

The online culture of agriculture: exploring social media readiness of agricultural professionals

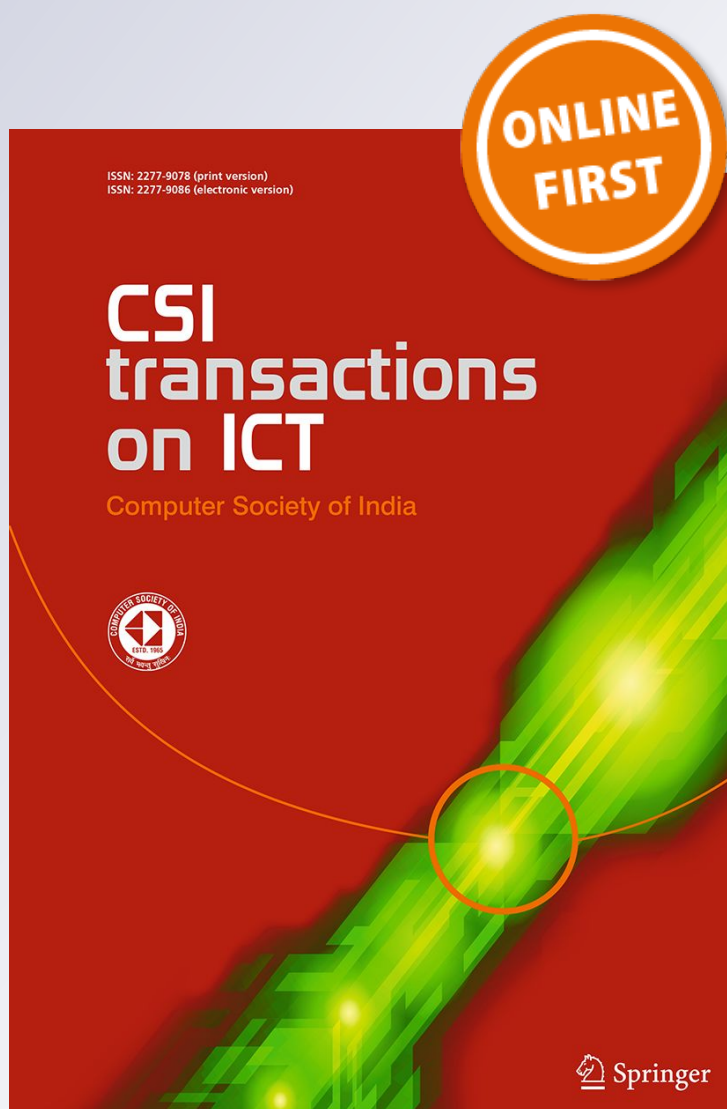
Bhattacharjee Suchiradipta & Saravanan Raj

CSI Transactions on ICT

ISSN 2277-9078

CSIT

DOI 10.1007/s40012-018-0205-0



Your article is protected by copyright and all rights are held exclusively by CSI Publications. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your article, please use the accepted manuscript version for posting on your own website. You may further deposit the accepted manuscript version in any repository, provided it is only made publicly available 12 months after official publication or later and provided acknowledgement is given to the original source of publication and a link is inserted to the published article on Springer's website. The link must be accompanied by the following text: "The final publication is available at link.springer.com".



The online culture of agriculture: exploring social media readiness of agricultural professionals

Bhattacharjee Suchiradipta¹ · Saravanan Raj¹ 

Received: 13 August 2018 / Accepted: 27 August 2018
© CSI Publications 2018

Abstract Agriculture is of high importance in India because of the dependence of 140 million farmers on the sector, its implications for a climate smart future, as a supplier of raw materials for industries, and for feeding the large population. Information becomes an important input in the sector to make it sustainable and social media is an important tool. Acceptance and use of social media is skewed across the sector because of multiple factors that ultimately decide its applicability. This study explored social media usage among agricultural extension professionals and their perceived benefits for agricultural development. The study draws data collected through online Google forms distributed through email and social media platforms (Facebook, Twitter, WhatsApp) from 269 extension professionals globally and 264 from India and discusses what affects use of social media in professional communication. WhatsApp, Facebook and YouTube were the most preferred platforms because of easier user interface and higher percentage of users, and personal mobile phones were the most preferred mode of access. Organizations were found to be catching up in use of social media but still lagged behind in concrete policies to guide the use of digital tools. The findings strongly advocate increased use of social media in agricultural extension and advisory services.

