

1 **Relationship of Demographic characteristics with usability of online and mobile media among**  
2 **farmers of Punjab**

**Comment [f1]:** This manuscript represents an important advance of new knowledge in ICT's by rural society. This shows a good methodology, results, discussion and conclusions.

There are some questions that want improve this article.

3  
4 **ABSTRACT**

5 In India, like other countries of the worlds, online and mobile media have opened new avenues of  
6 the information and entertainment for people from different sectors of life including agriculture. The  
7 present paper is an endeavour to analyze the accessibility and usability of online and mobile media among  
8 farmers and to find out the relationship between demographic variables and various online and mobile  
9 media. The primary data were collected from randomly selected 720 farmers from 16 villages of Punjab  
10 through self-structured questionnaire. The findings of the study indicate that almost all farmers in the  
11 study area had access to mobile phones while 78.05 per cent farmers were using internet on their mobile  
12 phones. However, 60.56 per cent farmers had used agri-apps and agricultural websites to obtain  
13 agricultural information. Only 43 per cent of them had positive perception towards the usefulness of  
14 information attained through online and mobile media. Further, there was a positive correlation of  
15 demographic characteristics such as education, income and land with usage of online and mobile media  
16 whereas age and experience had shown negative correlation. This implies that with the increase in age  
17 and experience of farmers, the possibility of using mobile and online media for agricultural information  
18 declined whereas higher education, larger landholdings and more income facilitated greater use of mobile  
19 phones and internet for agriculture purposes. Thus, the socio-economic characteristics of farmers had a  
20 direct and deep relationship with the accessibility and usage of online and mobile media among farmers  
21 of Punjab.

**Comment [f2]:** (%) please

**Comment [f3]:** How often?

22 **Keywords:** Online and mobile media, agriculture, agri-apps and agricultural websites.

23  
24 **INTRODUCTION**

25 The present era is a digital and technology era. Invention of computer technology has made life  
26 easier and convenient in many ways. One can virtually acquire information about everything from pin to  
27 piano with the help of computer (Saleh *et al*, 2018). Williamson and Smoak (2005) posited that  
28 computers have become a robust tool of this technological era and internet facility has catalyzed the scope  
29 of "edutainment". Internet is the biggest invention in mass media which has transformed the world into  
30 global village by reducing the distances of information exchange. As a result, people all over the globe  
31 have recognized the internet as their latest developmental tool. Although, Internet is not solution for rural  
32 and agrarian development, but it brings new resources of information and can start new communication  
33 channels for rural society. It can create mechanisms that enable the bottom-up articulation and sharing of  
34 local knowledge. The various advantages provided by it in reducing cost as well as time are the reasons  
35 for its eruptive and perpetual growth. It pervades political affairs, social networking, culture, commerce,  
36 and daily life (Poushter, 2016).

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40 Furthermore, invention of mobile phone and smart phone has brought out revolutionary change in  
41 the world. It has become a boon for human beings and also become the most ubiquitous  
42 telecommunication technology in developing countries where subscription rates have soared from 250

43 million in 2000 to almost 7 billion 13 years later. Business persons, government agencies and non-  
44 government organizations are gradually paying attention to provide services through mobile phones (m-  
45 services) in areas of health, agriculture, education and entertainment to gain the maximum benefits of this  
46 trend. This rapid growth was possible due to less expensive cell phones, falling call rates and internet  
47 packages as well as spreading the networks to rural areas (Baumuller, 2015).

48 India is the second-largest mobile phone user with over 1034.25 million users in the world  
49 (Anonymous, 2016b). About 30.92 million mobile phones users are from Punjab (Anonymous, 2016b). It  
50 brings new opportunities for rural farmers to acquire the information regarding agriculture and  
51 agricultural technologies. Rural agro-advisory services increase the opportunities for farmers to  
52 accomplish agricultural development goals through supplementary investments, resources, and strategies.  
53 Better and timely information related to market price, weather, etc. may be necessary for the well-being  
54 of farmers in various ways.

55 Online and Mobile media can benefit the farmers by helping research new methods to increase  
56 output; monitoring weather on a daily/hourly basis; exchange of ideas between farmers, researchers,  
57 cooperatives, suppliers and buyers; purchase of machinery, seed, chemicals, etc. online; monitoring of  
58 prices; gathering investing and marketing tips, etc. The possibilities are numerous with the increasing  
59 usage of online and mobile media. Farmers' information needs may encompass subjects as diverse as  
60 agricultural, economic, literacy, health, religious or socio-political information. Therefore, to know the  
61 usage of online and mobile media among farmers of Punjab, the present study focused on the following  
62 objectives:

- 63  to analyze the accessibility and usability of online and mobile media among farmers
- 64  to find out the relationship between demographic variables and various online and mobile media

