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Social media reporting on agricultural adaptation to climate change in Pakistan: Measures and implications for sustainability

Muhammad Naeem Javed [a,b,*], Hamedi Mohd Adnan [a], Mian Ahmad Hanan [c], Nor Zaliza Sarmiti [a], Hina Adeeb [d], Amraiz Khan [b], Aatif Iftikhar [e]

[a] *Department of Media and Communication Studies, Faculty of Arts and Social Sciences, Universiti Malaya, Kuala Lumpur 50603, Malaysia*
[b] *Department of Mass Communication, Lahore Leads University, Lahore, Pakistan*
[c] *School of Communication Studies. University of the Punjab, Lahore, Pakistan*
[d] *Faculty of Media and Mass Communication, University of Central Punjab, Lahore, Pakistan*
[e] *Department of Media, And Communication Studies. National University of Modern Languages Islamabad, Pakistan*

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ABSTRACT

The agricultural sector is the backbone and single-largest sector of the Pakistani economy. Pakistan's agricultural productivity is suffering due to climate change. The study aimed at finding how social media reporting can change patterns of attitudes among farmers to cope with sudden weather changes. A correlation-experimental research design was used to find the relationships and effects of climate change on agriculture in Punjab (Pakistan) and the mediating effect of social media reporting. A purposive sampling technique was used to collect samples from 120 male farmers. Online surveys, with the help of Google Docs, were used to collect participants' responses about the type of behavior they used to adopt when getting information about climate change through social media. After determining their reliability and validity through piloting, two self-constructed questionnaires were used: (i) Measuring Farmers' Behavior Influenced by Social Media Reporting of Climate Change and (ii) Effects of Social Media Reporting of Climate Change on Agriculture. Data were analyzed using SPSS-21, and correlation analysis was done to find out the relationship between social media reporting and farmers' behavior. Linear regression was used to measure the functional relationship between social media reporting about climate change and farmers' attitudes towards adopting precautions to increase annual yield. The coefficient of social media reporting was positively and significantly related to farmers' attitudes towards the selection of crops, land management, and water storage. Based on the findings, the social media reports significantly predicted patterns of farmers' behavior towards the adaptation of advanced measures to select crops, reduce pest attacks, manage land, and store water.

1. Introduction

Climate change affects agriculture in several ways around the globe. Global warming and climate change result in reduced agricultural productivity [1]. In Pakistan, agriculture is a crucial sector, contributing to the country's GDP, employment, and export earnings. The agricultural sector is the backbone and single-largest sector of the Pakistani economy [2]. It contributes 22 % of GDP, 45

* Corresponding author.Department of Media and Communication Studies, Faculty of Arts and Social Sciences, Universiti Malaya, Kuala Lumpur 50603, Malaysia.

E-mail address: naeemch18@gmail.com (M.N. Javed).

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% of labor force employment, and 60 % of export earnings [3]. Agriculture's productivity relies on climate, impacting human welfare and industrial interests [4]. However, Pakistani agriculture is highly vulnerable to climate change, with rising temperatures reducing crop sowing and harvesting durations and negatively impacting food production and fodder yields [5]. The impacts of climate change on the agriculture sector not only affect farmers' livelihoods but also have broader economic losses and many consequences [6]. Climate change poses significant agriculture risks in underdeveloped countries like Pakistan, leading to decreased productivity and economic rates for agricultural products [7]. This persistent loss in the agriculture sector can be mitigated by modifying farmers' behaviors and facilitating their acquisition of new farming learning skills [8]. Media plays a vital role in climate change communication, with social media platforms providing a convenient and accessible medium for reporting and disseminating climate-related information [9]. In Pakistan, social media has become an integral part of modern lifestyles, offering updates on climate change, global warming, and other political and social issues [10]. Timely reporting of climate change through social media has proven beneficial for agricultural development and improving farmers' awareness and behavior, leading to improved agricultural practices and productivity [11]. Social media faces challenges in reporting climate change globally, but state officials are exploring services to increase farmers' exposure in Punjab, improving agricultural outcomes in Pakistan. Reporting on climate change around the globe is a big challenge for social media. State officials are exploring social media services to increase farmers' exposure in Punjab, which has been shown to improve agricultural outcomes in Pakistan [12]. Social media applications enhance learning for small-scale farmers, enhancing their interest and ease in selecting effective cultivation processes [13]. Agriculture suffers from weather changes, often unaware of them, as social media provides information on climate change impacting crops [14].

However, it is essential to understand the specific effects of social media reporting on climate change and how it influences farmers' behavior in Punjab, Pakistan. The existing literature lacks a comprehensive understanding of the effects of social media reporting on climate change and its impact on farmers' behavior in Punjab, Pakistan. This study aims to address this research gap and shed light on the association between social media reporting of climate change, farmers' crop selection behavior, and agricultural conditions in Punjab.

This study is also helpful to find out the association between social media reporting about rain patterns, frequencies of droughts, temperature change, and farmers' crop selection behavior in Punjab. Usually, agricultural officials in Pakistan rely on agricultural extension services, demonstration farms, training programs, and workshops to disseminate knowledge and information to farmers. The government of Pakistan invests in agricultural research and development to generate new knowledge and technologies. This study is significant in its nature as it contributes to the literature by simply highlighting the importance of non-regular methods of information provided by authorities to the farmers of Pakistan. The findings of this research will contribute to the existing knowledge on climate change communication, agricultural practices, and the role of social media in supporting sustainable agriculture in the region.

So, this study intends to examine the impact of social media reporting on climate change on the farming practices used by Punjabi farmers as well as the relationship between social media reporting on weather and agriculture and its possible impact on behavior change among farmers in the region.

2. Literature review and hypothesis development

This part of the study tries to evaluate previous literature in the present context. Studies conducted in various parts of the world have been reviewed. Considering previous literature, the relationship between social media reporting and climate change was positively correlated. Matthews et al. [15] state that people all around the world are cognizant of climate change issues and are adapting to these conditions. Guo et al. [16] found that people are convinced cognitively and have developed behavioral modifications to cope with climate change, so farmers are more inclined to follow scientific methods in agriculture. Holloway & Ilbery [17] discuss the farmer's behavior in response to environmental alterations, especially universal warming, and the adaptations of cultivation mixes and land administration. This study found a positive relationship between climate change and the attitudes of farmers towards increasing agricultural products. Zheng & Lue [18] provide an overview of social media's potential role in agricultural applications for climate change adaptation and strategies. It identifies areas for further study and addresses the benefits and difficulties of using social media platforms for agricultural information transmission. Arbuckle et al. [19] presented beliefs about weather alterations and behaviors towards modifications and mitigation among cultivators in the United States. The primary testing results show that cultivator's firms are concerned about weather change and their reasons for significantly changing, as well as their connections among typical firms, their interests in the potential effects of weather change and behaviors in modification, their attention to potential influences, and their attitudes in terms of suitable and mitigated works that differ in a planned source. The consequences recommend that outreach among cultivators should focus on these interrelationships in faiths, transactions, and behaviors in the interest of modification and mitigation.

In Pakistan, Pathak [20] investigated how farmers perceive climate change, how it affects agriculture, and how they are preparing for it. Although it does not concentrate on social media reporting, it offers insightful information about the background of agricultural adaptation to climate change in Punjab, Pakistan. According to Mutengwa et al. [21], the latest media has changed people's living standards and resulted in a new system of social communication. Several years ago, people could not have imagined all the possibilities and accessibility that such well-known social platforms as Instagram and Twitter could provide through connections. According to Boafo et al. [22], climate change includes an economic component, resulting in a loss of social cohesiveness and traditional farming expertise. Meldrum et al. [23] conducted a study on weather changes. According to the study, meteorologists can communicate information about weather changes to the public. These electronic media experts have strong opinions about what information to convey or keep current for their listeners. Odemark et al. [24] depicted that extreme precipitation events, which can lead to excess surface water, floods, and agricultural losses, are becoming an increasing social burden because of urbanization and our changing climate. Woroniecki et al. [25] emphasized how knowing the diverse social and ecological processes that lessen susceptibility to climate change may help harness the numerous advantages of interacting with nature in a warming environment. Habib-u-Rehman et al. [26] cover the larger impact of social media on climate change communication and involvement, but they do not specifically focus on agricultural adaptation. It talks about how social media sites could be used to spread knowledge about climate change, increase public awareness, and encourage group action—all of which could be important for efforts to adapt agriculture. Raza et al. [27] determined that agriculture and weather change are fundamentally interconnected in numerous ways, such as how weather change is the primary cause of biotic and abiotic forces that have the greatest impact on agricultural states. According to Kurukulasuriya & Rosenthal [28], changes in climate in terms of temperature, rain patterns, and air humidity cause changes in farmers' behavior to adopt land and water management regimes, which affect agricultural productivity.