Keywords Social media · Agricultural extension · Extensionist · Innovation · Facebook · WhatsApp · Mobile phone

1 Introduction

Information, particularly through social media, has become an important commodity in today's digital world. Innovation co-creation process due to higher interaction among stakeholders through social media has amounted to social collaborations that have enhanced impact, better relationships, and efficient feedback in business as well as development sectors like health, refugee rehabilitation, poverty alleviation, grassroots technology development, and agriculture. Instant and borderless communication through social media, aided with increasing mobile and internet subscriptions worldwide, provides an unprecedented opportunity to share information in visual as well as textual forms that can be spread to millions in a matter of seconds [1]. The implications of this are especially high in sectors like health and agriculture where disease and pest outbreaks can actually be diagnosed and prevented before they cross the economic threshold, thus saving millions in resources. Democratization of information through social dissemination has given social media the edge and popularity among the masses by making their voices heard, making them a part of the development dialogue, connecting them to the global marketplace and a world of opportunities. Social media is helping to raise awareness, strengthen communities, increase access to education and resources, change and influence cultures, and bringing economic opportunities [2].

Increasing growth in mobile phone subscription across the globe has ensured that nine out of ten active social

✉ Saravanan Raj
saravananraj@hotmail.com

Bhattacharjee Suchiradipta
suchiradipta@hotmail.com

¹ National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana 500030, India

media users in the world access social media through their mobile devices. During the year 2017, almost 11 new users started using social media for the first time every second, with Saudi Arabia (32%) and India (31%) having the first and second highest growth in social media users. Gender balance is still a concern though, with women significantly underrepresented across much of Central Africa, the Middle East, and Southern Asia [3]. More than 29 million messages were sent via WhatsApp in a minute on average in 2017, that's more than 40 billion messages per day [4]. People in emerging economies are much likely to consume news on social media than the advanced economies but the use of internet for news consumption is comparatively higher in the advanced economies [5]. Developing and emerging economies tend to have the largest education gaps¹ in accessing news on social media and that stands true for all online content as well.

This rapid increase in social media users across the globe also increases its scope in the development sector. Branding, advocacy, and fundraising have become easier for the third sector because of social media. These free to use platforms have given a huge boost to the development sector, especially because of the involvement of NGOs that were the early adopters of these platforms [6]. Riding on the increase in low cost smart phones, social media has greatly impacted the health sector, where in 80% of countries, health service providers are using social media to connect with clients, and many offer training programme on social media for health [7]. Mass mobilization of people in physical space [8] with the help of social media has had far-reaching consequences in the social, political, and economic landscape of countries across the globe. Consumer interaction with brand related content has changed the way brands and products are consumed across the globe forming brand communities, influencing peer communication, user-generated and firm-created content, involvement with user-generated content, and ultimately influencing consumption [9–14], which has far reaching consequences especially for local produces and markets.