## 65 **METHODOLOGY**

66 Exploratory in nature, the present study was conducted in the rural areas of Punjab by using  
67 multiple stage random sampling. At Level I, four districts were randomly selected from three cultural  
68 regions of Punjab i.e. Jalandhar from *Doaba*, Amritsar from *Majha* and Sangrur and Moga from *Malwa*  
69 region. (Two districts were chosen from Malwa region for it being the largest of the three regions.) At  
70 Level II, Two blocks were selected from each of the selected districts on random basis. Thus, a total of  
71 eight blocks were chosen from four districts. Level III: Further, two villages from each selected block  
72 were chosen. Hence, a total of 16 villages were finalized for the study from selected 8 blocks (Annexure  
73 I). At level IV, farmers from three categories such as marginal, small and large farmers were chosen  
74 randomly as respondents from the selected villages. For this, 15 farmers from each category were selected  
75 from each identified village. So, this added up to 45 farmers from each village. Thus, the total sample was  
76 of 720 farmers from rural areas of Punjab. They were asked to fill close-ended questionnaire in the  
77 language of their choice i.e. Punjabi and English. The obtained data were tabulated and frequency  
78 distribution, percentages and averages were worked out for analysis of data. Pearson coefficient of  
79 correlation was also employed to find out the relationship between demographic profiles and online and  
80 mobile media.

81 **Operational Definitions:** The following operational definitions were framed to control the  
82 variable by making the measurement constant and to ensure reproducibility of results.

### 84 **Marginal Farmer**

85 A Marginal farmer means a farmer who cultivates agricultural land up to two acre as an owner or as  
86 tenant.

**Comment [f4]:** Are that definitions own? Or are there literature?

87 **Small Farmer**

88 A Small farmer, whether he is land owner or tenant, cultivates agricultural land between 2 to up to 5  
89 acre.

90 **Large Farmer**

91 A large farmer cultivates the agricultural land more than 5 acre as an owner or as tenant.

92 **RESULTS AND DISCUSSION**

93 **Demographic Profile of Farmers**

94 The demographic characteristics of farmers such as age, education qualifications, marital status,  
95 family type, annual income and experience in farming are important factors for the present study as these  
96 may help to determine the utilization of online and mobile media for agriculture. That is why; these  
97 variables were analyzed and have been discussed below in detail.

98 Age is an important variable influencing the perception and performance of an individual towards  
99 various issues of society. According to the data presented in table 1, (30.28%+21.67%+13.19%= 65.14%)  
100 a large number of respondents belong to the age group of 40 years and above whereas only a few  
101 respondents were of young age group. It implies that rural youth is opting for the other lines of  
102 employment as sources of their income or livelihood, as agriculture is generally considered not very  
103 remunerative. Age comparison between three categories of farmers shows that 54.17 per cent of marginal,  
104 51.66 per cent of small and 50 per cent large farmers belonged to age group between 40 to 60 years  
105 whereas age of 34.58 per cent of marginal farmers, 33.34 per cent of small farmers and 36.67 per cent of  
106 large farmers lied between 20 to 40 years. It indicates that children of large and marginal farmers are  
107 more likely to adopt agriculture as compared to small farmers.

108 Further the table 1 reveals the education of farmers under the study. The results shown in table 1  
109 indicate that out of the total farmers, 15 per cent were illiterate. More than half of farmers (28.06% +  
110 23.61%) were educated up to matric and senior secondary level, respectively and the rest were (6.93%)  
111 graduates and above. By comparing the three categories of farmers, it was observed that small farmers  
112 (30.42% and 23.75%) and large farmers (25.83% and 26.25%) were having education up to matric and  
113 senior secondary as compared to marginal farmers (27.92% matric & 20.83% senior secondary). In terms  
114 of higher education, there were 7.08 per cent (6.25% +0.83%) of small and 9.59 per cent (7.92%+1.67%)  
115 of large farmers who were graduates and above as compared to marginal farmers (4.16% graduates and  
116 above). It can be concluded that accessibility and affordability of higher education was more among  
117 small and large farmers as compared to marginal farmers.

118 **Table: 1 Distribution of Farmers on the basis of demographic characteristics**

Age (in Years)	Marginal farmer n=240	Small farmer n=240	Large farmer n=240	Total (N=720)
20 years ≥ and < 30 years	23 (9.58)	25 (10.42)	29 (12.08)	77 (10.69)
30 years ≥ and < 40 years	60 (25.00)	55 (22.92)	59 (24.59)	174 (24.17)
40 years ≥ and < 50 years	82 (34.17)	84 (35.00)	52 (21.67)	218 (30.28)
50 years ≥ and < 60 years	48 (20.00)	40 (16.66)	68 (28.33)	156 (21.67)

