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Farmers Preferred Information Sources Regarding Climate Change Awareness in Mountainous Areas of Punjab, Pakistan

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A B S T R A C T

Climate change is one of the key challenges having adverse impacts on agriculture, which is the key source of food and livelihood. Information is a critical component in the process of climate risk management. Therefore, this study was conducted in mountainous areas of Punjab and Khyber Pakhtunkhwa to explore the preferred information sources of the farmers to cope the climate change. A total of 384 farmers were interviewed face to face on a structured interview schedule from District Rawalpindi of Punjab and Mansehra of KPK. Collected data were analysed using Statistical Package for Social Sciences (SPSS). The results indicated that farmers had more reliance on electronic media gadgets for information seeking as least on social media gadgets. Fellow farmers and extension field staff were also rated as the preferred information sources of the farmers. This was deduced that farmers were emphasizing n traditional sources rather than modern tools of communication like social media. There is a need to promote the use of social media tools for information sharing for climate change awareness. Social media tools have the potential to meet the information needs of the farmers and have diverse contents to disseminate about climate change. Extension field staff should use social media gadgets for information dissemination among the farmers.

Keywords: Climate change, Climatic awareness, Traditional media, Social media, Mountainous areas.

INTRODUCTION

Agriculture holds the position of being the most substantial sector in Pakistan's economy. It makes a significant contribution to employment opportunities and the generation of foreign exchange revenue. Additionally, it serves as a vital source of industrial raw materials, establishing numerous linkages with the overall economy. In terms of economic indicators, agriculture accounts for 22.4% of Pakistan's Gross Domestic Product (GDP) and employs 37.4% of the labour force within this sector (GOP, 2022). Similar to other developing nations, Pakistan is classified as an agricultural country possessing significant potential for crop farming, livestock rearing, and various other agricultural activities, owing to its abundant natural resources. With its favourable agricultural climate, fertile soils, conducive environment, and ample water resources, Pakistan can establish sustainable agriculture if proper management practices are implemented (Khan *et al*., 2019). The agricultural sector plays a crucial role in Pakistan's economic system as it serves as a primary source of raw materials for industries, thereby contributing to poverty reduction in the country. Additionally, the growth of agriculture is reliant on favourable weather conditions (Rahman, 2013). Climate change, encompassing factors such as variations in precipitation, temperature fluctuations, floods, and other climatic elements, directly influences economic growth and agriculture. In response to these emerging global challenges, the policy focus has shifted towards the development of the agricultural sector (GOP, 2017). The agricultural sector holds a fundamental position in the global economy as it not only contributes to overall income but also serves as the cornerstone of the food supply system and a source of raw materials for industries. Despite Pakistan's abundance of natural resources, the country is also susceptible to climate

change and natural disasters. The combined effects are projected to diminish agricultural productivity by the conclusion of this century, particularly affecting developing countries that are experiencing a greater impact than others (Hanif *et al*., 2010).

Climate change stands as one of the most significant challenges faced by humanity, presenting a major problem. As per estimates, the average annual temperature of the Earth has increased by approximately 0.82°C between the years 1880 and 2012 (Hartmann *et al*., 2013). In 2013, the annual average global concentration of CO_2 reached 400 ppm, and the accumulation of other major greenhouse gases led to global warming (Schuur *et al*., 2013). The impact of climate change will be observed through occurrences of elevated temperatures and heavy rainfall, which will disrupt ecosystems. Over the first decade of the twenty-first century, Pakistan experienced a rise in average temperatures, except for the year 2005 (Ahmad *et al*., 2015). Climate change has severe repercussions on human beings, negatively affecting global livelihoods, ecosystems, environmental processes, natural resources, infrastructure, and socio-economic and cultural assets. Changes in climatic conditions severely disrupt global food production systems by altering ecosystems and causing damage to human infrastructure and livelihoods (Smit and Wandel, 2006).

The situation worsens due to the lack of adaptive measures taken by rural farm households to address the changing climate and market conditions, leading to food insecurity (Moroda *et al*., 2018). Consequently, adaptations are considered crucial in strengthening the agricultural sector and ensuring food security (Bryan *et al*., 2013). In the process of adopting these adaptations, the importance and utilization of various information sources are recognized as significant. Farmers' awareness and perceptions of climate change play a vital role in developing effective agricultural policies and assistance programs (Mertz *et al*., 2009). The knowledge and education levels of farmers are essential for implementing adaptations effectively and assisting them in. addressing the challenges posed by climate change (Harvey *et al*., 2013). Hence, this study was conducted to investigate the different sources of information accessed by farmers to cope with climate change.