2 Social media in agricultural development: impact and implications

Social media refers to web based tools of electronic communication that allows users to interact, create, share, retrieve, and exchange information and ideas in any form (text, pictures, video, etc.). These messages can be discussed, archived, and used by anyone in virtual communities and networks [15]. Social media has the potential to

form informed communities in the agriculture sector that can take better decisions to prepare themselves against emerging agricultural challenges of climate change, global food price instability, unsustainable agricultural activities, heavy reliance on non-renewable sources of energy, and so on [16–18]. The impact of information and communication technologies (ICTs) like mobile phones, web portals, radio, and TV have been immense on the agriculture sector, especially giving a special edge to AEAS [19]. Agricultural extension and advisory services (AEAS) needs to emerge as a facilitator in the changing context of agriculture to foster linkages among stakeholders and develop conducive environment for innovation and development in Agricultural Innovation Systems (AIS). As a platform of mass influence with agriculture as content, AEAS can facilitate a value chain extension system, engage multiple stakeholders, increase profit margin of producers, increase the negotiating power of producers, all through mass-personal communication [20, 21]. Increased online visibility of extension organizations through social media [22] also adds to the cause, while creating a network of agricultural peers and professionals. Social media further helps access and share information and content in places where physical content like books and libraries are non-existent; provides a platform to share information helping rural youth get trained and engage in economic agricultural activities; increases youth–youth engagement encouraging agri-entrepreneurship; helps in real time deliberation on issues with instant feedback ion platforms like Twitter, reducing communication time lag, giving instant solutions to queries, and real time updates on activities and organizational policy issues; increases discussion on issues like gender participation in agriculture and impacts real life efforts to mainstream gender in agriculture; gives farming a face and increases the information available in public domain on production and journey of food from farm to plate, thus making the consumers active stakeholders in the food production process. Social media is more about sociology and psychology of communication than about technology [23]. Facebook, YouTube, blogs, wikis, and podcasts provide large potential for use to extensionists but the content and outreach needs to be determined based on users and content [15, 24, 25].

Given the revolutionary impact of social media on communication worldwide and its huge impact across development sector, the current study was undertaken to understand the extent of social media use in agricultural extension and advisory services worldwide and in India separately. The global study tried to understand the trend in social media use among extensionists worldwide and at the next phase, the study was undertaken solely in India, given increased focus on digital development in the country in recent times. The next section of the research paper

¹ Difference in level of education of the average population between the economies.

Table 1 Organizational affiliation of respondents

Sl. No.	Organization type	Global (%)	India (%)
1	National AEAS ^a organizations	24.6	42.5
2	National research institution	18.0	15.9
3	National NGO	08.0	04.5
4	National educational institute	23.2	02.7
5	Civil society organization (Farmers organization/producers organization/SHGs ^b /FIGs ^c /FBOs ^d , etc.)	07.9	01.5
6	International NGO ^e	02.2	01.1
7	International educational institute	04.8	01.1
8	International agricultural extension organization	03.5	00.8
9	Others	17.1	29.9
	Total	100.0	100.0

^aAgricultural Extension and Advisory Services

^bSelf Help Groups

^cFarmer Interest Groups

^dFarmer Based Organizations

^eNon-Government Organizations

Table 2 Types of social media users

Type of user	Global (%)	India (%)
Versatile user (update profile, send public and private messages, shares links, and comment on discussion threads, mostly in social media for professional activities)	33.5	33.7
Expert communicator (logs in several times a day, actively engaged in all social media/networking activities, stay updated and interact very frequently both professionally and personally)	28.1	27.3
Introvert (Only updates profile and mostly communicates through private messages)	19.2	19.7
Novel user (updates profile, actively seek out information, spend time tagging photos, logs in between 1 and 5 h a week)	19.2	19.3
Total	100.0	100.0

discusses the methodology used in the study, the fourth section discusses the findings of research, the fifth section suggests recommendations for better implementation of social media in agriculture sector and finally the sixth section concludes with the major points.