The existing literature offers insights into the potential advantages and difficulties of using social media for agricultural information transmission, but more research is required to comprehend the precise implications and efficacy of social media reporting in the context of sustainable agriculture in Punjab, Pakistan. The lack of studies, particularly exploring the role and impact of social media reporting on agricultural adaptation to climate change in Punjab, Pakistan, is thus the research gap found in the literature review.

Based on the above literature, this study assumes.

H1. There will be a significant positive relationship between social media reporting of climate change and crop selection to increase agriculture production in Punjab.

H2. There will be a significant positive relationship between social media reporting and farmers' adaptation toward the use of advanced fertilizers to reduce pest attacks in Punjab.

H3. Social media information will significantly positively correlate with farmers' strategies to store water drainage to increase yield in Punjab.

H4. Social media reporting of climate change would significantly predict farmers' annual realizations of weather and dynamic adaptations in agriculture.

H5. Social media reporting of climate change would predict farmers' field experiments, land values, and soil management skills.

H6. It is more likely to be believed that young and old farmers in Punjab have not changed their minds about the effects of climate change reporting from social media on agriculture.

H7. It is more likely to be believed that educated and illiterate farmers in Punjab have not changed their minds about how social media reporting on climate change has affected farmers' behavior.

H8. It is more likely to be believed that poor and rich farmers in Punjab have not changed their minds about the effects of climate change reporting from social media on agriculture.

2.1. Theoretical framework

This study is conducted under the theories of knowledge, attitude, and practices (KAP) and uses and gratifications theory (UGT). KAP offers an approach to qualitative and quantitative data (a structured questionnaire with predefined questions). These KAP interviews are highly effective in improving behavior by revealing misinterpretations or assumptions that act as challenges to the plans

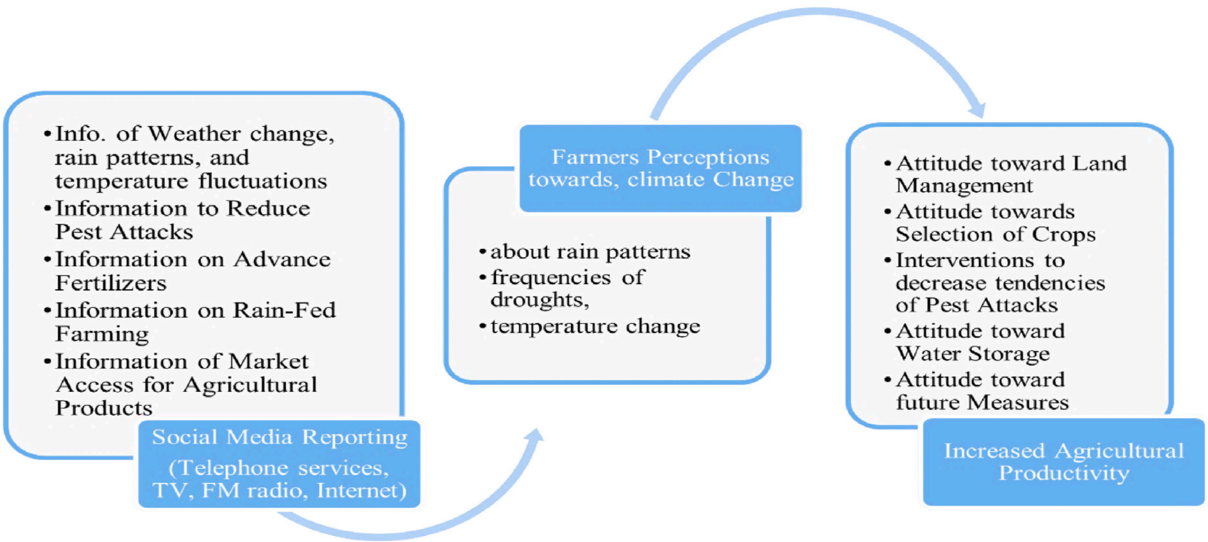

Fig. 1. Possible Effects of Social Media Reporting on Climate Change and Farmers' Attitudes to increase Agriculture in Punjab.

this study mediates to implement. (UGT) is a method of recognizing how and why people are active in seeking out specific media to meet specific needs. Media usage helps people fulfill their needs.

2.2. Model of significant effects of media reporting on farmers' behavior

Fig. 1 Shows how media reporting can affect the behavior of farmers through direct sources of TV, FM radio, and the internet and indirect sources of agricultural officers. As a result, the farmers can change their attitude towards land management, crop selection, water storage, and future measures.

Fig. 3 in Appendix-1 shows the associations between social media reporting of changing climates and resulting farmers' attitudes towards interventions to decrease tendencies for pest attacks, etc. Farmers are guided by agricultural officers, pesticide sellers, and seed sellers. It reveals that the reporting component includes information about pest attacks, fertilizer use, rain-fed farming, and weather changes. The farmers' attitude component includes their perspectives on these factors, including land management, crop selection, pest control interventions, water storage practices, and openness to future measures. This model underscores the importance of information dissemination in influencing agricultural decision-making and practices in Punjab, emphasizing the need for effective communication and collaboration between the two.

2.3. Conceptual framework

It explains the connections between personalities, thoughts, objectives, values, and an individual's actions. First, another characteristic of behavioral purpose is that it involves a method of influencing rather than trying to segregate mind states. The presumption is all about activity, but it limits the consequences it has on behavior and state of mind. The theory foresees circumstantial priorities, behavior stability, and an evaluation of the state of mind. Two components of the activity hypothesis are used to forecast behavioral goals: norms and demeanors.

Fig. 2 illustrates a comprehensive approach to combat climate change, focusing on three main strategies: avoiding high temperatures, reducing fossil fuel consumption, and minimizing future global warming. These strategies are crucial due to the escalating global warming crisis, which is causing significant damage to agricultural lands and plant life. The core issue lies in greenhouse gas emissions from fossil fuel burning. The diagram emphasizes the importance of our practices, knowledge, and behaviors in addressing this challenge, ultimately leading to comprehensive climate change mitigation. It underscores the need for positive preventive measures and collective efforts for a sustainable future.

The model proposed in Fig. 4 in Appendix-1 predicts farmers' behavior based on social media reporting of climate change. It consists of two elements: the source of climate change information and the amount of agricultural land. The model also considers factors like weather changes, rain patterns, pest control strategies, fertilizer usage, rain-fed farming practices, access to agricultural markets, and farmer attitudes. It aims to understand how these factors influence farmers' behavior and decision-making processes. The model provides insights into how social media reporting on climate change can predict and impact farmers' behaviors and practices in relation to their agricultural activities.

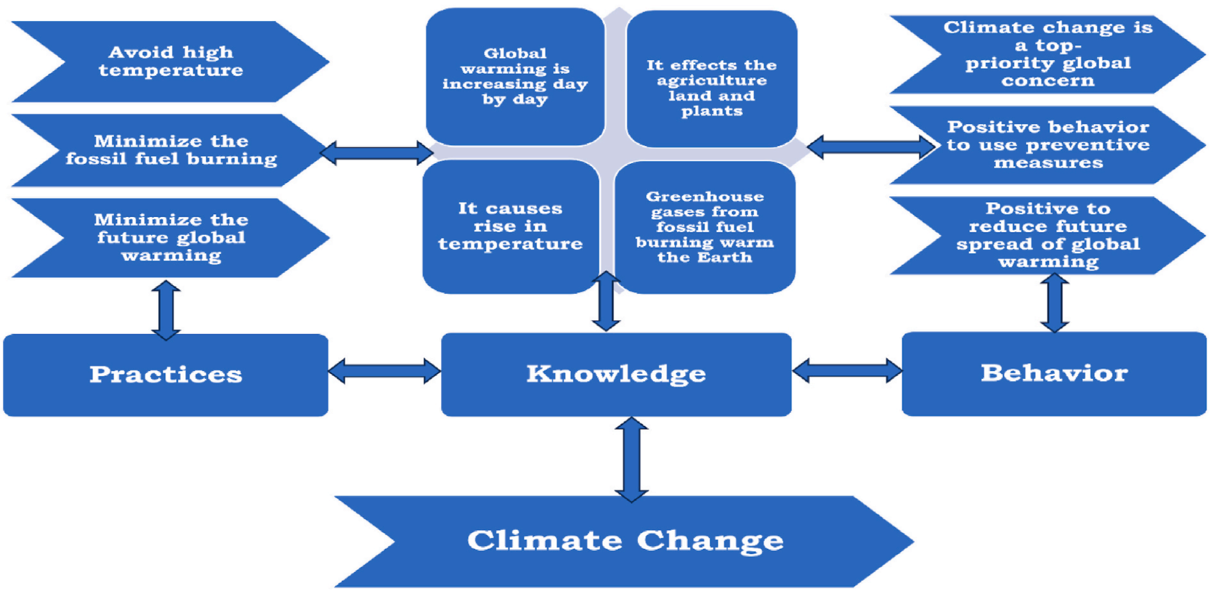

Fig. 2. Forecast of behavioral goals of norms and demeanors.