METHODOLOGY

Mountainous areas have been reported as the most vulnerable regions to the impact of climate change. Mountainous districts of Khyber Pakhtunkhwa (KP) and the Punjab provinces were selected, Rawalpindi district from Punjab and Mansehra district from Khyber Pakhtunkhwa (KP) were selected as study areas purposively based on their topography and extensive farming. Two tehsils from each district were selected purposively based on their topography. Murree and Kahuta were selected from the Rawalpindi district whereas Baffa and Balakot were selected from the Mansehra district.

A multistage sampling technique was used for the selection of study respondents. All the farmers in the two districts comprise the population of the study. The population of both districts includes 181970 registered farmers. A sample size of 384 respondents was determined using www.surveysystem.com keeping the confidence level of 95% and a confidence interval 5. Two tehsils from each district were selected purposively based on their maximum number of farmers and the adverse impact of climate change. Murree and Kahuta were selected from the Rawalpindi district whereas Baffa and Balakot were selected from the Mansehra district. From each selected district, respondents were selected proportionally, a total of 296 respondents from Rawalpindi and 88 from Mansehra on the base of their total number of farmers, making a sample size of 384 respondents. Equally, 148 from tehsil Kahota and 148 from tehsil Murree of Rawalpindi district, whereas, equally from two tehsils of Mansehra district, 44 from Baffa and 44 from Balakot were selected. From each selected tehsil, respondents were selected through a simple random sampling technique.

To meet the objectives of the study a comprehensive research instrument has been developed. The interview schedule was based on closed-ended questions to obtain accurate results. To check the reliability, Cronbach's alpha value was calculated and obtained value of the instrument was 0.875, indicating that the research tool was reliable. Data were collected through face-to-face interview technique and Statistical Package for Social Sciences (SPSS) was used for the data analysis.

RESULTS

Farmers generally get information about agriculture, when they meet their friends or neighbors. To share agricultural information. Farmers usually do this by attending farmer group meetings. Group meeting forums

such as farmer group meetings and community gatherings at the village level are the forums most widely used by farmers to gather information and find solutions for their farming practices. The research found that farmers tend to rely more on interpersonal and face-to-face (Widiyanti *et al*., 2020).

The sources of farmers' information in the context of climate change are categorized into electronic media, traditional media, print media, and social media. Moreover, the results are divided into two three sections (i) demographic attributes of the respondents (ii) different information sources and their use (iii) and comparative use of information sources. The use of information sources was measured on a scale Scale: (1 = Never, 2 = Rarely, 3 = Sometimes, 4 =Often, 5 =Always), rated based on mean values.

Demographic attributes of the respondents

Table 1 shows that respondents' age ranged from 18 to 76 years, with a mean age of 43.56 years and a standard deviation of 12.64, indicating moderate variability. The education level varied from 0 to 18 years, with a mean of 9.58 years and a standard deviation of 3.88. Family sizes vary from 2 to 23 members, with an average of 7.82 members and a standard deviation of 3.54. Participants have farming experience ranging from 1 to 60 years, with a mean of 18.96 years and a standard deviation of 12.14. Land sizes range from 1 to 400 Kanal, with a mean of 38.53 Kanal and a large standard deviation of 52.41, indicating substantial variability. The number of animals owned ranges from 1 to 50, with an average of 4.84 animals and a standard deviation of 5.46.

Table 1. Demographic attributes of respondents.