**Comment [f5]:** It is possible compare main results between regions (Doaba, Majha, Malwa)?

**Comment [f6]:** That's a problem in a rural society in different places.

≥ 60 years	27 (11.25)	36 (15.00)	32 (13.33)	95 (13.19)
<b>Educational Qualifications</b>				
Illiterate	50 (20.83)	32 (13.33)	26 (10.83)	108 (15.00)
Primary	24 (10.00)	16 (6.67)	18 (3.33)	58 (8.06)
Middle	39 (16.25)	46 (19.17)	47 (19.58)	132 (18.33)
Matric	67 (27.92)	73 (30.42)	62 (25.83)	202 (28.06)
Senior Secondary	50 (20.83)	57 (23.75)	63 (26.25)	170 (23.61)
Graduate	8 (3.33)	15 (6.25)	19 (7.92)	42 (5.83)
Post Graduate & above	2 (0.83)	2 (0.83)	4 (1.67)	8 (1.11)
<b>Marital Status</b>				
Unmarried	16 (6.67)	19 (7.92)	19 (7.92)	54 (7.50)
Married	223 (92.92)	220 (91.67)	221 (92.08)	664 (92.22)
Divorced	1 (0.42)	1 (0.42)	-	2 (0.28)
<b>Family Type</b>				
Joint family	92 (38.33)	95 (39.58)	111 (46.25)	298 (41.39)
Nuclear	148 (61.67)	145 (60.42)	129 (53.75)	422 (58.61)
<b>Annual Income (in Rupees)</b>				
< 100000	145 (60.42)	12 (5.00)	-	157 (21.81)
100000 ≥ and < 300000	79 (32.91)	152 (63.33)	33 (13.74)	264 (36.67)
300000 ≥ and < 500000	16 (6.67)	62 (25.84)	97 (40.42)	175 (24.31)

500000 ≥ and < 700000	-	14 (5.83)	88 (36.67)	102 (14.17)
≥ 700000	-	-	22 (9.17)	22 (3.06)
<b>Experience in Farming (in years)</b>				
< 5	21 (8.75)	16 (6.67)	13 (5.42)	50 (6.94)
5 ≥ and < 10	31 (12.92)	31 (12.92)	24 (10.00)	86 (11.94)
10 ≥ and < 15	65 (27.08)	55 (22.92)	58 (24.17)	178 (24.72)
15 ≥ and < 20	53 (22.08)	47 (19.58)	55 (22.92)	155 (21.53)
≥ 20	70 (29.17)	91 (37.92)	90 (37.50)	251 (34.86)

Figures in parentheses are percentages

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The data pertaining to marital status in Table 1 indicates that majority (92.22%) of farmers were married and 7.50 per cent were unmarried. Same trend was observed among all categories of farmers (92.92% of marginal, 91.67% of small and 92.08% of large farmers) regarding marital status. Family system has been undergoing many changes which affect not only its functions but also its structure. From last one decade, nuclear family system is become quite common not only in urban India but also in rural India due to changing social norms, urban and western influences, modernization, growing individualistic approach, etc. Similar results were found in the study. Results presented in table 1 reveal that more than half of farmers (58.61%) were having nuclear families whereas only 41.39 per cent of them belong to joint families. It depicts that nuclear families which were earlier found in urban areas have now made inroads in rural areas too as shown in table 1. Interestingly, the number of joint families was more among the large farmers (46.25%) as compared to marginal (38.33%) and small (39.58%) farmers.

As far as annual income is concerned, it was found that more than one-fifth of farmers had annual income less than Rs. 100000 from which majority was the marginal farmers and only five per cent were small farmers. Further, it was noticed that more than one-third (36.67%) and nearly one-fourth (24.31%) of farmers had annual income between Rs. 100000 ≥ and Rs.< 300000 and Rs. 300000 ≥ and Rs.< 500000, respectively whereas only 17.23 per cent of them were having annual income above Rs. 500000 annually, out of which 5.83 per cent were small farmers and 45.84 per cent were large farmers. It implies that overall, majority of farmers whether they are marginal or small, had income between Rs. 100000 to Rs. 300000 per annum except large farmers who earned even up to Rs.700000 and above annually.

The figures pertaining to farming experience show that more than one-third of farmers (34.67%) had more than 20 years experience in farming followed by one-fourth (24.72%) and one-fifth (21.53%) farmers who had experience of 10 ≥ and < 15 years and 15 ≥ and < 20 years, respectively. The remaining 18.88 per cent (6.94+11.94) were pursuing agriculture for up to 10 years (table 1).

#### **Accessibility of Mobile Phones and its usage Pattern**

144 In the present study, farmers were asked about ownership of mobile phones and their pattern of  
 145 usage. As presented in table 2, overall, majority of farmers (99.17%) had their own mobile phones while a  
 146 very few of them (0.83%, 6 in numbers) did not have mobile phones which could be due to ignorance and  
 147 poor economic conditions. Therefore, the study implies that farmers had accessibility and availability of  
 148 mobile phones as it is affordable, portable as well as beneficial during hours of emergency.