3. Material and methods

3.1. Study design

The study used quantitative research data with a correlation-experimental design to discover the relationship between climate change and the agricultural production rate in Punjab. A correlation-experimental research design combines elements of both correlation and experimental research methodologies to examine the relationship between variables while also establishing causal connections. This design allows researchers to explore the strength and direction of relationships between variables and investigate potential cause-and-effect relationships. Furthermore, the effects of social media reporting of climate change on farmers' behavior and adaptation were found.

3.2. Data collections

Pakistan is home to 8.2 million farm families, and presently, 90 % of overall farmers (7.4 million) are categorized as smallholder farmers in Pakistan as they own less than 12.5 acres of land (5 ha) [29]. Agricultural officers and land professionals from different cities in Punjab were contacted who had direct contact with farmers. Data was collected in different divisions of Punjab, namely Multan, Bahawalpur, Sahiwal, and Dera Ghazi Khan. The main reason for choosing these divisions and cities for data collection is because they are famous due to agricultural land and climate-effected cities. Due to time and monetary constraints, one hundred and twenty male farmers were accessed through agricultural officers based on the amount of agricultural land they had. Farmers with more than 25 acres of agricultural land were included in the sample because of their vast level of experience using precautionary measures every year and their higher tendencies towards behavioral adaptations in response to climate change as reported by social media. Farmers with more than 25 acres of land often operate on a larger scale, as they can typically manage substantial agricultural resources, including land, machinery, and capital. Surveying them provides insights into their approaches to resource management, including land use patterns, crop diversification, mechanization, and investment decisions. Smallholders were not contacted because of the assumption that those farmers had low adaptive capacity, or even if they had the resources to buy machinery and other resources, it was not feasible to employ them because of their low landholdings.

3.3. Sampling

In current research, purposive sampling is used. Purposive sampling, also known as judgmental or selective sampling, is a non-probability sampling technique in which researchers intentionally select participants based on specific characteristics or criteria that are relevant to the research question. Unlike probability sampling methods that aim to achieve random representation, purposive sampling focuses on selecting participants who possess the desired qualities, have expertise, or have experience relevant to the research. Questionnaires were mailed to agricultural officers, and they were trained to conduct such types of studies so they could contact farmers and record their responses to each statement of the questionnaire.

3.3.1. Inclusion criteria

A sample has the following characteristics.

- Only male farmers were included, with the assumption that male farmers can better adapt to climate change as compared to female farmers.
- Farmers who had more than 25 acres of agricultural land were included.
- Agricultural officers from different cities in Punjab were contacted to get responses from farmers in the Punjab province.
- Both married and unmarried farmers were included.
- Farmers who had irrigation and cultivation experience were included.

3.3.2. Exclusion criteria

Samples with the following characteristics were excluded from the study.

- Female participants were not included due to study purposes.
- In the context of Punjab, Pakistan, there is a notable gender disparity in agricultural practices, with male farmers traditionally being the primary operators and decision-makers. This gender disparity is influenced by various socio-cultural factors that limit the involvement of female farmers in agricultural activities.
- Farmers from other provinces were not included.
- Farmers who gave their agriculture land on lease and had no agricultural experience were not included as samples.

3.4. Instruments and measures

3.4.1. Demographic information sheet

Demographic information about participants was gathered using sheets such as age, gender, city or town of residence, amount of agricultural land owned, behavioral tendencies, and the medium of social media used to learn about climate change over time. The purpose of collecting demographic information was to find any characteristics belonging to farmers that can act as mediating or moderating factors in the relationship between climate change and the rate of agricultural production. Demographic characteristics were analyzed to understand participants' inclination to take precautions to protect their crops from pests and ensure adequate water availability.

3.4.2. Measuring farmer behavior influenced by social media climate change reporting

To assess farmers' behavioral tendencies, an instrument measuring farmer behavior influenced by social media climate change reporting was developed. For a response asking for specific behavior after social media reporting of climate change, it was a five-point Likert scale ranging from 1 = not at all to 5 = always. In the form of a pilot study, the questionnaire was first administered to 25 participants to test its reliability. The value of alpha indicated that the questionnaire had good reliability. After the pilot study, the statement of the scale that participants found difficult to understand was removed and replaced with simple language. The score on the scale was calculated by simply adding numeric values for each response. The scale was divided into five subscales measuring different behaviors. (i) Attitude Toward Land Management; (ii) Attitude Toward Crop Selection; (iii) Interventions to Reduce Pest Attack Tendencies (iv) Attitude Toward Water Storage; (v) Attitude Toward Future Measures.

3.4.3. Effects of social media reporting of climate change on agriculture

Social media reporting and its effects on agriculture were measured using a self-constructed questionnaire. It was also a 5-point Likert scale measuring social effects, ranging from 1 = strongly disagree to 5 = strongly agree, to collect farmers' consent for each effect of social media reporting on agriculture. A reliability check of the questionnaire was calculated through a pilot study. This scale was divided into five subscales measuring different effects. Information on weather change, rain patterns, and temperature fluctuations (i); Information to Reduce Pest Attacks (ii); Information on Advance Fertilizers (iii); Information on Rain-Fed Farming (iii); and Information on Market Access for Agricultural Products (iii). Scores for the questionnaire were collected by computing scores for each statement in the questionnaire.

3.5. Procedure

After getting permission from the department and concerned agricultural institutes for data collection, farmers from different cities, villages, and towns in Punjab were approached to collect their responses to specific questions from the questionnaire. An information sheet containing information about the research study, its purpose and need, and what will be done with the pre-questionnaire responses. A pilot study was done by researchers with a smaller sample of participants before the questionnaires were given to agricultural officers. This pilot study helped to assess the clarity, comprehension, and reliability of the questionnaire. Researchers made necessary modifications based on the feedback received during the pilot study, ensuring that the final questionnaire was more accessible and comprehensible to the target audience. Researchers provided training to the agricultural officers who were involved in data collection. The training aimed to familiarize them with the questionnaire, clarify any doubts, and ensure that they understood the purpose and relevance of each question.

Researchers have provided farmers with clear and accessible information to ensure they are aware of how their personal information will be used and the safeguards in place to protect confidentiality. It is important to inform farmers about the research process, its goals, and the significance of their participation. To avoid confusion during data collection, questionnaires were translated into an easily understandable language. All the terminologies in the questions were translated into known words so that farmers could record their answers easily. After data collection, further analysis was done accordingly.

3.5.1. Ethical consideration

We get ethical consent from the respondent who participated in the survey, and there is no need to get any approval from any ethical committee for our questionnaire. Information about the research, its aim and purpose, and the role of research participants was provided before the questionnaires were given. Participants were assured that their information would be kept confidential through a consent form.

3.6. Data analysis

The data was used for appropriate analysis after proper collection and recording. Pearson product-moment correlation analysis was done to evaluate the nature and kind of relationship between variables. Linear regression was used to determine the role of one variable in predicting another. An independent sample *t*-test was used to evaluate the effects of social media reporting of climate change on the agriculture situation in Punjab.

4. Results

Farmers' patterns of behavior and influences on attitudes were systematically measured in a pattern analysis. The impact of timely reporting on social media platforms on agricultural conditions in Punjab and the annual yield was also investigated. Constructed questionnaires were circulated, and responses to the statements to measure behavior were collected. The collected data for the research study was analyzed using Statistical Packages for Social Science, version 21 (SPSS-21). After piloting a study with fewer participants, reliability analysis was used to determine the value of the scales' Cronbach's alpha consistency. Descriptive statistics containing the mean, standard deviation, and frequency of the demographic characteristics of participants were calculated. A Pearson product-moment analysis of correlation was followed to find the nature and direction (either negative or positive) of the relationship between variables. The prediction of outcome variables was found using regression analysis.

4.1. Reliability analysis

The table below shows that the value of reliability for selected items to measure national integration was moderate to high.

Table 1 shows the results of reliability analysis for two questionnaires: "measuring farmers' behavior influenced by social media reporting of climate change" and "effects of social media reporting of climate change on agriculture." The value of Alpha showed moderate to high reliability of the scales, showing consistency and accuracy of the responses and scale reliability, which is what is supposed to measure.

4.2. Descriptive statistics

Table 2 shows the descriptive statistics of gender response and demographic profile.

