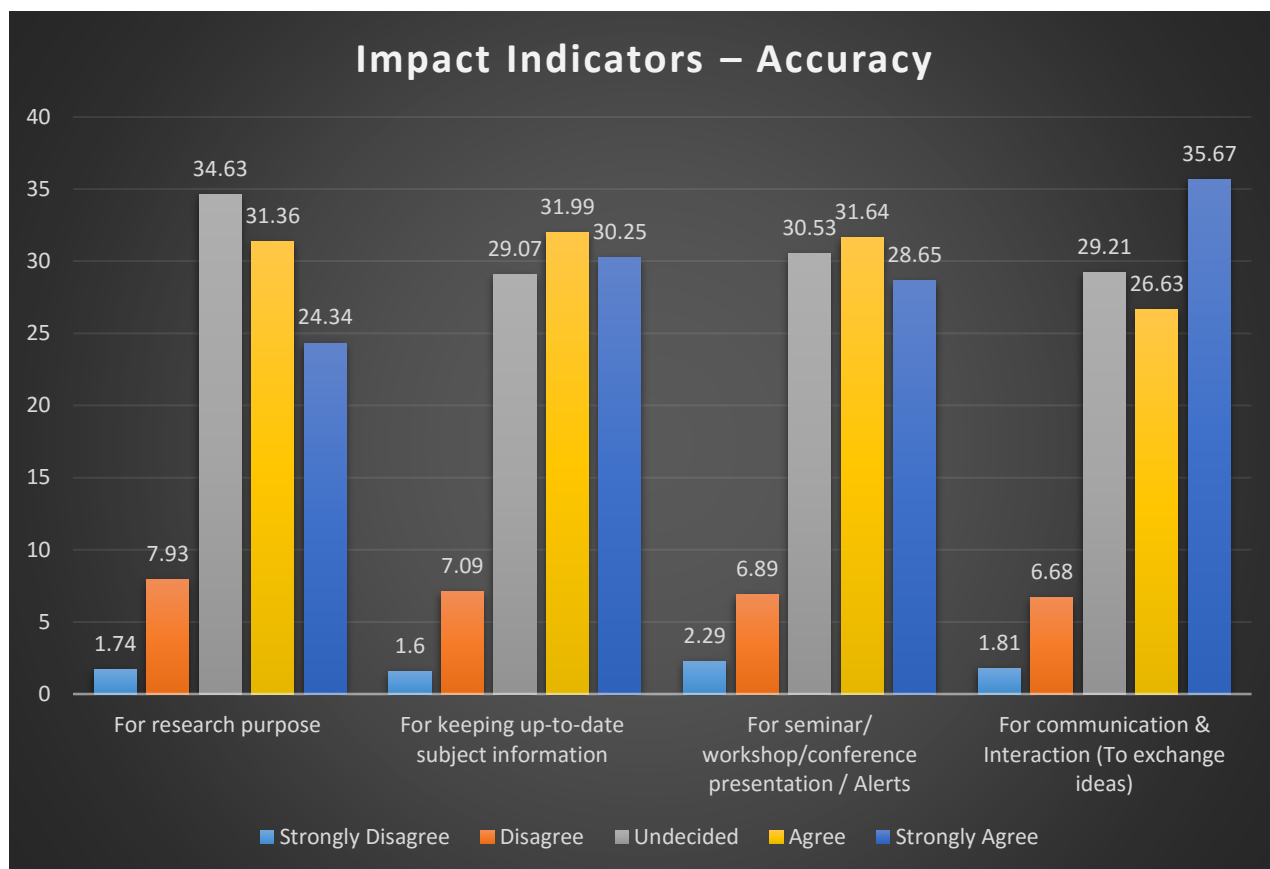
Detailed information in Table 38 depicts that more than 35% students under study strongly agreed that ICTs were time saving for research purpose, keeping up-to-date subject matter information, getting alerts on seminars/ conferences and to exchange ideas. A very few of the students *i.e.* less than 9% either disagreed or strongly disagreed that ICTs are time saving for the purpose of research, keeping up-to-date information, for seminar/conference alerts and for communication and interaction. This can be attributed to the results shown in Table 29 regarding personal resources which shows that 33.45 % students did not have their personal computer/laptop and 17.04% did not have internet connection at personal level. It is quite possible that these 9% who are in the category of strongly disagree or agree are from this group of students who lacked personal ICT resources. It is quite obvious that when one lacks a particular resource, he or she has to either go to market, or to a friend's place or wait for the next day to get his or her work done therefore no longer finds it time saving.

**Table 38: Impact Indicators – Accuracy**

**n=1438**

S. No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	For research purpose	1.74	7.93	34.63	31.36	24.34
2	For keeping up-to-date subject information	1.60	7.09	29.07	31.99	30.25
3	For seminar/workshop/conference presentation / Alerts	2.29	6.89	30.53	31.64	28.65
4	For communication & Interaction (To exchange ideas)	1.81	6.68	29.21	26.63	35.67

Regarding considering ICT as an accurate media for keeping up-to-date subject information, for seminar/workshop/conference presentation and for communication and exchange of ideas, majority of the students either agreed or strongly agreed whereas for considering ICT to be providing accurate information related to research, less than 60% agreed or strongly agreed. One third of the students under study seemed to be undecided regarding the accuracy of information provided by ICTs for research purpose. Since variety of information is provided on a particular subject which is not always authentic, one is not sure of its level of accuracy.

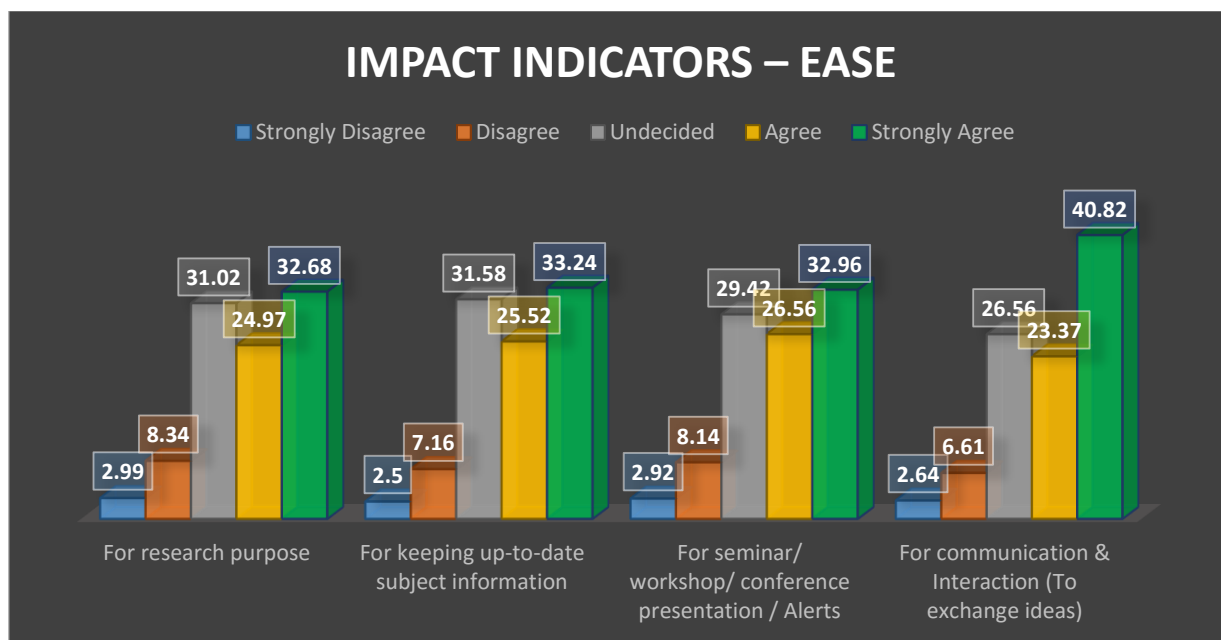


**Fig 37: Impact Indicators – Accuracy**

**Table 39: Impact Indicators – Ease**

**n=1438**

S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	For research purpose	2.99	8.34	31.02	24.97	32.68
2	For keeping up-to-date subject information	2.50	7.16	31.58	25.52	33.24
3	For seminar/ workshop/ conference presentation / Alerts	2.92	8.14	29.42	26.56	32.96
4	For communication & Interaction (To exchange ideas)	2.64	6.61	26.56	23.37	40.82



**Fig 38: Impact Indicators – Ease**

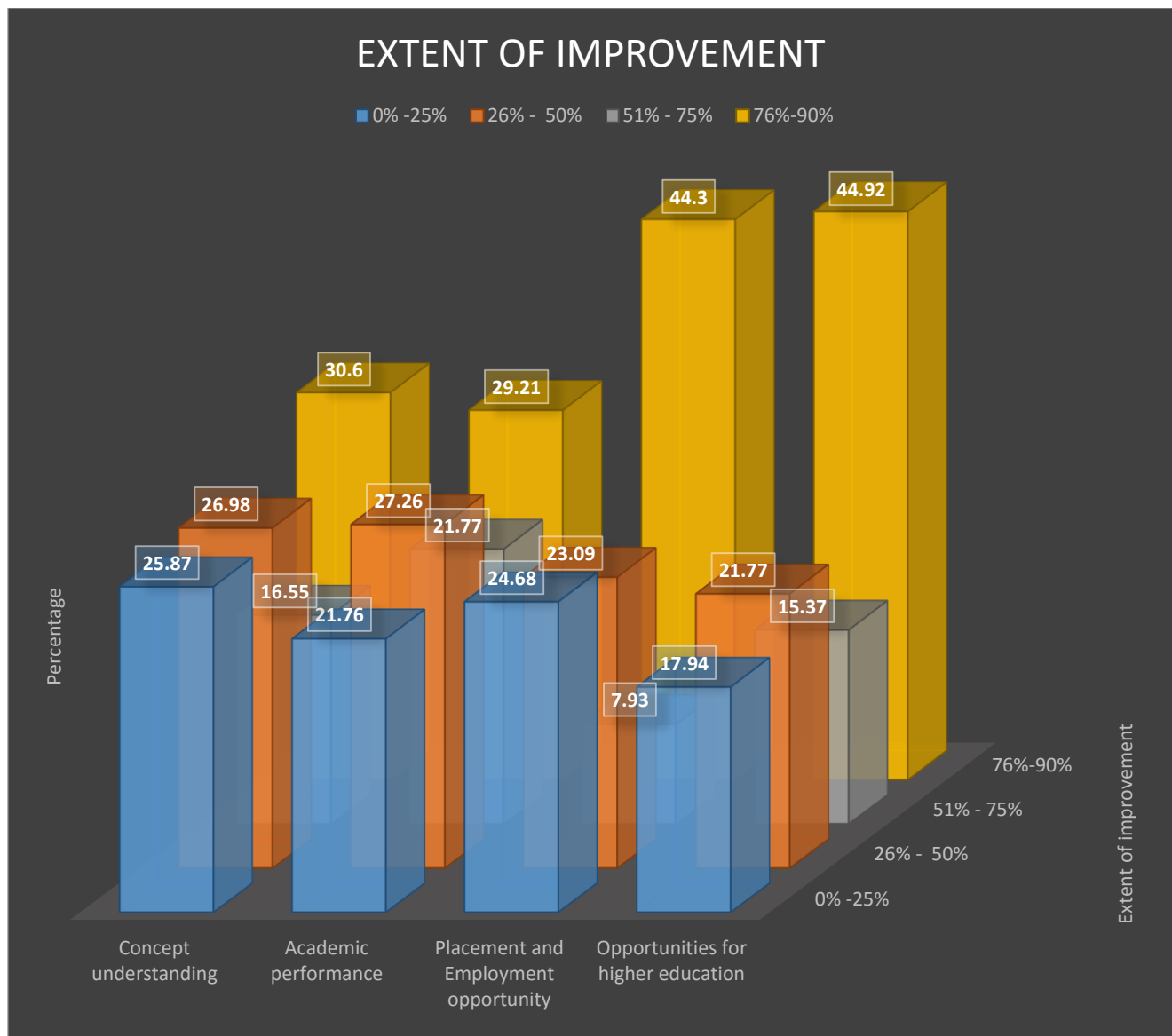
Majority of the students from the state agricultural universities of northern India either agreed or strongly agreed that the use of ICTs have eased their work in terms of their research work, getting up-to-date subject information, alerts on seminars/conferences and for communication and interaction with teachers/ friends. This can be attributed to the fact that because of unprecedented explosion of knowledge in this era of ICT, students prefer to sit in the comfort of home/hostel and retrieve information rather than go to the library and read books, journals *etc.*

**Table 40: Extent of Improvement**

**n=1438**

S.No	Category	0% -25%	26% - 50%	51% - 75%	76%-90%
1	Concept understanding	25.87	26.98	16.55	30.60
2	Academic performance	21.76	27.26	21.77	29.21
3	Placement and Employment opportunity	24.68	23.09	7.93	44.30
4	Opportunities for higher education	17.94	21.77	15.37	44.92

Table 40 demonstrates that majority of the teachers of agricultural universities under study consider ICTs to be impacting the agricultural higher education in terms of more than 76-90% improvement in placement and employment opportunities and opportunities for higher education whereas much more than half of the teachers said that ICTs have made 76-90% improvement in concept understanding and academic performance. Jones and Madden (2002) stated that many students reported that internet and related technology plays an important role in their education.



