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Perception and Correlation of Dairy Cattle Farmers Concerning Electronic Media as a Source of Information in Punjab, Pakistan

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Abstract: Pakistan is ranked fourth among all the milk-producing countries across the globe. Despite this, livestock farm families are often located far from potential locations for dairy production. This gap exists due to a lack of information regarding recommended dairy production practices. In this modern era, the provision of information necessary for enhanced dairy production could be achieved through the effective use of electronic media. The present study was confined to the district of Faisalabad due to our limited time and economic resources. We aimed to identify farmers' perceptions of the use of electronic media as a source of reliable information. A total of 165 dairy farmers participated in this research survey after being selected using a simple random sampling technique. The findings of the present research study indicate that a lack of education followed by male–female influences the adoption of electronic media as a potential information tool. The use of mobile phones for obtaining necessary information, on the other hand, was ranked the highest among dairy farmers. It is recommended that dairy farmers' training includes the effective use of electronic media so that they may equip themselves with advanced dairy production information.

Keywords: information and communication technologies; correlation and effectiveness of technology transfer; demographic characteristics

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1. Introduction

The livestock and dairy sector is a large source of food and income for developing countries around the world. In Pakistan, livestock is the most important subsector of agriculture, with a remarkable contribution of about 50%. For livestock, milk production is the largest commodity and plays an important role in income generation. The average milk yield per cow in Pakistan is 14 L per day [1].

The households who keep cattle for milk production in the province of Punjab, Pakistan, is 3,550,020. The total number of cattle kept in this province is 14,412,323. The Faisalabad district (study area) contains a total of 147,451 households with cattle and has a total cattle population of 460,632 [2]. In the category of mixed farming systems, keeping livestock is also the main source of income for rural people and provides productive employment for the poor and rural women [3]. The dairy industry in Pakistan mostly relies on small farmers who have between three and five milking animals each. About 90% of the livestock farmers in Pakistan are small farmers [4]. Dairy production is also one of the best ways to earn foreign exchange and maximize revenue to improve and strengthen the economy in developing countries, including Pakistan. The dairy industry also provides a great opportunity for overcoming unemployment, acts as a defense against drought (overcoming food shortages), provides a means of transportation, and provides organic fertilizer for crop production. Landless dairy farmers are totally dependent on this

occupation, and they earn income to provide for their families from the sale of milk and animals [5].

In Pakistan, the dairy sector has many stakeholders in its value chain who depend on it for their livelihoods, including retailers, distributors, processors, transporters, milk collectors, and 6.8 million farmers [6]. Dairy contributes more than USD 1 billion of revenue per month for these poor households. Small dairy farmers play a major role, producing more than half of the livestock production revenue [7].

It is necessary to improve the dairy sector to fulfill the increasing demand. The high participation of both men and women, young and old, in various dairy production practices shows the importance of this sector in supporting and nurturing family labor [8].

The government of Pakistan has placed the dairy sector as the sector most prioritized for development. Despite this, the dairy sector does not currently show high potential due to the prevalence of many factors associated with dairy farmers. Information and communication technology (ICT) illiteracy and the lower interest of aged dairy farmers in advanced dairy practices are the most prominent factors hindering the adoption of recommended dairy production practices [9].

However, it is necessary to increase the knowledge of dairy farmers and improve their decision-making abilities regarding the latest technologies and improved livestock activities in general through the use of various sources of information and media [10].

The sustainable development of these small farmers is not possible without correct and reliable information. Dairy farmers require information related to innovative dairy production practices and market updates regarding such aspects as nutrition, the treatment and control of diseases, new breeding techniques, and other management practices. If all this information is provided to dairy farmers, then they will be able to improve their productivity, which will ultimately improve their living standards and boost the economy [11]. There are different types of accessible ICTs that can be used by livestock farmers. These ICTs include landline telephones, radio, television, mobile phones, and the Internet (which is assumed to be used on a computer). The utilization of these information and communication technologies can greatly help with the dissemination of different types of information needed by farmers and therefore improve their knowledge base [12].