Table 2 indicated that according to gender responses, the male frequency of respondents was 120 and had a percentage of 100 %, and the female frequency of respondents was and had a percentage of 0 %. While M = 1.00 and SD = 000. According to the occupation frequency of respondents, there were 93 farmers with a percentage of 77.5 % and 27 agricultural officers with a percentage of 22.5 % of the total participants (Mean = 1.225; standard deviation = 0.4193). In education, the respondent showed that the highest frequency of participants with higher education than intermediate was 43, making up a percentage of 35.8 % of the total sample. M = 4.00, and SD = 1.472. The average income of the participants was influenced by climate change updates on social media. Table 1 showed the higher frequency of the participants with average monthly income (310,001–40,0000) who were 49 and had 40.0 %, while M was 3.6500 and SD was 1.5154. The average amount of household land owned by farmers belonging to different areas of the province of Punjab. Most of the participants (57.5 %) had 1–2 acres of household land. M = 1.4250, and SD = 0.4964. At the bottom of the table were frequencies and percentages of participants' agricultural land holdings. In the 101–150 acres of agricultural land category, the highest frequency of participants was 47 and 39.2 %, while M is 3.608 and SD is 1.342.

4.3. Pearson product moment correlation analysis

Correlation analysis, an alternative to Spearman correlation, was used to discover relationships between various aspects of farmers' behavior influenced by weather change and climate fluctuations on social media. The correlation between the effects of social media transmission of information for the selection of crops, prevention from pest attacks, and farmers' attitudes towards precautionary measures was also analyzed and aimed to test the given hypothesis *(H1)*. There will be a significant positive relationship between social media reporting of climate change and crop selection to increase agriculture production in Punjab *(H2)*. There will be a significant positive relationship between social media reporting and farmers' adaptation toward the use of advanced fertilizers to reduce pest attacks in Punjab *(H3)*. Social media information will significantly positively correlate with farmers' strategies to store water for drainage to increase yield in Punjab.

Table 3 depicts the relationship between the effects of social media reporting on climate change and the various patterns of behavior adopted by farmers in Punjab to increase agricultural output (H1). hypothesis to find a correlation between social media reporting of climate change and farmers' attitudes towards crop selection was rejected because the value was not significant in nature ($p > .5$) (H2). With a p-value of .5 and a positive direction, the hypothesis to test a significant correlation between social media reporting and farmers' attitudes towards land management and decreasing pest attack tendencies was approved (H3). The results of the correlation analysis also found a non-significant relationship between social media reporting and farmers' attitudes towards water storage, describing non-recorded measures taken by the farmers when they got an update on savior summers or a lack of water. Results found a significant positive association between social media reporting and farmers' attitudes towards taking steps for future intervention to prevent crop pests and management systems for seed protection for the next crop. $P < .005$.

4.4. Linear regression analysis

This analysis was conducted to determine the role of social media reporting of climate change and its effects on farmers' behavior and attitudes towards agricultural production in Punjab.

(H4) Social media reporting of climate change would significantly predict farmers' annual realizations of weather and dynamic adaptations in agriculture *(H5)*. Social media reporting of climate change would predict farmers' field experiments, land values, and

Table 1
Psychometric properties of questionnaires (N = 120).

Variables	K	M	SD	α
Measuring of Farmer's Behavior Influenced by Social Media Reporting of Climate Change	9	34.70	5.09	.743
Effects of Social Media Reporting on Climate Change on Agriculture	5	21.74	2.80	.736

Note. K = Number of items in Scale, M = Mean, SD= Standard Deviation, α = Reliability Co-efficient.

Table 2
Descriptive statistics of participants.

Variables	Category response	Frequency	Percent
Gender	Male	120	100
	Female	0	0.00
	Total	120	100.0
Occupation	Farmers	93	77.5
	Agricultural Officers	27	22.5
	Total	120	100.0
Education	Primary	12	10.0
	Middle	11	9.2
	Matric	11	9.2
	Intermediate	30	25.0
	Above	43	35.8
	Illiterate	13	10.8
	Total	120	100
Income	50,000–100000	24	20.0
	110,000–200000	2	1.7
	210,000–30000	15	12.5
	310,000–400000	30	25.0
	Above	49	40.8
	Total	120	100.0
Domestic Land	1-2 Acre	69	57.5
	3-4 Acre	51	42.5
	Total	120	100.0
Agricultural Land	25-50 Acre	20	16.7
	51-100 Acre	20	16.7
	101-150 Acre	47	39.2
	Above	33	27.5
	Total	120	100.0

Table 3
Relationship between Farmer's patterns of behavior and social media reporting of climate change (N = 120).

Variables	2	3	4	5	6	M	SD
1.Effects of Social Media Reporting	−0.22	.193*	0.74*	0.15	0.24**	2.00	1.08
2.Farmer's Attitude to the Selection of Crops	–	.615**	.167*	1.90*	−091*	2.06	1.145
3.Farmer's Attitude to Land Management	–	–	.147*	.089**	.110**	2.09	1.08
4. Farmer's Attitude to decrease Pest Attack	–	–	–	.062*	.055**	2.00	1.149
5. Farmer's Attitude to Water Storage	–	–	–	–	.197*	2.39	1.1086
6. Farmer's Attitude for Future Measures	–	–	–	–	–	2.02	1.876

soil management skills, which were hypotheses to test through regression analysis. Table 4 shows the results of the linear regression analysis. The effects of social media reporting helped predict patterns of behavior for the selection of crops, land management, attitudes towards decreasing tendencies of pest attack, and water storage. The hypothesis of significant prediction among variables was approved except for farmers' attitudes towards decreasing tendencies of pest attack, where the value of significant beta was not significant in nature, (F (34.3) = 2.56, $p < .005$).

Table 5 shows the impact of the profession on farmers' behavior, which is influenced by social media reporting of climate change, showing a positive and meaningful relationship. Structural Equation Model coefficient values show a positive relationship between the

Table 4
Linear regression analysis of climate change predicting farmers' patterns of behavior adopted as a result of social media reporting (N = 120).

Predictor	Effects of Social Media Reporting	
	ΔR^2	*B*
Step 1	3.41	
Control Variables		0.25*
Step 2	2.43	
Farmer's Attitude for Selection of Crops		0.313**
Farmer's Attitude to Land Management		0.410
Farmer's Attitude to decrease Pest Attack		0.334**
Farmer's Attitude to Water Storage		1.72*
Total R^2	1.03	
N	120	

Note. ΔR^2 = Significant Change, β = Standardize Coefficient.

variables.

As seen in Table 6, an independent-sample *t*-test was used to compare the Farmer's Behavior Influenced by Reporting of Climate Change scores of farmers and agriculture officers. Farmers' scores were not significantly different from agriculture officers' (M = 34.6452, SD = 5.268; t (118) = −0.218, p = .158) (two-tailed). The size of the disparity in the means was small (eta squared = 0.0004) (means difference = −0.24,373, 95% CI: −2.45613 to 1.96868). Farmers' Effects of Reporting of Climate Change on Agriculture Ratings were not significantly different from Agriculture Officers' (M = 21.9677, SD = 2.70045; t (118) = 1.652, p = .709). (Two-tailed). The size of the disparity in means (means difference = 1.00478, 95% CI: −0.19,996 to 2.20952) was small (eta squared = 0.02).

Table 7 presents the impact of land owned by farmers and the influence of social media reporting of climate change on agricultural productivity. Again, the coefficient of SEM shows a positive relationship among the variables.

An independent-sample *t*-test was used to compare the farmer's behavior influenced by reporting climate change scores of farmers who owned 1–2 acres and farmers who owned 3–4 acres of land, as seen in Table 8. Farmers who owned 1–2 acres scores were not significantly different from farmers who owned 3–4 acres' land (M = 34.9565, SD = 5.21151; t (118) = 0.641, p = .497) (two-tailed). The size of the disparity in the means was very small (eta squared = 0.003) (means difference = 0.60,358, 95% CI: 1.26242 to 2.46958). Effects of Reporting of Climate Change on Agriculture Ratings of farmers who owned 1–2 acres were not significantly different from farmers who owned 3–4 acres' land (M = 21.7826, SD = 2.94992; t (118) = 0.185, p = .650) (two-tailed). The size of the disparity in means (means difference = 0.09633, 95% CI: −0.93,288 to 1.12555) was very small (eta squared = 0.0002).

Table 9 presents the impact of social media reporting of climate change on the behavior of farmers who owned land on lease and the results of SEM again showed a positive relationship among the variables of interest.

An independent-sample *t*-test was used to compare the farmer's behavior influenced by reporting climate change scores of farmers who owned land on lease and farmers who did not own land on lease, as seen in Table 10. Farmers who owned land on lease scores were not significantly different from farmers who did not own land on the lease (M = 34.8286, SD = 5.50126; t (118) = 0.177, p = .546) (two-tailed). The size of the disparity in the means was very small (eta squared = 0.0002) (means difference = 0.18,151, 95% CI -1.85119 to 2.21422). Effects of Reporting of Climate Change on Agriculture ratings of famers who owned land on the lease were not significantly different from famers who did not own land (M = 21.1714, SD = 3.15749; t (118) = −1.436, p = .066) (two-tailed). The size of the disparity in means (means difference = −0.80,504, 95% CI: −1.91491 to.30,482) was very small (eta squared = 0.01).