149 Regarding the availability of mobile phones at home, the table discloses that the farmers having  
 150 two mobile phones and 'three or more' mobile phones at homes were 40.42 per cent each followed by  
 151 18.75 per cent farmers with one mobile phone at their homes which either belonged to the farmers or their  
 152 family members. The difference between categories of farmers shows that there are maximum  
 153 percentages (34.58% and 52.09%) of those large farmers who had two and 'three or more' mobile phones,  
 154 respectively at their homes in comparison to marginal (39.58% and 32.50 %) and small (47.08% and  
 155 36.67%) farmers, respectively. More than one fourth (26.67%) of marginal farmers were having one  
 156 mobile handsets at their houses as compared to 16.25 per cent of small and 13.33 per cent of large  
 157 farmers.

158 A further investigation elicited the responses regarding number of hours mobile phones were used  
 159 by farmers in a day. A majority of 27.17 per cent farmers spent less than one hour in a day on a mobile  
 160 phone which could be due to time constraints whereas 18.91 per cent and 15.69 per cent of them were  
 161 making use of mobile phones between 1-2 and 2-3 hours, respectively. Only 5.32 per cent farmers  
 162 (3.78%+1.54%) used mobile phones for more than three hours per day. Though, farmers (49.36%  
 163 marginal, 45.83% small and 35.15% large farmers) from all three categories used mobile phones for less  
 164 than one hour, in a day, but maximum percentages of such low users belonged to marginal category.

165 **Table 2: Distribution of farmers on the basis of their mobile phone usage pattern**  
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Ownership of mobile	Marginal farmer n=240	Small farmer n=240	Large farmer n=240	Total (N=720)
Yes	235 (97.92)	240 (100)	239 (99.58)	714 (99.17)
No	5 (2.08)	-	1 (0.42)	6 (0.83)
<b>No of mobiles are there at home</b>				
None	3 (1.25)	-	-	3 (0.41)
One	64 (26.67)	39 (16.25)	32 (13.33)	135 (18.75)
Two	95 (39.58)	113 (47.08)	83 (34.58)	291 (40.42)
Three or more	78 (32.50)	88 (36.67)	125 (52.09)	291 (40.42)
<b>Type of Mobile</b>				
Ordinary Phone	70	71	50	191

	(29.79)	(29.58)	(20.92)	(26.75)
Smart Phone	165 (70.21)	169 (70.42)	189 (79.08)	523 (73.25)
<b>Hours spent on using mobile in a day</b>	<b>Marginal farmers n<sub>1</sub>=235</b>	<b>Small farmers n<sub>2</sub>=240</b>	<b>Large farmers n<sub>3</sub>=239</b>	<b>*Total N=714</b>
<1	116 (49.36)	110 (45.83)	84 (35.15)	194 (27.17)
1-2	67 (28.51)	59 (24.58)	76 (31.80)	135 (18.91)
2-3	42 (17.87)	55 (22.92)	57 (23.84)	112 (15.69)
3-4	7 (2.98)	10 (4.17)	17 (7.11)	27 (3.78)
>4	3 (1.28)	3 (1.25)	5 (2.09)	11 (1.54)

167 Figures in parentheses are percentages  
 168 MF=Marginal farmer, SF=Small farmer, LF=Large farmer  
 169 \*those respondents who have their own personal mobile phones

#### 170 **Purpose of Using Mobile Phones**

171 The data presented in table 3 revealed that almost every single farmer was making use of mobile  
 172 phones to keep in touch with friends/family members/relatives via calling. Maximum numbers of farmers  
 173 were found to be making good use of mobile phones for agriculture or obtaining agriculture related  
 174 information as well. It was seen that 57.56 per cent farmers had used it for getting weather updates  
 175 regularly as it is the first and foremost information required by farmers. SMS service for updates on  
 176 agriculture news, sending/receiving calls to agriculture experts, establishing link with markets and  
 177 seeking market information scored 43.84 per cent, 32.07 per cent and 29.55 per cent, respectively. Only  
 178 14.01 per cent of them were accessing extension service through mobile phones.

179 As explained above, mostly, farmers were accessing the information related to weather  
 180 updates/news through mobile phones. However, it was observed that percentages of small and large  
 181 farmers were almost similar (60.42% and 59.41 per cent, respectively) in seeking weather information  
 182 whereas marginal farmers with 52.77 per cent were slightly behind them. A closer look reveals that large  
 183 farmers were using mobile phones for various purposes more often as compared to small and marginal  
 184 farmers except weather updates and chat as shown in table 3.