3 Research methodology

This research paper discusses and compares two separate but related studies conducted globally and in India respectively to understand the extent of social media use among agricultural professionals, especially extensionists. Data was collected through online survey questionnaire prepared using Google Forms and circulated using social media platforms like Facebook, Twitter, and WhatsApp; web portals of Global Forum for Rural Advisory Services (GFRAS), e-Agriculture, Agricultural Extension in South Asia (AESAs), and other agricultural communities; and email links. Purposive sampling method was used for the

study wherein agricultural stakeholders working in agricultural extension were selected for data collection. In the global study, 229 respondents from 62 countries responded to the survey with 7.6% of respondents from low income economies, 78.5% from middle income economies, and 13.9% from high income economies. For the study on Indian agricultural professionals, a total of 264 responses were received from agricultural stakeholders belonging to 26 states and 3 Union Territories of the country. The following sections discuss the findings of these two studies.

4 Social media readiness of agricultural extension professionals

4.1 Particulars of the respondents

The set of respondents from the global and Indian study respectively included researchers (25.9% and 22.3%), extensionists (21.5% and 26.5%), academicians (20.6%

and 19.7%), entrepreneurs (5.7% and 8.3%), policy makers (4.4% and 1.1%), farmers (0.4% and 3.8%) and others (21.5% and 11.5%). Female representation in the global survey was 25% against 75% male while in the Indian study, 14% of the respondents were female and 86% were male, which was quite the contrary to global social media use trends where women are becoming more active compared to men. But in the agriculture sector, men are the majority as professionals which reflect the skewed distribution of respondents as well.

In both the studies, large majority of the respondents were from the age group 26–65 years, which was not surprising since the study focused on working professionals. Majority of the respondents were from national extension organizations (24.6% and 39.8% respectively) in both the studies followed by research and educational institutions, and third sector (NGOs, etc.) institutions (Table 1).

4.2 Preference of social media platforms and their access

Use of social media by individuals is highly dependent on the type of user and their engagement with online content. Majority of the respondents in both global as well as Indian study identified themselves as versatile users of social media (Table 2).

Following global trends, Facebook and WhatsApp were the major social media platforms used. The Indian respondents though, preferred WhatsApp to Facebook because of the personalised nature of information sharing through the platform (Table 3). As the major reasons for using social media are sharing information, exchange of knowledge, and finding out about news and events (Table 4), it works best within peer groups, for which WhatsApp provides a better platform than Facebook. Twitter has been the major medium for information sharing and assimilating globally but, is yet to gain traction in the agriculture sector of India.

Social media is becoming the major source of news consumption, especially for people in the age group of 18–34 years [26, 27]. The same trends were also seen in the study. News consumption was the major purpose for using social media by the respondents of the global study along with sharing information, knowledge exchange (in-depth discussion on certain topics that goes beyond mere sharing of information), sharing professional activities, as well as connecting with friends and family identified as major reasons for using social media (Table 4).

Access device of social media also influences the time spent on a platform. Globally, of the 42% active social media users, 39% access it on their mobile phones. For the agricultural professionals as well, mobile phones were the

Table 3 Major social media platforms used by respondents

Social media	Global (%)	India (%)
Facebook	64.7	45.8
WhatsApp	37.3	61.0
Google+	32.5	16.3
YouTube	20.0	26.1
Blogs	22.2	9.4
Wikis	30.9	8.3
Twitter	23.4	7.2

