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Exploring The Use of Information Communication Technologies among Dairy Farmers to Improve Farm Productivity in Punjab Pakistan

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ABSTRACT

This study was conducted to examine the impact of demographic attributes on the usage of information and communication technologies (ICTs) among dairy farmers in District Sheikhupura, which is a prominent area in terms of dairy potential and dairy households. The use of ICTs was aimed at improving dairy farm productivity through extended awareness and adoption of recommendations. Tota 383 randomly selected respondents were interviewed face to face on a structured questionnaire. The collected data were analysed using Statistical Package for Social Sciences (SPSS). Results indicated that 36% of farmers were aged between 36-50 years, 35.8% had no formal education, 60.1% had less than 5 acres of land and 37.6% had the experience of over 20 years. The chi-square test of association confirmed that education ($P<0.05$), land size ($P<0.05$) and monthly income ($P<0.05$) were significantly associated with the use of ICTs. Whereas, age and experiences were insignificant ($P>0.05$) with the use of ICTs. Multiple Regression analysis confirmed that age, education and size of landholdings had statistically significant relationships with the adoption of ICTs among dairy farmers. This study, concludes that improvement in the socio-economic attributes of the farmers was associated with the improvement in the use of ICTs. Therefore, efforts are needed to improve the socio-economic conditions of farmers through farmer facilitation, subsidies, training and skills development regarding use of ICT gadgets.

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INTRODUCTION

Livestock is the leading sub-sector of agriculture which provide employment and food items to rural people especially. Livestock contributes 61.89 percent to agriculture and 14.04 percent to the GDP of the national economy of Pakistan. Significant growth of 3.26 percent as compared to the previous year 2020-21 is a good sign for economic growth, food security and poverty alleviation. The dairy sector also plays a positive role in increasing the 3.1 percent production of milk overall. The contribution of Cow and buffalo in milk production is 36.8 and 60 percent of total milk production, respectively (GOP, 2022).

In the modern era of technology, things are changing very quickly. People are using the latest tools to save time and effort. Information and communication technologies (ICT) play a superior role to disseminate information in a minimum time among livestock farmers accurately to improve many aspects of livestock and dairy production practices. ICT makes it easy to connect the farmers and aware them of the latest technologies regarding animals' health, dairy herd management, market scenario and

livestock produce (Manoj, et al. 2021). Information and communication technologies are used in precision livestock farming which is the digital management system for all operations of livestock production practices like animal health, reproduction and other management practices. Through these latest technologies, animals and their activities can be easily and continuously monitored and information is transferred from animals to humans in the form of audiovisual data (Takin et al. 2021).

The traditional extension has become a very weak method to deliver extension services among farmers to enhance their productivity. Limited resources and lack of advancement in the dissemination of knowledge are the major factors in the delivery of innovations to the agricultural community. Cyber extension or digital agriculture is replacing the traditional approaches with the help of information and communication technologies (ICT) to educate the farmers regarding all aspects of agricultural practices timely. ICTs always contribute a significant role in the growth and development of the delivery of farmer services in the right way and accurately. Robert et al. (2022) reported that in West Africa, ICTs are an important part of all agricultural operations. Especially, TV, radio and mobile phones were the prominent ICT tools through which they receive information about agricultural practices. Mobile phone is used to update their knowledge to boost livelihood and upgrade the living standard of rural people.

METHODOLOGY

The design is a research tool that investigates "people's beliefs, opinions, and behaviours" (Ary et al., 2010). Sheikhupura district was selected for the study due to its richness of livestock and dairy animal population.

The target population was dairy animal keepers (buffaloes and cows) registered with the Department of Livestock, Punjab in the district Sheikhupura. The researcher visited the head office of the District Livestock Officer (DLO) and requested a list of registered households of dairy farmers and extension field staff (EFS) in the district. 1,69,896 buffalo and cattle households were the population of this research.

The sample size was selected by using an online surveysystem.com (Creative Research Systems, 1982) calculator with a 95% confidence level and confidence interval 5. The total sample size was 383 dairy farmers against a population of 1,69,896 buffalo and cattle households. With a total sample size of dairy farmers 383, a simple random sampling technique was used due to the homogenous population of this research study. Three tehsils, Sheikhupura, Sharaqpur and Muridke were selected from five tehsils of district Sheikhupura. From each tehsil eight union councils (UCs) were selected randomly. From each union council, two villages were selected. Then, eight dairy farmers were interviewed from each village as respondents.

The researcher developed an interview schedule keeping in view the study objectives. Generally, the questions were closed-ended. A five-point Likert Scale i.e, Very low (1), Low (2), Medium (3), High (4), Very high (5) was used to determine the level of agreement or disagreement about the effectiveness of ICTs. The data were collected through face-to-face interviews. The Statistical Package for Social Sciences (SPSS) was used to analyze the research data.

