Information Needs and Dissemination Among Farmers: A Step Towards Sustainability

Mehak Kapoor and Harpreet Singh
Punjabi University, Patiala, Punjab, India
kapoor.mehak204@gmail.com; harpreetajnali@gmail.com

[Abstract] The study identified the information needs and sources used by the farmers of Malwa region of Punjab and analyzed how those sources are used based on the size of their landholdings. The study also identified the challenges encountered when trying to get the necessary information. By adopting a multistage stratified disproportionate sampling technique and a standardized questionnaire, data was collected from 607 farmers. Various statistical techniques utilized were Descriptive statistics, One-way Annova and Factor analysis (EFA). Information on pesticide application and market and price were the main information required by the farmers and farmers mostly rely on other farmers, input dealers as well as mass media sources like television and radio to obtain information. Additionally, the study discovered a significant difference between the utilization of various information sources on the basis of land size. Four factors were identified using factor analysis and categorized as Source, Individual, Information Provider related, and Other Challenges, and no statistically significant difference was found between these difficulties and the farmers land size.

[Keywords] information sources/channels, challenges in accessing information, information dissemination, developing countries, information needs/requirements, landholding size-based source usage

Introduction

To meet their need for food, humans have invented and used the skill of agriculture. Due to the dependence of most rural residents on agriculture, every developing nation views it as an entire sector. By subtracting the number of urban residents from the overall population, the rural population – those people who reside in rural areas—can be determined. According to a set of development indicators compiled by the World Bank, India's rural population made up 65.53% of the country's total population in 2019, and 70% of rural households depend on agriculture for a living. Regarding worldwide output, India is the leading manufacturer of cashews, cotton, wheat, fruits, vegetables, rice, sugarcane, and oilseeds. It ranks second in producing milk, jute, cashews, tea, and spices. It also ranks first in the export of mangoes, bananas, and grapes. The top agricultural exports in value are rice, marine products, and spices. Other important exports include sugar, cotton, buffalo meat, and oil. Additionally, it can be seen from various data provided by CSO and NSSO that farmers' incomes are lower than those of people employed in non-agricultural sectors.

Farmers and non-agricultural workers now earn significantly different amounts of money. This income inequality is a serious policy matter that has to be addressed. This is the leading cause of the dramatic rise in farmer suicides that the nation saw between 1995 and 2004; after considering these issues, Prime Minister Sh. Narendra Modi set the objective of doubling farmers' income by 2022–2023 to improve farmer welfare, lessen agrarian stress, and eliminate the income gap between farmers and those employed in non–agricultural sectors. Other problems that Indian farmers face include a lack of adequate water supplies, a lack of use of modern farming equipment, an excessive reliance on traditional crops like wheat and rice, a lack of reliable marketing infrastructure, inadequate storage and transportation options, high-interest rates that burden farmers with debt, the failure of government programs to reach small farmers, etc. Thus, it

becomes necessary to give farmers helpful information based on their needs to help them increase agricultural output.

The information sought must be pertinent to farmers and valuable to them, and it must also be presented in a style that is most appealing to farmers (Diekmann et al., 2009). The most excellent and current agricultural practices, as well as modern tools and equipment, must be promptly made accessible to farmers to achieve sustainability in agriculture (Naveed and Anwar, 2013; 2015). Farmers must have the best knowledge available to them to practice sustainable agriculture for reducing poverty, developing rural areas and ensuring food security (Mchombu, 2001; Naveed & Anwar, 2013, 2014, 2015). Low yield per acre compared to the farmers' potential could result if they are not given the necessary information. When revamping current information infrastructure or creating any new information delivery system, it is essential to identify information demands and farmers' information-seeking behaviors as this will increase their satisfaction because they will be able to obtain appropriate information according to their needs in the given context. (Zaverdinos-Kockott, 2004; Mahindarathne and Min, 2018; Banmeke & Olowu, 2005).

Farmers' access to information has historically been a top priority for agricultural extensionists and rural advisory service providers in an effort to improve their socioeconomic status. They have therefore offered a variety of sources via which they can offer their services to farmers in order to address the knowledge vacuum, and these days they are more interested in experimenting with e-extension initiatives. Information providers can provide interventions that specifically target farmers with specific information needs by conducting an assessment of their information needs. As it can be observed that the possession and usage of mobile phones, as well as computers, has become a basic necessity in present-day society, and people use them regularly irrespective of age, income, place of residence, profession etc., Therefore, it is necessary to investigate how farmers are currently using these sources for getting information related to agriculture activities, which could aid information providers in boosting ICT-based information delivery depending on how farmers are presently using ICT-based sources. To raise farmers' knowledge, it is necessary to demonstrate the advantages of using ICT-based sources. For example, Jabir (2011) noted that compared to ICT non-users, information delivery based on ICT has helped various livestock producers in the Indian state of Uttar Pradesh to make considerably better-quality decisions on a number of livestock operations. ICTs provide chances to reach more people by making information and knowledge accessible locally or globally. The new developing paradigm of agricultural growth is thus posing a challenge to traditional ways of providing essential services to citizens. Around the world, traditional civilizations are also evolving into knowledge societies, which alters how villagers perceive and behave. (Meera et al., 2004).

Statement of the Problem

The researcher has made an effort to investigate the type of information needed for supporting agricultural activities, utilization of various information sources, the impact of land size on utilization of information sources, as well as the difficulties farmers encounter while trying to get information on agriculture, given that agriculture and rural development play a significant role in every developing economy. Understanding how much farmers use various sources, including the media, people they know, ICT, and other sources, will support the expansion of an effective information distribution system and provide improved extension services for improving the socioeconomic standing of rural communities and farmers. In light of this, the following goals for the study were created:

1. To study the agricultural information needs of the farmers.
2. To assess the farmer's use of different information sources.

3. To compare the utilization of information sources based on Land Size.
4. To identify the challenges faced by the farmers in accessing the required information

Review of Literature

A literature review is a thorough summary of earlier studies on a subject. Academic journals, books, and other resources relevant to a particular field of study are examined in the literature review. This earlier work needs to be cited, summarized, appraised critically, and explained in the review. It must give the investigation a theoretical foundation and help the researcher specify the study's boundaries. A literature review provides a detailed account of earlier findings. Table 1 in the current study offers a thorough synthesis of prior research on farmers' information/knowledge requirements in various countries. Additionally, it reviewed the results of earlier research on the resources utilized by farmers worldwide and the challenges that farmers confront while accessing information.