Demographics	Min	Max	Mean	SD
Age	18	76	43.56	12.64
Education	0	18	9.58	3.88
Family size	2	23	7.82	3.54
Farming experience	1	60	18.96	12.14
Land size (Kanal)	1	400	38.53	52.41
No. of animals	1	50	4.84	5.46

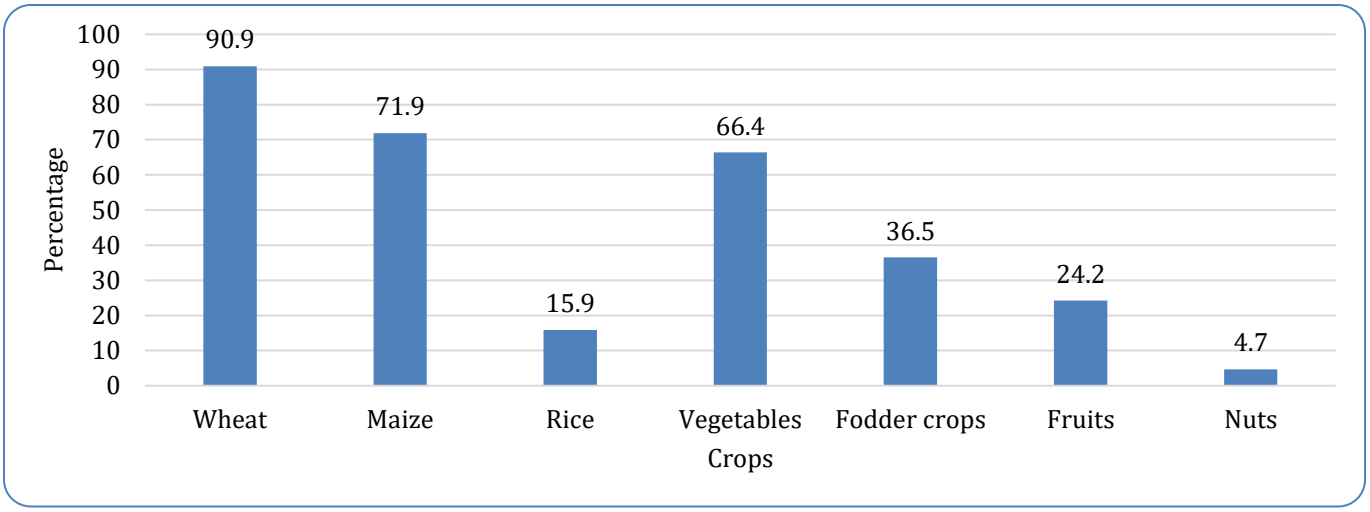

Figure 1. Major crops in the study area.

Figure 1 represents that wheat was the major crop in the study area as being cultivated by over 90% of respondents. Maize was another important crop as cultivation was reported by 71.9% of the respondents. Of the total respondents, 66.5% were cultivating vegetables, 36.5% fodder crops for their animals, 24.2% fruit plants and 15.9% were cultivating rice crops. Out of the total respondents, 4.7% reported the cultivation of nuts.

According to Figure 2, slightly more than half (52.6%) of respondents were generating income from farming only. Whereas, one-fourth (26%) of respondents were earning income from farming along with their private business. There were 15.1% of respondents who were generating income from farming and the job followed by 6.3% of respondents who were generating income from farming along with other activities. Other activities included their jobs, and daily wage work. This can be deduced from the results that respondents had diverse income-generating sources although with heavy reliance on farming.

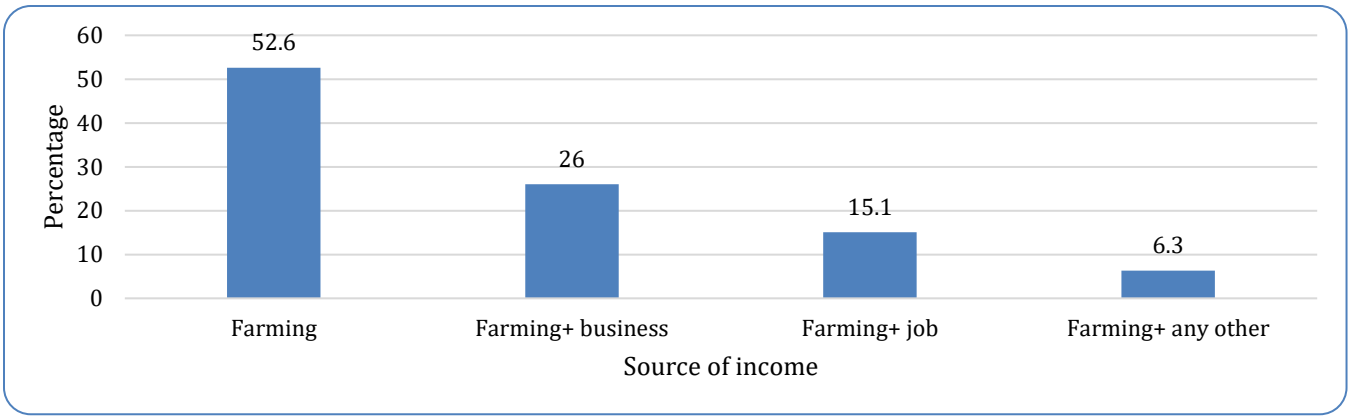

Figure 2. Sources of income.