**Fig 39: Extent of Improvement**

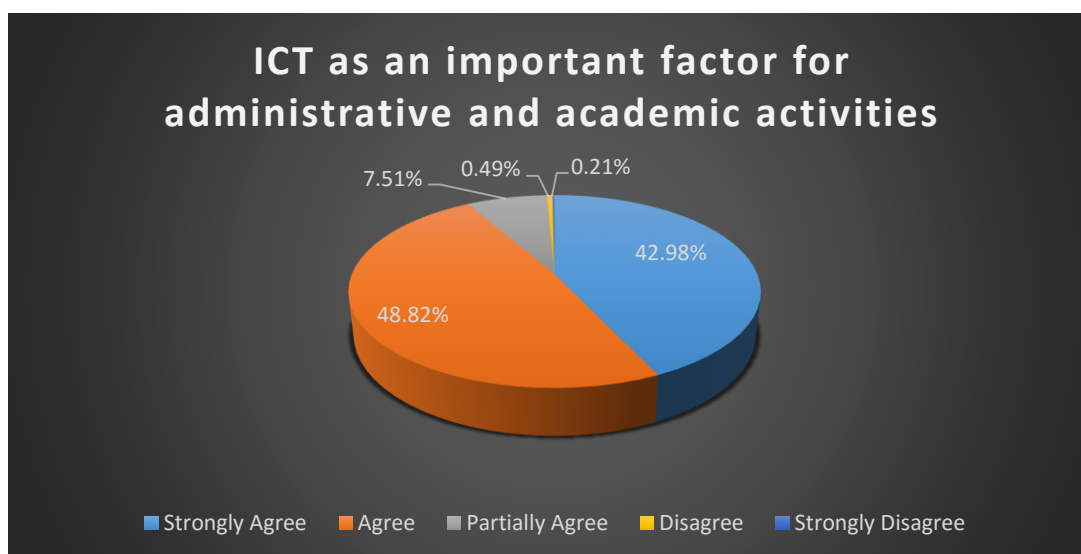


**Table 41: ICT has become very important factor for carrying out administrative and academic activities**

**n=1438**

S. No.	Categories	Frequency	Percentage
1	Strongly Agree	618	42.98
2	Agree	702	48.82
3	Partially Agree	108	7.51
4	Disagree	7	0.49
5	Strongly Disagree	3	0.21

ICTs have become a very important factor for carrying out administrative and academic activities of a typical agricultural university system in this era of information and communication technologies. On asking the opinion of the students of the various agricultural universities of northern India, it was found that (Table 41) majority were in the category of either agree (48.82%) or strongly agree (42.98%) whereas only seven students out of 1438 disagreed and strongly disagreed (7.72%) that ICTs are an important factor for carrying out administrative and academic activities of the universities. A meagre number (7.51%) of students under study agreed partially to the statement that ICT has become very important factor for carrying out administrative and academic activities of the institute. The findings seem to be in line with that of Joshi and Chauhan (2013) that introduction of computer application in the field of education, extension education and research has completely changed the conventional way of teaching and learning by modifying and making the enormous use of computers.

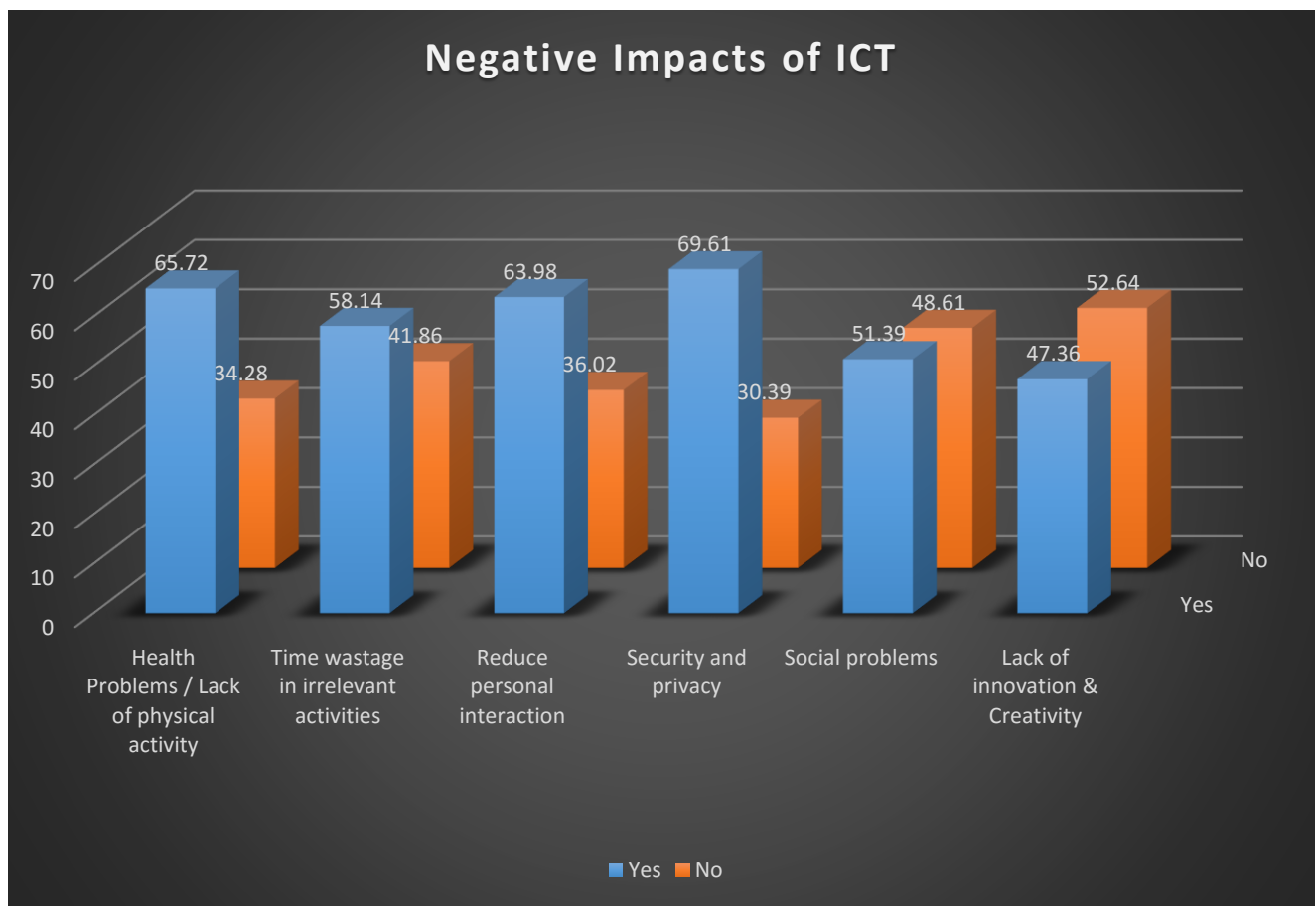


**Fig 40: ICT as an important factor for administrative and academic activities**

**Table 42: Negative Impact of ICT as perceived by students**

**n=1438**

S.No	Category	Frequency (Yes)	Percentage	Frequency (No)	Percentage
1	Health Problems / Lack of physical activity	945	65.72	493	34.28
2	Time wastage in irrelevant activities	836	58.14	602	41.86
3	Reduce personal interaction	920	63.98	518	36.02
4	Security and privacy	1001	69.61	437	30.39
5	Social problems	739	51.39	699	48.61
6	Lack of innovation & Creativity	681	47.36	757	52.64



**Fig 41: Negative Impact of ICT as perceived by students**

ICT has made a major impact on the education sector, on organizations and on teaching and learning methods (Olaore, 2014). ICT has the potential to contribute to substantial improvements in the educational system (Moursund, 2005). Therefore, it is said that ICT has a positive impact on education but nevertheless the manner in which the subject is taught has a larger effect than the mere use of ICT, *i.e.* if the teacher does not adapt their methods in order to make best use of ICT, then the purpose of using ICT becomes defeated, also the attitude of the educational establishment also seems to have a greater effect, when the people running them do not have the knowledge and experience, or often the money, to enable widespread and effective use of ICT (Olaore, 2014). Thus, no doubt though ICTs are supposed to be associated with positive impact, still there are some negative impacts of ICT as perceived by the students which is visible in Table 42. Majority of the students linked ICT with health problems/lack of physical activity, reduced personal interaction and a threat to security & privacy whereas more than half of the students considered ICTs to be leading to time wastage in irrelevant activities and social problems like cyber-crimes *etc.* On discussion with the students, it was revealed that while teaching, the teachers were just displaying the power point presentations and not explaining well. Also, some of them were using the readymade slides from the internet which were not truly serving the purpose of the course being taught. Another negative impact that the students reported was that whenever they go to meet the teachers, they find them always busy in their personal computers whether performing official work or surfing on social networking sites. As a result, students are losing personal contact with the teachers which is very important in order to clarify subject related doubts.

### **3.4 FACTORS AFFECTING THE ADOPTION OF ICT TOOLS IN AGRICULTURAL EDUCATION.**

Adoption of Information and Communication Technologies in Agricultural Education refers to that stage in which the technology is selected to be brought to use by the University administration, teachers and students. Factors are those various situations or elements that contribute to a result. In the present section, an attempt has been made to find out those factors which affect the adoption of various ICT tools and the constraints associated with their adoption in a typical teaching learning situation. This is based on the perception of the Deans, teachers and students of the 20 SAUs under study.

**Table 43: Perception of Deans regarding Factors affecting adoption of ICT tools**

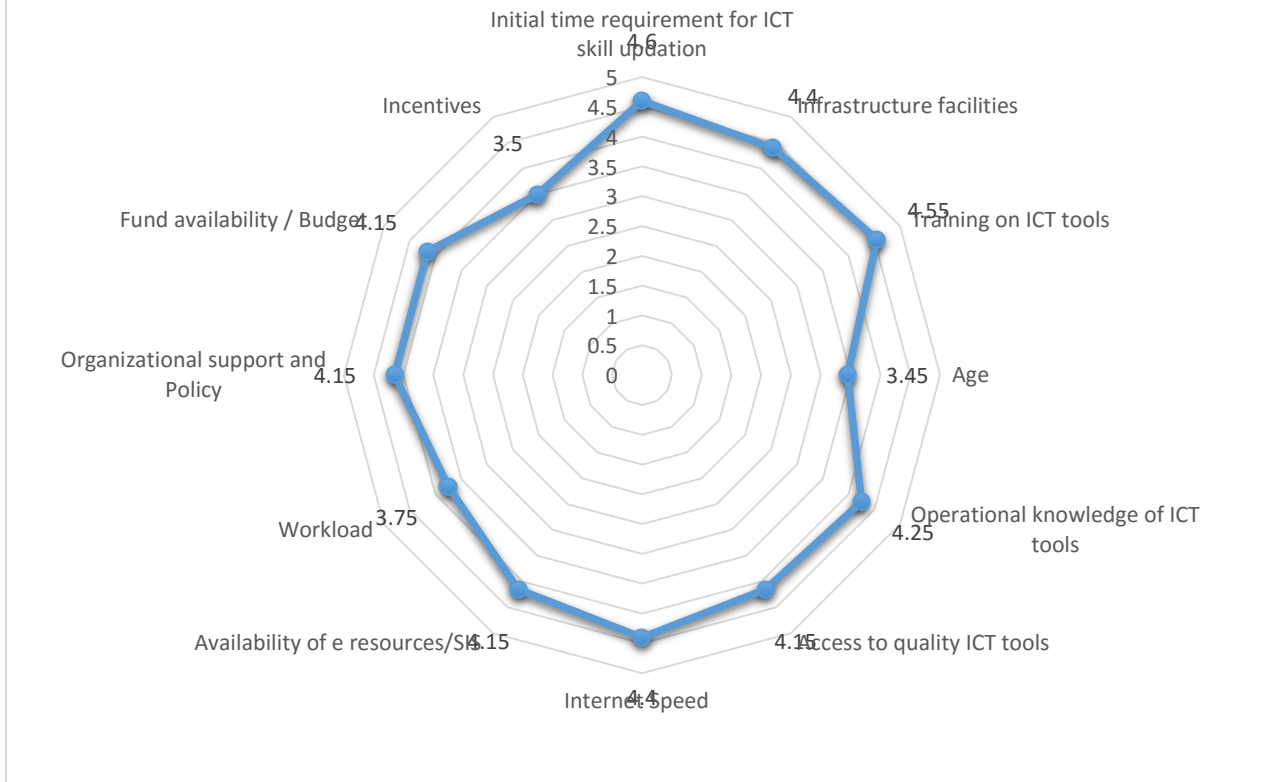
**n=20**

<b>S. No</b>	<b>Category</b>	<b>Mean Score*</b>
1	Initial time requirement for ICT skill updation	4.6
2	Infrastructure facilities	4.4
3	Training on ICT tools	4.55
4	Age	3.45
5	Operational knowledge of ICT tools	4.25
6	Access to quality ICT tools	4.15
7	Internet Speed	4.4
8	Availability of e- resources/SIS	4.15
9	Workload	3.75
10	Organizational support and Policy	4.15
11	Fund availability / Budget	4.15
12	Incentives	3.5

**\*(5- Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree, 1- Strongly Disagree)**

Cursory of Table 43 shows the perception of Deans of the various State Agricultural Universities of northern India regarding the factors that are responsible for adoption of ICT in Agricultural Education in India. On the basis of the mean scores, it is concluded that out of 12 factors, the mean scores for nine of them were found to be between 4.15 to 4.60 which shows that the Deans under study considered initial time requirement for ICT skill updating, ICT infrastructural facilities, training on ICT tools, operational knowledge of ICT tools, internet speed, availability of e-resources/Student Information System, organizational support & policy and budget availability for ICT as important factors that influence adoption of ICT in agricultural university system in a country like India. Their mean scores indicate that they had either agreed or strongly agreed on these nine parameters. While age, workload of an individual and provision of incentives for ICT use were the components where their responses were between 3-4 which clearly depicts that they were sort of between undecided or agree and not sure as to whether age, workload and incentives do really affect adoption of ICT in agricultural universities. It is true that when computers were introduced, that time regardless of age, many teachers had made efforts to learn computers to cope up with the technology. Jamieson *et al* (2006) reported that teacher age is not significantly related to confidence in using ICT with students for teaching and learning.