Information Needs/Requirements of the Farmers

Table 1

Summary of Literature Related to Information Needs/Requirements

S.No	Author Name	Year	Country	Sample	Information needs
1.	Naveed & Hassan	2020	Pakistan	Citrus Farmers	Information on how to prepare the site, then on how to manage and conserve soil fertility, on better citrus varieties, on protecting citrus trees, when and how to harvest, etc.
2.	Benard, Dulle & Hieromin (2018)	2018	Tanzania	Fish Farmers	Activities for fish processing and preservation, water management, and spawning
3.	Nkebukwa	2018	Tanzania	540 respondents	Market segmentation, manure use, and soil preservation
4.	Mohanaku mara et al.,	2017	India	Farmers	Information on fodder production
5.	Ayiah	2017	Nigeria and Ghana	Farmers	Information on the availability of fertilizers and varieties of seeds/plants was followed by information on pest control, subsidy availability, plant disease and control, credit facilities and weed control (with the same weightage), a mechanized system of farming, storage facilities, market opportunities, weather and government policies.
6.	Daramola, Adebo, & Adebo	2016	Nigeria	Vegetable farmers	Financial information is presented first, followed by market knowledge, building organizations for better bargaining, and care in managing produce.
7.	Sánchez-Soto	2016	Mexico	Farmers who are self-employed and those who lease their farms	Information on disease and pest control, fertilizer use and application for independent farmers, new agave production methods, agrochemical use and application, government funding, and agricultural credit for the farmers who rent out their land.

Table 1

Summary of Literature Related to Information Needs/Requirements (continued…)

S.No.	Author Name	Year	Country	Sample	Information needs
8.	Mahapatra	2016	India	Farmers	Information on irrigation followed by information on the current agricultural system, disease and insect management, crop storage, manure management, government programs, seeds and planting supplies, soil and water conservation, market information, and post-harvest practices.
9.	Adejo, Okwu & Saliu	2016	Nigeria	189 Maize Farmers	Post-Harvest Information needs: Storage of Maize
10.	Singh, Malhotra & Singh	2016	India	Dairy Farmers	Information about government incentives and subsidies to maintain dairy farming and aspects of cattle health.
11.	Omoregbee and Banmeke	2014	Nigeria	Cassava Farmers	Information on applying fertilizer followed by information on insecticides and herbicides.
12.	Elly & Silayo	2013	Tanzania	Rural Farmers	information on financing choices, agricultural and livestock care, marketing, and value addition
13.	Menong, Mabe & Oladele	2013	South Africa	Commercial Farmers	Information on disease management followed by details on supply companies, product demand, accessible agricultural markets, agricultural equipment, seed, fertilizer, and pesticide producers, as well as on grading.
14.	Naveed and Anwar	2013	Pakistan	Farmers	Information on soil preparation, how to take good care of crops, animal husbandry and harvesting activities
15.	Churi et al.	2012	Tanzania	Farmers	Climate information
16.	Adebayo and Oyetoro	2011	Nigeria	110 small-scale maize farmers	The planting time and agronomic procedures for growing maize followed by details on preventing pests and diseases, processing, storing, and selling maize.
17.	Oladeji et al.	2011	Nigeria	Root and tuber-crop grower	Details on marketing practices, soil management approaches, enhanced planting methods, and processing
18.	Samarakoon and Shamil	2010	Sri Lanka	Vegetable farmers	Price information is followed by details on fertilizer and pesticide use, farming methods, and how to lessen animal and plant hazards. information about vegetable seeds, market demand and supply statistics, and sales-related data.
19.	Okwu and Umoru	2009	Nigeria	Women farmers	Information on how to apply pesticides and fertilizer, as well as information on new and better farm tools and types of equipment
20.	Elizabeth	2008	Nigeria	Women farmers	Weather-related information, credit availability, soil management, knowledge of higher-quality seedlings, farm management, fertilizer and pesticides, future market pricing, animal health, land tenure, animal vaccination, and child vaccinations.
21.	Rezvanfar, Moradrezhai and Vahedi	2007	Iran	125 Dairy farm women	Information on the treatment of animals, controlling external parasites, controlling internal parasites, animal breeding

Information Sources Utilized by the Farmers

Table 2

Overview of Literature Related to Information Sources Utilized by the Farmers

S.No.	Author Name	Year	Country	Sample	Sources Used
1	Ndimbwa, Mwantimwa & Ndumbaro	2021	Tanzania	341 smallholder farmers	Fellow Farmers followed by mobile phones and demonstration plots
2	Durgun, Gunden and Unal	2020	Turkey	Fishers	Other farmers followed by Fishery cooperatives, Own experience, Television and Radio.
3	Jalali et al.	2020	Iran	300 dairy farmers	agricultural conferences and seminars, as well as those in universities and technical and vocational training facilities
4	Sharma Pandit et al.	2020	Nepal	Farmers	Notice board service Traders Other farmers
5	Isaya, Agunga and Sanga	2018	Tanzania	Women farmers	Radio, Extension agents, television, local government representatives, and suppliers of agricultural inputs.
6	Msoffe and Ngulube	2017	Tanzania	Farmers	Extension officers, which family, friends and neighbors followed.
7	Ijatuyi	2016	Nigeria	Fish farmers	Mobile phones, radio and professional colleagues and radio.
8	Msoffe and Ngulube	2016	Tanzania	Farmers	Friends, neighbors, extension officers, researchers and radio.
9	Consolata, Msuya, & Matovelo	2016	Tanzania	livestock farmers	Veterinary shops and extension officers
10	Rimi, Akpoko & Abdullahi	2015	Nigeria	cowpea farmers	Fellow friends who were followed by Radio, Extension agent's advice, Attendance at the on-farm demonstration, Community leaders, Attendance at extension training/meetings, Attendance at field days and contact with agrochemicals sales agents
11	Kabir et al.	2014	Bangladesh	Farmers	Pesticide dealer, seed dealer, and mass media
12	Ajani and Agwu	2012	Nigeria	108 small farmers	Radio, mobile phones, video and television
13	Fawole and Olajide	2012	Nigeria	192 Farmers	Radio and television
14	Nyamba and Mlozi	2012	Tanzania	Rural farmers	Mobile phone
15	Verma et al.	2012	India	Livestock farmers	Localite sources- neighbours followed by progressive farmers. Cosmopolitan sources-veterinary officers followed by the private veterinary service provider, Bhartiya Agro Industries Foundation and *Para veterinary* workers. Mass media sources-radio, followed by mobile phones and newspapers.
16	Kameswari, Kishore & Gupta	2011	India	Farmers	Middlemen, Government agencies, and friends/relatives.
17	Opara	2008	Nigeria	1386 farmers	Extension agent
18	Tologhonse, Mesini and Tsado	2006	Nigeria	500 Rice farmers	Extension agents, demonstration, SPAT, neighbor friends, radio, field day and parents
19	Musib	1989	West Bengal	258 rural farmers	Personal experience followed by friends and relatives, market/shopkeeper and fellow professional