RESULTS AND DISCUSSION

Data presented in Figure 1 reveals that 36% and 34.5% of the respondents were middle-aged (36-50 years) and young (up to 35 years), respectively. Slightly similar results were mentioned by Amitendu et al. (2014) who described that 46 and 24.4% of the farmers belonged to the categories of "35-50 years old" and "Below 35 years old" in their age.

However, more than one-third (35.8%) of the dairy farmers were illiterate while only 12.3% of the respondents had more than a high school (Matric) education. A slightly comparative study was observed by Hossain et al. (2021) as they described that 30% of the respondents had no education (illiterate). A simple majority (60.1%) of the dairy farmers had up to 5 acres of land holding to cultivate fodders and other supporting crops. Opposite results were reported by Adu et al. (2001) which revealed that 37 and 32% of the farmers had "Below 4 acres" and "5-10 acres" landholding, respectively. More than one-third (37.6%) of the respondents had "more than 20 years" of dairy farming experience in their lives. Opposite results were informed by Ali et al. (2019) who revealed that 13.6 and 19.4% of the respondents had "16-20 years" and "21-30 years" farming experience. In the category of monthly income, 35.5% of the respondents earned "15000-25000 PKR" from livestock production. Saleem et al. (2022) found 34.2% of livestock farmers earned "15000 to 30000 PKR" monthly to run their farms and family. Thus, the findings are more or less similar.

Association between demographics and use of ICTs

Parametric analysis is made by drawing associations based on given information provided by respondents. To figure out the relationship between the adoption of ICTs (dependent variables) and various socio-economic characters (independent variables), Chi-square and F-test are used.

Table 1. Association between respondents' age and their level of usage of ICTs for dairy animals' production practices.

Age (in years)	Use of ICTs			Total
	Low	Medium	High	
Young	51	60	21	132
	38.6%	45.5%	15.9%	100.0%
Middle	100	33	5	138
	72.5%	23.9%	3.6%	100.0%
Old	100	8	5	113
	88.5%	7.1%	4.4%	100.0%
Total	251	101	31	383
	65.5%	26.4%	8.1%	100.0%

Chi-square = 74.41 d. f. = 4 P-value = .000**

Table 1 shows that age of the respondents had highly statistically significant relationship with the usage of the ICTs ($\chi 2 = 74.41$, $p = .000$). This relationship accentuates that age of the farmers and the use of ICTs are associated with each other. With the change in age there is likelihood of the change in the use of the ICTs among farmers. This can be deduced from the data give in table that farmers with young age had 15.9% high level of use of ICTs as compared to middle and old aged respondents. On other hand, 88.5% of old age farmers had low level of use of ICTs. This implies that young age farmers were likely more inclined towards modern gadgets to access required information as compared to older age farmers.

Table 2. Association between education and use of ICTs.

Education	Use of ICTs			Total
	Low	Medium	High	
Illiterate	125	9	3	137
	91.2%	6.6%	2.2%	100.0%
Primary	63	17	4	84
	75.0%	20.2%	4.8%	100.0%
Middle	20	30	5	55
	36.4%	54.5%	9.1%	100.0%
Matric	26	29	5	60
	43.3%	48.3%	8.3%	100.0%
Above matric	17	16	14	47
	36.2%	34.0%	29.8%	100.0%
Total	251	101	31	383
	65.5%	26.4%	8.1%	100.0%

Chi-square = 117.39 d. f. = 8 P-value = .000**

Table 2 shows that educational level of the farmers had a highly statistically significant ($\chi 2 = 117.39$, $p = .000$) association with the use of ICTs, endorsing an association between the two variables. Data shows that, respondents having qualification of more than matriculation level fell into 29.8% of high-level use of ICTs, similarly the level of use had downward trend with the decrease in education. Results are supported with those of Qazi et al., 1994) as

they found a significant association between the education and the use of ICTs. This can be concluded that increase in education can expedite the level of use of ICTs followed by the escalation of use of Information Communication Technologies (ICTs) among farmers.

Table 3. Association between the size of landholdings of the respondents and use of ICTs

Size of landholdings (Acres)	Use of ICTs			Total
	Low	Medium	High	
Up to 5	177	46	7	230
	77.0%	20.0%	3.0%	100.0%
6-12	60	40	7	107
	56.1%	37.4%	6.5%	100.0%
13-25	14	15	17	46
	30.4%	32.6%	37.0%	100.0%
Total	251	101	31	383
	65.5%	26.4%	8.1%	100.0%

Chi-square = 78.73 d. f. = 4 P-value = .000**

Table 3 shows that land size of the respondents and the use of ICTs were statistically associated ($\chi 2$ = 78.73), as the P=0.000 endorsed statistically highly significant association. This implies that with the increase in size of land the level of use of ICTs is likely to grow. Farmers with the large land size are supposed to have more information needs, thus, use of ICTs can enrich them with the desired information. Data shows that farmers having 13-25 acres of land had 37% high use of the ICTs whereas farmers with land size less tha 5 acres had 77% low use of ICTs. Similar findings were reported by the Koutsouris (2006) and Saadi et al. (2008) as they found association between land size and the ICTs use and its effectiveness.