## Perception of Deans regarding Factors affecting adoption of ICT tools



**Fig 42: Perception of Deans regarding Factors affecting adoption of ICT tools**

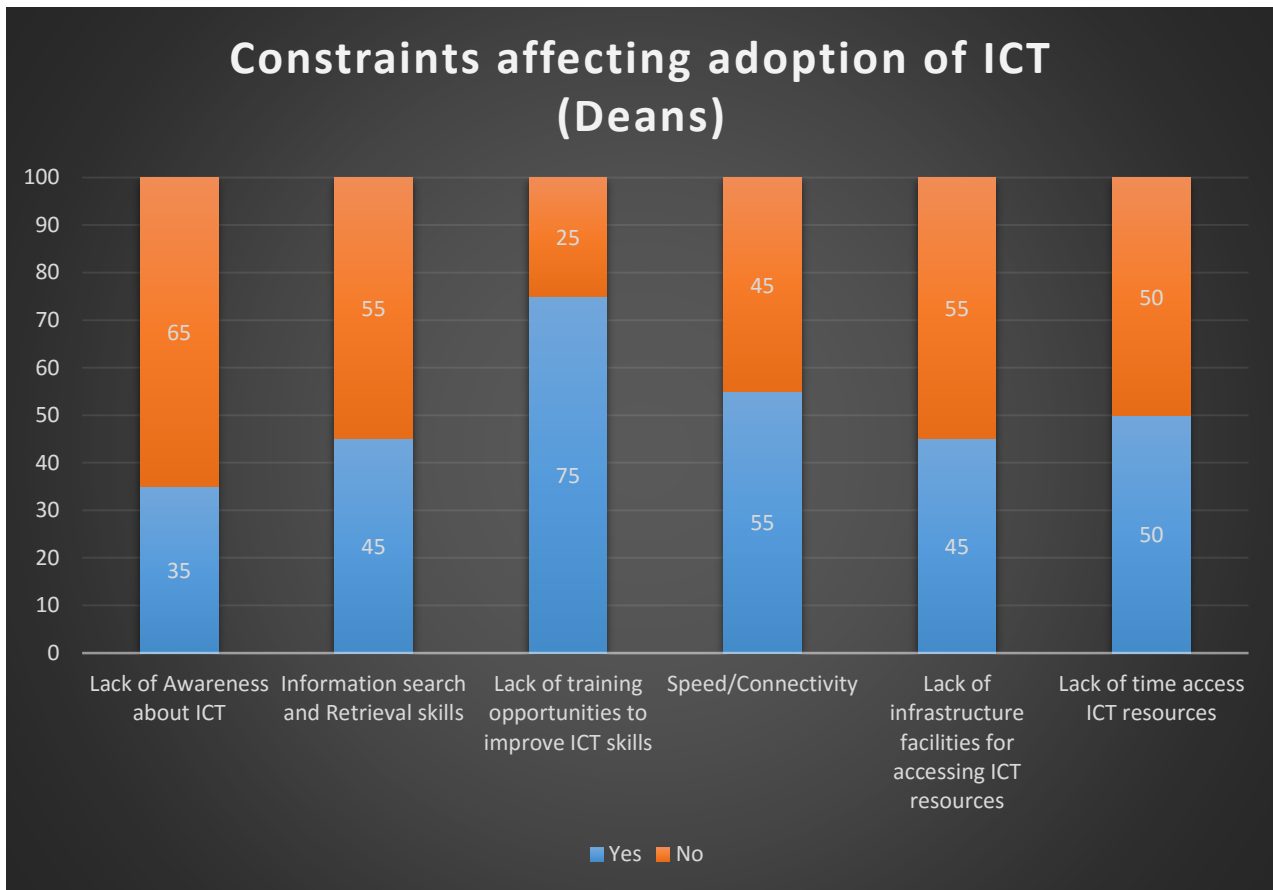
On viewing the details of Table 44, it is very well documented that majority of the deans under study strongly agreed that initial time requirement, training on ICT tools and internet speed are some of the factors which affect adoption of ICT tools. Majority of the Deans of colleges under study agreed that adoption of ICT tools is affected by their operational knowledge and workload of an individual. It is true that if an individual possess skills to use ICT tools, there are more chances that he/she will adopt them and same applies to workload; more the workload, less are the chances of adopting ICTs by an individual. Pouratashi and Rezvanfar (2010) in their study on factors influencing use of internet by agricultural faculty members in educational research activities showed that skill, support and facilities were the three factors influencing the application of ICT by agricultural students.

**Table 44: Factors influencing adoption of ICT by the Deans****n=20**

S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Initial time requirement for ICT skill updation	0.00	0.00	0.00	40.00	60.00
2	Infrastructure facilities	0.00	0.00	10.00	40.00	50.00
3	Training on ICT tools	0.00	0.00	5.00	35.00	60.00
4	Age	0.00	20.00	30.00	35.00	15.00
5	Operational knowledge of ICT tools	0.00	0.00	5.00	65.00	30.00
6	Access to quality ICT tools	0.00	0.00	15.00	55.00	30.00
7	Internet Speed	0.00	10.00	0.00	30.00	60.00
8	Availability of e resources/SIS	0.00	0.00	15.00	55.00	30.00
9	Workload	5.00	15.00	0.00	60.00	20.00
10	Organizational support and Policy	0.00	5.00	15.00	40.00	40.00
11	Fund availability / Budget	0.00	10.00	0.00	55.00	35.00
12	Incentives	0.00	15.00	30.00	45.00	10.00

**Table 45: Distribution of Deans on the basis of constraints in adoption of ICT****n=20**

S. No	Category	Frequency	Percentage	Frequency	Percentage
<b>Technical Problems</b>		<b>Yes</b>		<b>No</b>	
1	Lack of Awareness about ICT	7	35.00	13	65.00
2	Information search and Retrieval skills	9	45.00	11	55.00
3	Lack of training opportunities to improve ICT skills	15	75.00	5	25.00
4	Speed/Connectivity	11	55.00	9	45.00
<b>Non-Technical Problems</b>					
1	Lack of infrastructural facilities for accessing ICT resources	9	45.00	11	55.00
2	Lack of time to access ICT resources	10	50.00	10	50.00



**Fig 43: Distribution of Deans on the basis of constraints in adoption of ICT**

Constraints are impediments that come in the way of adoption of a particular technology and constraints can be technical as well as non-technical. Three fourth of the Deans of the State Agricultural Universities of northern India reported lack of training opportunities to improve ICT skills as the major problem followed by speed/connectivity of internet (55%). Among the non-technical problems; half of the respondents reported that they were so busy with their work that there was no time for them to make judicious use of ICT resources. Lack of awareness about ICT was the constraint reported by only one – third of the Deans (35%). It is evident from Table 16 (section 3.2) that the deans under study were aware of almost all the ICT gadgets so that is why very few deans reported lack of awareness of ICT as one of the constraints. On discussion with the deans, it was revealed that insufficient staff was another impediment coming in the way of ICT adoption. Adedokun and Kehinde (2013) also reported that insufficient technical staff and epileptic power supply were the major problems which were impacting ICT usage.

**Table 46: Perception of Teachers regarding factors affecting adoption of ICT tools****n=20**

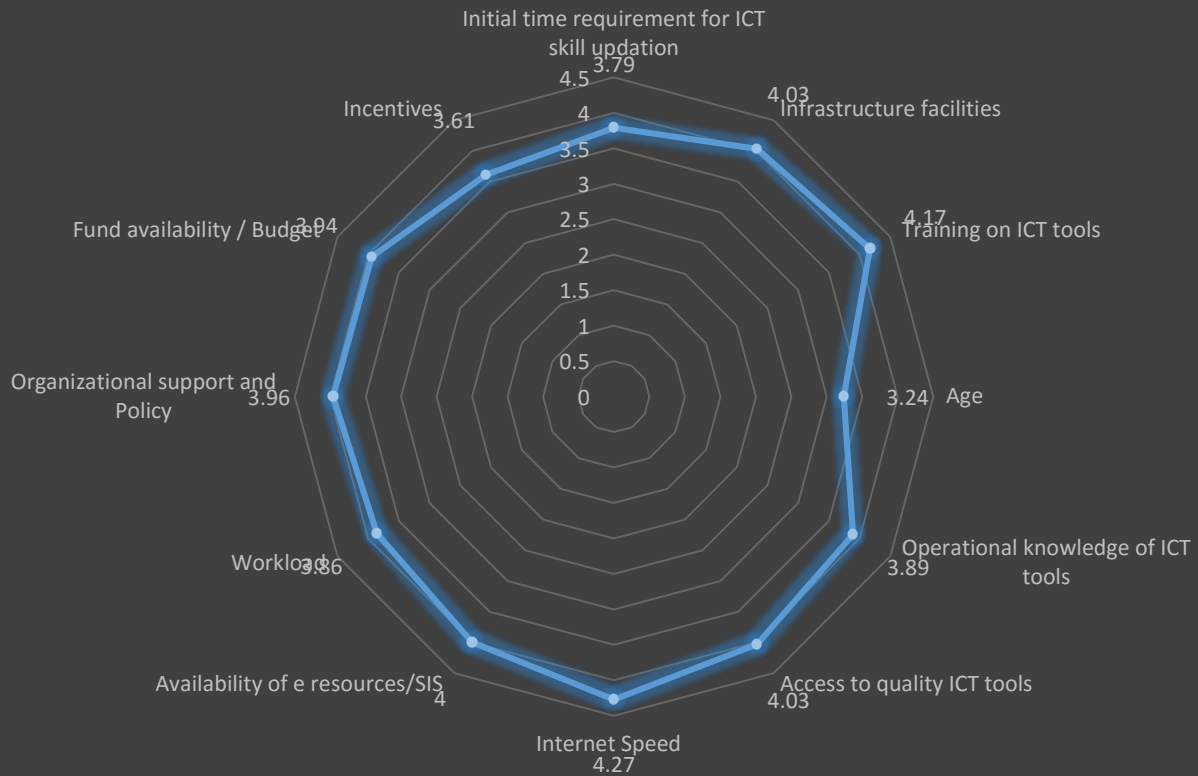
S. No	Category	Mean Score*
1	Initial time requirement for ICT skill updation	3.79
2	Infrastructure facilities	4.03
3	Training on ICT tools	4.17
4	Age	3.24
5	Operational knowledge of ICT tools	3.89
6	Access to quality ICT tools	4.03
7	Internet Speed	4.27
8	Availability of e- resources/SIS	4.00
9	Workload	3.86
10	Organizational support and Policy	3.96
11	Fund availability / Budget	3.94
12	Incentives	3.61

**\*(5- Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree, 1- Strongly Disagree)**

Table 46 shows that the mean scores were 4 – 4.27 for considering infrastructural facilities, training on ICT tools, access to quality ICT tools, internet speed and availability of e-resources as factors which affect the adoption of ICT by the teachers of the SAUs. While age was the factor for which the teachers were sort of undecided as to whether it should be considered a factor or no as the mean scores calculated were as low as 3.24. The picture seems to be same as that of the deans who also had similar mean scores (3.45). On viewing the detailed information with reference to the factors which affect adoption of ICT by the teachers under study; it is seen that more than half (55%) strongly agreed that internet speed is a major factor responsible for adoption of ICT by the teachers of the SAUs under study whereas, more than 40% agreed that initial time requirement for ICT skill upgradation, infrastructural facilities, operational knowledge of ICT tools, access to quality ICT tools, availability of e-resources and workload in the office are the factors which influence the adoption of ICT by them. More than one – third of the teachers under study agreed that age had a bearing on the adoption of ICT in teaching learning situation. Nallusamy *et. al.* (2015) reported that age was found to be the most important factor influencing the usage of ICT. As a matter of fact, even if the student community is ready to adopt ICT, effective deployment of ICT is not possible unless the teachers make them ICT savvy.