Farmers' Difficulties/Challenges in Acquiring Information

Table 3

Overview of Literature Related to Challenges Faced

S.No.	Author Name	Year	Country	Sample	Challenges
1.	Satapathy and Mishra	2020	India		Poor communications infrastructure, insufficient information infrastructure, Illiteracy, linguistic obstacles, attitudes and behaviors that are gender-specific, the distance from the information center household duties, societal restrictions on women, Farmer communities' lack of agricultural libraries, and inadequate financial means.
2.	Folitse et al	2018	Ghana	150	Lack of expertise in accessing information, Inadequate poultry information resources, insufficient veterinary officers, Less information centers, and improper timing of programs on radio stations on agriculture.
3.	Kavi et al.,	2018	Ghana		Inability to utilize the information, ignorance of the sources, and distance between the origins of the data. Information is broadcasted on the radio and television at the wrong time.
4.	Misaki et al.,	2018	Africa	11 studies	Less participation in the early phase of the invention, High servicing cost, Low education and training, less trust and transparency, Inadequate infrastructure, Poor commitment from the government to implement proper policies, Low awareness, Theft of mobile phones and bureaucracy and misuse of a foreign language (English) in an environment where it is inappropriate
5.	Mbagwu, Benson, & Onuoha	2017			Insufficient ICT infrastructure, rural farmers have little interest in utilizing information connected to agriculture, Lack of knowledge among farmers in rural areas, Lack of ICT literacy, and inadequate understanding of rural farmers' information demands. In remote places, no agency provides information.
6.	Singh & Varma	2017	India		Inability to access formal channels of information Insufficient market information, Low level of income Lack of ability to access formal channels of communication, Poor transport facility, and broadcast agricultural information on television and radio at an unconventional hour.
7.	Radad, Behzadi & Zadehrahim	2017			Professionals lack consideration for farmers' needs, have Poor technological expertise, and have poor training/promotional sessions.
8.	Osei et al.,	2016	Ghana		Subpar public relations with Agriculture extension agents, A lack of local language television broadcasts of agricultural information, illiteracy in reading and writing (illiteracy), lack the funds to acquire DIY guides, lack of farmer forums, and Lack of workshops, seminars, and training programs.
9.	Nzonzo & Mogambi	2016	Kenya	362	Lack of education, ICT expertise, inability to use ICTs, ICTS and financial cost.
10.	Syiem & Raj	2015	India	120	A lack of faith in using ICTs, inconsistent electricity supply, a poor network connection Less knowledge of ICTs' advantages.
11.	Odini	2014	Kenya		Illiteracy, Poverty, Ignorance of information sources, language barrier, Time to find the information, Inadequate information, Information is unavailable and difficult to get, Negative attitude, Cultural belief, non-availability and

					affordability, no sufficient information, concealing of information by the people Outdated information, Distance to information sources, Shy to access information, Not attending meetings.
12	Mwalukasa	2013	Tanzania		Obsolete information, long access times, high access costs, insufficient power, language barrier, and poor infrastructure for information services.
13	Siyao	2012	Tanzania		Unsatisfactory infrastructure, the awful transmission of power and housing, inadequate knowledge about information access, filthy transportation system, a high level of illiteracy, language difficulties, and not having enough financial resources.
14	Mokotjo and Kalusopa	2010	Lesotho		Lack of visits by AIS staff, Lack of feedback, Less promotion, Lack of training to the farmers, Broadcasting of the same information again and again, Inappropriate broadcasting time, non-availability of appropriate channels, Late announcement
15.	Ghafoor, Muhammad, and Chaudhary	2008	Pakistan		Less emphasis on spreading information about citrus in radio and TV programs, less availability of printed materials, Lack of cooperation, unable to find extended field staff, Illiteracy, lack of growers' interest, no access to electronic media, Extension field employees have less technical expertise.

Methodology

The Malwa region was chosen for this study because it accounts for up to 60 and 70 percent of Punjab, where the study was done. Farmers from the Malwa region were included in the study, and those farmers were further divided according to the size of their farms. Eleven districts make up the Malwa area, including Firozpur, Faridkot, Fazilka, Shrimuktsar Sahib, Bathinda, Moga, Barnala, Ludhiana, Mansa, Patiala and Sangrur. Districts like Fatehgarh Sahib, Rupnagar, and Ajitgarh (Mohali) are included in the Poadh region (Ropar). Poadh is one of Punjab's most significant regions, yet it is included in Malwa and not given its own status.

Additionally, five categories are used to group the farmers' operating landholdings, i.e., marginal, small, semi-medium, medium, and large farmers. Small and marginal farmers have many identical concerns and demands. Hence, they were categorized as small farmers.

Description of the Study Area

One of India's well-known rural states in the north is Punjab. It has made Indian food independent and tremendously contributed to Indian agriculture and the economy. Punjab produces over 17% of India's total wheat production, ranking second among the states after Uttar Pradesh, as well as about 12% of the nation's total rice production and about 5% of its total milk production, according to Agriculture data at a glance for 2018. Because of this, it is referred to as "India's breadbasket" or the "granary of India." The State of Punjab has set the bar for agricultural development and paved the path for India's Green Revolution. The majority of the nation's needs for rice and wheat are met by the State, while small and marginal farmers who are deeply indebted find farming to be a non-profitable endeavor. Several unanticipated complicated issues have arisen due to overexploitation of the land and significant dependence on the rice-wheat agriculture cycle. The high incidence of cancer and organ failures is a result of many health difficulties caused by the rapidly declining water table and high toxicity of the soil from excessive fertilizer and pesticide use.

Agriculture still accounts for the vast majority of jobs in the state despite a fall in its overall contribution of gross state product (GSVA). For the state's maximum population, agriculture continues to be their primary means of subsistence. To achieve sustainability in Punjab's agriculture, researchers and the government must prioritize the problems and demands of those farmers. This would allow them to receive appropriate and timely remedies.

Data Collection and Data Analysis

The sample size was determined by utilizing Godden. B. formula (2004), and the investigation utilized a multistage stratified disproportionate sampling technique. The study applied the Godden, B. (2004) formula to the total number of small landholdings, semi-medium landholdings, medium landholdings, and large landholdings. In the case of small, semi-medium, and medium-sized landholdings, the Godden. B. formula of the infinite population was used, whereas in the case of large-size landholdings, the Godden. B. formula of the finite population was used. The formula estimates a sample size of 600 for each situation. A suggested sample is used to equalize each calculated instance by 1/4th to make the sample representative and enable easy comparison, i.e., 150 in each category. So, 600 respondents were considered to represent the overall population. The study utilized the pre-structured questionnaire to gather the data. It was distributed among 700 farmers, and 650 questionnaires were filled with a response rate of 92.8%, among which 43 questionnaires were found useless. So, the responses of the final 607 respondents were made part of the study. Microsoft Excel and the Statistical Package for Social Sciences (SPSS) were used to analyze the data. Several analysis procedures were utilized, such as mean, standard deviation, One-Way Anova test, and Exploratory Factor Analysis.

Results and Discussion

Socio-Economic Characteristics of the Respondents

Results indicate that 56.5% of respondents were between the age group of 31 and 40, 168 respondents had completed a secondary education, 148 respondents had met only a primary education, 120 graduates, and 46 postgraduate respondents. This indicates that 79.4% of respondents had completed a good level of education. This study shows that Punjab's agriculture is still primarily controlled by men (with a 99 percent male response rate) and very few women working in the field (with a 1 percent female response rate). Therefore, the government should take several actions to encourage women to work in agriculture. The findings also indicated that most farmers (n=252) earned yearly incomes of 50001–10000, which is relatively little to support a livelihood. As a result, the government should make every effort to be in the farmers' best interests.