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189 **Table 3: Purpose of using mobile phone**

Purpose	Marginal farmers n <sub>1</sub> =235	Small farmers n <sub>2</sub> =240	Large farmers n <sub>3</sub> =239	*Total N=714
Sending/receiving calls to friends/family/relatives	235 (100.0)	240 (100.0)	239 (100.0)	714 (100.0)
Sending/receiving calls to agriculture experts	88 (37.45)	88 (36.67)	112 (46.86)	288 (40.33)
Access to extension services	17 (25.96)	29 (12.08)	54 (22.59)	100 (14.01)
Establishing market links	61 (32.77)	68 (28.33)	100 (4.84)	229 (32.07)
Seeking market information	77 (32.76)	66 (27.50)	68 (28.45)	211 (29.55)
Using SMS service for updates on agriculture news	75 (31.91)	106 (44.17)	132 (55.23)	313 (43.84)
Listening to music	112 (47.66)	120 (50.00)	129 (53.97)	361 (50.57)
Watching films/songs through mobile internet	95 (40.42)	98 (40.83)	107 (44.77)	300 (42.01)
Weather updates	124 (52.77)	145 (60.42)	142 (59.41)	411 (57.56)

191 Figures in parentheses are percentages

192 \*those respondents who have their own personal mobile phones

### 193 Accessibility of Online media and its usage Pattern

194 Out of the total respondents, 78.05 per cent farmers were the internet users whereas 21.95 per  
 195 cent of them were non internet users because either they had simple phones or they were unable to use  
 196 and afford internet packages. Comparison between marginal, small and large farmers shows that  
 197 percentages (85%) of large farmers were on higher side as active internet users as compared to small  
 198 (77.92%) and marginal (71.25%) farmers. It indicates that large farmers were a step ahead in adopting  
 199 new technology.

200 **Table 4: Distribution of farmers on the basis of their internet usage**

Internet Using	Marginal farmers n=240	Small farmers n=240	Large farmers n=240	Total N=720
Yes	171 (71.25)	187 (77.92)	204 (85.00)	562 (78.05)
No	69 (28.75)	53 (22.08)	36 (15.00)	158 (21.95)

201 Figures in parentheses are percentages

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### 203 Type of Agricultural Information Searching through Internet



204 Further, the study explored the various kinds of information, the farmers searched on the internet  
 205 i.e. weather report, new technology, input prices, marketing information, financial assistance, etc. Out of  
 206 internet user respondents (562 in numbers, table 4), it was observed that amongst all information, weather  
 207 related information was the first and foremost information required and searched by all farmers from all  
 208 regions on internet. The presented data in table 5 indicates that a majority (94.48%) of farmers regularly  
 209 searched on internet for weather report/updates followed by marketing information (53.56%), new  
 210 technology (39.32%) and input prices/availability (25.62%) whereas only 13.52 per cent, 12.81 per cent  
 211 and 11.03 per cent farmers sought information related to financial assistant/bank loans, best packages of  
 212 practices and allied occupation, respectively on internet. Information regarding plant protection  
 213 technology (8.72%) and crop insurance (3.56%) was searched by a very few farmers.

214 Further, the data shows slight difference between marginal, small and large farmers for acquiring  
 215 information through internet as shown in table5. Largely, farmers were interested in acquiring  
 216 information related to weather updates, new technology and marketing information through internet.

217 **Table 5: Distribution of respondents according to type of agricultural information searched**  
 218 **through internet**

219 **Multiple Responses**

	<b>Marginal farmers n<sub>1</sub>=171</b>	<b>Small farmers n<sub>2</sub>=187</b>	<b>Large farmers n<sub>3</sub>=204</b>	<b>*Total N=562</b>
Weather report	165 (96.49)	182 (97.33)	184 (94.19)	531 (94.48)
New technology	52 (30.40)	68 (36.36)	101 (49.51)	221 (39.32)
Input prices and availability	30 (17.54)	45 (24.06)	69 (33.82)	144 (25.62)
Marketing information	94 (54.97)	97 (51.87)	110 (53.92)	301 (53.56)
Plant protection technology	9 (5.26)	20 (10.69)	20 (9.80)	49 (8.72)
Financial assistance/Bank loans	27 (15.79)	19 (10.16)	30 (14.71)	76 (13.52)
Best package of practices	13 (7.60)	24 (12.83)	30 (14.70)	72 (12.81)
Crop Insurance	4 (2.33)	7 (3.74)	9 (4.41)	20 (3.56)
Allied occupations	12 (7.02)	25 (12.25)	25 (12.25)	62 (11.03)

220 Figures in parentheses are percentages  
 221 \*those respondents who are internet users

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223 **Usage of Mobile based Agri Apps**

**Comment [f7]:** Is it possible speak about frequency of use of agri-apps? And what is target by used them?

224 Out of the total internet users, 59.79 per cent farmers used mobile based agri-apps for obtaining  
 225 agricultural information. Comparison between farmers' categories reveals that lesser number of marginal  
 226 farmers (53.22%) use agri apps as compared to small (63.64%) and large (61.76%) farmers. It can be  
 227 concluded that despite limited education, more than half of the respondents who used internet, were using  
 228 agri apps through mobile phones.