In this age of "global information", progress and development reflect the importance of ICTs as vital instruments. It can be observed that the majority of people living in urban and rural areas have mobile phones, meaning that they can directly communicate with dairy experts, as well as other ICTs [13]. Mobile phones are the most prominent among all electronic tools because they are the fastest emerging technology among electronic media (EM) and seem to be effective for disseminating livestock-related information, such as precautionary measurements, market issues, and measures to protect against diseases [14].

Electronic media plays an important role in providing farmers with accurate and immediate information [15]. Some media such as TV as well as printed media such as newspapers disseminate knowledge regarding different livestock production practices from the government and private agencies. However, the mobile phone seems to be the most modern and fast-growing technology through which farmers can broaden their exposure by obtaining the latest information related to dairy management practices using the Internet (through websites and social media) and direct contact with dairy experts [16].

The objectives of this research were twofold:

(1) To assess the relationship between demographic characteristics and farmers' use of EM;
(2) To cover the main channels of EM used by dairy farmers to gain production-related knowledge and improve farm management in Faisalabad district, Punjab province, Pakistan.

2. Materials and Methods

2.1. Study Area

This study was carried out in the district of Faisalabad, located in the Punjab province of Pakistan. The district of Faisalabad covers a total area of 5856 km^2 from latitude 31°25′0″ N to longitude 73°5′28″ E. It has a total population of 7.8 million, of which 4.1 million people live in rural areas [2]. A total 165 dairy farmers were interviewed in the study area in the district Faisalabad. It comprises 5 rural areas of tehsils (subdistricts): ChakJhumra, Sadar, Jaranwala, Samundri, and Tandlianwala. Livestock and crop cultivation are the major activities in Faisalabad.

2.2. Survey Design

A mixed-methods research design was used in the present research. This is a type of research in which a researcher or team of researchers combines elements of qualitative and quantitative approaches (e.g., the use of qualitative and quantitative viewpoints, data collection, analysis, and inference techniques) for the purpose of broadening the breadth and depth of understanding. Using a combination of different techniques for data collection provides the researcher with more information when compiling and interpreting the results [17].

2.2.1. Research Instrument

Various techniques are used for data collection. Face-to-face interviews were the most appropriate data collection method used for obtaining information [18]. Considering the study objectives, a face-to-face interview schedule was developed in order to obtain the desired results. The questionnaire included the demographic characteristics of dairy farmers, the knowledge levels of dairy farmers regarding production practices, the levels of effectiveness of farmers' use of EM for obtaining dairy information, and the farmers 'levels of utilization of EM regarding dairy animal production (Appendix A).

2.2.2. Validity of Interview Schedule

Validity is how accurately a method measures a phenomenon. The validity of the research tool was measured through consultation with the supervisory committee of the researcher. Every question was critically analyzed to ensure that it was effective and authentic.

2.2.3. Reliability of Interview Schedule

Reliability refers to the "consistency" or "repeatability" of measures [19]. In order to determine whether the research tool was reliable or not, it was pretested on 30 respondents; the obtained Cronbach alpha value was 0.85, indicating that this research tool was reliable.

2.2.4. Quantitative Data Collection

Both quantitative and qualitative data were collected for the present study. Most of the respondents were only semi-literate; therefore, the quantitative data were collected through face-to-face interviews. The face-to-face interactions provided us with the opportunity to obtain ample information relating to the study. We used a 5-point Likert scale, which was explained to the respondents through symbols and examples.

2.2.5. Qualitative Data Collection

No statistical techniques or other means of quantification were involved in this research [20]. Qualitative data were collected to elucidate the quantitative data and gain a holistic understanding of the problem. A semi-structured interview schedule was developed.

2.3. Administration of Interview Schedule

A well-structured interview schedule was prepared to collect relevant information. It was checked by experts in the field of livestock and dairy. Additionally, before utilization,

the interview schedule was pretested in the field to check its reliability and validity. Answers to all the questions of the interview schedule were coded, quantified, and divided into 4 sections: (1) the demographic characteristics of the dairy farmers, (2) the knowledge levels of the dairy farmers regarding production practices, (3) the levels of effectiveness of the farmer's use of EM for obtaining dairy information, and (4) the farmer's level of utilization of EM regarding dairy animal production. The responses to all the other sections were in a multiple-choice format that was converted into scores on the 5-point Likert scale: 1 (very low), 2 (low), 3 (medium), 4 (high), and 5 (very high). In total, 20 questions were asked (Appendix A).