Information Needs of the Farmers

Findings in Table 4 indicated that for Punjab farmers, highly needed information was information on Pesticide application, Market and price, Fertilizer application, Pest and disease management followed by Weeding, Weather related information, Amount of water to be given to plants, Availability of credit (Sources), Training on techniques of farming, use of agriculture machinery, training on agriculture machinery, Government policies and subsidies, Availability of agricultural machinery, Price of agricultural machinery, Time and frequency of irrigation, Proper time and method of Harvesting, the Best time to sow the seeds, Planting methods, Information on Price and quantity of seeds needed per acre, Information on the location of distribution offices of sources, Information on Suitability to area and climate, Information for Crop selection and Soil testing/Preparation and the least needed information were information on

Poultry, Sericulture, Horticulture, Fisheries, and Organic farming. The moderately required information was Information related to mobile applications/portals, Storage of agricultural produce, Distribution of agrarian produce, Business and Trade, Transportation, Crop diversification, Crop Insurance, Socioeconomic Characteristics of Consumers, Expectations/Perceptions of Consumers, Contract farming, Grading, Management of natural resources and diary.

Table 4

Information Needed by the Farmers

Information Type	N	Mean	S.D.
Pesticide application	607	5.68	1.471
Market and price information	607	5.62	1.145
Fertilizer application	607	5.55	1.407
Pest and disease management	607	5.23	1.421
Weeding	607	4.98	1.601
Weather-related information	607	4.76	1.523
Amount of water to be given to plants	607	4.61	1.434
Availability of credit (sources)	607	4.61	1.499
Training on the techniques of farming	607	4.59	1.572
Uses of agricultural machinery	607	4.58	1.610
Training on agricultural machinery	607	4.58	1.601
Government policies and subsidies	607	4.57	1.476
Availability of agricultural machinery	607	4.53	1.508
Price of agricultural machinery	607	4.50	1.552
Time and frequency of irrigation	607	4.49	1.465
Proper time and method of Harvesting	607	4.45	1.450
Best time to sow the seeds	607	4.44	1.568
Planting methods	607	4.44	1.629
Information on Price and quantity of seeds needed per acre	607	4.35	1.128
Information on the location of distribution offices of seeds	607	4.22	1.228
Information on Suitability to area and climate	607	4.18	1.285
Information for Crop selection	607	4.11	1.752
Soil testing/preparation	607	3.75	1.593
Information related to mobile applications/portals	607	3.23	1.290
Storage of agricultural produce	607	3.14	1.403
Distribution of agricultural produce	607	3.09	1.435
Business and trade	607	3.08	1.295
Transportation of agricultural produce(cost)	607	3.07	1.404
Crop diversification	607	2.80	1.154
Crop Insurance	607	2.70	1.312
Socioeconomic Characteristics of Consumers	607	2.69	1.309
Expectations/Perceptions of Consumers	607	2.68	1.275
Contract farming	607	2.67	1.265
Grading of agriculture produce	607	2.66	1.191
Management of natural resources	607	2.60	1.255
Dairy	607	2.37	.862
Organic farming	607	1.98	.954
Forestry	607	1.97	.866
Fisheries	607	1.96	.993
Horticulture	607	1.95	.808
Sericulture (silk farming)	607	1.71	.875
Poultry	607	1.52	.698

Utilization of Information Sources by the Farmers

The second objective was assessing the agricultural information sources and channels rural farmers frequently use and access. Using a seven-point Likert scale and the data collected, descriptive analysis was applied to rate the utilization of the information sources. The findings in Table 5 show that, to a large extent, Punjab farmers utilize interpersonal communication sources/channels such as other farmers and Input dealers/shops/private companies, followed by traditional mass media sources such as television, radio, newspapers/magazines. Among internet sources, farmers utilize more of the internet on mobile phones and mostly use social media applications like YouTube, Facebook, Instagram and Twitter. It can be observed from the findings that the most minor utilized sources are landline phones, NGOs, Internet on mobile-agriculture websites, Internet on computer-agriculture websites, social media sites like YouTube, Facebook, Instagram, Twitter, WhatsApp, and cooperatives accessed via the internet on computers and laptops.

Table 5

Farmer's utilization of Information Sources

Sources of Information	*n*	Mean	S.D.	Rank
Other farmers	607	4.65	1.556	1
Input dealers/shops/private companies	607	4.62	1.639	2
Television	607	4.38	1.653	3
Radio	607	4.28	1.948	4
Newspaper/Magazines	607	3.45	2.106	5
Internet on mobile- social media applications like YouTube, Facebook, Instagram and Twitter	607	3.37	1.825	6
Krishi Mela	607	3.05	1.792	7
Call and SMS services of mobile phones	607	2.82	1.365	8
Internet on mobile phones-Agriculture applications	607	2.80	1.667	9
KVKs/Research Stations	607	2.68	1.667	10
State department of agriculture	607	2.61	1.696	11
State agricultural universities	607	2.61	1.635	12
Cooperatives	607	2.04	.849	13
Internet on Computer/Laptops-Social media applications like Facebook, Instagram, YouTube, WhatsApp and Twitter	607	2.02	.736	14
Internet on Computer/Laptops-Agriculture websites	607	1.87	.640	15
Internet on mobile- Agriculture websites	607	1.84	1.096	16
NGO	607	1.78	.673	17
Landline phones	607	1.24	.544	18

Therefore, it can be seen that the use of online resources is still lacking. Farmers need to be aware of the advantages of using online resources, such as agriculture websites on computers and mobile devices, as they can gain the most by using these websites to obtain information about agriculture. Farmers have remained reliant on informal and traditional techniques for gathering information. To inform most farmers, agencies producing information and knowledge must determine the best channels. There is a further need to determine why most contemporary communication channels, such as ICT sources, are still not viewed as significant agricultural information providers. Traditional sources of information offer information of general interest since they have to meet the demands of farmers at large. Still, ICT sources offer context-specific information, which is required to increase work efficiency and improve productivity. Suppose the information producers—such as universities, research institutions, governments, and others – decide to provide the farmers with context-specific information. In that case, television programs, local radio,

newsletters and leaflets could likely be sources of information. Farmers must be taught how to use ICT sources to survive in this cutthroat environment. Additionally, knowledge of ICT sources must be raised because they will soon occupy the top spot in every company category.

Comparison of Information Sources Concerning Land Size

One-way ANOVA was conducted to check whether any differences existed in the farmers' use of information sources based on the size of their farms. The findings of Levene's test for homogeneity of variance and the robust tests of equality of means are provided in Tables 6 and 7 (Pallant, 2010). The factors, including television, landlines, internet on computers and laptops, websites related to agriculture, and social media applications such as Facebook, YouTube, Twitter, Instagram, and WhatsApp, online agricultural applications, online agricultural websites, mobile phone calls and SMS services, NGO, and cooperatives all adhere to the homogeneity of variance assumptions. ($p > 0.05$) (Table 6).