Table 11 shows the impact of age on farmers' behavior, which is influenced by social media reporting and the resulting change in agricultural output. The upper and lower bound values of farmers' behavior influenced by reporting did not show much difference, but the effects of reporting on agricultural output were much different from the perspectives of upper and lower bounds.

Table 12 shows the ANOVA results. Here, reporting on agricultural output is significant but not significant in the case of farmers' behavior influenced by reporting.

A one-way between-groups study of variation was used to investigate the farmer's behavior influenced by climate change reporting, according to Table 13. According to their age, the participants were grouped into three classes (G1: 30–40 years, G2: 41–50 years, and G3: above 50 years). The Farmer's Behavior Influenced by Reporting of Climate Change ratings for the three age groups are not statistically significant at the P.05 level: F (2, 117) = 0.009, p = .991. According to the table, there was a statistically important gap in the Effects of Reporting of Climate Change on Agriculture ratings for the three age groups at the P.05 level: F (2, 117) = 10.510, p = .000. Despite statistical significance, the real difference in mean scores between groups was large (eta squared = 0.15).

Table 14 presents the influence of education on farmer behavior influenced by climate change reporting. The table shows that farmers with varying levels of education, including Primary, Middle, Matric, Intermediate, Above, and Illiterate, exhibit varying mean scores for behavior influenced by reporting. The study reveals that intermediate-educated farmers have a higher mean score of 36.87, while illiterate farmers have a mean score of 31.23. The study found that younger farmers were more likely than older farmers to believe that climate change reporting had an impact on agriculture, with a mean score of 23.4706, compared to 20.9773 and 21.1429, respectively. The table results show that education influences farmer behavior and the impact of climate change reporting on agriculture.

Table 15 provides the results of the ANOVA (analysis of variance) analysis to assess the influence of climate change reporting on farmers' behavior and its effects on agriculture. Results reveal a statistically significant impact of climate change reporting on farmers' behavior (F = 3.352, p = .007), while the F-statistic for agriculture was 0.566, indicating no significant effect.

A one-way between-groups study of variation was used to investigate the farmer's behavior influenced by reporting climate change, according to Table 16. According to their education, the participants were grouped into six classes (G1: Primary, G2: Middle, G3: Matric, G4: Intermediate, G5: Above, and G6: Illiterate). The Farmer's Behavior Influenced by Reporting of Climate Change ratings for the five educational groups are statistically significant at the P.05 level: F (5, 114) = 3.352, p = .007. Despite achieving statistical significance, the real gap in mean scores between the groups was high (eta squared = .12). The mean score for Group 4 (M = 36.8667,

Table 5
Impact of the profession on Farmer's behavior influenced by reporting of climate change and effects of reporting of climate change on agriculture.

	Occupation	N	M	SD	SEM
Farmer's Behavior Influenced by Reporting of Climate Change	Farmer	93	34.6452	5.26813	.54,628
	Agriculture Officer	27	34.8889	4.50925	.86,781
Effects of Reporting of Climate Change on Agriculture	Farmer	93	21.9677	2.70045	.28,002
	Agriculture Officer	27	20.9630	3.05692	.58,830

Table 6
Independent samples test.

	Levene's Test		*t*-test for Equality of Means						
	F	Sig.	t	Df	Sig. (2-tailed)	MD	SED	95 % CID Lower	95 % CID Upper
Farmer's Behavior Influenced by Reporting of Climate Change	2.018	.158	−.218	118	.828	−.24,373	1.11722	−2.45613	1.96868
			−.238	48.535	.813	−.24,373	1.02543	−2.30491	1.81745
Effects of Reporting of Climate Change on Agriculture	.140	.709	1.652	118	.101	1.00478	.60,837	−.19,996	2.20952
			1.542	38.556	.131	1.00478	.65,155	−.31,359	2.32314

Table 7
Impact of land owned on Farmer's Behavior Influenced by Reporting of Climate Change and Effects of Reporting of Climate Change on Agriculture.

	Household Land	N	M	SD	SEM
Farmer's Behavior Influenced by Reporting Climate Change	1–2 acre	69	34.9565	5.21151	.62,739
	3–4 acre	51	34.3529	4.95105	.69,329
Effects of Reporting on Climate Change on Agriculture	1–2 acre	69	21.7826	2.94992	.35,513
	3–4 acre	51	21.6863	2.61909	.36,675

Table 8
Independent samples test.

	Levene's Test		*t*-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	MD	SEM	95 % CID Lower	95 % CID Upper
Farmer's Behavior Influenced by Reporting of Climate Change	.464	.497	.641	118	.523	.60,358	.94,230	−1.26242	2.46958
			.646	110.792	.520	.60,358	.93,502	−1.24927	2.45643
Effects of Reporting of Climate Change on Agriculture	.207	.650	.185	118	.853	.09633	.51,973	−.93,288	1.12555
			.189	114.017	.851	.09633	.51,051	−.91,498	1.10765

Table 9
Impact of land owned on Lease on Farmer's Behavior Influenced by Reporting of Climate Change and Effects of Reporting of Climate Change on Agriculture.

	Land on Lease	N	M	SD	SEM
Farmer's Behavior Influenced by Reporting of Climate Change	Yes	35	34.8286	5.50126	.92,988
	No	85	34.6471	4.94423	.53,628
Effects of Reporting of Climate Change on Agriculture	Yes	35	21.1714	3.15749	.53,371
	No	85	21.9765	2.62758	.28,500

Table 10
Independent samples test.

	Levene's Test		*t*-test for Equality of Means						
	F	Sig.	T	Df	Sig. (2-tailed)	MD	SEM	95 % CID Lower	95 % CID Upper
Farmer's Behavior Influenced by Reporting of Climate Change	.367	.546	.177	118	.860	.18,151	1.02648	−1.85119	2.21422
			.169	57.790	.866	.18,151	1.07344	−1.96738	2.33040
Effects of Reporting of Climate Change on Agriculture	3.453	.066	−1.436	118	.154	−.80,504	.56,046	−1.91491	.30,482
			−1.331	54.366	.189	−.80,504	.60,504	−2.01789	.40,781

SD = 4.75419) was different from Group 6 (M = 31.2308, SD = 0.45,634). According to the table, there was not a statistically important gap in the effects of reporting climate change on agriculture ratings for the six educational groups at the P.05 level: $F(5, 114) = 0.566$, $p = .726$.

Table 17 shows the impact of income on the farmers' influenced by the reporting and the resulting change in output. The results show that farmers with higher incomes are more likely to adopt coping mechanisms as compared to lower-income farmers.

In Table 18, an ANOVA (analysis of variance) was conducted to investigate the impact of farmer behavior on agriculture because of

Table 11
Impact of age on Farmer's behavior influenced by reporting of climate change and effects of reporting of climate change on agriculture.

		N	M	SD	SE	95 % CIM		Min	Max
						LB	UB		
Farmer's Behavior Influenced by Reporting of Climate Change	30–40year	34	34.7647	4.02311	.68,996	33.3610	36.1684	27.00	41.00
	41–50year	44	34.7273	5.88401	.88,705	32.9384	36.5162	23.00	45.00
	above 50 years	42	34.6190	5.08442	.78,454	33.0346	36.2035	26.00	43.00
	Total	120	34.7000	5.09011	.46,466	33.7799	35.6201	23.00	45.00
Effects of Reporting of Climate Change on Agriculture	30–40year	34	23.4706	1.82964	.31,378	22.8322	24.1090	18.00	25.00
	41–50year	44	20.9773	2.79941	.42,203	20.1262	21.8284	13.00	25.00
	above 50 years	42	21.1429	2.90140	.44,770	20.2387	22.0470	15.00	25.00
	Total	120	21.7417	2.80305	.25,588	21.2350	22.2483	13.00	25.00

Table 12
ANOVA.

	SoS	df	MS	F	Sig.
Farmer's Behavior Influenced by Reporting of Climate Change	.450	2	.225	.009	.991
	3082.750	117	26.348		
	3083.200	119			
Effects of Reporting of Climate Change on Agriculture	142.401	2	71.200	10.510	.000
	792.591	117	6.774		
	934.992	119			

Table 13
Multiple comparisons (tukey Hsd).