2.4. Data Analysis

All the data collected were analyzed using the Statistical Package for Social Sciences (version 22.0, IBM Corp., Armonk, NY, USA). Descriptive analysis was applied for the demographic characteristics, whereas bi-variant correlation was applied to test the relationship between dairy management practices and ICTs. We calculated the frequencies of responses and their ranks. The frequencies of responses were ranked based on the mean value of every variable. Pearson's correlation coefficient (r) was used to determine if the relation was directly (positive) or indirectly (negative) proportional and if this relation was strong (closer to one) or weak (closer to zero). A p-value less than 0.05 denoted a significant correlation.

2.5. Conceptual Framework

Figure 1 visually represents our overall conceptual framework, providing a comprehensive model with which to understand the overall research procedure [21,22]. It included the researched ICTs (EM), the methodology used, and the information flow from all sources to the end stakeholder and then back to the source after systematic and scientific steps (defining the problem, identifying variables, designing the study, collecting data, analyzing the data, and interpreting the findings).

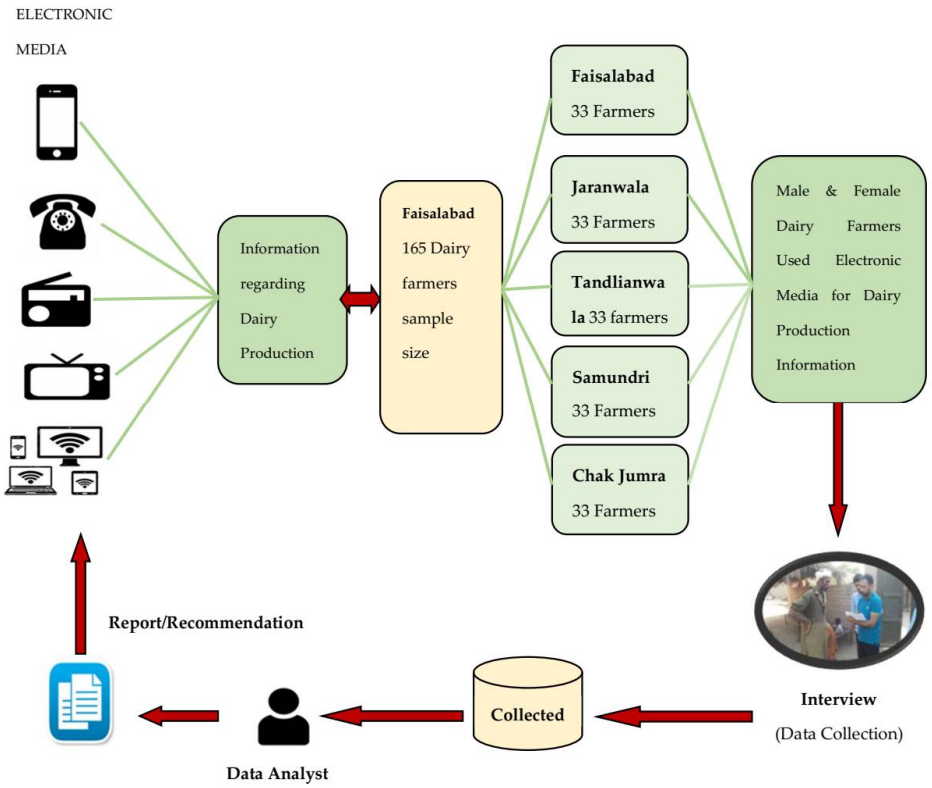

Figure 1. Conceptual framework used for the research study.

3. Results

3.1. Ages of the Dairy Farmers

A total of 93 (56.4%) dairy farmers were middle aged (36–50 years), whereas 66 (40%) respondents were in the young category (<35 years). There were only six (3.6%) respondents in the old category (>50 years).