Table 6

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Television	.164	3	603	**.920**
Radio	19.808	3	603	.000
Newspaper/Magazines	10.688	3	603	.000
Landline phones	.895	3	603	**.443**
Internet on Computer/Laptops-Agriculture websites	.417	3	603	**.741**
Internet on Computer/Laptops-Social media applications like Instagram and Twitter, Facebook, WhatsApp, YouTube	.507	3	603	**.677**
Internet on mobile phones-Agriculture applications	.647	3	603	**.585**
Internet on mobile- social media applications like YouTube, Facebook, Instagram and Twitter	6.814	3	603	.000
Internet on mobile- Agriculture websites	.091	3	603	**.965**
Call and SMS services of mobile phones	.687	3	603	**.560**
KVKs/Research Stations	12.757	3	603	.000
Krishi Mela	18.343	3	603	.000
Input dealers/shops/private companies	5.448	3	603	.001
Other farmers	3.582	3	603	.014
State agricultural universities	11.328	3	603	.000
State department of agriculture	7.373	3	603	.000
NGO	.412	3	603	**.744**
Cooperatives	.183	3	603	**.908**

Input dealers/shops/private companies, radio, newspapers/magazines, the Internet on mobile devices, social media platforms like Facebook, Instagram, and Twitter, Krishi Mela, other farmers, state agricultural universities, and the state department of agriculture are examples of variables that defied the equality of means test ($p < 0.05$) but failed the homogeneity of variance assumption. (Table 7).

Table 7

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Television	Welch	15.032	3	334.594	**.000**
Radio	Welch	52.284	3	333.196	**.000**
Newspaper/Magazines	Welch	47.550	3	331.754	**.000**
Landline phones	Welch	.291	3	334.855	.832
Internet on Computer/Laptops-Agriculture websites	Welch	.862	3	334.245	.461
Internet on Computer/Laptops-Social media applications such as Facebook, YouTube, WhatsApp, Instagram and Twitter	Welch	.434	3	334.419	.729
Internet on mobile phones-Agriculture applications	Welch	.884	3	334.476	.450
Internet on mobile- social media applications like YouTube, Facebook, Instagram and Twitter	Welch	141.692	3	332.220	**.000**
Internet on mobile- Agriculture websites	Welch	.695	3	334.987	.556
Call and SMS services of mobile phones	Welch	1.155	3	333.748	.327
KVKs/Research Stations	Welch	52.737	3	330.139	**.000**
Krishi Mela	Welch	68.126	3	330.977	**.000**
Input dealers/shops/private companies	Welch	69.511	3	333.067	**.000**
Other farmers	Welch	47.627	3	333.771	**.000**
State agricultural universities	Welch	55.742	3	330.379	**.000**
State department of agriculture	Welch	45.017	3	331.775	**.000**
NGO	Welch	.349	3	334.785	.790
Cooperatives	Welch	.264	3	334.490	.851

Asymptotically F distributed

Source: SPSS (2022)

Results (Table 8) demonstrate that the use of information sources like Television, Radio, Newspaper/Magazines, Internet on mobile- social media applications like YouTube, Facebook, Instagram and Twitter, KVKs/Research Stations, Krishi Mela, State department of agriculture, other farmers, Input dealers/shops/private companies, and State agriculture universities differ significantly with different farm sizes. Due to farmers' varying farm sizes, which affect how they use sources, a variation has been documented.

Table 8

ANOVA Results for Information Source Utilization with Respect to Top Farm Sizes of the Farmers

		Sum of Squares	df	Mean Square	F	Sig.
Television	Between Groups	113.490	3	37.830	14.793	**.000**
	Within Groups	1542.072	603	2.557		
	Total	1655.562	606			
Radio	Between Groups	441.502	3	147.167	47.751	**.000**
	Within Groups	1858.445	603	3.082		
	Total	2299.947	606			
Newspaper/Magazines	Between Groups	523.415	3	174.472	48.594	**.000**
	Within Groups	2164.997	603	3.590		
	Total	2688.412	606			
Landline phones	Between Groups	.262	3	.087	.293	.830
	Within Groups	179.139	603	.297		
	Total	179.400	606			
Internet on Computer/Laptops-Agriculture websites	Between Groups	1.155	3	.385	.940	.421
	Within Groups	247.036	603	.410		

	Total	248.191	606			
Internet on Computer/Laptops-Social media applications like YouTube, Facebook, Instagram, Twitter, WhatsApp	Between Groups	.735	3	.245	.451	.717
	Within Groups	327.894	603	.544		
	Total	328.629	606			
Internet on mobile phones-Agriculture applications	Between Groups	7.387	3	2.462	.886	.448
	Within Groups	1676.092	603	2.780		
	Total	1683.479	606			
Internet on mobile- social media applications like YouTube, Facebook, Instagram and Twitter	Between Groups	890.560	3	296.853	158.656	**.000**
	Within Groups	1128.247	603	1.871		
	Total	2018.807	606			
Internet on mobile- Agriculture websites	Between Groups	2.628	3	.876	.728	.535
	Within Groups	725.503	603	1.203		
	Total	728.132	606			
Call and SMS services of mobile phones	Between Groups	6.221	3	2.074	1.114	.343
	Within Groups	1122.563	603	1.862		
	Total	1128.784	606			
KVKs/Research Stations	Between Groups	272.819	3	90.940	38.884	**.000**
	Within Groups	1410.245	603	2.339		
	Total	1683.064	606			
Krishi Mela	Between Groups	399.215	3	133.072	51.896	**.000**
	Within Groups	1546.202	603	2.564		
	Total	1945.417	606			
Input dealers/shops/private companies	Between Groups	375.434	3	125.145	60.279	**.000**
	Within Groups	1251.893	603	2.076		
	Total	1627.328	606			
Other farmers	Between Groups	253.650	3	84.550	42.007	**.000**
	Within Groups	1213.697	603	2.013		
	Total	1467.348	606			
State agricultural universities	Between Groups	278.757	3	92.919	41.767	**.000**
	Within Groups	1341.487	603	2.225		
	Total	1620.244	606			
State department of agriculture	Between Groups	264.933	3	88.311	36.046	**.000**
	Within Groups	1477.311	603	2.450		
	Total	1742.244	606			
NGO	Between Groups	.479	3	.160	.351	.789
	Within Groups	274.250	603	.455		
	Total	274.728	606			
Cooperatives	Between Groups	.577	3	.192	.266	.850
	Within Groups	436.474	603	.724		
	Total	437.051	606			

A pairwise comparison of the mean using Tukey HSD revealed that in the utilization of Television, Krishi mela and the State department of agriculture, all groups were statistically different from each other except the 4 to 10-hectare and ten and above 10-hectare group. Further, in the case of radio and internet on mobile phones-social media applications, all groups were significantly different from each other. Whereas in sources like newspapers/magazines, input dealers and other farmers, below 2 and 2-4-hectare groups were not statistically significantly different from each other. For the sources like KVK research stations and state agricultural universities, two groups were not found to be significant additional such as 2-4 hectares and 4-10 hectares.