Dependent Variable	(I) Age_1	(J) Age_1	MD (I-J)	SE	Sig.	95 % CI	
						Lower Bound	Upper Bound
Farmer's Behavior Influenced by Reporting of Climate Change	30–40year	41–50year	.03743	1.17208	.999	−2.7450	2.8199
		above 50 years	.14,566	1.18418	.992	−2.6655	2.9568
	41–50year	30–40year	−.03743	1.17208	.999	−2.8199	2.7450
		above 50 years	.10,823	1.10732	.995	−2.5205	2.7369
	above 50 years	30–40year	−.14,566	1.18418	.992	−2.9568	2.6655
		41–50year	−.10,823	1.10732	.995	−2.7369	2.5205
Effects of Reporting of Climate Change on Agriculture	30–40year	41–50year	2.49332*	.59,431	.000	1.0825	3.9042
		above 50 years	2.32773*	.60,045	.001	.9023	3.7531
	41–50year	30–40year	−2.49332*	.59,431	.000	−3.9042	−1.0825
		above 50 years	−.16,558	.56,147	.953	−1.4985	1.1673
	above 50 years	30–40year	−2.32773*	.60,045	.001	−3.7531	−.9023
		41–50year	.16,558	.56,147	.953	−1.1673	1.4985

climate change reporting. The analysis showed no significant differences in farmer behavior influenced by climate change reporting, with an F-statistic of 1.661 and a p-value of .164. The study found that climate change reporting significantly impacts agriculture, with an F-statistic of 3.268 and a p-value of .014, indicating a significant impact on the agriculture sector.

A one-way between-groups study of variation was used to investigate the farmer's behavior influenced by climate change reporting, according to Table 19. According to their income, the participants were grouped into five classes (G1: 50,000–10000, G2: 110,000–150,000, G3: 160,000–200000, G4: 210,000–300000, and G5: Above). Farmers' behavior influenced by the reporting of climate change ratings is statistically insignificant at the P.05 level; F (4, 115) = 1.661, p = .164. According to the table, there was a statistically important gap in the Effects of Reporting of Climate Change on Agriculture ratings for the five income groups at the P.05 level: F (5, 114) = 3.268, p = .014. Despite reaching statistical significance, the actual difference in mean scores between groups was large (eta squared = 0.10). The mean score for Group 3 (M = 23.4000, SD = 1.84391) was different from Group 5 (M = 20.8980, SD = 2.55966).

Table 20 presents data on the relationship between climate change reporting and its effects on farmer behavior and agriculture, examining the relationship between climate change reporting and its impact on both sectors. The table provides data on farmer behavior and its impact on agriculture, including observations, mean, standard deviation, standard error, and 95 % confidence

Table 14
Impact of education on Farmer's behavior influenced by reporting of climate change and effects on agriculture.

		N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Mini	Maxi
						Lower Bound	Upper Bound		
Farmer's Behavior Influenced by Reporting of Climate Change	Primary	12	32.2500	3.88763	1.12226	29.7799	34.7201	27.00	39.00
	Middle	11	34.8182	4.72902	1.42585	31.6412	37.9952	24.00	40.00
	Matric	11	36.1818	4.70783	1.41946	33.0191	39.3446	28.00	43.00
	Intermediate	30	36.8667	4.75419	.86,799	35.0914	38.6419	27.00	45.00
	Above	43	34.5116	5.30665	.80,926	32.8785	36.1448	23.00	44.00
	Illiterate	13	31.2308	4.45634	1.23597	28.5378	33.9237	25.00	39.00
	Total	120	34.7000	5.09011	.46,466	33.7799	35.6201	23.00	45.00
Effects of Reporting of Climate Change on Agriculture	Primary	12	22.0000	2.73030	.78,817	20.2652	23.7348	17.00	25.00
	Middle	11	22.5455	2.11488	.63,766	21.1247	23.9663	19.00	25.00
	Matric	11	22.2727	3.28910	.99,170	20.0631	24.4824	15.00	25.00
	Intermediate	30	21.8667	2.77592	.50,681	20.8301	22.9032	15.00	25.00
	Above	43	21.2326	2.83547	.43,240	20.3599	22.1052	13.00	25.00
	Illiterate	13	21.7692	3.11325	.86,346	19.8879	23.6505	17.00	25.00
	Total	120	21.7417	2.80305	.25,588	21.2350	22.2483	13.00	25.00

Table 15
ANOVA result for influence of climate change reporting on farmers' behavior and agriculture.

	Sum of Squares	df	Mean Square	F	Sig.
Farmer's Behavior Influenced by Reporting of Climate Change	395.159	5	79.032	3.352	.007
	2688.041	114	23.579		
	3083.200	119			
Effects of Reporting of Climate Change on Agriculture	22.634	5	4.527	.566	.726
	912.358	114	8.003		
	934.992	119			

intervals. The table categorizes farmers based on land size, showing that farmer behavior and climate change reporting impact may vary depending on land size, such as '25 acres', '60–100 acres', '101–150 acres', and 'above'.

Table 21 shows the results of the study's ANOVA evaluation of the impact of farmer behavior and agricultural reporting on climate change. The table showed that no significant differences in farmer behavior were influenced by climate change reporting, as indicated by an F-statistic of 1.024 and a p-value of .385. The table found no significant effects of reporting climate change on agriculture, with an F-statistic of 0.236 and a p-value of .871.

A one-way between-groups study of variation was used to investigate the farmer's behavior influenced by climate change reporting, according to Table 22. According to their land, the participants were grouped into four classes (G1: 25 acres, G2: 60–100 acres, G3: 101–150 acres, and G4: above). Farmers' Behavior Influenced by Climate Change Reporting Ratings is not statistically significant at the P.05 level; F (3, 116) = 1.024, p = .385. According to the table, there was not a statistically important gap in the effects of reporting climate change on agriculture ratings for the four land groups at the P.05 level: F (3, 116) = 0.236, p = .871.

5. Discussion

The effectiveness of consumers' behavior patterns influenced by climate change reporting on social media was demonstrated by the evaluated results of a given research study. Social media is now having diverse effects on every aspect of life, whether personal, political, social, or economic in nature. Social media services and implications have an impact on agriculture as well. Climate change reporting is another challenge to changing the behavior of agriculture employees and farmers to timely implement the set of precautions that will lead to increased agricultural production. The literature supporting the current study's findings was linked to each evaluated result and hypothesis considering finding measures.

Social media uses different platforms and social networking sites to inform farmers and agriculture-related economists about climate change and weather forecasting. A study concluded that the climate change content on different networking platforms affected the pattern of agricultural production. Farmers' behavior, actions, and efficacy of those actions towards the adaptation of measures in response to climate change are highly influenced by social media reporting. NGOs in 38 community regions were chosen as a source for transmitting weather change information, and observations of farmers' behaviors were recorded. Farmers' crop handling and household farming techniques changed because of climate change reporting [30]. To record the hypothesized results, behavioral scales and open observations were used. It was determined that 66 % of farmers demonstrated immediate adaptations and behavioral changes to demonstrate that they were following global warming awareness in agriculture. As farmers are most affected by weather change, they are reluctant to change their patterns of action to resolve future acceleration [31].

Agricultural stocks are subject to biotic and abiotic stresses, which have an impact and are related to the selection of crops

Table 16
Multiple comparisons (tukey Hsd).