3.2. Education of the Dairy Farmers

A total of 58 (35.2%) farmers were illiterate. Meanwhile, 32 and 33 (19.4% and 20%) farmers received elementary and high school education, respectively, and 22 and 20 respondents (13.3% and 12.1%) received primary and post-high school education, respectively (Figure 2).

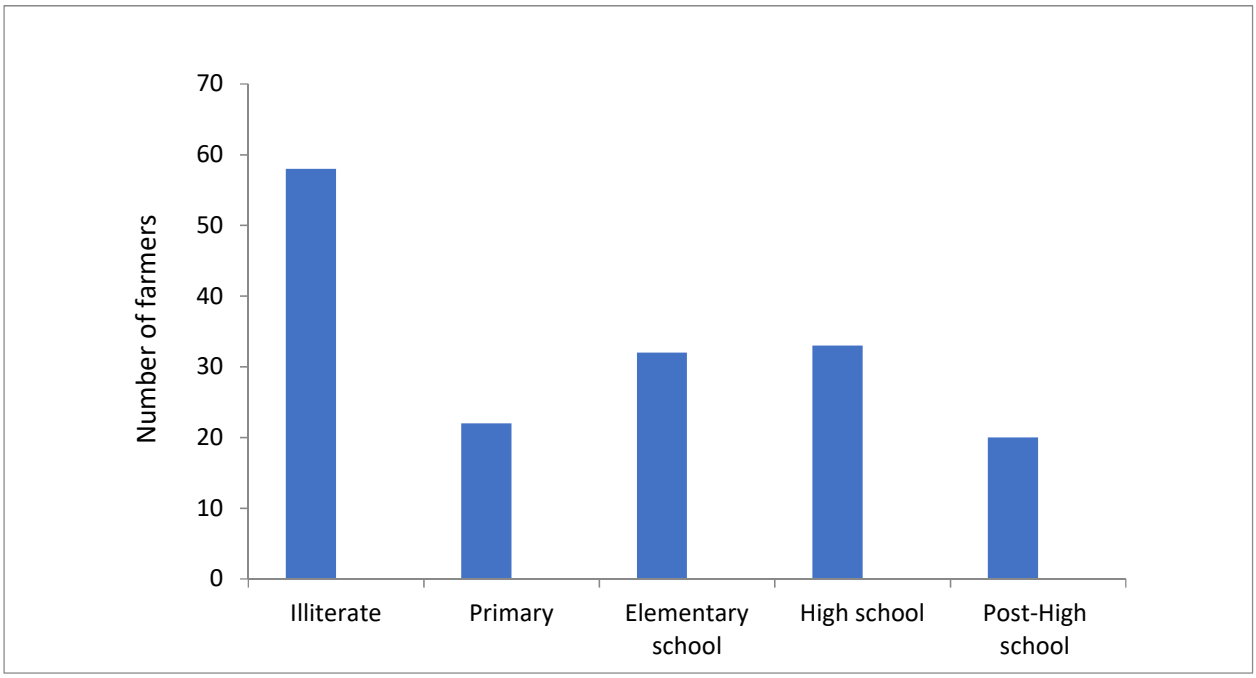

Figure 2. Education levels of the farmers interviewed.

3.3. Male and Female Dairy Farmers

In total, 85 (51.5%) male dairy farmers participated in this research, while 80 (48.5%) female dairy farmers responded to the interview questions.

3.4. Usefulness of Electronic Media as a Source of Information

The mean value on a scale of 1 (lowest) to 5 (highest) for using mobile phones as a media source was 3.07. This was the highest ranking for effectiveness for the use of EM to receive dairy farm production and management-related information. Behind this, TV ranked second, with a mean value of 1.69. After this, radio, landline telephones, and the Internet had much lower mean values (0.36, 0.12, and 0.06, respectively; Table 1). The mobile phone seems to be the most-used modern information-sharing technology for farmers in the Punjab province of Pakistan. It is important to bear in mind that, generally, the dairy farmers did not have smartphones (with access to the Internet) but rather used them to call experts and obtain information regarding their problems and innovative techniques for dairy animal production. The data obtained are presented in tables in Appendix B, along with the reasons behind the low mean values for the usefulness of EM.