Challenges Faced in Accessing Information

Factor analysis was conducted to identify and categorize farmers' difficulties accessing information. Is Bartlett's test of sphericity used to check the factorability of the data? The Kaiser-Meyer-Olkin (KMO) value was utilized to confirm the sampling adequacy of the data. KMO was determined to have a value of 0.876, which is higher than the suggested cut-off point of 0.6, as indicated in Table 9, and Bartlett's test of sphericity is significant ($p< 0.05$) (Pallant, 2010). For factor extraction, Principal component analysis was utilized. Communalities were checked as they are the deciding factor in including or excluding a variable in the factor analysis. Cut off the value of Communality should be 0.5. According to Hair et al. (2006), the average factor loading of all the factors' items should be greater than 0.5. Based on the findings, values of commonalities and factor loading of 3 statements were found to be less than the cut-off values and were removed. Those three statements were: non-availability of information in local/simple language, Poor public relations with extension officers and Lack of professional attention to the needs of the farmers. The remaining 21 statements were categorized into four factors. The four factors' eigenvalues are more significant than the suggested value of 1. About 69.7% of the variance is explained by these factors collectively.

The following categories and labels apply to the factors. All variables categorized as "Source related challenges" are included in the first factor. Out of the 69.7% of the explained variance, this group accounts for a reasonably large fraction (23.6%). Thus, it suggests that the majority of farmers believe they encounter source-related difficulties while trying to get the necessary information, i.e. Online platforms only offer partial information; information sources are not easily accessible; information is broadcast on television or radio at odd hours; mobile applications do not function properly in terms of offering immediate solutions to problems; information sources are expensive to acquire; there are high fees associated with using the internet and phones to obtain information; and there is poor network connectivity. The second variable consists of all the variables that fall under the category of "Individual related problems." It explained an 18.536% variance in the total variance. Under this category, challenges faced by the farmers are Insufficient technical knowledge, Inability to read and write (Illiteracy), Unawareness of sources of information, Insufficient funds to get information, less time for searching for information and Less interest in the report. The third factor comprises six statements explaining 15.561 % of the total variance. This factor is about the "Information provider related challenge." It includes words like Lack of technical guidance by the authority concerned, Lack of training programs/workshops on the use of the Internet, sources for accessing agriculture information, Lack of follow-up activity, Lack of visit by agricultural extension officers and Inadequate knowledge and preparation by extension officers. The next factor extracted included three statements which were related to each other. This factor explained 11.982 % of the total variance. Based on the statement's meaning and nature, this factor is named 'Other Challenges.' It includes information like the Slow rate of private investment in the agriculture sector of Punjab, the Digital divide and the Lack of regular power supply.

Table 9

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.876
Bartlett's Test of Sphericity	Approx. Chi-Square	8893.325
	Df	276
	Sig.	.000

Table 10

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.592	31.391	31.391	6.592	31.391	31.391	4.968	23.656	23.656
2	3.579	17.042	48.433	3.579	17.042	48.433	3.893	18.536	42.193
3	2.770	13.192	61.625	2.770	13.192	61.625	3.268	15.561	57.753
4	1.703	8.110	69.735	1.703	8.110	69.735	2.516	11.982	69.735
5	.948	4.516	74.251						
6	.574	2.735	76.986						
7	.550	2.621	79.607						
8	.522	2.487	82.094						
9	.485	2.309	84.403						
10	.456	2.169	86.572						
11	.375	1.788	88.360						
12	.369	1.758	90.118						
13	.354	1.687	91.805						
14	.306	1.456	93.262						
15	.279	1.327	94.589						
16	.254	1.211	95.800						
17	.237	1.129	96.929						
18	.201	.959	97.889						
19	.184	.874	98.763						
20	.141	.671	99.434						
21	.119	.566	100.000						

Note: Method of extraction: a principal component analysis.

Table 11

Rotated Component Matrix

	Component			
	1	2	3	4
Online platforms provide incomplete information	.876			
Lack of accessibility to information sources	.874			
Information broadcasting at odd hours on television/radio	.873			
Mobile applications do not work properly in terms of providing immediate solutions to the problems	.824			
High cost of acquiring Information sources	.820			
High tariffs for using the internet and phones to get information	.809			
Poor network connectivity	.695			
Insufficient technical knowledge		.822		

Inability to read and write (Illiteracy)		.813		
Unawareness of information sources		.804		
Deficiency of funds to obtain information		.756		
Lack of time to search for information		.750		
Lack of interest in the information		.743		
Lack of technical guidance by the authority concerned			.861	
Lack of training programmes/workshops on the use of Internet sources for accessing agriculture information			.804	
Lack of follow-up activity			.754	
Lack of visits by agricultural extension officers			.730	
Inadequate knowledge and preparation by extension officers			.720	
The slow rate of private investment in the agriculture sector of Punjab				.843
Digital divide				.838
Lack of regular power supply				.837

Notes: Method of extraction: principal component analysis;
Method of rotation: varimax with Kaiser normalization; a process converged in five iterations

A Comparison of the Challenges Faced Concerning Farm Size

One-way ANOVA was used to determine if there were differences in terms of challenges faced by the farmers concerning their farm sizes. Tables IV provides Levene's test for homogeneity of variance. The independent variables, namely Source related challenges, Individual related challenges, Information provider-related challenges, and other challenges, conform to the assumptions of homogeneity of variance ($p > 0.05$) (Table 12).

Table 12

Testing of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Source Related Challenge	.145	3	603	**.933**
Individual Related Challenge	.146	3	603	**.932**
Information Providers Related Challenge	.936	3	603	**.423**
Other Challenges	.024	3	603	**.995**

Table 13

ANOVA Results of Comparison of Challenges Concerning Farm Size

		Sum of Squares	df	Mean Square	F	Sig.
Source Related Challenge	Between Groups	7.109	3	2.370	1.899	.128
	Within Groups	752.307	603	1.248		
	Total	759.417	606			
Individual Related Challenge	Between Groups	2.827	3	.942	1.164	.323
	Within Groups	488.040	603	.809		
	Total	490.867	606			
Information Providers Related Challenge	Between Groups	1.813	3	.604	1.021	.383
	Within Groups	356.863	603	.592		
	Total	358.675	606			
Other Challenges	Between Groups	2.073	3	.691	.412	.745
	Within Groups	1012.303	603	1.679		
	Total	1014.376	606			

Findings (Table 13) demonstrate that the difficulties farmers with various farm sizes encounter in gaining access to information are similar. So, farm size has no impact on the challenges faced by the farmers of the Malwa region of Punjab.

Conclusions, Implications and Recommendations

According to the results, most farmers prefer to learn more about crop farming, and the results showed that information connected to allied activities is the least necessary information. The study's implications are as follows: suppose the situation persists as it does now and shortly. If modern means of communication, such as Information and communication technologies, had contained locally relevant, context-specific information for farmers, they might have been more accessible and appropriate sources. In that case, traditional and interpersonal forms of communication will continue to be of the utmost importance and widespread sources of information amongst the farmers.