Table 4 Respondents' purpose of using social media

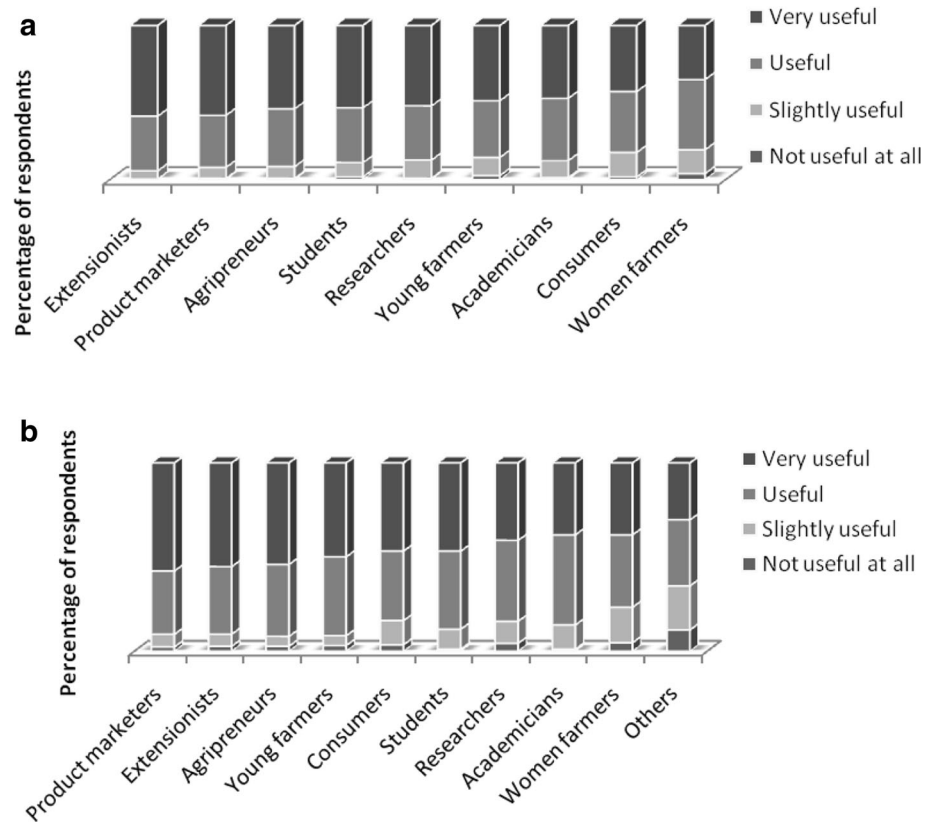
Purpose	Global (%)	India (%)
To find out about news and events	79.9	77.7
To share information	62.9	88.3
Exchange knowledge	62.9	82.2
Share professional activities	55.4	76.1
Connect with friends and relatives	60.7	70.5
Discuss new events related to profession	54.0	62.1

device of choice (68.2% globally and 45.7% in India) for accessing social media, followed by personal laptop (60.1% globally and 10% in India), personal computer (49.8% globally and 8.3% in India), office computer (41.7% globally and 4.2% in India) and office laptop (26% globally and only 1.1% in India). As organizational use of social media is comparatively less among Indian professionals, naturally this limits their use of social media on office devices. Very low data tariff in India has encouraged more people to be active on their mobiles than other devices. While globally in 2017, on an average a person spent 2.15 h on social media [28], 21.7% of the respondents used social media for 1–2 h a day, 19.5% used it for 31–60 min a day, and 19.5% used social media for 15–30 min a day. Among the Indian respondents, 23.5% spend 31–60 min every day on social media while 23.1% spent 1–2 h, 22.3% spent 15–30 min, and 13.3% spent 2–3 h per day on social media. Rest of the respondents in both the studies said they did not use social media every day.

4.3 Extension professionals' attitude towards and perceived usefulness of social media

In both the surveys, a huge majority (94.7% globally and 95.9% in India) said that social media is going to have a major impact on communication in the agricultural sector.

Fig. 1 a Perceived usefulness of social media to agricultural stakeholders (Global).
b Perceived usefulness of social media to agricultural stakeholders (India)



The usefulness was perceived to be highest for extensionists, agricultural product marketers and agri-entrepreneurs among the agricultural stakeholders because of their roles in the sector like networking, facilitation, negotiation, convening, brokering, and so on. The perception that women farmers have the least usefulness of social media, though shows a traditional mind-set among agricultural professionals which many a times prevents them from engaging with farmers effectively through social media, thus limiting its usefulness. In the global survey, 93.4% of respondents used social media for accessing agricultural information while the remaining 6.6% did not use social media for agriculture information (Fig. 1a, b).