Table 1. Usefulness of electronic media (EM) as a source of information among dairy farmers.

Electronic Media	Mean	Std. Deviation	Rank Order
Mobile phone	3.07	1.654	1
TV	1.69	1.636	2
Radio	0.36	0.788	3
Telephone (landline)	0.12	0.572	4
Internet	0.06	0.377	5

3.5. Awareness about Production Practices for Dairy Animals

The data presented in Table 2 reveal that there is a highly significant and inversely proportional relationship between the practice of artificial insemination (AI) and the use of landline telephones. In general, the use of AI by dairy farmers has increased but the prevalence of information dissemination by means of telephone has decreased day by day. However, there is no relationship between AI and other tools of EM. In the case of foot and mouth disease, there is no significant relationship between this disease and any of the EM studied, as there are values between 0.01 and 0.05 and their correlation coefficients (r-values) are not near to +1 or −1. For the case of HS, the use of the Internet ("r = 0.206"; p = 0.008) and landline telephones (r = 0.166; p = 0.033) had a positive and weak but significant relationship with the management of this dairy animal disease. Finally, the use of mobile phones (r = −0.204; p = 0.009) had a strong, significant, negative relationship with the prevalence of enterotoxin disease, which shows opposite directions for the two variables. Meanwhile, the use of a landline telephone (r = 0.175; p = 0.025) had a weak, positive relationship with the levels of awareness of dairy farmers about enterotoxin disease.

Table 2. Pearson correlation of awareness about artificial insemination and other diseases with the utilization of EM.

Variables	Correlation	Landline	TV	Mobile	Internet	Radio
Artificial Insemination	Pearson correlation	−0.218 **	0.069	−0.135	−0.096	0.098
	Sig. (2-tailed)	0.005	0.382	0.084	0.219	0.209
Foot and Mouth Disease	Pearson correlation	−0.024	0.055	0.029	−0.018	0.020
	Sig. (2-tailed)	0.764	0.483	0.715	0.820	0.798
Hemorrhagic septicemia (HS)	Pearson correlation	0.166 *	−0.071	−0.137	0.206 **	−0.058
	Sig. (2-tailed)	0.033	0.367	0.080	0.008	0.463
Enterotoxin	Pearson correlation	0.175 *	−0.069	−0.204 **	0.132	−0.104
	Sig. (2-tailed)	0.025	0.381	0.009	0.091	0.182

* Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level.

3.6. Utilization of Electronic Media

The data presented in Table 3 show that there is no relationship between the ages of the respondents and EM because the p-values for EM do not fall between 0.01 and 0.05. However, there is a strong, positive relationship between the education levels of the respondents and the use of EM tools. Therefore, an increase in the level of education increases the level of utilization of EM. Additionally, there is a positive and significant correlation between male gender and all the tools of EM.

Table 3. Pearson correlation between socio-economic characteristics of the farmers and the utilization of EM.

Variables	Correlation	Telephone	TV	Mobile	Internet	Radio
Age	Pearson correlation	−0.006	−0.019	−0.106	−0.006	−0.089
	Sig. (2-tailed)	0.936	0.808	0.174	0.935	0.257
Education	Pearson correlation	0.162 *	0.361 **	0.267 **	0.268 **	0.168 *
	Sig. (2-tailed)	0.038	0.000	0.001	0.000	0.032
Male gender	Pearson correlation	0.206 **	0.314 **	0.160 *	0.157 *	0.210 **
	Sig. (2-tailed)	0.008	0.000	0.040	0.044	0.007

* Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level.

4. Discussion

4.1. Demographic Characteristics

Young people are a great asset who comprise the majority (63%) of the total population of Pakistan [23]. In this study, 56.4% of the respondents belonged to the middle-aged (36–50) category because young and old-aged people were less interested in this occupation. Another study found a similar level of involvement of young farmers but different levels of involvement of the middle and older age categories, Saghir [24]. Another study [25] discovered that most farmers belonged to the young category. The younger generation is showing interest in this sector, which is a good indicator for the dairy sector.