1. To develop appropriate policies for information generation for farmers, policy-making bodies must take context-specific information into account.
2. When creating efficient extension and dissemination initiatives, it is essential to consider the preferences and demands of a particular group of farmers.
3. Farming communities vary widely regarding their traits and information demands; therefore, intervention programs must pay careful attention to these differences.
4. The following recommendations are given in light of these findings:

The information providers need to decide on the best channels for reaching farmers with the information that they need. If the situation doesn't change, traditional and interpersonal methods work better in rural areas. An open line of contact among the suppliers of information and the information sources is necessary for this to occur. Agricultural programs broadcasted on television and radio need to be encouraged and established first. Then, local periodicals relevant to the area should be supported, motivated, and published locally. The local community where programs are implemented must be a focus of information distribution in the agenda of the government and development partners. Farmers' information demands are dynamic, so there is a requirement to identify those information needs constantly. In light of this, it is advised that future studies should consider various agroecological zones while also taking local development into account.

References

Adejo, P. E., Okwu, J. O., & Saliu, O. J. (2016). Assessment of post-harvest information needs of maize farmers in Kogi State, Nigeria. *Journal of Agricultural & Food Information*, *17*(4), 260-273.

Adebayo, O.O., & Oyetoro, J. O. (2011). Perception of agricultural information needs by small scale maize farmers in Iran Local Government Area of Kwara State, Nigeria. *International Journal of Agricultural Economics and Rural Development*, *4*(1), 56-61.

Ajani, E. N., & Agwu, A. E. (2012). Information communication technology needs of small-scale farmers in Anambra State, Nigeria. *Journal of Agricultural & Food Information*, *13*(2), 144-156.

Banmeke, T. O. A., & Olowu, T. A. (2005a). Accessibility of women farmers to agricultural information in South Western Nigeria. *South African Journal of Agricultural Extension, 34*(2), 237-246.

Benard, R., Dulle, F. W., & Hieromin, L. A. (2018). Information needs and accessibility by fish farmers in the southern highlands of Tanzania. *Global Knowledge, Memory and Communication*, *67*(4/5), 209-225.

Churi, A. J., Mlozi, M. R., Tumbo, S. D., & Casmir, R. (2012). Understanding farmers information communication strategies for managing climate risks in rural semi-arid areas, Tanzania. *International Journal of Information and Communication Technology Research, 2*(11), 838-845.

Consolata, A., Msuya, J., & Matovelo, D. (2016). Assessing the information needs and information sources of urban and peri-urban livestock keepers in Kinondoni and Morogoro Urban Districts, Tanzania. *Library Philosophy & Practice*, (1363), 1-33.

Daramola, C., Adebo, T., & Adebo, G. (2016). Challenges and information need assessment of dry season vegetable farmers in Akure metropolis, Ondo State. *Journal of Agriculture and Veterinary Science*, *9*, 52-58.

Diekmann, F., Loibl, C., & Batte, M. T. (2009). The economics of agricultural information: Factors affecting commercial farmers' information strategies in Ohio. *Applied Economic Perspectives and Policy*, *31*(4), 853-872.

Durgun, D., Günden, C., & Ünal, V. (2021). Information source preferences of small-scale fishers in the Aegean Sea coast of Turkey. *Acta Ichthyologica et Piscatoria*, *51*(1), 47-52.

Elizabeth, S. (2008). Agricultural information needs of women farmers in Mubi region, Adamawa State. *Journal of Tropical Agriculture*, *45*(1), 69-71.

Elly, T., & Silayo, E. E. (2013). Agricultural information needs and sources of the rural farmers in Tanzania: A case of Iringa rural district. *Library Review, 62*(8/9)547-566.

Fawole, O. P., & Olajide, B. R. (2012). Awareness and use of information communication technologies by farmers in Oyo State, Nigeria. *Journal of agricultural & food information*, *13*(4), 326-337.

Hair, J. J. F., Black, W. C., Babin, B. J., Anderson, R., & Tatham, R. (2006). *Multivariate data analysis* (6th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Isaya, E. L., Agunga, R., & Sanga, C. A. (2018). Sources of agricultural information for women farmers in Tanzania. *Information Development*, *34*(1), 77-89.

Jabir, A. (2011). Use of quality information for decision-making among livestock farmers: role of information and communication technology. *Livestock Research for Rural Development*, *23*(3).

Jalali, A., Bagheri, A., Allahyari, M. S., Aghjehgheshlagh, F. M., Surjulal, J., & Michailidis, A. (2020). Information needs and information seeking behaviour of dairy farm managers. *International Journal of Sustainable Agricultural Management and Informatics*, *6*(2), 107-122.

Kameswari, V. L., Kishore, D., & Gupta, V. (2011). ICTs for agricultural extension: A study in the Indian Himalayan region. *The Electronic Journal of Information Systems in Developing Countries*, *48*(1), 1-12.

Kabir, K. H., Roy, D. E. B. A. S. H. I. S., & Kuri, S. K. (2014). Information seeking behavior of the farmers to ensure sustainable agriculture. *European Academic Research*, *2*(3), 3723-3734.

Kavi, R. K., Bugyei, K. A., Obeng-Koranteng, G., & Folitse, B. Y. (2018). Assessing sources of information for urban mushroom growers in Accra, Ghana. *Journal of Agricultural & Food Information*, *19*(2), 176-191.

Mahapatra, R. K. (2016). Information needs and information seeking behavior of farmers in a local community in Odisha: An analytical study. *SRELS Journal of Information Management*, *53*(1), 35-41.

Mahindarathne, M. G. P. P., & Min, Q. (2018). Developing a model to explore the information seeking behaviour of farmers. *Journal of Documentation*, July.

Mbagwu, F. C., Benson, O. V., & Onuoha, C. O. (2017). Challenges of meeting information needs of rural

farmers through internet-based services: Experiences from developing countries in Africa. *IFLA WLIC, 2018, Kuala Lumpur.*

Mchombu, K. (2001) Research on measuring the impact of information on rural development. In Stilwell C., Leach A., &Burton S. (eds.), *Knowledge, Information and Development: An African Perspective*, (pp. 229-238*)*. Pietermaritzburg: University of Natal, School of Human and Social Studies.

Meera, S. N., Jhamtani, A., & Rao, D. U. M. (2004). *Information and communication technology in agricultural development: A comparative analysis of three projects from India*, (p. 14). London: Overseas Development Institute.

Menong, J. M., Mabe, L. K., & Oladele, O. I. (2013). Analysis of Extension Needs of Commercial Farmers in North-West Province, South Africa. *Journal of Human Ecology*, *44*(2), 139-147.

Misaki, E., Apiola, M., Gaiani, S., & Tedre, M. (2018). Challenges facing sub-Saharan small-scale farmers in accessing farming information through mobile phones: A systematic literature review. *The Electronic Journal of Information Systems in Developing Countries*, *84*(4), e12034.