## Perception of Teachers regarding factors affecting adoption of ICT tools



**Fig 44: Perception of Teachers regarding factors affecting adoption of ICT tools**

**Table 47: Factors influencing adoption of ICT by Teachers**

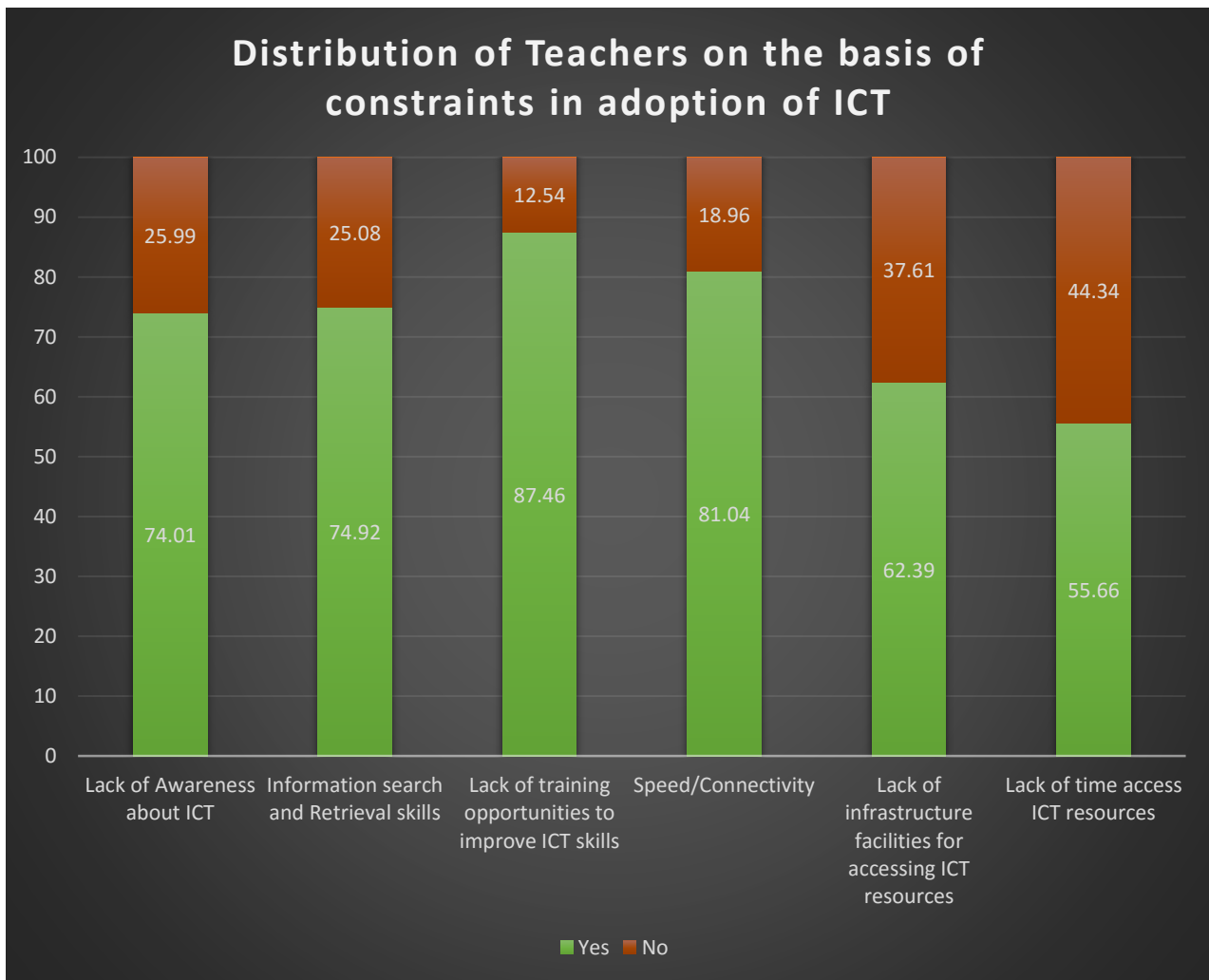
n=327

S. No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Initial time requirement for ICT skill updation	3.36	5.50	21.11	48.93	21.10
2	Infrastructure facilities	3.37	5.50	12.54	41.59	37.00
3	Training on ICT tools	3.67	4.89	7.03	39.76	44.65
4	Age	13.16	11.62	27.52	33.94	13.76
5	Operational knowledge of ICT tools	2.75	5.81	17.13	48.32	25.99
6	Access to quality ICT tools	2.14	4.28	12.84	49.85	30.89
7	Internet Speed	4.59	3.36	8.26	28.44	55.35
8	Availability of e resources/SIS (student information system)	3.36	3.67	13.15	49.24	30.58
9	Workload	3.98	5.50	19.27	43.43	27.82
10	Organizational support and Policy	1.83	6.12	19.88	38.84	33.33
11	Fund availability / Budget	4.89	7.03	14.37	36.09	37.62
12	Incentives	9.79	6.42	22.63	35.17	25.99

**Table 48: Distribution of Teachers on the basis of constraints in adoption of ICT**

n=327

S. No.	Categories	Frequency	Percentage	Frequency	Percentage
<b>Technical Problems</b>		<b>Yes</b>		<b>No</b>	
1	Lack of Awareness about ICT	242	74.01	85	25.99
2	Information search and Retrieval skills	245	74.92	82	25.08
3	Lack of training opportunities to improve ICT skills	286	87.46	41	12.54
4	Speed/Connectivity	265	81.04	62	18.96
<b>Non-Technical Problems</b>					
1	Lack of infrastructural facilities for accessing ICT resources	204	62.39	123	37.61
2	Lack of time to access ICT resources	182	55.66	145	44.34

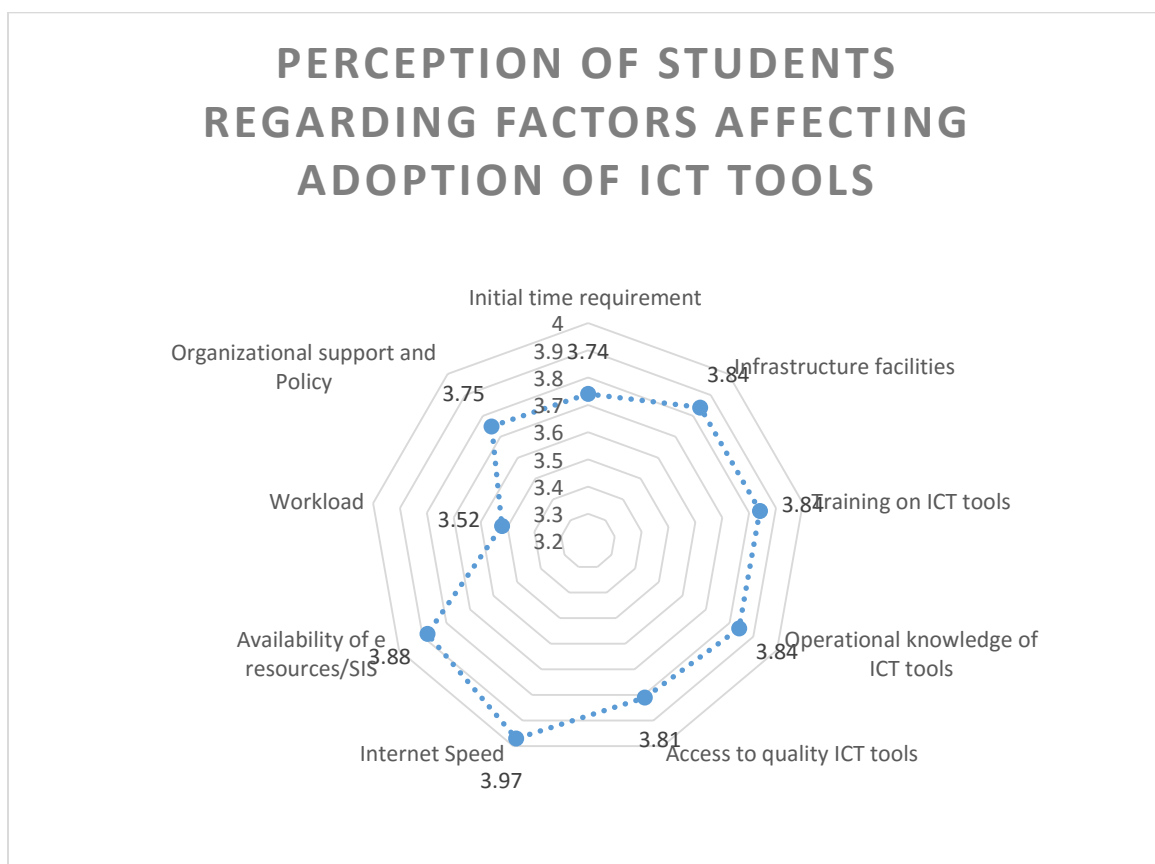


**Fig 45: Distribution of Teachers on the basis of constraints in adoption of ICT**

Though ICT has become a systematic tool facilitating the teaching – learning process, still there are certain problems coming in the way of the faculty members while exploiting the potential of ICT in teaching learning process. Table 48 shows that the top rated constraints as reported by the teachers were lack of training opportunities to improve ICT skills (87.46%) and speed connectivity (81.04%). Regarding the non-technical problems; majority were considering lack of infrastructural facilities for accessing ICT resources and more than half said they do not have ample time to make full use of ICT resources. Adedokun and Kehinde (2013) identified inadequate facilities and limited access in terms of working hours, constraints to ICT use, insufficient buildings for the conduct of computer based exam.

**Table 49: Perception of Students regarding factors affecting adoption of ICT tools**  
n=1438

S. No	Category	Mean Score
1	Initial time requirement	3.74
2	Infrastructure facilities	3.84
3	Training on ICT tools	3.84
4	Operational knowledge of ICT tools	3.84
5	Access to quality ICT tools	3.81
6	Internet Speed	3.97
7	Availability of e resources/SIS	3.88
8	Workload	3.52
9	Organizational support and Policy	3.75



**Fig 46: Perception of Students regarding factors affecting adoption of ICT tools**

For a student to make the best possible use of ICT in learning, it is deemed important to have the infrastructural facilities, training & operational knowledge of ICT tools, access to quality ICT tools, good internet speed, availability of e-resources and presence of organizational support and policy. The highest mean scores were found to be for internet speed with a mean score of 3.97 as shown in Table 49. Alhassan and Afolabi (2012) in a study in Nigerian universities indicated poor internet connectivity on the utilization of ICT for agricultural research in University as a constraint. Out of the nine factors listed, except workload; all the eight had mean scores between 3.75-3.97 which denotes that the students agreed for all these eight factors. As far as effect of workload in adoption of ICT tools is concerned, the agricultural students did not consider it as a factor for adoption of ICT and were in an undecided condition. The reason for this could be students have only one type of work that is studies and it seems they were not clear of what type of workload affects adoption of ICT.

**Table 50: Distribution of Students on the basis of factors affecting adoption of ICT**

**n=1438**

S.No	Category	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Initial time requirement	4.87	4.59	18.84	54.59	17.11
2	Infrastructure facilities	2.99	6.61	17.18	50.13	23.09
3	Training on ICT tools	2.99	5.63	19.34	48.19	23.85
4	Operational knowledge of ICT tools	4.10	5.01	17.94	48.68	24.27
5	Access to quality ICT tools	3.55	5.49	19.54	48.89	22.53
6	Internet Speed	4.38	4.73	16.34	38.46	36.09
7	Availability of e resources/SIS	3.27	5.15	19.53	44.23	27.82
8	Workload	5.70	10.64	25.87	41.45	16.34
9	Organizational support and Policy	3.20	6.19	23.37	53.68	13.56

While revealing the minor details of the factors affecting adoption of ICT by the students, it can be seen in Table 50 that more than half of the respondents agreed to the fact that initial time required for getting acquainted with ICT, infrastructural facilities and organizational support and policy were the factors responsible for ICT adoption. Soleimanpour *et al.* (2013) revealed that the factors which affected the application of ICT in agricultural higher education system in Tehran, Iran were policy, technical, social, financial, educational and human.

### **Suggestions by Deans:**

The Deans of the colleges of various Agricultural Universities gave a few suggestions on enhancing the use of ICT in Agricultural Education. It was suggested that ICT should be an integral part of the curriculum right from the beginning. Since use of ICT is just a beginning in most of the colleges so it is deemed important to have regular upgradation of knowledge of the students as well as the staff. There is a need for infrastructural development and skilled man power in the area of ICT. It is suggested that there should be separate IT budget. Also, workshops, seminars, conferences, webinars should be organized in the area of ICT. There should be mandatory capacity building programmes for students as well as staff including administrative, finance and technical personnel with provision of additional funding for ICT training and capacity building. Campuses of State Agricultural Universities should be provided with high speed internet facility which may facilitate and strengthen ICT based education in our Agricultural Universities. The process of installation of biometrics, online fees and internet facility for students in hostels stands initiated and will be made functional shortly but additional funds are required for this purpose.

### **Suggestions by Teachers:**

For integration of ICT into the teaching learning, it is deemed important to have the support of administration which includes infrastructural facilities, regular updating of ICT tools, trained manpower; be it administrative staff, students or teachers, availability of needed soft wares and of course policy support for implementation. As revealed in Table 51, the University teachers of the SAUs of northern India had given various suggestions for integration of ICT into education. Majority of them (97.86-82.26%) said that there should be capacity building programmes for students, teachers and administrative staff in the area of ICT, provision of good infrastructural facilities, proper internet speed/connectivity, regular upgradation of ICT tools, continuous support for digitalization, comprehensive use of ICT in UG and PG studies, availability of education related soft

wares in colleges, provision of virtual classrooms. As far as the capacity building in the area of ICT is concerned, it was recommended by the teachers that periodic trainings should be organized for the teachers, students and administrative staff. It must be mandatory for faculty to make use of ICT in teaching learning by way of ICT tools, e-lectures, Power Point presentation and using current updates/data/information from related official website of government and other agencies as per the need of course curricula. Seeing to the lack of teachers in newly formed universities, virtual classrooms were highly recommended where each and every classroom of all agricultural universities are interconnected and each student at each college can enjoy best lecture by best teacher with ease and comfort to gain knowledge rather than marks or grades.

**Table 51: Suggestions given by Teachers**

**n=327**

<b>S. No.</b>	<b>Suggestions</b>	<b>Frequency</b>	<b>Percentage</b>
1	Capacity building in the area of ICT	320	97.86
2	Infrastructural facilities	318	97.24
3	Proper internet speed/connectivity	315	97.86
4	Regular upgradation of ICT tools	300	97.25
5	Continuous support for digitalization	288	96.33
6	ICT should be used comprehensively in UG and PG studies	275	91.74
7	Education related software be made available to all	269	88.07
8	Provision of Virtual classrooms	250	84.10
9	Webinars should be encouraged in teaching	214	82.26
10	Information centres/ Libraries of the universities be open on holidays and beyond office hours	189	57.79
11	e-mails should be considered official	180	55.04

## **Suggestions given by Students**

1. ICT courses associated with the curricula should be practical oriented rather than theoretical.
2. There should be collaboration between all agricultural universities regarding reading material and information on same topic to be accessed by all.
3. Free and open access to students in universities regarding ICT facilities and they shouldn't be locked anymore.
4. Availability of the sites like G-gate, e-journal, *Krishi kosh*, *krishi prabha*, e-CeRA *etc.* have to be made available outside the boundaries of Universities too.
5. ICT related courses should be practical based and introduced from the first semester of UG courses and assessment should be of practical focus.
6. Mobile applications related to agricultural subjects as well as placement related information should be developed.
7. Universities should develop their own e-courses and each student should have access to computer laboratory.
8. Free Wi-Fi in hostel and college with good internet speed, infrastructural facilities and quality and updated tools are sufficient for students to learn.