Information sources

Table 2 provides descriptive statistics for the mean scores and standard deviations of different electronic media platforms, namely TV, mobile phones, internet, and radio, as well as their respective ranks. The mean score for TV was the highest at 3.13, indicating that it is perceived as the most influential electronic media platform among the respondents. It was closely followed by mobile phones with a mean score of 2.68. The internet was ranked third with a mean score of 2.44, and radio has the lowest mean score of 2.69. The standard deviations suggest varying levels of dispersion in the responses for each platform, with radio having the highest standard deviation of 1.495, indicating greater variability in the perceived influence of radio among the respondents. Overall, these statistics highlight the relative influence and variability of different electronic media platforms in the perceptions of the respondents, with TV being considered the most influential followed by the mobile phone.

Table 2. Use of electronic media gadgets as information sources.

Electronic media	Mean	SD	Rank
TV	3.13	1.123	1
Mobile phone	2.68	1.187	2
Internet	2.44	1.231	3
Radio	2.69	1.495	4

Table 3. Use of print media gadgets as information sources.

Print media	Mean	SD	Rank
Newspapers	2.77	1.158	1
Agri. pamphlet	1.93	1.167	2
Agri. leaflet	1.87	1.113	3
Zari digest	1.73	1.051	4
Zaraat nama	1.69	1.045	5

Table 3 presents the descriptive statistics for the mean scores and standard deviations of various print media platforms, namely newspapers, agricultural pamphlets, agricultural leaflets, Zari digest, and Zaraat nama, along with their respective ranks. The mean score for newspapers is the highest at 2.77, indicating that they are perceived as the most influential print media platform among the respondents. Agricultural pamphlets have a mean score of 1.93, ranking second in influence. Agricultural leaflets follow closely with a mean score of 1.87, ranking third. Zari Digest and Zaraat nama have the lowest mean scores of 1.73 and 1.69, respectively, indicating relatively lower influence compared to the other print media platforms. The standard deviations suggest varying levels of dispersion in the responses for each platform, with newspapers

having the highest standard deviation of 1.158, indicating greater variability in the perceived influence of newspapers among the respondents. In conclusion, these statistics provide insights into the relative influence and variability of different print media platforms in the perceptions of the respondents, with newspapers being considered the most influential. Agri. magazines i.e., zarat nama were ranked least.

Table 4. Use of traditional sources gadgets as information sources.

Traditional sources	Mean	SD	Rank
Fellow farmers	3.39	1.250	1
Private company dealers (fertilizer & pesticides)	2.80	.938	2
Govt. helpline	2.56	.958	3
Extension Field Staff	2.42	.871	4
Flexes	2.38	1.056	5
Seminars/ workshops	2.40	1.065	6
Farmers' days	2.13	1.095	7
NGO workers	2.06	.889	8
Burji/ wall chalking	2.10	.933	9

Table 4 presents descriptive statistics for the mean scores and standard deviations of various traditional sources of information in the agricultural domain. The respondents were asked to rank these sources based on their perceived influence. Fellow farmers received the highest mean score of 3.39, indicating that they are considered the most influential traditional source of information among the respondents. Private company dealers for fertilizers and pesticides ranked second with a mean score of 2.80. The government helpline received a mean score of 2.56, ranking third. Extension Field Staff, flexes (advertisements), seminars/workshops, farmers' days, NGO workers, and burji/wall chalking received mean scores ranging from 2.42 to 2.10, indicating their varying degrees of influence. The standard deviations reveal the level of variability in the responses for each source, with fellow farmers having the highest standard deviation of 1.250, suggesting greater diversity in the perceived influence of fellow farmers among the respondents. Overall, these statistics provide insights into the relative influence and variability of different traditional sources of information in the perceptions of the respondents, with fellow farmers being considered the most influential source.