We found that 35.2% of the farmers were illiterate, partly because Pakistan's livestock and dairy animals are mostly found in rural areas far from cities, where the literacy rate is much lower than that in cities. This finding is similar to that of [26], who found that half (50%) of the respondents were illiterate and only 22% of the farmers had high school and post-high school education. These results are not in line with our current research findings. The study of [27] indicated that 56% of dairy farmers had primary education and others had an even lower education level. All these cited reports confirm our belief that it is necessary to educate farmers to increase their levels of adoption of dairy technology innovations.

Regarding male/female status, a slight majority of the farmers were found to be male in our study. Traditionally, in rural societies, men are believed to take on the responsibilities of farming and agri-business activities while women take care of their families and participate in household activities. That was not the case in our study. We found that both men and women seemed to share equal responsibilities in dairy farm production practices.

4.2. Usefulness of Electronic Media as a Source of Information among Livestock Dairy Farmers

Dairy farmers use different tools and channels to educate themselves and gain information about the latest animal management practices as well as cow healthcare information. The findings of the current study are somewhat like those of [28], who reported that farmers were reluctant to use mobile phones to maximize their awareness regarding government instructions about agriculture. In addition, that study found that farmers mostly relied on local sources—i.e., fellow farmers, market stakeholders, etc.—for obtaining necessary information. Our findings are closer to those of Khan et al. [14], who reported that mobile phones were the prominent tool through which farmers updated themselves about new dairy-production-related information. Raza et al. [29] concluded that mobile phones were the most efficient electronic tool for disseminating information related to agriculture production practices compared to sources such as television, radio, landline phones, and the Internet. This study supports the findings of our conducted research.

4.3. Pearson Correlation of Awareness about Artificial Insemination and Animal Diseases with the Utilization of Electronic Media

The *p*-value for the correlation between AI and landline telephone use indicates a significant but negative relationship between them. It shows that the use of AI is increased but that information transmission through landline telephone use is decreased. Modern technologies are replacing old communication methods. There is no association between the use of AI and other tools of EM. Furthermore, the majority of the EM tools have no relationships with foot and mouth disease, hemorrhagic septicemia, or enterotoxin disease, except for hemorrhagic septicemia with Internet use, enterotoxin disease with mobile phone use (a negative relationship), and enterotoxin disease with landline telephone. A study conducted by De et al. [30] stated that the overwhelming majority of cattle farmers had no awareness regarding the necessity of vaccination against contagious diseases. In Pakistani society, farmers mostly rely on government veterinary officers for the scheduling of vaccinations for seasonal diseases. They do not take the trouble to gain the latest information by using electronic or other sources of information.

4.4. Correlation of Socio-Economic Characteristics of the Farmers with the Utilization of Electronic Media

As seen in our collected data, the *p*-values indicate that the ages of the respondents had no relationship with the extent of use of EM. This means that neither had any effect on each other. Our findings do not agree with those of Aldosari et al. [31], who found that there was a strong relationship between the ages of the respondents and obtaining information through the utilization of EM. This relationship shows that, as the ages of the respondents increase, the levels of utilization of EM also increase as they become more mature and take advantage of these sources of information.

The levels of education of the respondents had a positive and significant relationship with their extent of use of ICTs. This indicates that the higher the levels of education of the respondents, the higher their chances of using EM to obtain information related to dairy animal production practices. Educated people are more willing to use EM than less educated people. There were strong relationships of the education levels, mass media exposure, and livestock and dairy ownership with the knowledge levels of the farmers [32]. EM play an important role in educating farmers about relevant information and innovations. It is documented that a high level of education leads to a high utilization of EM, especially the Internet and mobile phones. Similarly, highly educated farmers tended to be more likely to explore the latest information to improve their management improvement processes [33].