229 **Table 6: Distribution of respondents according to the use of mobile based agri. Apps for getting**  
 230 **agricultural information**

	<b>Marginal farmers n<sub>1</sub>=171</b>	<b>Small farmers n<sub>2</sub>=187</b>	<b>Large farmers n<sub>3</sub>=204</b>	<b>*Total N=562</b>
Yes	91 (53.22)	119 (63.64)	126 (61.76)	336 (59.79)
<b>If yes, Which mobile based agro-advisory service or agri apps do you use</b>				
<b>Multiple Responses</b>				
	<b>Marginal farmers n<sub>1</sub>=91</b>	<b>Small farmers n<sub>2</sub>=119</b>	<b>Large farmers n<sub>3</sub>=126</b>	<b>**Total N=336</b>
IFFCO Kisan	25 (27.47)	22 (18.49)	48 (38.09)	95 (28.27)
KisanSuidha	38 (41.76)	54 (45.38)	66 (52.38)	158 (47.02)
Kheti-Badi	53 (58.24)	70 (58.82)	64 (50.97)	187 (55.65)
AgriApp	12 (13.19)	21 (17.65)	26 (20.63)	59 (17.56)
Fertilizer calculator	1 (1.09)	3 (2.52)	4 (3.17)	8 (2.38)
PusaKrishi	7 (7.69)	11 (9.24)	8 (6.34)	26 (7.74)
KrishiGyan	8 (8.79)	18 (15.13)	22 (17.46)	48 (14.29)
Crop Insurance	2 (2.19)	1 (0.84)	-	3 (0.89)
AgriMarket	-	2 (1.68)	2 (1.59)	4 (1.19)

231  
 232 Figures in parentheses are percentages  
 233 \*those respondents who are internet users  
 234 \*\*\*those respondents who are using only apps

235 Further, the perusal of table 6 shows the distribution of farmers on the basis of type of apps they  
 236 preferred for information and these farmers were those who were using agri apps on their own. So the

237 data indicates that amongst all agri-apps, Kheti-Badi (55.65%) and Kisan Suvidha (47.02%) were  
 238 preferred often by farmers for agricultural information followed by IFFCO Kisan (28.27%), AgriApp  
 239 (17.56%) and KrishiGyan (14.29%). Pusa Krishi (7.74%), Agri-Market (1.19%) and Crop insurance  
 240 (0.89%) were used by very few farmers. Same trend was observed among marginal, small and large  
 241 farmers regarding the type of agri apps used.

242 **Website Accessed by Farmers Often**

243 Out of total internet users, 72.77 per cent farmers were using agricultural websites for acquiring  
 244 agricultural information (table 7). It is interesting to note that percentage of marginal (74.85%) farmers  
 245 using websites is slightly higher than small (70.53%) and large (73.54%) farmers. Further, farmers were  
 246 asked about the types of websites accessed often by them for acquiring different kinds of agricultural  
 247 information. So the perusal of table 7 shows that *Krishiworld.com* is the most accessed website by 42.29  
 248 per cent of farmers followed by *farmer.gov.in* (23.23%), *krishijagran.com* (20.78%), *agriwatch.com*  
 249 (11%), *agriquest.info* (10.27%) and *agricoop.nic.in* (8.80%) whereas *isapindia.org* (5.87%),  
 250 *rmlglobal.com* (3.42%), *fert.nic.in* (2.44%), *indiaagristat.com* (1.71%) and *fcweb.nic.in* (0.98%) were  
 251 preferred by a very few farmers for agricultural information. Data discloses that there was slight  
 252 difference in percentages of marginal, small and large farmers from all regions.

253 **Table 7: Website accessed by farmers often**

254 **Multiple Responses**

Accessed websites	Marginal farmers n <sub>1</sub> =171	Small farmers n <sub>2</sub> =187	Large farmers n <sub>3</sub> =204	*Total N=562
Yes	128 (74.85)	131 (70.53)	150 (73.54)	409 (72.77)
Types of websites	Marginal farmers n <sub>1</sub> =128	Small farmers n <sub>2</sub> =131	Large farmers n <sub>3</sub> =150	Total N=409
agricoop.nic.in	14 (10.94)	9 (6.87)	13 (8.67)	36 (8.80)
agriquest.info	14 (10.94)	12 (9.16)	16 (10.67)	42 (10.27)
agriwatch.com	15 (11.72)	12 (9.16)	18 (12.00)	45 (11.00)
farmer.gov.in	32 (25.00)	27 (20.61)	36 (24.00)	95 (23.23)
isapindia.org	4 (3.13)	10 (7.63)	10 (6.67)	24 (5.87)
rmlglobal.com	7 (5.47)	3 (2.29)	4 (2.67)	14 (3.42)
krishijagran.com	15 (11.72)	34 (25.95)	36 (24.00)	85 (20.78)
agmarknet.nic.in	15 (11.72)	19 (14.50)	15 (10.00)	49 (11.78)

fert.nic.in	3 (2.34)	2 (1.53)	5 (3.33)	10 (2.44)
krishiworld.com	46 (35.94)	59 (45.04)	68 (45.33)	173 (42.29)
indiaagristat.com	3 (2.34)	2 (1.53)	2 (1.33)	7 (1.71)
fciweb.nic.in	1 (0.78)	1 (0.76)	2 (1.33)	4 (0.98)