Table 5. Use of social media gadgets as information sources.

Social media	Mean	SD	Rank
WhatsApp	2.59	1.223	1
Facebook	3.09	1.150	2
Twitter	1.29	1.373	3
Instagram	1.25	1.474	4
LinkedIn	1.16	1.532	5

Table 5 explains the descriptive statistics for the mean scores and standard deviations of various social media platforms, including WhatsApp, Facebook, Twitter, Instagram, and LinkedIn, along with their respective ranks. WhatsApp received the highest mean score of 2.59, indicating that it is perceived as the most influential social media platform among the respondents. Facebook follows closely with a mean score of 3.09, ranking second in influence. Twitter received a mean of 1.29, ranking third, while Instagram and LinkedIn have even lower mean scores of 1.25 and 1.16, respectively, indicating relatively lower influence compared to the other social media platforms. The standard deviations suggest varying levels of dispersion in the responses for each platform, with LinkedIn having the highest standard deviation of 1.532, indicating greater variability in the perceived influence of LinkedIn among the respondents. Overall, these statistics provide

insights into the relative influence and variability of different social media platforms in the perceptions of the respondents, with WhatsApp and Facebook being considered the most influential platforms.

Table 6. Comparative use of different information sources.

Comparative use of Information sources	Mean ± SD
Electronic media	2.735± 1.259
Print media	1.998±1.1068
Traditional media	2.471±1.006
Social media	1.876±1.3504

Scale: (1 = Never, 2 = Rarely, 3 = Sometimes, 4=Often, 5=Always)

Table 6 indicates that the farmers were relying more on electronic media gadgets ($\bar{x}$=2.73) like TV and radio followed by traditional sources of information ($\bar{x}$=2.47). The mean scores indicate the use of electronic media and traditional media rates the rare use but inclined towards the sometimes use. However, the use of print media was also rated rare. Social media is regarded as a tool of intense potential, but its use of rated less than rare, indicating the poor inclination towards modern tools. This is deduced from the data that farmers were more relying on electronic media and poor inclination toward social media.

DISCUSSION

Mean age, education, family size, farming experience, land size, and number of animals in the study area were 12.64, 9.58, 7.82, 18.96, 38.53, and 4.84 respectively. This implies that the socio-economic condition of the respondents in the study area was diverse, where education was average, land size was small but farmers were experienced. This is complemented by the findings from the studies such as Rasul and Hussain (2015), Ullah *et al*. (2020), Shahzad *et al*. (2021) and Yousafzai *et al*. (2022) as they endorsed that the farmers living in mountainous regions of Pakistan experience a wide range of socio-economic situations and encounter various obstacles related to both the natural environment and societal factors. Challenges such as poverty, climate change, and limited access to financial services significantly affect the well-being of these farmers. To sustain their livelihoods, they needed to rely on sources of income beyond farming. In the mountainous areas of Pakistan, the common utilization of land involved activities like arable farming, pasture management, and social forestry. Results are evident that farmers were doing agriculture, were cultivating different crops like wheat, maize, rice and vegetables. It was reported in the Dawn (2002) that The Northern Regions of Pakistan cover a total area of 72,496 square kilometers. Out of this, only 69,480 hectares (0.96 percent) are actively used for cultivation, while approximately 60,000 hectares of arable land remain unused. The average amount of land owned per person is 0.124 hectares, but this is gradually decreasing due to the division of land within families caused by the fast pace of urbanization. And in another study, Muhammad and Arshad (2006) reported that the average land size in the mountainous areas was 0.58 hectares of operational land and more than half (64%) of growers had less than 00.51 hectares and 15% had 1.01 hectares of operational land.