## **3.5 FUTURE ROAD MAP FOR STRENGTHENING ICT IN AGRICULTURAL EDUCATION**

### **At the level of ICAR**

1. As per the recommendations of the 5<sup>th</sup> Dean's committee, a common course on Information and Communication Technology has been introduced which is to be taught in one semester. It is recommended that it should be spread at different levels from basic to advance in subsequent years. Web ethics should also be added in the syllabus
2. There is a provision of establishment of SMART classrooms in each university consisting of interactive white board, touch screen, biometrics, visualized e-kiosk and Artificial Intelligence based course module *etc.* It was observed that none of the universities under study had a SMART classroom as defined by ICAR. Even the best of the universities just had an interactive white board and projector and a few had CCTV, still they were called SMART classrooms. While releasing budget, ICAR should ensure that a standardized



SMART classroom is established and teachers are trained in the art of teaching through SMART classrooms. ICAR – NAARM can provide trainings in this regard

3. There should be uniformity in the content of all SAUs websites. For this a project can be sanctioned on content analysis and standardization of website material for SAUs of the country.
4. There should be formulation of formal policies, strategic plan, regulatory framework for using ICT for agricultural education

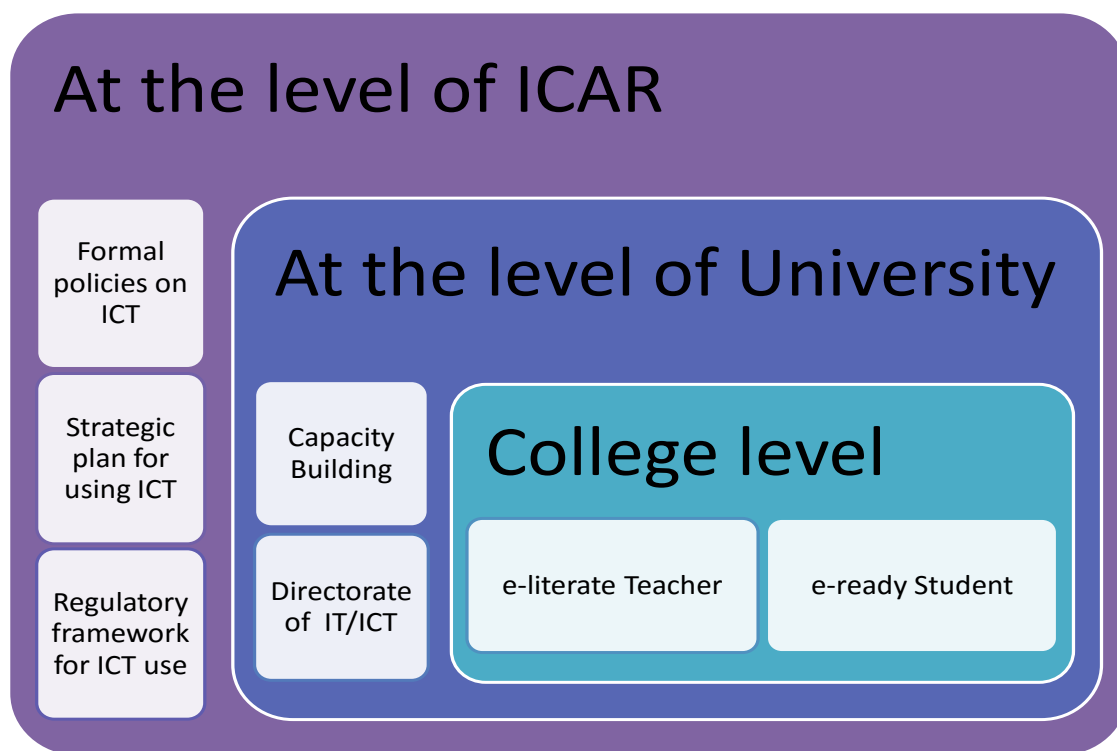
**At the level of University:**

1. Agricultural Universities should maintain one column on websites for ICT use in University
2. SAUs websites should be regularly updated.
3. CeRA password be made accessible to all students and teachers so as to work at the comfort of their home/hostel.
4. ICT facilities should be handled by experts in the field of Information Technology
5. Virtual Classrooms should be introduced where Student: Teacher ratio is high
6. Unlike State Agricultural Universities of Gujarat, establishment of Directorate of IT/ICT should be done in all SAUs. Develop online admission programme for UG and PG. This would also deal with online job application for teaching and non-teaching cadre and establish well equipped data centre for web hosting and data storage at University level. These Directorates will also provide e-learning facilities through intranet and internet, services related to e-library, maintenance of university website *etc.*
7. E-mail communication should be authenticated thus reducing the burden of two types of communications
8. To attract students to attend classes, use of blended learning and innovative ICT methodologies apart from Power Point Presentations should be used.
9. Wi-Fi enabled campus with high speed secured internet in all colleges and hostels as well as staff quarters with full time access.
10. Since mobile possession, frequency of usage was highest among all the stakeholders, it is recommended that mobile Applications should be developed on agricultural courses.
11. Teachers should be motivated, given ample facilities, have access and practical training. After that there should be compulsion on use of various ICT tools in teaching learning situation.

- There should be an ICT plan formulated at university level along with total infrastructural support to Director of Information Technology, all Deans, teachers and students with training.

### At College Level

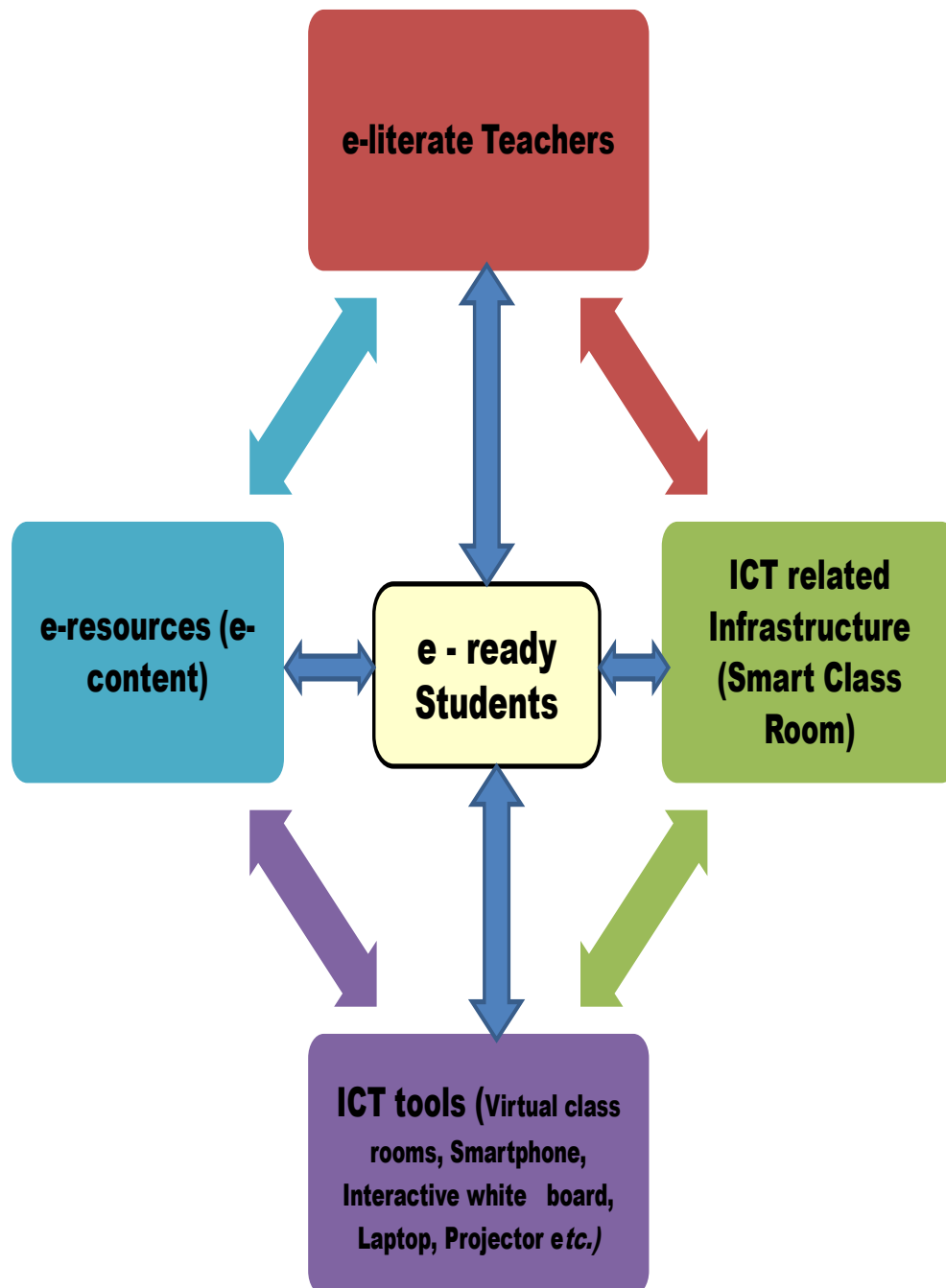
- As far as possible, it should be tried to have Student: Computer ratio as 1:1. This can be achieved by having one computer laboratory in each department of the college.
- All ICT facilities in the colleges should be available to all the students and teachers with monitoring done by CCTV and biometrics.
- Since agriculture is a field oriented subject of practical concern and agriculture being a state subject, SAUs of each state should develop their own interactive e-courses and place them on their websites for consultation of students and teachers.
- Since awareness and usage of smart phone, computer and Wi-Fi was highest among all the respondents so is recommended to develop educational course-wares which can be accessed on computers and smart phones.



**Fig 47: Future projection of ICT enabled Agricultural Education**

### **At the level of Teacher & the taught**

1. Creating awareness among the various stakeholders of agricultural education regarding use of latest ICT modes like Massive Online Open Courses, SIS, e-portfolio and Digital Student Report Card
2. Capacity building of administrative staff, teachers and students as well as motivational activities should be an integral part of each college
3. Peer learning should be given due place in institutions of higher learning
4. Enhancement in the e-literacy and e-readiness of teachers and students.
5. Promotion of hand written assignments which would check the habit of copy paste which is very much prevalent among students, and if soft copy is submitted, plagiarism check by teachers should be done.
6. Innovative assignment topics and use of group discussion and oral presentation methods to retain the creative thinking of the students
7. Availability of high speed internet in all the hostels
8. Since Facebook and WhatsApp were the social media which were accessed by majority, it is recommended that more use of this media to be made by teachers by way of forming Facebook and WhatsApp groups for knowledge dissemination.
9. The students and teachers were not very much sure of the accuracy of the information provided by the various ICT resources, it is recommended that firstly, a list of authenticated websites should be provided on the university websites and also, they should be provided with training workshop on information retrieval.



**Fig 48: ICT integrated Teaching-Learning Situation**

---

In light of the objectives and observations of the study following conclusions can be summarized as below:

**A. Profile of the respondents**

- Majority of the University teachers in the ten State Agricultural Universities of northern India were men of 25-53 years of age, holding PhD degree and had not undergone any formal training in the area of Information and Communication Technologies (ICTs). As regards years of service experience, more than one third (36.09%) of them had 0-15 years of experience. More than half (52.60%) of the teachers of the State Agricultural Universities in the northern part of the country belonged to urban background.
- Majority (61.54 percent) of the students under study were young men belonging to either General or Other Backward Class (OBC) from rural areas pursuing their Under Graduate studies without any fellowship and had not undergone any formal training related to ICT

**B. Status of Various ICT Tools in Agricultural Education**

- Out of the 16 State Agricultural Universities in the four states of Madhya Pradesh, Gujarat, Rajasthan, and Jammu & Kashmir; only four Universities in their website reported ICT related information for mode of course delivery namely; JNKVV (Madhya Pradesh), Anand Agricultural University (Gujarat), SKNAU, Jobner (Rajasthan) and MPUA&T, Udaipur (Rajasthan). JNKVV, Jabalpur has resources for course delivery such as e-learning through e- content development and AAU, Anand has every class room equipped with interactive white board, projector and CCTV and online examination conducted in College of Agricultural Information Technology. In order to update the subject matter knowledge of teachers, the global knowledge bowl is made accessible to all our teachers on their desk itself through ICT applications in MPUA&T, Udaipur and SKNAU, Jobner had the schedule of lectures taught on their website. Coming to infrastructure, all the 14 Universities had reported the use of ICT on their website except Nanaji Deshmukh Veterinary Science University, Jabalpur and Kamdhenu University, Gandhinagar. Almost all the universities reported that e-library facility with CeRA, *Krishiprabha* are available for students to help them with their academic and research

programmes. All the websites of the 16 Universities were making use of ICT for recruitment notifications and results displayed in their website, time table as well as for student registration. Apart from this, universities reported to be using ICT for various other matters such as results, syllabus, Pre – Degree Certificate and examination notification.