Dependent Variable	(I) Education	(J) Education	Mean Difference (I-J)	Std. Error	Sig.	95 % Confidence Interval	
						Lower Bound	Upper Bound
Farmer's Behavior Influenced by Reporting of Climate Change	Primary	Middle	−2.56818	2.02695	.802	−8.4438	3.3075
		Matric	−3.93182	2.02695	.384	−9.8075	1.9438
		Intermediate	−4.61667	1.65859	.067	−9.4245	.1912
		Above	−2.26163	1.58534	.711	−6.8572	2.3339
		Illiterate	1.01923	1.94390	.995	−4.6157	6.6542
	Middle	Primary	2.56818	2.02695	.802	−3.3075	8.4438
		Matric	−1.36364	2.07054	.986	−7.3657	4.6384
		Intermediate	−2.04848	1.71159	.838	−7.0100	2.9130
		(I) Education	(J) Education	Mean Difference (I-J)	Std. Error	Sig.	95 % Confidence Interval
		Above	.30,655	1.64071	1.000	−4.4495	5.0626
		Illiterate	3.58741	1.98931	.468	−2.1792	9.3540
	Matric	Primary	3.93182	2.02695	.384	−1.9438	9.8075
		Middle	1.36364	2.07054	.986	−4.6384	7.3657
		Intermediate	−.68,485	1.71159	.999	−5.6464	4.2767
		Above	1.67019	1.64071	.911	−3.0859	6.4262
		Illiterate	4.95105	1.98931	.136	−.8155	10.7176
	Intermediate	Primary	4.61667	1.65859	.067	−.1912	9.4245
		Middle	2.04848	1.71159	.838	−2.9130	7.0100
		Matric	.68,485	1.71159	.999	−4.2767	5.6464
		Above	2.35504	1.15513	.327	−.9934	5.7035
		Illiterate	5.63590*	1.61238	.009	.9620	10.3098
	Above	Primary	2.26163	1.58534	.711	−2.3339	6.8572
		Middle	−.30,655	1.64071	1.000	−5.0626	4.4495
		Matric	−1.67019	1.64071	.911	−6.4262	3.0859
		Intermediate	−2.35504	1.15513	.327	−5.7035	.9934
		Illiterate	3.28086	1.53693	.277	−1.1744	7.7361
	Illiterate	Primary	−1.01923	1.94390	.995	−6.6542	4.6157
		Middle	−3.58741	1.98931	.468	−9.3540	2.1792
		Matric	−4.95105	1.98931	.136	−10.7176	.8155
		Intermediate	−5.63590*	1.61238	.009	−10.3098	−.9620
		Above	−3.28086	1.53693	.277	−7.7361	1.1744
Effects of Reporting of Climate Change on Agriculture	Primary	Middle	−.54,545	1.18088	.997	−3.9686	2.8777
		Matric	−.27,273	1.18088	1.000	−3.6958	3.1504
		Intermediate	.13,333	.96,628	1.000	−2.6677	2.9344
		Above	.76,744	.92,361	.961	−1.9099	3.4448
		Illiterate	.23,077	1.13250	1.000	−3.0521	3.5136
	Middle	Primary	.54,545	1.18088	.997	−2.8777	3.9686
		Matric	.27,273	1.20628	1.000	−3.2240	3.7695
		Intermediate	.67,879	.99,716	.984	−2.2118	3.5693
		Above	1.31290	.95,586	.743	−1.4579	4.0837
		Illiterate	.77,622	1.15896	.985	−2.5833	4.1358
	Matric	Primary	.27,273	1.18088	1.000	−3.1504	3.6958
		Middle	−.27,273	1.20628	1.000	−3.7695	3.2240
		Intermediate	.40,606	.99,716	.999	−2.4845	3.2966
		Above	1.04017	.95,586	.885	−1.7307	3.8110
		Illiterate	.50,350	1.15896	.998	−2.8561	3.8631
	Intermediate	Primary	−.13,333	.96,628	1.000	−2.9344	2.6677
		Middle	−.67,879	.99,716	.984	−3.5693	2.2118
		Matric	−.40,606	.99,716	.999	−3.2966	2.4845
		Above	.63,411	.67,297	.935	−1.3167	2.5849
		Illiterate	.09744	.93,936	1.000	−2.6256	2.8204
	Above	Primary	−.76,744	.92,361	.961	−3.4448	1.9099
		Middle	−1.31290	.95,586	.743	−4.0837	1.4579
		Matric	−1.04017	.95,586	.885	−3.8110	1.7307
		Intermediate	−.63,411	.67,297	.935	−2.5849	1.3167
		Illiterate	−.53,667	.89,540	.991	−3.1322	2.0589
	Illiterate	Primary	−.23,077	1.13250	1.000	−3.5136	3.0521
		Middle	−.77,622	1.15896	.985	−4.1358	2.5833
		Matric	−.50,350	1.15896	.998	−3.8631	2.8561
		Intermediate	−.09744	.93,936	1.000	−2.8204	2.6256
		Above	.53,667	.89,540	.991	−2.0589	3.1322

Table 17
Impact of income on Farmer's behavior influenced by reporting of climate change and effects of reporting of climate change on agriculture.

		N	M	SD	SE	95 % CIM		Min	Max
						LB	UB		
Farmer's Behavior Influenced by Reporting of Climate Change	50,000–100000	24	34.4583	5.08176	1.03731	32.3125	36.6042	27.00	44.00
	110,000–150,000	2	34.0000	5.65685	4.00000	−16.8248	84.8248	30.00	38.00
	160,000–200000	15	34.5333	5.55321	1.43383	31.4581	37.6086	26.00	43.00
	210,000–300000	30	36.6667	4.13007	.75,404	35.1245	38.2089	29.00	45.00
	Above	49	33.6939	5.32762	.76,109	32.1636	35.2241	23.00	43.00
	N	M	SD	SE	95 % CIM	Min	Max	N	M
	Total	120	34.7000	5.09011	.46,466	33.7799	35.6201	23.00	45.00
Effects of Reporting of Climate Change on Agriculture	50,000–100000	24	21.4583	2.68618	.54,831	20.3241	22.5926	15.00	25.00
	110,000–150,000	2	22.0000	1.41421	1.00000	9.2938	34.7062	21.00	23.00
	160,000–200000	15	23.4000	1.84391	.47,610	22.3789	24.4211	19.00	25.00
	210,000–300000	30	22.5000	3.26687	.59,645	21.2801	23.7199	15.00	25.00
	Above	49	20.8980	2.55966	.36,567	20.1627	21.6332	13.00	25.00
	Total	120	21.7417	2.80305	.25,588	21.2350	22.2483	13.00	25.00

Table 18
ANOVA result for impact of climate change reporting on farmers' behavior and agriculture.

	SoS	Df	MS	F	Sig.
Farmer's Behavior Influenced by Reporting of Climate Change	168.434	4	42.108	1.661	.164
	2914.766	115	25.346		
	3083.200	119			
Effects of Reporting of Climate Change on Agriculture	95.444	4	23.861	3.268	.014
	839.548	115	7.300		
	934.992	119			

appropriate for different regions [32]. Temperature fluctuations, changes in rainfall patterns, heat stocks, and changes in weed and pest control are all typical factors that have an influence on agriculture [33]. The level of CO in the soil changed with persistent changes in weather. Because of their compositions and seal levels, different crops have different effects on climate change. The study concluded that a farmer's behavior in adapting seed selection and crop change was related to weather change and weather change reporting [34].

The present study found a significant positive correlation between social media reporting of climate change and farmers' behavior measures to reduce pest attacks [35]. A study also concluded the same results by illustrating that weather change causes an increase and decrease in the level of carbon dioxide, which leads to a decrease in the level of nitrogen content in the leaves and lower body of the plant. Weather changes make plants more vulnerable to pest attacks [36]. Social media provides information about pest attacks and suitable soil fertility in changing weather conditions [37].

Farmers' behavior is influenced by climate change reporting, and the effects of climate change reporting by social media [38] on agriculture scores are not different between farmers and agriculture officers, according to the results of this study (Table 3). The results of this study show that participants think that farmers' behavior is influenced by social media reporting on climate change and that the effects of climate change reporting on agriculture scores are no different for farmers who own 1–2 acres and 3–4 acres of land (Table 7). The results of this study show that participants agree that farmers' behavior is influenced by climate change reporting and that the effects of climate change reporting by social media on agriculture scores are not different between farmers who own land on lease and those who do not (Table 9). For the three age ranges, the farmer's behavior influenced by climate change reporting scores were not statistically important. According to the study's findings, there was a statistically significant difference in the scores for the effects of climate change reporting on agriculture for the three age groups. Younger farmers were more likely than older farmers to believe that climate change reporting from social media affects agriculture (Table 11).

The findings of the study reject the null hypothesis *(H6)* that *"it is more likely to believe that young and old farmers in Punjab have not changed their minds about the effects of climate change reporting from social media on agriculture."* As opposed to illiterate farmers, educated farmers agree that social media reporting on climate change has affected farmers' behavior, but farmers do not believe in the effects of climate change reporting on agriculture (Table 14).

The findings of the present research reject the null hypothesis *(H7)* that *"it is more likely to believe that educated and illiterate farmers in Punjab have not changed their minds about how social media reporting on climate change has affected farmers' behavior."* The findings of the research explore that the farmer's behavior influenced by reporting of climate change ratings for income is not statistically significant. But, compared to the richest farmers, the farmers with middle-range earnings believe that there are more effects of reporting on climate change on social media on agriculture. The findings of the present study reject the null hypothesis *(H8)* that *"it is more likely to believe that poor and rich farmers in Punjab have not changed their minds about the effects of climate change reporting from social media on agriculture."*

Table 19
Multiple comparisons (tukey Hsd).