255 Figures in parentheses are percentages

256 MF=Marginal farmer, SF=Small farmer, LF=Large farmer

257 **Criteria of selecting the apps or website**

258 Here, the study sought to know the criteria adopted by farmers while selecting agri-apps and  
 259 websites for agricultural information (table 8). **It is interesting to note that nearly half (47.25%) of farmers**  
 260 **had relied on expert advice** while selecting them whereas 19.72 per cent of them relied on the suggestions  
 261 given by their friends/relatives. About 15.83 per cent of farmers' selection criteria were based on the  
 262 popularity of apps and websites while 17.20 per cent of them chose apps and websites on random basis.

**Comment [f8]:** That reflects importance of extensionists in a rural development.

263 Comparison between farmers' categories shows the selection criteria of 57.85 per cent of small  
 264 farmers was based on expert advice by extension/agricultural expert followed by marginal (41.18%) and  
 265 large (43.13%) farmers. It implies that small farmers relied heavily on expert advice for selecting agri-  
 266 apps and websites as compared to marginal and large farmers.

267 **Table: 8 Criteria of selecting the apps or website for agricultural information by farmers**

	<b>Marginal farmers n<sub>1</sub>=136</b>	<b>Small farmers n<sub>2</sub>=140</b>	<b>Large farmers n<sub>3</sub>=160</b>	<b>*Total N=436</b>
Expert advice	56 (41.18)	81 (57.85)	69 (43.13)	206 (47.25)
Popularity	24 (17.65)	15 (10.71)	30 (18.75)	69 (15.83)
Choose randomly	27 (19.85)	20 (14.28)	28 (17.50)	75 (17.20)
Suggested by friends/relatives	29 (21.32)	24 (17.14)	33 (20.62)	86 (19.72)

268  
 269 Figures in parentheses are percentages

270 \*those farmers who are using websites and agri-apps

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273 **Perception of farmers regarding usefulness of online information**

274 Farmers were asked whether agricultural information attained through internet is really beneficial  
 275 for them or not. The table 9 describes the perception of farmers regarding usefulness of agricultural  
 276 information. Overall, 43.47 per cent farmers reported that information obtained through internet was  
 277 really useful for them whereas 23.89 per cent replied in negative and 32.64 per cent farmers had a neutral  
 278 approach. Among all the three categories of farmers, more than half of (54.17%) large farmers had a  
 279 positive perception along with the 34.42 per cent of marginal and 40.83 per cent of small farmers towards  
 280 it whereas 28.75 per cent marginal and 26.67 per cent small farmers had given negative opinion as they  
 281 did not find online agricultural information useful. This portends that the digital or online content needs to  
 282 be improved and made more gripping to evoke the interest of the farming community. Only then can an  
 283 agriculturist harvest the benefits of online medium.

284 **Table 9: Perception of farmers regarding usefulness of online information**

	Marginal farmers n=240	Small farmers n=240	Large farmers n=240	Total N=720
Yes	85 (34.42)	98 (40.83)	130 (54.17)	313 (43.47)
No	69 (28.75)	64 (26.67)	39 (16.25)	172 (23.89)
Can't say	86 (35.83)	78 (32.50)	71 (29.58)	235 (32.64)

285 Figures in parentheses are percentages

286 **Relationship between online and mobile media use and various demographic variables**

287 Information pertaining to demographic profile facilitates the judicious selection of medium which  
 288 enhances the efficacy of extension work (Cartmell II *et al.*, 2006). Moreover, Socio-economic  
 289 characteristics should be under consideration for spreading various ICTs (Ojo, 2005). Keeping in view  
 290 the importance of this issue, Pearson coefficient correlation test was applied to find out the relationship  
 291 between various demographic variables such as age, education, marital status, land, family type, income  
 292 and experience and usage pattern of online and mobile media among farmers. The results of correlation  
 293 coefficient have been discussed below in detail.

294 The results presented in table 10 depict that positive significant correlation was found between  
 295 education (.441\*\*), income (.313\*\*), land (.285\*\*) and usage of mobile media whereas mobile phone  
 296 usage had negative correlation with age (-.209\*\*), marital status (-.150\*\*), and experience (-.188\*\*). It  
 297 indicates that usage of mobile media for agriculture escalated with increase in the level of education, land,  
 298 income; whereas, negative correlation shows that with increasing age and experience, use of mobile  
 299 phone for agriculture decreased.