- Majority of the Deans under study reported that there was no provision of separate Information Technology budget but SKUAST, Jammu and RVSKVV, Gwalior reported 10 Lakhs IT budget. Out of 20 colleges under study, 13 had Educational Technology Cells in their colleges.
- On an Average, each college had 442 students and 44 faculty members to teach them and had around 91 computers which includes desktop as well as laptops.
- On an average, per college; there were 80 computers with internet, 442 students with internet and 32 printers. Majority of the student hostels had internet facility barring a few.
- Highest number of SMART classrooms were found in College of Agriculture, Jobner & Agriculture Chatta Campus, Jammu (8 each) followed by College of Agriculture, Gwalior. Majority of colleges had 2 or 3 SMART seminar halls. Video conference facility was found in half of the colleges but was used by majority occasionally as per need.
- e- journals were reported to be available in majority of the Universities whereas only two universities out of the 10 under study had developed their own e-courses. The practice of digital report system was prevalent in only eight colleges out of 20 under study. Thirty percent of the colleges under study were updating their websites daily whereas 25% were updating their websites weekly and equal percentage i.e. 20% were updating fortnightly and occasionally whereas only 5% were updating their websites monthly. Almost half of the universities under study did not have their domain mail id, still the teacher and the taught were communicating with each other through e-mails in majority of the universities under study.
- Online admissions have become a part and parcel of almost all the State Agricultural Universities under study. SIS was found in 50% of the colleges under study whereas staff biometrics was found only in 7 colleges out of 20 under study. As far as student biometrics attendance is concerned, only one college under study, i.e. College of

Agriculture, Indore has adopted it. Only two states (Madhya Pradesh and Rajasthan) under study had the facility for students to pay their fees online.

- Deans of majority of the colleges under study reported that they were using ICT in order to carry out institute management related tasks, were communicating online with teachers and communication by e-mails with educational authorities. Only 40% of the Deans were communicating online with the wards of students.
- Out of 20 colleges, 11 Deans reported that they had in – house maintenance of computers, laptops and other ICT related equipments whereas only five colleges were outsourcing the maintenance work. Still, four of the colleges were having in-house as well as outsourcing of maintenance work.

### **C. Impact of ICT Tools in Teaching and Learning Process**

- Majority of the Deans under study were aware of the usage of various ICT tools and all of them were using computers, Wi-Fi, smart phones and LCD projectors and computers, smart phones and Wi-Fi were used by them daily.
- Almost all Deans fell in the category of Strongly Agree regarding considering online admissions and student staff communication through e-mail to be time saving, Strongly Agree and Agree regarding accuracy of online admissions, Student Information System (SIS), Online payment of fees and student-staff communication through e-mail. Regarding how far has ICT eased their lives, all the Deans agreed for all the categories of work except for biometrics for staff for which the Deans just agreed.
- Majority of the Deans agreed to the fact that transparency & accountability and governance has improved to an extent of more than 76% to 90% whereas half of the respondents reported that academic development of students has improved to the extent of more than 76%.
- More than half of the teachers of State Agricultural Universities strongly agreed that ICT has become a very important factor for carrying out Administrative and academic activities of the colleges.
- Cent percent university teachers under study were aware of interactive white board, computer/laptop, LCD projector, television, Wi-Fi and mobile/smartphone but as far as the usage is concerned, only Wi-Fi was being used by all the teachers under study whereas majority of the teachers reported to have been using interactive white board,

computer/laptop, projector, television, mobile/smart phone and e-library for teaching-learning. Wi-Fi was the only technology which was used by all the teachers under study but as far as the frequency of usage was concerned, computer/laptop, Wi-Fi and mobile/smartphones were used by more than 90% of the respondents daily.

- All the teachers agreed that ICTs are time saving, provide accurate information and can be accessed with ease for research purpose, help in maintaining up-to-date subject information, for seminars/workshops/conference/presentation/ alerts, for communication and interaction, improved student leaning outcome, concept understanding, teaching style and strategy improvement, transparent assessment, review and update of course content, provision of additional learning resources and professional development. As far as accuracy was concerned, the mean value was less for concept understanding, research purpose and improving student learning outcome.
- Almost half of the teachers of State Agricultural Universities of northern India consider ICTs to be impacting the agricultural higher education in terms of academic development of students and staff to the extent of 76-90%,
- The negative impacts of ICT which were reported by majority of the teachers under study were students reluctant to attend classes, insufficient use of library by students, wastage of time in net surfing, over dependence on ICT, plagiarism problem, social media distraction, spurious information, duplication of research and diminishing reading and writing skills of students.
- Majority of the students of the agricultural universities of northern India had their own mobiles/tablets, laptops and internet connections. Cent percent students under study were aware of computer, television and mobile/smart phone whereas all of them were using a mobile/smartphone. Majority of the students were using computer/laptop, projector, television, Wi-Fi, e-library and academic websites. Wi-Fi, mobile/smartphone and e-library were used daily by majority.
- Majority of the students were using WhatsApp (90.61%), Facebook (84.49%) and Google+ (69.26%) and WhatsApp was the only social media being used daily by majority (78.58%) of the respondents and almost half (49.30%) were using Facebook daily.



- All the mean scores indicate that the responses were almost near to agree for time saving, accuracy and ease (3.76 – 3.88). Regarding considering ICTs as an accurate media for keeping up-to-date subject information, for seminar/workshop/conference presentation and for communication and exchange of ideas, majority of the students either agreed or strongly agreed whereas for considering ICT to be providing accurate information related to research, less than 60% agreed or strongly agreed. Majority of the students from the State Agricultural Universities of northern India either agreed or strongly agreed that the use of ICTs have eased their work in terms of their research work, getting up-to-date subject information, alerts on seminars/conferences and for communication and interaction with teachers/ friends.
- Majority of the students of agricultural universities under study consider ICTs to be impacting the agricultural higher education in terms of more than 76-90% improvement in placement & employment opportunities and opportunities for higher education. For considering ICT to be an important factor for carrying out administrative and academic activities of Universities, majority of the students were in the category of either agree (48.82%) or strongly agree (42.98%).
- Majority of the students linked ICT with health problems/lack of physical activity, reduced personal interaction and a threat to security & privacy whereas more than half of the students considered ICTs to be leading to time wastage in irrelevant activities and social problems like cyber-crimes *etc.*

#### **D. Factors affecting the adoption of ICT tools in Agricultural Education**

- Deans under study considered initial time requirement for ICT skill updating, ICT infrastructural facilities, training on ICT tools, operational knowledge of ICT tools, internet speed, availability of e-resources/Student Information System, organizational support & policy and budget availability for ICT as important factors that influence adoption of ICT in agricultural university system.
- Three fourth of the Deans of the State Agricultural Universities of northern India reported that lack of training opportunities to improve ICT skills as the major problem followed by speed/connectivity of internet (55%). Among the non-technical problems; half of the respondents reported that they were so busy with their work that there was no time for them to make judicious use of ICT resources.

- Considering infrastructural facilities; training on ICT tools, access to quality ICT tools, internet speed and availability of e-resources were the factors which affect the adoption of ICT by the teachers of the SAUs.
- Top rated constraints as reported by the teachers were lack of training opportunities to improve ICT skills (87.46%) and speed connectivity (81.04%). Regarding the non-technical problems; majority were considering lack of infrastructural facilities for accessing ICT resources.
- Initial time requirement, Infrastructural facilities, Training on ICT tools, Operational knowledge of ICT tools, Access to quality ICT tools, Internet Speed, availability of e resources/SIS, Organizational support & Policy had mean scores between 3.75-3.97 which denotes that the students agreed for all these eight factors to be affecting the adoption of ICT.

#### **E. Suggestions by Respondents**

- The Deans of the colleges of various Agricultural Universities gave a few suggestions on enhancing the use of ICT in Agricultural Education. It was suggested that ICT should be an integral part of the curriculum right from the beginning. Since use of ICT is just a beginning in most of the colleges so it is deemed important to have regular upgradation of knowledge of the students as well as the staff. There is a need for infrastructural development and skilled man power in the area of ICT. It was suggested that there should be separate IT budget. Also, workshops, seminars, conferences, webinars should be organized in the area of ICT. There should be mandatory capacity building programmes for students as well as staff including administrative, finance and technical personnel with provision of additional funding for ICT training and capacity building. Campuses of State Agricultural Universities should be provided with high speed internet facility which may facilitate and strengthen ICT based education in our Agricultural Universities.
- University teachers of the SAUs of northern India had given various suggestions for integration of ICT into education. Majority of them (97.86-82.26%) said that there should be capacity building programmes for students, teachers and administrative staff in the area of ICT, provision of good infrastructural facilities, proper internet speed/connectivity, regular upgradation of ICT tools, continuous support for

digitalization, comprehensive use of ICT in UG and PG studies, availability of education related soft wares in colleges, provision of virtual classrooms. As far as the capacity building in the area of ICT is concerned, it was recommended by the teachers that periodic trainings should be organized for the teachers, students and administrative staff. It must be mandatory for faculty to make use of ICT in teaching learning by way ICT tools, e-lectures, Power Point presentations and using current updates/data/information from related official website of government and other agencies as per the need of course curricula.

- ICT courses associated with the curricula should be practical oriented rather than theoretical. There should be collaboration between all agricultural universities regarding reading material and information on same topic to be accessed by all. Free and open access to students in universities regarding ICT facilities and they shouldn't be locked anymore. Availability of the sites like G-gate, e-journal, *Krishikosh*, *krishiprabha*, e-CeRA *etc.* have to be made available outside the boundaries of Universities too. Free Wi-Fi in hostel and college with good internet speed, infrastructural facilities and quality and updated tools are sufficient for students to learn.

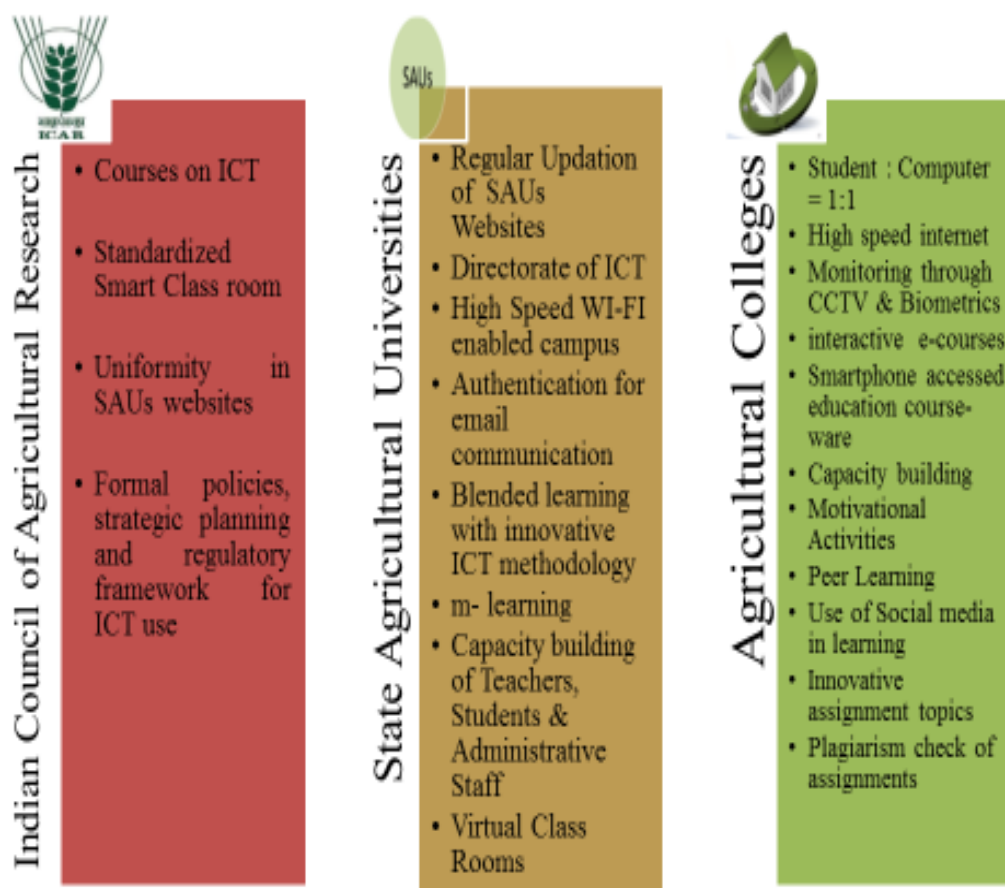
## POLICY STRATEGIES

---

---

- Information & Communication Technology course which is studied at Undergraduate level should be more practical oriented. It is recommended that it should be spread at different levels from basic to advance in subsequent years rather than just in one semester. Web ethics should also be added in the syllabus.
- While releasing budget, ICAR should ensure that a standardized SMART classroom is established and teachers are trained in the art of teaching through SMART classrooms. ICAR – National Academy of Agricultural Research Management can provide trainings in this regard
- There is an urgent need to enhance infrastructural facilities related to ICT such as latest soft wares, computers and high speed internet access in university colleges, hostels and even staff quarters. Virtual classrooms should be an answer to faculty crunch in newly formed SAUs. This would enable each and every classroom of all agricultural universities would be interconnected and each student at each college can enjoy best lecture by best teacher with ease and comfort to gain knowledge.
- Establishment of Directorate of IT/ICT should be done in all SAUs which would be responsible for development of online admission programme for UG and PG. This would also deal with online job application for teaching and non-teaching cadre and establish well equipped data centre for web hosting and data storage at University level. These Directorates will also provide e-learning facilities through intranet and internet, services related to e-library, maintenance of university website and documentation of all ICT resources in the University *etc.*
- There should be uniformity in content in all State Agricultural Universities websites and should be at least updated weekly. Agricultural Universities should maintain one column on authenticated websites for use in University.
- E-mail communication should be authenticated thus reducing the burden of two types of communications. Paperless communication would surely save environment and be time saving.