Dependent Variable	(I) Average Income	(J) Average Income	MD (I-J)	SE	Sig.	95%I	
						LB	UB
Farmer's Behavior Influenced by Reporting of Climate Change	50,000–100000	110,000–150,000	.45,833	3.70526	1.000	−9.8109	10.7276
		160,000–200000	−.07500	1.65704	1.000	−4.6676	4.5176
		210,000–300000	−2.20833	1.37874	.499	−6.0296	1.6129
		Above	.76,446	1.25433	.973	−2.7120	4.2409
	110,000–150,000	50,000–100000	−.45,833	3.70526	1.000	−10.7276	9.8109
		160,000–200000	−.53,333	3.78980	1.000	−11.0369	9.9702
		210,000–300000	−2.66667	3.67665	.950	−12.8566	7.5233
		Above	.30,612	3.63183	1.000	−9.7596	10.3719
	160,000–200000	50,000–100000	.07500	1.65704	1.000	−4.5176	4.6676
		110,000–150,000	.53,333	3.78980	1.000	−9.9702	11.0369
		210,000–300000	−2.13333	1.59204	.667	−6.5457	2.2791
		Above	.83,946	1.48559	.980	−3.2779	4.9568
	210,000–300000	50,000–100000	2.20833	1.37874	.499	−1.6129	6.0296
		110,000–150,000	2.66667	3.67665	.950	−7.5233	12.8566
		160,000–200000	2.13333	1.59204	.667	−2.2791	6.5457
		Above	2.97279	1.16710	.087	−.2619	6.2074
	Above	50,000–100000	−.76,446	1.25433	.973	−4.2409	2.7120
		110,000–150,000	−.30,612	3.63183	1.000	−10.3719	9.7596
		160,000–200000	−.83,946	1.48559	.980	−4.9568	3.2779
		210,000–300000	−2.97279	1.16710	.087	−6.2074	.2619
Effects of Reporting of Climate Change on Agriculture	50,000–100000	110,000–150,000	−.54,167	1.98857	.999	−6.0530	4.9697
		160,000–200000	−1.94167	.88,931	.193	−4.4064	.5231
		210,000–300000	−1.04167	.73,995	.624	−3.0925	1.0091
		Above	.56,037	.67,318	.920	−1.3054	2.4261
	110,000–150,000	50,000–100000	.54,167	1.98857	.999	−4.9697	6.0530
		160,000–200000	−1.40000	2.03394	.959	−7.0371	4.2371
		210,000–300000	−.50,000	1.97321	.999	−5.9688	4.9688
		Above	1.10204	1.94915	.980	−4.3001	6.5042
	160,000–200000	50,000–100000	1.94167	.88,931	.193	−.5231	4.4064
		110,000–150,000	1.40000	2.03394	.959	−4.2371	7.0371
		210,000–300000	.90,000	.85,442	.830	−1.4681	3.2681
		Above	2.50204*	.79,730	.018	.2923	4.7118
	210,000–300000	50,000–100000	1.04167	.73,995	.624	−1.0091	3.0925
		110,000–150,000	.50,000	1.97321	.999	−4.9688	5.9688
		160,000–200000	−.90,000	.85,442	.830	−3.2681	1.4681
		Above	1.60204	.62,637	.085	−.1340	3.3380
	Above	50,000–100000	−.56,037	.67,318	.920	−2.4261	1.3054
		110,000–150,000	−1.10204	1.94915	.980	−6.5042	4.3001
		160,000–200000	−2.50204*	.79,730	.018	−4.7118	−.2923
		210,000–300000	−1.60204	.62,637	.085	−3.3380	.1340

Table 20
The effects of climate change reporting on farmer behavior and the impact of climate change reporting on agriculture.

		N	M	SD	SE	95 % CIM		Min	Max
						LB	UB		
Farmer's Behavior Influenced by Reporting of Climate Change	25 acres	20	33.5500	4.88257	1.09178	31.2649	35.8351	24.00	40.00
	60–100 acre	20	33.6000	5.09282	1.13879	31.2165	35.9835	25.00	43.00
	101–150 acre	47	35.0851	5.18287	.75,600	33.5634	36.6069	23.00	45.00
	Above	33	35.5152	5.06903	.88,241	33.7178	37.3126	26.00	44.00
	Total	120	34.7000	5.09011	.46,466	33.7799	35.6201	23.00	45.00
Effects of Reporting of Climate Change on Agriculture	25 acres	20	21.5000	3.15394	.70,524	20.0239	22.9761	15.00	25.00
	60–100 acre	20	22.0500	2.60516	.58,253	20.8307	23.2693	17.00	25.00
	101–150 acre	47	21.5745	3.20153	.46,699	20.6345	22.5145	13.00	25.00
	Above	33	21.9394	2.09074	.36,395	21.1980	22.6807	18.00	25.00
	Total	120	21.7417	2.80305	.25,588	21.2350	22.2483	13.00	25.00

6. Conclusion

This study proves that farmers in Punjab are affected by their awareness level regarding climate change. The difficulty in accessing the market because of weather changes also had an impact on agricultural production rates. The present study found a significant

Table 21
ANOVA evaluation of the impact of farmer behavior and agricultural reporting.

	SoS	df	MD	F	Sig.
Farmer's Behavior Influenced by Reporting of Climate Change	79.548	3	26.516	1.024	.385
	3003.652	116	25.894		
	3083.200	119			
Effects of Reporting of Climate Change on Agriculture	5.674	3	1.891	.236	.871
	929.318	116	8.011		
	934.992	119			

Table 22
Multiple comparisons (tukey Hsd).

Dependent Variable	(I) Agricultural Land	(J) Agricultural Land	MD (I-J)	Std. Error	Sig.	95 % CI	
						LB	UB
Farmer's Behavior Influenced by Reporting of Climate Change	25 acres	60–100 acre	−.05000	1.60915	1.000	−4.2445	4.1445
		101–150 acre	−1.53511	1.35853	.672	−5.0763	2.0061
		Above	−1.96515	1.44199	.525	−5.7239	1.7936
	60–100 acre	25 acres	.05000	1.60915	1.000	−4.1445	4.2445
		101–150 acre	−1.48511	1.35853	.694	−5.0263	2.0561
		Above	−1.91515	1.44199	.547	−5.6739	1.8436
	101–150 acre	25 acres	1.53511	1.35853	.672	−2.0061	5.0763
		60–100 acre	1.48511	1.35853	.694	−2.0561	5.0263
		Above	−.43,005	1.15567	.982	−3.4425	2.5824
	Above	25 acres	1.96515	1.44199	.525	−1.7936	5.7239
		60–100 acre	1.91515	1.44199	.547	−1.8436	5.6739
		101–150 acre	.43,005	1.15567	.982	−2.5824	3.4425
Effects of Reporting of Climate Change on Agriculture	25 acres	60–100 acre	−.55,000	.89,506	.927	−2.8831	1.7831
		101–150 acre	−.07447	.75,566	1.000	−2.0442	1.8953
		Above	−.43,939	.80,208	.947	−2.5302	1.6514
	60–100 acre	25 acres	.55,000	.89,506	.927	−1.7831	2.8831
		101–150 acre	.47,553	.75,566	.922	−1.4942	2.4453
		Above	.11,061	.80,208	.999	−1.9802	2.2014
	101–150 acre	25 acres	.07447	.75,566	1.000	−1.8953	2.0442
		60–100 acre	−.47,553	.75,566	.922	−2.4453	1.4942
		Above	−.36,493	.64,282	.941	−2.0406	1.3107
	Above	25 acres	.43,939	.80,208	.947	−1.6514	2.5302
		60–100 acre	−.11,061	.80,208	.999	−2.2014	1.9802
		101–150 acre	.36,493	.64,282	.941	−1.3107	2.0406

correlation between social media reporting of climate change and farmers' behavior adaptations to increase agricultural production in Punjab. It was determined that social media reporting significantly predicted patterns of farmer behavior towards the adaptation of advanced measures to select crops, reduce pest attacks, manage land, and store water. Young farmers were more welcoming in accepting and adopting climate change information. While social media reporting offers a platform for information sharing, engagement, and community building, it also presents challenges in terms of credibility, misinformation, oversimplification, bias, lack of expert input, sensationalism, and limited representation. In developing countries, it is crucial for farmers to approach agricultural information on social media critically, seek out credible sources, verify information, and consider diverse perspectives. In developed countries, multinational corporations can also influence the information and needs of farmers through high expenditures on publicity measures, so reliable sources of information are a dire need for the farmers through social media platforms globally. A balanced and comprehensive understanding of agriculture requires a combination of social media engagement, traditional media sources, scientific research, and direct interactions with agricultural officers in the field.

Although this study highlighted the need for social media to shape the possible adaptation strategies of farmers, it is crucial to highlight the need for filtering social media because of the possible spread of misinformation and fake news by multinational corporations. This study suggests the need for a social media reporting filtration department by the local authorities.

6.1. Limitations of the study

Social media platforms are notorious for the spread of misinformation and fake news. In the context of agriculture, this can lead to the dissemination of inaccurate information, myths, and pseudoscience. Moreover, social media platforms typically have character or time constraints that encourage brevity. As a result, complex agricultural issues may be oversimplified or lack the necessary context.

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The authors report that there are no competing interests to declare.

Ethical consent and approval

We get ethical consent from the respondent who participated in the survey, and there is no need to get any approval from any ethical committee for our questionnaire.

Data availability

Data will be made available on request.

CRediT authorship contribution statement

Muhammad Naeem Javed: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Hamedi Mohd Adnan:** Supervision, Data curation. **Mian Ahmad Hanan:** Validation, Investigation, Conceptualization. **Nor Zaliza Sarmiti:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Conceptualization. **Hina Adeeb:** Writing – review & editing, Software, Resources. **Amraiz Khan:** Investigation, Data curation. **Aatif Iftikhar:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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