4.4 Social media in agricultural extension and advisory services

With increasing globalization of agriculture and information, agricultural extension also needs to hitch a ride in the social media bandwagon and reap the benefits. The respondents, both globally and in India, believed social media can be useful to agricultural extension and advisory services in multiple ways because of the global reach of the knowledge sharing platforms with multiple media formats that can be easy to access and understand and at times surpasses barriers like language. Real time communication

with constant and instant feedback also encourages the use of social media in agricultural extension (Table 5).

While the advantages are many, focusing on just those might miss a major part of the discussion on social media involvement in development. In times of social media forwards,² authenticity of information becomes a serious issue and respondents have reported finding them confusing because of conflicting information. Also, in countries where social media use is just picking up, a large number of experienced experts are missing from social media platforms, which limits the quality of discussions or expertise at times, and might also affect the moderation of content. This might have severe repercussions on the livelihood of farmers in case the content accessed on social media is not authentic. Other than these, the research-extension-farmer-market linkage is yet to be cohesive in India as well as most other developing countries and in such conditions, social media alone can do only very little, especially with lack of competency to use social media among extension professionals and without required organizational support. Various disadvantages of social media use in AEAS, as expressed by the respondents, are given in

² The increasing phenomena of forwarding messages on social media as received, without fact checking of any kind, snowballs the chances of spreading information that lacks authenticity, and may provide wrong information in cases, thus causing negative impacts.

Table 5 Advantages of social media use in agricultural extension

Sl. No.	Purpose	Global (%)	India (%)
1	Ideas can be posted to a large number of users beyond physical boundaries	79.0	81.3
2	A knowledge pool is created with large number of participants in real time	68.9	75.6
3	Social media initiates and supports discussions among global and local peers	66.2	66.4
4	Social media ensures better feedback	47.9	60.3
5	Large number of interactive media makes communication through social media interesting	49.8	59.2
6	Others	5.9	3.1

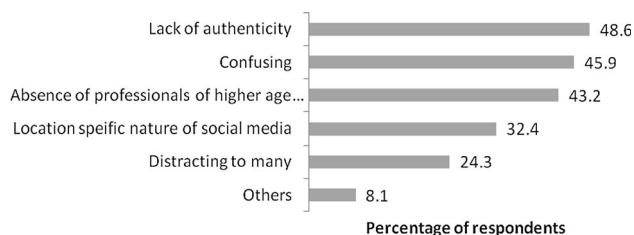


Fig. 2 Disadvantages of social media (global study)

Fig. 2. Among the respondents of the Indian study group though, only two respondents said that social media is not useful in agricultural extension as older professionals are generally not in social media and as agriculture is highly location based, general experience might not be helpful.

In the case of market led extension, Business to Business (B2B) and Business to Customer (B2C) interactions, larger reach to potential clients, encouraging boost to local farmers' markets, and better estimation of market demands were highlighted by the respondents as reasons to promote social media use. Value chain has been getting importance with start-up culture in agriculture sector and increasing use of social media for customer engagement and increased transparency can be a major factor in its success (Table 6).

Social construction of information—development and publication of information socially by the users through and in social media—has been a major feature of social media in the development sector. In agriculture too, social construction has its own advantages and disadvantages. While a large majority of the respondents both in the global as well as the Indian surveys identified this as a major

advantage of social media, some disadvantages as well were also pointed out by the respondents (Table 7).

Innovation brokers are the systemic intermediaries in Agricultural Innovation Systems (AIS) whose main purpose is to build appropriate linkages and facilitate multi-stakeholder interaction in innovation co-creation. Innovation brokering is an important role of AEAS for development of the sector and as expressed by all the respondents of both the surveys, social media can be of immense help in innovation brokering.