However, our study confirms that there was a significant relationship between the education of the farmers and their utilization of radio, as found in [31], with a *p*-value of 0.002 **, indicating that there was a positive impact of education on the change in the behavior of farmers. These results are also in agreement with those of Muhammad et al., 2012 [34], who stated that there was a strong relationship between the education of the respondents and their utilization of TV as an EM and source of information.

Our study is the first to report a relationship between the two variables of male gender and the extent of the utilization of EM. The *p*-values for sex and EM use indicate a strong association between them. Male respondents are more likely to use more EM devices than females to gain knowledge related to dairy animal production practices.

5. Conclusions

We found that most of the livestock farmers in Faisalabad, Pakistan, were male, middle aged, and illiterate. Most of the dairy farmers considered mobile phones as an effective technology for obtaining necessary information related to dairy farm management. Educated farmers used electronic media to access information regarding livestock activities. However, as the age of the farmers increased, their utilization of electronic media decreased. It is necessary to encourage livestock farmers to use electronic media as a source of information. By using best management practices and the latest scientific information attained through electronic media, farmers will be able to improve their dairy farm management practices, which will be beneficial for their farms' profitability as well as the overall economy. In addition to dairy extension and technical public services, private channels of communication can contribute to the dissemination of technical information related to dairy farm production.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of University of Agriculture Faisalabad Pakistan.

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Data Availability Statement: The data cannot be shared due to a privacy protection statement included in the informed consent.

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Appendix A

Interview Schedule

Perception and Correlation of Dairy Cattle Farmers concerning Electronic Media as a Source of Information in Punjab-Pakistan

Question. No. 1 Demographic characteristics of the respondents.

I. **Tehsil** _____
II. **Village name/number** _____
III. **Household number** _____
IV. **Gender:** Male_____ Female_____
V. **Age (years):(i)** Young (up to 35) **(ii)** Middle age (36–50) **(iii)** Old (above 50)
VI. **Educational level (years of schooling):**
(i) Illiterate **(ii)** Primary (1–5) **(iii)** Elementary (6–8) **(iv)** High (9–10) **(v)** Post High (Above 10)

Question. No. 2 Are you aware of the following dairy production practices?

Variables	Extent of Awareness				
	1	2	3	4	5
Artificial Insemination					
Foot and Mouth Disease					
Hemorrhagic Septicemia (HS)					
Enterotoxin					

Scale: 1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5 = Very High.

Question. No. 3 How would you rate the level of usefulness of electronic media as ICTs related to the dairy sector?

Variables	Extent of Usefulness				
	1	2	3	4	5
Mobile					
TV					
Radio					
Telephone					
Internet					

Scale: 1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5 = Very High.

Question. No. 4 Please indicate your level of utilization of electronic media regarding dairy animal production practices.

Variables	Extent of Utilization				
	1	2	3	4	5
Mobile					
TV					
Radio					
Telephone					
Internet					

Scale: 1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5 = Very High.

Appendix B

Table A1. No. of farmers and percentages of five Likert scale scores for the usefulness of electronic media as a source of information among dairy farmers.

Electronic Media	Very Low		Low		Medium		High		Very High	
	No.	%	No.	%	No.	%	No.	%	No.	%
Mobile	03	1.8	15	9.1	29	17.6	63	38.2	27	16.4
TV	11	6.7	16	9.7	46	27.9	17	10.3	06	3.6
Radio	15	9.1	14	8.5	04	2.4	01	0.6	00	00
Telephone	00	00	06	3.6	00	00	02	1.2	00	00
Internet	02	1.2	01	0.6	02	1.2	00	00	00	00

Table A2. Mean, std. deviation, minimum and maximum of electronic media usefulness for dairy farmers.

Statistics						
Variables		Telephone	Radio	TV	Mobile	Internet
N	Valid	165	165	165	165	165
	Missing	0	0	0	0	0
Mean		0.1212	0.3576	1.6909	3.0727	0.0606
Std. Deviation		0.57156	0.78826	1.63654	1.65487	0.37769
Minimum		0.00	0.00	0.00	0.00	0.00
Maximum		4.00	4.00	5.00	5.00	3.00

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