- Develop educational course wares such as e-courses and mobile Applications on various agricultural subjects for competitive examinations which can be accessed on computer and smart phones
- As far as the capacity building in the area of ICT is concerned, periodic trainings should be organized for the teachers, students and administrative staff. It must be mandatory for faculty to make use of ICT in teaching learning by way of ICT tools, e-lectures, Power Point presentation and using current updates/data/information from related official website of government and other agencies as per the need of course curricula.



**Fig 49: Policy strategies for ICT integration**

## REFERENCES

---

---

- Adedokun, N.A. and Kehinde, A. J. 2013.** ICT Impact Assessment Model: An Extension of CIPP and Kirkpatrick Evaluation Model, [https://hetl.org/wp-content/uploads/gravity\\_forms/2/2013/.../HETL%20article.doc](https://hetl.org/wp-content/uploads/gravity_forms/2/2013/.../HETL%20article.doc) retrieved on 14 April 2016.
- Alhassan, J.A. and Afolabi, M. 2012.** The use of information and communication in agricultural research in Nigerian universities. *PNLA Quarterly*, The official publication of the Pacific Northwest library Association, 76(3).
- Chauhan, N. B. 2014.** Information Technology for Agricultural Development in India, <http://agropedialabs.iitk.ac.in/openaccess/sites/default/files/WS%2014.pdf>
- Hattangdi, A and Ghosh, A.** Enhancing the quality and accessibility of higher education through the use of Information and Communication Technologies. <http://www.iitk.ac.in/infocell/announce/convention/papers/Strategy%20Learning-01-Ashish%20Hattangdi,%20%20Atanu%20Ghosh.pdf>
- Jamieson-Proctor, R. M. Burnett, P.C. Finger, G. and Watson, G. 2006.** ICT integration and teachers' confidence in using ICT for teaching and learning in Queensland state schools, *Australasian Journal of Educational Technology*, 22(4), 511-530.
- Jones, S., & Madden, M. 2002.** The Internet Goes to College: How Students are Living in the Future with Today's Technology [http://www.pewinternet.org/PPF/r/71/report\\_display.asp](http://www.pewinternet.org/PPF/r/71/report_display.asp). Retrieved on 1 May 2016.
- Joshi, P.J. and Chauhan, N. B. 2013.** Tool to measure attitude towards computer Application, *Gujarat Journal of Extension Education*, 24(12): 55-57.

- Koshy, S. M. and Kumar, K. 2015.** Retrieval and storage of research information by the post graduate students of Kerala Agricultural University, *Indian journal of Extension Education*, 51(1 &2): 99-101.
- Koulaouzides, G.A., Acker, D., Vergos, E. A., Crunkilton, J. R. 2003.** Innovative Agricultural Education Curriculum Practices Promote Sustainability in the Balkan Region of South Eastern Europe, *Journal of International Agricultural and Extension Education*, 10(1).
- Mendhe M. R. and Dhandore, K 2014.** Knowledge and Use of E-Resources: Awareness of Agriculture and Agricultural Engineering Faculties and Scientist of India, *PEARL - A Journal of Library and Information Science* 8 (2): 76-81.
- Moursund, D. 2005.** Introduction to Information and Communication Technology in Education, <http://pages.uoregon.edu/moursund/Books/ICT/ICTBook.pdf> accessed on 18/ 03/2016.
- National Agricultural Education Project (NAEP), 2012.** Indian Council of Agricultural Research Department of Agricultural Research & Education Detailed Project Report of the National Agricultural Education Project (NAEP) <http://www.icar.org.in/files/NAEP-Project-documentt.pdf> accessed on 27/11/2016.
- Nallusamy, A. Balasubramaniam, S. and Cheeappan, S. K. 2015.** Use of information communication technology (ICT) to achieve information literacy in Agriculture, *International journal of Agricultural Extension*, 03(02):111-122.
- Parsania, P.S. Kamani, K.C. and Shukla, X. U. 2013.** Perception of the college students regarding various aspect of computer applications. *Guj. J. Ext. Edu.* 24 (Dec) 4-8.
- Patel and Chauhan 2011.** The profile of the multimedia application expecting teachers for higher agricultural education, *Journal of global communication*, 4(1) January-June: 50-56.

- Pauratashi, M. and Mokhtarnia, M. 2009.** Investing factors influencing use of internet by agricultural faculty members for educational and research activities. *American-Eurasian J. Agric. & Environ. Sci.* 5(3): 398-402.
- Pauratashi, M. and Rezvanfar, A. 2010.** Analysis of factors influencing application of ICT by agricultural graduate students. *Journal of the American Society for information sciences and technology*, 61(1):81-87.
- Pelgrum, W.J. 2001.** Obstacles to the integration of ICT in education: results from a worldwide educational assessment, *Computers & Education* 37:163–178.
- Pestridge, S. 2012.** The beliefs behind the teacher that influences their ICT practices, *Computers & Education* 58: 449–458.
- Olare, B. I. 2014.** The impacts (positive and negative) of ICT on Education in Nigeria, *Developing Country Studies*, 4(23) pp 154-156
- Raj, M.P. Kathiriya , D.R. and Parmar, R.S. 2014.** Web based customized e-learning management system for students’ academic evolution. *Guj. J. Ext. Edu.* 25 (1) 80-82.
- Rathore, S. Ravichandran, S. and Poonam 2017.** Status of ICTs in Agricultural Higher Education: A Bird’s Eye View, ICAR – National Academy of Agricultural Research Management, Rajendranagar, Hyderabad – 500030, Telangana, India. 51p.
- Rhoades, E.B. Irani, T. Myers, B.E. 2008.** Internet as an information source: Attitudes and usage of students enrolled a college of agriculture course. *J. of Agril. Edu.* 49(2) pp108-117.
- Sankar, M. and Srinivasaraghavan, S. 2013.** Digital Information and Its Impact on Higher Education in Agricultural Sciences, *PEARL - A Journal of Library and Information Science* 7(2): 65-69.



**Soleimanpour, M. R. Rezaei, R. and Bakhtiari, R. 2013.** Factors Affecting the Application of Information and Communication Technologies in Agricultural Higher Education System (Case Study: Tehran), *J. Basic. Appl. Sci. Res.*, 3(2)564-568.

**Tondeur. J. Keer, H. V. Braak, J. V. Valcke, M. 2008.** ICT integration in the classroom: Challenging the potential of a school policy, *Computers & Education* 51: 212–223.

**UNESCO, 2002.** 'Open And Distance Learning Trends, Policy and Strategy Considerations', <http://unesdoc.unesco.org/images/0012/001284/128463e.pdf>

**Yusuf, M. O. 2005.** Information and communication technology and education: Analysing the Nigerian national policy for information technology, *International Education Journal*, 6(3), 316-321.

# ANNEXURES

## *Annexure-I*



ICAR-National Academy of Agricultural Research Management  
Rajendranagar, Hyderabad



### QUESTIONNAIRE-ADMINISTRATOR

“IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES  
(ICTs) ON AGRICULTURAL EDUCATION IN INDIA”

Date: \_\_\_\_\_ Name of University/College: \_\_\_\_\_

#### 1. General Information:

1. Name of the Administrator: \_\_\_\_\_
2. Email: \_\_\_\_\_
3. Designation & Address: \_\_\_\_\_
4. Mobile no: \_\_\_\_\_
5. No. of Colleges affiliated to this University \_\_\_\_\_
6. Presence of Educational Technology Cell (YES/NO) \_\_\_\_\_
7. IT Budget (in Rupees) \_\_\_\_\_

#### 2. Information/Details from Administrator related to usage of ICT tools in the University/College:

1. No. of faculty members \_\_\_\_\_
2. No. of Computer labs \_\_\_\_\_
3. No. of Desktops \_\_\_\_\_ Laptops \_\_\_\_\_ & Printers \_\_\_\_\_ for Academic / Research / Extension.
4. No. of computers with internet connectivity in this campus \_\_\_\_\_ & Bandwidth \_\_\_\_\_.
5. No. of SMART classrooms in this college \_\_\_\_\_
6. No. of SMART seminar halls in this college \_\_\_\_\_
7. No. of students in the college \_\_\_\_\_
8. No. of students with internet access in this college \_\_\_\_\_
9. Whether internet facility is available in the hostel (YES/NO) \_\_\_\_\_
10. Whether e-journals, e-books, e-Magazines etc. are available YES/NO \_\_\_\_\_
11. No. of e-courses available \_\_\_\_\_
12. Use of “Digital Student Report Card System” YES/NO \_\_\_\_\_
13. How often this institute’s website is updated (daily/weekly/ fortnightly/monthly/ occasionally) \_\_\_\_\_

14. Whether video-conference facility is available (YES/NO) \_\_\_\_\_  
If yes, how often it is used (daily/weekly/fortnightly/ monthly/occasionally)
15. Availability of online admissions (YES/NO) \_\_\_\_\_
16. Availability of students' information system YES/NO \_\_\_\_\_
17. Use of biometrics for staff (YES/NO) \_\_\_\_\_
18. Use of biometrics for students (YES/NO) \_\_\_\_\_
19. Online payment of fees (YES/NO) \_\_\_\_\_
20. Students and staff communication through email (YES/NO) \_\_\_\_\_
21. Use of domain email ids (YES/NO) \_\_\_\_\_

### 3. Use of ICT for any of the following?

1. Institute management related tasks (budgeting, planning, timetabling, etc.) (Yes/No)
2. Communicating online with teachers (email, web site announcements, etc.) (Yes/No)
3. Communicating online with parents (email, web site announcements, etc.) (Yes/No)
4. Communicating by emails with educational authorities (at local, regional, or central level) (Yes/No)

### 4. Maintenance of ICT equipment by a) In-house staff ( ) & b) Outsourced ( )

### 5. Availability, Awareness and Usage Pattern of ICT Materials and Tools:

Items	Awareness		Usage (YES / NO)		Usage: (1- Never, 2- Occasionally, 3-Monthly, 4-Weekly, 5- Daily)
	Aware	Unaware	YES	NO	
1. Interactive white board					
2. Computer					
3. Projector					
4. Television					
5. Video conference					
6. Teleconference					
7. E-Portfolio					
8. Wi-Fi / LAN					
9. Digital student report card system					
10. Virtual class rooms					
11. Mobile					
12. E-Library					

## 6. Constraints affecting adoption of ICT:

### A Technical problems

- |   |  |            |
|---|--|------------|
| 1 | Lack of awareness about ICT                          | (Yes / No) |
| 2 | Information Search and Retrieval skills              | (Yes / No) |
| 3 | Lack of training opportunities to improve ICT skills | (Yes / No) |
| 4 | Speed / Connectivity                                 | (Yes / No) |

### B Non-technical problems

- |   |   |            |
|---|---|------------|
| 1 | Lack of infrastructure facilities for accessing ICT resources | (Yes / No) |
| 2 | Lack of time to access ICT resources                          | (Yes / No) |
| 3 | Others please specify _____                                   |            |

## 7. ICT Impact Indicators:

### 7.1 ICT Impact Indicators (Please tick (✓) in the specific column)

S. No.	Items	After using ICT Tools (Answer only if you have used)														
		Time saving					Accuracy					Ease				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1.	Online admissions															
2.	Student Information System (e.g. Notifications, Course registration, Hostel accommodation, Curriculum, Study material, Attendance, Fee payment status, Grades/Results etc.)															
3.	Biometrics for staff															
4.	Online payment of fees															
5.	Students and staff communication through email															
6.	Online recruitment process															
7.	Online Assessment															

**Note: 1- Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree**

## 8. Suggestions for improving usage of ICT in Education:

---



---



---

**THANK YOU FOR YOUR TIME AND EFFORT**



*Annexure-II*  
**ICAR-National Academy of Agricultural Research Management**  
**Rajendranagar, Hyderabad**



**QUESTIONNAIRE-PRINCIPAL / DEAN**

**“IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES  
(ICTs) ON AGRICULTURAL EDUCATION IN INDIA”**

**Date:** \_\_\_\_\_ **Name of University/College:** \_\_\_\_\_

**1. General Information:**

1. Name of the Administrator: \_\_\_\_\_
2. Email: \_\_\_\_\_
3. Designation & Address: \_\_\_\_\_
4. Mobile no: \_\_\_\_\_
5. No. of Colleges affiliated to this University \_\_\_\_\_
6. Presence of Educational Technology Cell (YES/NO) \_\_\_\_\_
7. IT Budget (in Rupees) \_\_\_\_\_

**2. Information/Details from Administrator related to usage of ICT tools in the  
University/College:**

1. No. of faculty members \_\_\_\_\_
2. No. of Computer labs \_\_\_\_\_
3. No. of Desktops \_\_\_\_\_ Laptops \_\_\_\_\_ & Printers \_\_\_\_\_ for Academic  
/ Research / Extension.
4. No. of computers with internet connectivity in this campus \_\_\_\_\_ & Bandwidth  
\_\_\_\_\_.
5. No. of SMART classrooms in this college \_\_\_\_\_
6. No. of SMART seminar halls in this college \_\_\_\_\_
7. No. of students in the college \_\_\_\_\_
8. No. of students with internet access in this college \_\_\_\_\_
9. Whether internet facility is available in the hostel (YES/NO) \_\_\_\_\_
10. Whether e-journals, e-books, e-Magazines etc. are available YES/NO \_\_\_\_\_
11. No. of e-courses available \_\_\_\_\_
12. Use of “Digital Student Report Card System” YES/NO \_\_\_\_\_
13. How often this institute’s website is updated (daily/weekly/ fortnightly/monthly/  
occasionally) \_\_\_\_\_
14. Whether video-conference facility is available (YES/NO) \_\_\_\_\_  
If yes, how often it is used (daily/weekly/fortnightly/ monthly/occasionally)
15. Availability of online admissions (YES/NO) \_\_\_\_\_