300 The results reflect the existence of highly significant correlation of farmers' education (341\*\*),  
 301 income (.188\*\*) and land (.171\*\*) with usage of online media among them at 1per cent level of  
 302 significance. It implies that usage of online media increased with the higher education level. In other  
 303 words, educated farmers were accessing various types of agricultural information through online media.  
 304 Their income was also contributing to increase in the use of online media among farmers as with high  
 305 income, they were able to avail the internet services and their agricultural land was their source of  
 306 income. On the other hand, age (-.214\*\*) and experience (-.225\*\*) appeared as negatively significant. It

**Comment [f9]:** Are there other similar studies by  
make results comparison?

307 indicates that curiosity to learn new technology and its adoption declined with increasing age and  
 308 experience of the farmers and they preferred to follow traditional ways rather than new ones.

309 **Table 10: Relationship between farmers' demographic profiles and usage pattern of online and**  
 310 **mobile media**

	Age	Education	Marital status	Land	Family type	Income	Experience
Mobile media	-.209**	.441**	-.150**	.285**	-.073*	.313**	-.188**
Online media	-.214**	.341**	-0.043	.171**	-0.022	.188**	-.225**
Overall usage of mobile and online media	-.214**	.341**	-0.043	.171**	-0.022	.188**	-.225**

311 \*\* Correlation is significant at the .01 level (1-tailed)

312 Further, the study observed a deep effect of demographic variables on the usage of overall  
 313 mobile and online media for agriculture among farmers. Age, education, land, income, experience had a  
 314 significant correlation with the overall usage of online and mobile media except marital status and family  
 315 type. Among these five, age (-.214\*\*) and experience (-.225\*\*) was found negatively correlated with  
 316 online and mobile media at one per cent level whereas education (.341\* at 5% level), land (.171\* at 5%  
 317 level), income (.188\*\* at 1% level) had positive and significant correlation with it. Further, category-wise  
 318 analysis illustrates that age (-.155\*\*), education (.324\*\*), land (.300\*\*), income (.264\*\*), experience (-  
 319 .213\*\*) of marginal farmers were significantly correlated with online and mobile media at one per cent  
 320 level followed by small farmers with age (-.199\*\*), education (.325\*\*) and experience (.213\*\*). On the  
 321 other hand, no significant relation was found between demographic profile of large farmers and overall  
 322 usage of online and mobile media.

323 It is clear that due to higher age, usage of mobile phones and internet remains less and curiosity to  
 324 gain new knowledge and to do new experiments is also reduced due to ample knowledge gained already  
 325 through experience. They believe in usual farming practices etc. (Islam and Gronlund, 2011; Jain and  
 326 Hudal, 2007). They (old farmers) are more traditional in nature and they are much interested to follow  
 327 their customary ways in doing agriculture. A study by Richardson *et al.* (2000) disclosed that young and  
 328 middle aged farmers have more curiosity to learn and adopt new ideas, new technology and new ICTs  
 329 tools such as computer, mobile/smart phones, internet/online media, etc.

330 **CONCLUSION**

331 Mobile phone and internet usage makes the lives of farmers easier in modern times. Mobile  
 332 phones facilitate farmers to get in touch with their relatives and friends, agricultural experts/extension  
 333 experts, explore markets for agriculture updates on affordable prices, transportation, etc. and that too by  
 334 spending less time. However, the fact that almost half of the farmers in the present study utilized mobile  
 335 phones for their profession i.e. agriculture and the rest were unable to harvest the benefits facilitated by  
 336 mobile phones, leaves a question mark on realizing the full potential of mobile media in agriculture. This  
 337 could be due to low education, less exposure to new technology, fear or disinterest in accepting or  
 338 operating new technology in old age etc. Farmers' demographic characteristics such as education, land,  
 339 income had significant correlations with online and mobile media. It means that with better education and  
 340 income resources, interest in obtaining new knowledge related to farming by using mobile and online

341 media also increased. While, age and experience had negative significant correlation with concerned  
342 variables, which indicates declining trend of using mobile and online media for agricultural information  
343 with increasing farmers 'age and experience. Thus, the socio-economic characteristics of farmers had a  
344 direct and deep relationship with the accessibility and utilization of online and mobile media among  
345 farmers of Punjab.

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**Comment [f10]:** Use a same format by references. There are different formats in this section.

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**Annexure I**

386

**List of Randomly Selected Districts, Blocks and Villages of Punjab**

<b>Regions</b>	<b>4 Districts</b>	<b>8 Blocks</b>	<b>16 Villages</b>
Doaba	Jalandhar	Phillaur	Thala Bansian
			Partap Pura
		Jalandhar West	Kahlwan
			Nussi
Majha	Amritsar	Rayya	Wadala Kalan
			Dhianpur
		Ajnala	Awan
			Kiampur
Malwa	Sangrur	Malerotla II	Dhaler Kalan
			Momnabad
		Sunam	Sheron
			Chatha Nanhera
	Moga	Dharmkot	Bakarwala
			Manawan
		Moga -I	Madoke
			Mehna

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