Results indicated that farmers were relying on electronic media and traditional media sources for information acquisition about agriculture. Farmers had a reliance on TV, fellow farmers and extension field staff for information acquisition. In a study, Yaseen *et al*. (2016) revealed that the primary source of information for most farmers (47.5%) was their neighbours, friends, and relatives. For 31.9% of farmers, this source ranked second, while for 33.7% of farmers, it was considered the third most significant source. In contrast, a small percentage of farmers (10%) regarded agricultural extension staff as their primary source of information. In another study, Naveed and Anwar (2013) stated that farmers were mainly reliant on interpersonal interactions to meet their information needs. The utilization of mass media and printed materials as information sources was determined to be minimal. Farmers encountered challenges in accessing timely information due to factors such as limited education and language barriers. These obstacles were identified as the main difficulties experienced by farmers in obtaining the necessary information. The findings of Yaseen *et al*. (2023) demonstrated notable disparities among farmers

regarding their usage of mobile phones, internet, television, radio, newspapers, extension services, market commission agents, and interactions with fellow farmers (Yaseen *et al*., 2023). Radio was reported as the least-used information source by the farmers (Lamontagne *et al*., 2018). Although there has been a rise in mobile phone ownership, only farmers who are below the age of 40 utilized mobile phones as a means to access agricultural information (Mburu, 2013).

Social media is being proven most potential mediums (Luqman *et al*., 2020), but the use of social media tools appeared low among farmers, despite social media tools being powerful mediums where large numbers of farmers are enabled to share information. Research conducted in Pakistan by Latif *et al*. (2020) revealed that social media platforms like Facebook, YouTube, and WhatsApp are emerging as more effective channels for the dissemination of agricultural information. Social media platforms, including Facebook, YouTube, and WhatsApp, are increasingly recognized as effective channels for sharing agricultural information. Farmers are actively engaging in conversations with fellow farmers and rural professionals on platforms like Twitter, which has become a preferred medium for social media communication among farmers (Dilleen *et al*., 2023). Social media enables farmers to connect with and learn from others outside their immediate localities, seek advice, and gain insights from their experiences. However, it should be noted that small-holder farmers, particularly those residing in rural areas, are less likely to have access to the Internet and social media platforms (Jallo, 2016). Consequently, there is an ongoing exploration of the role of social media in disseminating agricultural information and technologies among farmers in Pakistan.

Concerning climate change, the findings of Gomes-Casillas *et al*. (2023) indicate that YouTube has the most pronounced and statistically significant positive impact on climate change awareness. It is followed by Instagram, Twitter, and WhatsApp in terms of their influence on climate change awareness. Additionally, being a user of multiple social media platforms also demonstrates a positive and statistically significant effect on climate change awareness. Another study, by Ramzan *et al*. (2019) indicated a notable difference between social media users and non-users regarding awareness of climate change. Respondents exhibited varying levels of interest in climate change based on factors such as age, gender, level of education, and other variables. The effectiveness of social media in raising awareness among youth was identified as a significant factor in safeguarding our climate and, consequently, living conditions. These studies imply that social media is a potential source to increase climate change awareness. Although, there is a need to explore the potential of social media in climate change awareness and management. It has been recommended by Ashraf *et al*. (2015) to encourage farmers to adopt modern information sources such as ICT tools instead of relying solely on traditional sources. Using social media campaigns have the potential to effectively communicate the collective responsibility in tackling climate change. Such campaigns can significantly influence social perception by fostering citizen engagement and concern for the climate, thereby increasing participation in climate action efforts (Leon *et al*., 2022).

CONCLUSION AND RECOMMENDATIONS

In conclusion, the descriptive statistics provided valuable insights into the perceived influence and usage of various information sources among farmers. The findings highlight that electronic media, particularly TV, holds the highest perceived influence among respondents, followed by traditional sources such as fellow farmers. Print media, social media, and modern online platforms like the internet and mobile phones are rated relatively lower in terms of influence. These results indicate the predominant reliance on traditional and electronic media, while print media and social media are utilized to a lesser extent. Based on these findings, it is recommended to focus on strengthening the dissemination of agricultural information through the most influential platforms, such as TV and fellow farmers, while also exploring ways to increase awareness and usage of print media and social media among farmers. This can be achieved through targeted awareness campaigns, training programs, and capacity-building initiatives to enhance farmers' access to and utilization of various information sources. Additionally, collaborations with agricultural extension services, private companies, and government agencies can facilitate the effective use of electronic and traditional media to provide timely and accurate information to farmers. Through diversifying and improving access to information sources, farmers can enhance their adaptive capacity to climate change, improve agricultural

practices, and ensure food security in the face of evolving challenges. There is also a need to put focus on social media tools to create climate change awareness among farmers. The extension field staff should be motivated to use social media networking sites for information sharing with the farmers.

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