Table 4. Association between farming experience of the respondents and use of ICTs.

Experience (years)	Use of ICTs			Total
	Low	Medium	High	
Up to 5	50	22	6	78
	64.1%	28.2%	7.7%	100.0%
6-10	38	26	5	69
	55.1%	37.7%	7.2%	100.0%
11-15	22	11	5	38
	57.9%	28.9%	13.2%	100.0%
16-20	31	18	5	54
	57.4%	33.3%	9.3%	100.0%
More than 20	110	24	10	144
	76.4%	16.7%	6.9%	100.0%
Total	251	101	31	383
	65.5%	26.4%	8.1%	100.0%

Chi-square = 12.44 d. f. = 8 P-value = .134^{NS}

Table 5 shows that farming experience of the respondents was statistically insignificant ($\chi 2$ = 12.44, p = .134) with the use of ICTs. Thus, the experience and use of ICTs were not associated with each other. The results of the present study are in line with those of Moon (2013) as he reported that relationship between farming experience and use of ICTs was statistically non-significant.

Table 5. Association between monthly income of the respondents and use of ICTs.

Income (PKR)	Use of ICTs			Total
	Low	Medium	High	
15000-25000	120	10	6	136
	88.2%	7.4%	4.4%	100.0%
26000-35000	61	18	5	84
	72.6%	21.4%	6.0%	100.0%
36000-50,000	50	31	5	86
	58.1%	36.0%	5.8%	100.0%
More than 50,000	20	42	15	77
	26.0%	54.5%	19.5%	100.0%
Total	251	101	31	383
	65.5%	26.4%	8.1%	100.0%

Chi-square = 91.74 d. f. = 6 P-value = .000**

Table 5 indicates that monthly income of the respondents was highly statistically significant related ($\chi 2 = 91.74$, $p = .000$). This implies that income and use of ICTs were associated with each other, showing that increase in income can expedite the use of ICTs. Increase in income gives farmers an opportunity to access the ICTs gadgets and other web-based services as compared to those with the low level of income. Data confirms that farmers falling in income group of more than 50,000 had 19.5% high use of ICTs whereas 88% of farmers with income range 15000-25000 had low use of ICTs. The results of the present study are opposite to those of Moon (2013) who reported that relationship between annual income and use of ICTs was non-significant.

Table 6. Impact of socio-economic attributes on use of ICTs.

Model	B	Std. Error	T	Sig.
Constant	1.627	.069	23.694	.000
Age	-.598	.056	-10.766	.000
Education	.224	.059	3.793	.000
Land size	.156	.066	2.360	.019
Experience	.036	.034	1.049	.295
Income	.025	.067	.369	.713
Dependent Variable: adoption of the ICTs for dairy animals' production practices			R^2=0.598	Adj R^2=0.592

Table 6 refers to the outcomes of the multiple regression model. The model was applied to investigate the impact of socio-economic characteristics on the adoption of the ICTs for dairy animals' production practices. To check the overall significance of the model R^2, adjusted R^2 and F-test were used. The respective values of R^2, adjusted R^2, and F-test were calculated as 0.598, 0.592, and 111.94. The value of R^2 indicated that about 60% of the total variation in the use of the ICTs for dairy animals' production practices was explained by the 5 explanatory variables (socio-economic characteristics) included in the model. As the primary data were used in the analysis, the estimated value was very high, and the overall model is considered reliable. The calculated value of 111.94 was statistically significant at less than one percent level of significance; this too indicated that all the independent variables included in the model were explaining the dependent variable.

In this model, three explanatory variables age, education and land size had statistically significant impact on the use of the ICTs ($P<0.05$). Results describe that with the increase in age of the farmers the use of ICTs was decreasing. This can be said that young age farmers were more incline towards the use of ICTs as compared to old age farmers. As for as education and land size were concerned, with the increase in education and land size the use of ICTs was having increasing trend. Educational capabilities were key in developing the capabilities, skills and sense of use of ICTs among farmers. On other side, increase in land size amplified the information needs of the farmers.

However, the farming experience and income had their P-

values more than 0.05 which indicate insignificant relationship with the adoption of the ICTs for dairy animals' production practices. It means young, educated and large dairy farmers had more adoption of the ICTs for dairy animals' production practices. The model indicates that farming experience and income of farmers was statistically insignificant with use of ICTs.

CONCLUSION

This study explained that Information Communication Technologies are the emerging technologies and have tremendous potential in development of livestock famers through extended awareness. Although the use of ICTs is yet not fully explored, and the use of ICTs was found associated with the socio economic attributes of the farmers. Farmers with the strong socio-economic position were likely to have more use of ICTs as compared to those farmers with weak socio-economic attributes. This study also confirmed that age, education, income and land size were significantly associated with the use of ICTs. This study concludes that there is need to improve the socio-economic attributes f the farmers through trainings and mass awareness campaigns for the farmers. There is need to develop farmers friendly contents enabling the use of ICTs easily and more precisely.

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