16. Availability of students' information system YES/NO \_\_\_\_\_
17. Use of biometrics for staff (YES/NO)\_\_\_\_\_
18. Use of biometrics for students (YES/NO)\_\_\_\_\_
19. Online payment of fees (YES/NO) \_\_\_\_\_
20. Students and staff communication through email (YES/NO)\_\_\_\_\_
21. Use of domain email ids (YES/NO)\_\_\_\_\_

**3. Use of ICT for any of the following?**

1. Institute management related tasks (budgeting, planning, timetabling, etc.) (Yes/No)
2. Communicating online with teachers (email, web site announcements, etc.) (Yes/No)
3. Communicating online with parents (email, web site announcements, etc.) (Yes/No)
4. Communicating by emails with educational authorities (at local, regional, or central level) (Yes/No)

**4. Maintenance of ICT equipment by a) In-house staff ( ) & b) Outsourced ( )**

**5. Availability, Awareness and Usage Pattern of ICT Materials and Tools:**

Items	Awareness		Usage (YES / NO)		Usage: 1- Never, 2- Occasionally, 3-Monthly, 4-Weekly, 5- Daily
	Aware	Unaware	YES	NO	
1. Interactive white board					
2. Computer					
3. Projector					
4. Television					
5. Video conference					
6. Teleconference					
7. E-Portfolio					
8. Wi-Fi / LAN					
9. Digital student report card system					
10. Virtual class rooms					
11. Mobile					
12. E-Library					

**6. Constraints affecting adoption of ICT:**

**A Technical problems**

- 1 Lack of awareness about ICT (Yes / No)
- 2 Information Search and Retrieval skills (Yes / No)
- 3 Lack of training opportunities to improve ICT skills (Yes / No)
- 4 Speed / Connectivity (Yes / No)

**B Non-technical problems**

- 1 Lack of infrastructure facilities for accessing ICT resources (Yes / No)
- 2 Lack of time to access ICT resources (Yes / No)
- 3 Others please specify \_\_\_\_\_

**7. ICT Impact Indicators:**

**7.1 ICT Impact Indicators (Please tick (✓) in the specific column)**

S. No.	Items	After using ICT Tools (Answer only if you have used)														
		Time saving					Accuracy					Ease				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
8.	Online admissions															
9.	Student Information System (e.g. Notifications, Course registration, Hostel accommodation, Curriculum, Study material, Attendance, Fee payment status, Grades/Results etc.)															
10.	Biometrics for staff															
11.	Online payment of fees															
12.	Students and staff communication through email															
13.	Online recruitment process															
14.	Online Assessment															

**Note: 1- Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree**

**7.2 Please rate the Extent of improvement for the following after using ICT Tools (Answer only if you have used... 0 – No improvement, 1 – 10%, 2 – 20%, 3 – 30 %,..... 9 – 90%):**

- 1. Transparency & Accountability \_\_\_\_\_
- 2. Manpower Productivity \_\_\_\_\_
- 3. Academic development of staff (High rated articles/ awards / Projects / Overseas visit) \_\_\_\_
- 4. Academic development of students (JRF/SRF/NET / Competitive exams etc...) \_\_\_\_\_
- 5. Employability of students \_\_\_\_\_
- 6. Governance \_\_\_\_\_

**7.3 List out the negative impacts of ICT:**

---

---

---

**8. Please rate the factors influencing the adoption of ICT 1- Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree:**

1. Initial time requirement for ICT skill updation \_\_\_\_\_
2. Infrastructure facilities \_\_\_\_\_
3. Training on ICT tools \_\_\_\_\_
4. Age \_\_\_\_\_
5. Operational knowledge of ICT tools \_\_\_\_\_
6. Access to quality ICT tools \_\_\_\_\_
7. Internet Speed \_\_\_\_\_
8. Availability of e resources/SIS (student information system) \_\_\_\_\_
9. Workload \_\_\_\_\_
10. Organizational support and Policy \_\_\_\_\_
11. Fund availability / Budget \_\_\_\_\_
12. Incentives \_\_\_\_\_

**9. Suggestions for improving usage of ICT in Education:**

---

---

---

**THANK YOU FOR YOUR TIME AND EFFORT**





*Annexure-III*  
**ICAR-National Academy of Agricultural Research Management**  
**Rajendranagar, Hyderabad**



**QUESTIONNAIRE-TEACHERS**

**“IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES  
(ICTs) ON AGRICULTURAL EDUCATION IN INDIA”**

**Date:** \_\_\_\_\_ **Name of University & College:** \_\_\_\_\_

**1. General Information:**

1. Name of the Faculty: \_\_\_\_\_

2. Designation: \_\_\_\_\_

3. Mobile No: \_\_\_\_\_

4. Email: \_\_\_\_\_

5. Age: \_\_\_\_\_

6. Gender: Man  Woman

7. Family Background: Rural  Urban

**2. Educational qualifications (Highest Degree with specialization):** \_\_\_\_\_

**3. Service Experience (Years):** \_\_\_\_\_

**4. Training received in Information and Communication Technology (ICT): Yes/No**

If yes, please provide the following information (Only for last years 2014-15 & 2015-16)

Sl. No.	Name of the training programme (Relevant to ICT application)	Name of the organizer & venue	Period(in days)

**5. Do you agree that ICT has become very important factor for carrying out administrative and academic activities of institute?**

Strongly Agree     Agree     Partially Agree     Disagree     Strongly Disagree

## 6. Constraints affecting adoption of ICT:

### A Technical problems:

- |   |  |            |
|---|--|------------|
| 1 | Lack of awareness about ICT                          | (Yes / No) |
| 2 | Information Search and Retrieval skills              | (Yes / No) |
| 3 | Lack of training opportunities to improve ICT skills | (Yes / No) |
| 4 | Speed / Connectivity                                 | (Yes / No) |

### B Non-technical problems:

- |   |   |            |
|---|---|------------|
| 1 | Lack of infrastructure facilities for accessing ICT resources | (Yes / No) |
| 2 | Lack of time to access ICT resources                          | (Yes / No) |
| 3 | Others please specify   |            |

## 7. ICT Impact Indicators:

### 7.1 ICT Impact Indicators (Please tick (✓) in the specific column)

S. No	Items	Indicators														
		Time saving					Accuracy					Ease				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	For research purpose (Thesis/Dissertation/projects/articles)															
2	For keeping up-to-date subject information															
3	For seminar/ workshop/conference presentation / Alerts															
4	For communication & Interaction (To exchange ideas)															
5	Concept understanding															
6	Improving Student learning outcome															
7	Teaching style & strategy improvement															
8	Transparent assessment															
9	Review & updating course content															
10	Provision of additional learning resources															
11	Professional development (Online Training, MOOCs)															

Note: 1- Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree

**7.2 Please rate the Extent of improvement for the following after using ICT Tools (Answer only if you have used...0 – No improvement, 1 – 10%, 2 – 20%, 3 – 30 %,..... 9 – 90%):**

1. Transparency & Accountability \_\_\_\_\_
2. Academic development of staff (High rated articles/ awards / Projects / Overseas visit) \_\_\_\_\_
3. Academic development of students (JRF/SRF/NET / Competitive exams etc...) \_\_\_\_\_
4. Employability of students \_\_\_\_\_
5. Governance \_\_\_\_\_

**7.3 List out the Positive & Negative impacts of ICT:**

---

---

---

---

---

**8. Please rate the factors influencing the adoption of ICT (1- Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree):**

1. Initial time requirement for ICT skill updation \_\_\_\_\_
2. Infrastructure facilities \_\_\_\_\_
3. Training on ICT tools \_\_\_\_\_
4. Age \_\_\_\_\_
5. Operational knowledge of ICT tools \_\_\_\_\_
6. Access to quality ICT tools \_\_\_\_\_
7. Internet Speed \_\_\_\_\_
8. Availability of e resources/SIS (student information system) \_\_\_\_\_
9. Workload \_\_\_\_\_
10. Organizational support and Policy \_\_\_\_\_
11. Fund availability / Budget \_\_\_\_\_
12. Incentives \_\_\_\_\_

**9. Suggestions for improving usage of ICT in Education:**

---

---

**THANK YOU FOR YOUR TIME AND EFFORT**



*Annexure-IV*  
**ICAR-National Academy of Agricultural Research Management**  
**Rajendranagar, Hyderabad**



**QUESTIONNAIRE - STUDENTS**

**“IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) ON AGRICULTURAL EDUCATION IN INDIA”**

**Date:** \_\_\_\_\_ **Name of University/College:** \_\_\_\_\_

**1. General Information:**

1. Name of the Student: \_\_\_\_\_
2. Course: UG  PG  Name of the course \_\_\_\_\_ Year \_\_\_\_\_
4. Mobile No: \_\_\_\_\_ 5. Email: \_\_\_\_\_
6. Age: \_\_\_\_\_ 7. Gender:  Man  Woman
10. Category: \_\_\_\_\_ General / SC / ST / OBC.
11. Background: Rural  Urban  12. Scholarship / Fellowship: Yes / No

**2. Additional training on ICT other than course syllabus: Yes / No**

No. of trainings: \_\_\_\_\_ Duration of training: \_\_\_\_\_

**3. Availability, Awareness and Usage Pattern of ICT Materials and Tools:**

Items	Awareness		Usage		1- Never, 2- Occasionally, 3-Monthly, 4-Weekly, 5- Daily
	Aware	Unaware	YES	NO	
1.Interactive white board					
2.Computer / Laptop					
3.Projector					
4.Television					
5.Video conference					
6.Teleconference					
7.E-Portfolio					
8.Wi-Fi					
9.Digital student report card System					
10.Virtual class rooms					
11.Mobile / Smartphone					

12.E-Library (Agropedia/CERA/ e-granth/e-prints@smfi/Agri daksh/ Krish Prabha/ ekrishishikha etc...)					
13.University website / ICAR website / other academic related websites					

**4. Personal ICT Resources:**

- |                     |                              |                             |
|---------------------|------------------------------|-----------------------------|
| 1. Mobile/Tablet:   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. PC/Laptop:       | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. Net connectivity | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

**5. Use of Social media in learning (Time spent: Never, Occasionally, Monthly, Weekly, and daily):**

1. Facebook (YES / NO) & Time spent on it \_\_\_\_\_
  2. Whatsapp (YES / NO) & Time spent on it \_\_\_\_\_
  3. Google Groups (YES / NO) & Time spent on it \_\_\_\_\_
  4. Wiki (YES / NO) & Time spent on it \_\_\_\_\_
  5. Twitter (YES / NO) & Time spent on it \_\_\_\_\_
  6. Blog (YES / NO) & Time spent on it \_\_\_\_\_
  7. Google+ (YES / NO) & Time spent on it \_\_\_\_\_
- Any other please specify \_\_\_\_\_

**6. Do you agree that ICT has become very important factor for carrying out administrative and academic activities of institute?**

- Strongly Agree   
 Agree   
 Partially Agree   
 Disagree   
 Strongly Disagree

**7. Please rate the Purposes of using ICT resources (1.Strongly disagree 2.Disagree 3. Undecided 4. Agree 5. Strongly Agree):**

1. For research purpose (Thesis/Dissertation/projects/articles/Assignments/Presentation) \_\_\_\_\_
2. For keeping up-to-date subject information \_\_\_\_\_
3. To gain current and general knowledge information \_\_\_\_\_
4. For seminar/ workshop/conference presentation \_\_\_\_\_
5. For communication (To exchange ideas) \_\_\_\_\_

## 8. ICT Impact Indicators:

### 8.1. ICT Impact Indicators (Please tick (✓) in the specific column):

S. No.	Items	Indicators														
		Time saving					Accuracy					Ease				
		0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
1	For research purpose (Thesis/Dissertation/projects/articles)															
2	For keeping up-to-date subject information															
3	For seminar/ workshop/conference presentation / Alerts															
4	For communication & Interaction (To exchange ideas)															

### 8.2. Please rate the Extent of improvement for the following after using ICT Tools (Answer only if you have used.... 0 – No improvement, 1 – 10%, 2 – 20%, 3 – 30 %.,..... 9 – 90%):

1. Concept understanding \_\_\_\_\_
2. Academic performance \_\_\_\_\_
3. Placement and Employment opportunity \_\_\_\_\_
4. Opportunities for higher education \_\_\_\_\_

### 9. Please rate the factors influencing the adoption of ICT (1- Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree):

1. Initial time requirement \_\_\_\_\_
2. Infrastructure facilities \_\_\_\_\_
3. Training on ICT tools \_\_\_\_\_
4. Operational knowledge of ICT tools \_\_\_\_\_
5. Access to quality ICT tools \_\_\_\_\_
6. Internet Speed \_\_\_\_\_
7. Availability of e resources/SIS (student information system) \_\_\_\_\_
8. Workload \_\_\_\_\_
9. Organizational support and Policy \_\_\_\_\_

### 10. Which of the following Impacts of ICT do you agree on:

1. Health Problems / Lack of physical activity (YES / NO) \_\_\_\_\_
2. Time wastage in irrelevant activities (YES / NO) \_\_\_\_\_

3. Reduce personal interaction (YES / NO) \_\_\_\_\_

4. Security and privacy (YES / NO) \_\_\_\_\_

5. Social problems (YES / NO) \_\_\_\_\_

6. Lack of innovation & Creativity (YES / NO) \_\_\_\_\_

Any other please specify \_\_\_\_\_

**11. Suggestions for usage of ICT in education:**

---

---

---

---

---

**Thank you for your time and effort.**