Mohanakumara, V., Biradar, N., Mulla, J., & Potdar, M. (2017). Analysis of farmers' information needs on fodder production. *Journal of Human Ecology*, *58*(3), 162-168.

Mokotjo, W., & Kalusopa, T. (2010). Evaluation of the agricultural information service (AIS) in Lesotho. *International Journal of Information Management*, *30*(4), 350-356.

Msoffe, G. E., & Ngulube, P. (2017). Information sources preference of poultry farmers in selected rural areas of Tanzania. *Journal of Librarianship and Information Science*, *49*(1), 82-90.

Msoffe, G. E., & Ngulube, P. (2016). Information needs of poultry farmers in selected rural areas of Tanzania. *Information Development*, *32*(4), 1085-1096.

Musib, S. K. (1989). Information needs and sources of information of the rural agriculturists.

Mwalukasa, N. (2013). Agricultural information sources used for climate change adaptation in Tanzania. *Library Review*, *62*(4/5), 266-292.

Naveed, M. A. (2013) *Information needs of rural Pakistani farmers: An exploratory study in Saleempur village*. LAP LAMBERT Academic Publishing.

Naveed, M. A., & Anwar, M. A. (2013) Agricultural information needs of Pakistani farmers*. Malaysian Journal of Library & Information Science*, *18*(3), 13-23.

Naveed, M. A., & Anwar, M. A. (2015) Understanding cotton growers' information needs from rural Bahawalpur Pakistan *Journal of Information Management & Libraries,* 16, 21-28.

Naveed, M. A., & Hassan, A. (2020). Sustaining agriculture with information: An assessment of rural citrus farmers' information behaviour. *Information Development,* 1-15.

Ndimbwa, T., Mwantimwa, K., & Ndumbaro, F. (2021). Channels used to deliver agricultural information and knowledge to smallholder farmers. *IFLA Journal*, *47*(2), 153-167.

Nkebukwa, L. L. (2018). Access and use of agricultural information in Muleba and Misenyi Districts, Tanzania. *Business Education Journal, II*(I).

Nyamba, S. Y., & Mlozi, M. R. (2012). Factors influencing the use of mobile phones in communicating agricultural information: A case of Kilolo District, Iringa, Tanzania. *International Journal of Information and Communication Technology Research, 2*(7).

Nzonzo, D., & Mogambi, H. (2016). An analysis of communication and information communication technologies adoption in irrigated rice production in Kenya. *International Journal of Education and Research*, *4*(12), 295-316.

Odini, S. (2014). Access to and use of agricultural information by small scale women farmers in support of efforts to attain food security in Vihiga County, Kenya. *Journal of emerging trends in economics and management sciences*, *5*(2), 80-86.

Okwu, O. J., & Umoru, B. I. (2009). A study of women farmers agricultural information needs and accessibility: a case study of Apa local government area of Benue state, Nigeria. *African Journal of Agricultural Research*, *4*(12), 1404-1409.

Oladeji, J. O., Oyesola, O. B., Ogunleye, K. Y., & Raji, K. (2011). Agricultural information needs of root and tuber farmers in the Atisbo Local Government Area of Oyo State, Nigeria. *Journal of agricultural & food information*, *12*(2), 199-205.

Omoregbee, F. E., & Banmeke, T. O. A. (2014). Information needs of cassava farmers in delta state of Nigeria. *Tanzania Journal of Agricultural Sciences*, *12*(2).

Opara, U. N. (2008). Agricultural information sources used by farmers in Imo State, Nigeria. *Information Development*, *24*(4), 289-295.

Osei, S. K., Folitse, B. Y., Dzandu, L. P., & Obeng-Koranteng, G. (2017). Sources of information for urban vegetable farmers in Accra, Ghana. *Information Development*, *33*(1), 72-79.

Pallant, J. (2010). *SPSS Survival Manual*, 4th ed. Maidenhead: McGraw-Hill.

Radad, I., Behzadi, H., &Zadehrahim, S. (2017). Information seeking behaviour of ordinary and elite saffron farmers in Iran. *The Electronic Library*, *35*(2), 233-245.

Rezvanfar, A., Moradnezhadi, H., & Vahedi, M. (2007). Information needs of farm women related to dairy farming and home management in Ilam State of Iran. *Livestock Research for Rural Development*, *19*(8), 19113.

Rimi, T. A., Akpoko, J. G., & Abdullahi, K. A. (2015). Sources of agricultural information used by cowpea farmers in Rimi Local Government Area of Katsina State. *Journal of Agricultural and Crop Research*, *3*(2), 21-26.

Samarakoon, S. M. A. K., & Shamil, M. M. M. (2010). Agriculture information network of small and medium size vegetable farmers in Sri Lanka. *Scientific papers of the University of Pardubice. Series D, Faculty of Economics and Administration, 17*(2/2010).

Sanchez Soto, A. (2016). Information needs and information behavior of blue agave farmers in Tequila, Jalisco: A case study. *Investigación Bibliotecológica*, *30*(69), 143-178.

Satapathy, S., & Mishra, D. (2020). Barriers in sharing of agricultural Information in Odisha (India): A critical study of small-scale farmers. In *Innovative Product Design and Intelligent Manufacturing Systems*, (pp. 907-915). Singapore: Springer.

Singh, N., Malhotra, P., & Singh, J. (2016). Information needs and seeking behaviour of dairy farmers of Punjab. *Indian Journal of Dairy Science*, *69*(1), 98-104.

Singh, K., & Varma, A. K. (2017). Agricultural information needs of farmers in select villages of Varanasi District: A case study. *Journal of Advances in Library and Information Science*, *6*(4), 305-311.

Siyao, P. O. (2012). Barriers in accessing agricultural information in Tanzania with a gender serspective: The case study of small-scale sugar cane growers in Kilombero District. *The Electronic Journal of Information Systems in Developing Countries*, *51*(1), 1-19.

Sharma Pandit, S., Kuwornu, J. K., Datta, A., Yaseen, M., & Anal, A. K. (2020). Analysis of marketing information sources among smallholder vegetable farmers. *International Journal of Vegetable Science*, *26*(1), 96-105.

Syiem, R., & Raj, S. (2015). Access and usage of ICTs for agriculture and rural development by the tribal

farmers in Meghalaya state of North-East India. *Agrarinformatika/Journal of Agricultural Informatics*, *6*(3), 24-41.

Ukachi, N., & Ayiah, E. M. (2017). Exploration of appropriate media for satisfying the information needs of future community of African farmers. *Library Philosophy and Practice, 2017*(1).

Verma, A. K., Meena, H. R., Singh, Y. P., Chander, M., & Narayan, R. (2012). Information seeking and sharing behaviour of the farmers: A case study of Uttar Pradesh State, India. *Journal of recent Advances in Agriculture*, *1*(2), 50-55.

Zaverdinos-Kockott, A. (2004) An information needs assessment in Oribi Village, Pietermaritzburg. *Innovation*, *29*(1), 13–23.