4.5 Organizational use of social media

In an age where information is power and in a sector like agriculture where information is one of the most important inputs in a production system, organizational use of social media is vital to the sector. It not only adds validity to the information shared, but establishes linkages among stakeholders and forms a network concentrated efforts. It also encourages communication within an organization as well as with clients, thus forming a favourable work environment [15, 29]. Majority of the respondents from both the studies were of the opinion that that an organization should have its own social media platform and most of the respondents felt that through social media usage, one can get more feedback; which can help in conducting need-based, area-specific and client-targeted research/training/technology dissemination.

While 77.5% of respondents of the global study and 66.7% of the respondents from the Indian survey said their organization used social media to connect with the clients.

Table 6 Social media use in market led extension

Purpose	Global (%)	India (%)
Both B2B (Business to Business) and B2C (business to Customer) interaction is increased through social media	69.7	77.7
Social media marketing brings in large number of customers	60.6	61.5
Local farmers market will flourish with social media marketing and farmers will be much more benefited	49.8	53.6
Market demand can be better estimated	45.2	52.5
Agricultural products having low shelf life, social media marketing will not be helpful	20.4	30.2
Others	3.6	0.4

Table 7 Advantages and disadvantages of social construction of information in social media

	Global (%)	India (%)
Advantages of social construction of information		
There is value creation of knowledge to users	71.4	79.7
It allows anyone to create/publish information	53.1	70.4
Social media encourages creation of user-generated content	75.1	69.2
There is seamless collaboration in knowledge creation	39.4	47.7
Other	0.5	0.8
Disadvantages of social construction of information		
Social media is not suitable for in-depth scientific discussion	39.5	100.0
In social media, impractical ideas may gain popularity thus creating noise in the process of communication	39.5	33.3
It cannot be practically applied in agricultural extension	21.1	66.6
Discussion in social media easily lose focus and divert from the main topic under discussion	57.9	33.3

Table 8 Organizational social media preference

Social media platforms	Global (%)	India (%)
Facebook	80.9	74.3
Google+	34.6	29.8
LinkedIn	34.6	17.0
Blogs	35.1	14.7
Twitter	40.4	13.6
Others	18.9	24.2

Facebook was the most preferred platform for larger reach and user friendly interface. Similar to personal preferences, for organizational use too, while twitter was quite popular at global level, it didn't have a large user base in India (Table 8).

The respondents unanimously mentioned in both the studies that with use of social media, number of clients reached directly per day is at least 100 to more than 10,000 at times, which was physically impossible at that time and cost.

Cost is one of the most important factors in extension activities and most of the respondents agreed that social media is cost effective, i.e. when compared with traditional extension methods, by using social media one can reach more number of people in less time, with less resource, and less cost. Respondents were also of the opinion that among all social media tools, WhatsApp is more cost effective because one can use personal mobile and personal number

to communicate agricultural information individually or to groups. Features of WhatsApp have made communication more effective in all aspects. Facebook was given second rank with respect to cost effectiveness because it usually consumes more data and distracts the communicator with other posts when compared to WhatsApp. It was interesting to see that Facebook features like Groups (convenient for group discussion and Q&A), Pages (helps in disseminating information to reach large client base at a time) and other features have made agricultural communication easier. Cost effectiveness was studied only for the Indian survey and was not part of the global study.

It was interesting to see that approximately seventy per cent of the respondents' organization in both the studies made use of social media to share recent development in agricultural technology followed by various agricultural events and so on (Table 9). This shows that the objectives of agricultural extension can be met by using social media. Here one can use social media to communicate with clients about many aspects related to agriculture in less time when compared to traditional communication methods. It is also evident from the responses that half of the organizations don't share information every day which is again a weakness that can be overcome by framing proper policy guidelines on social media usage.

There were a few organizational or institutional difficulties faced by the respondents in using social media as part of the organization. Restriction in the use of social

Table 9 Major reasons of organizational social media use in agriculture sector

Purpose	Global (%)	India (%)
Information dissemination is faster through social media	75.5	73.2
Social media has better reach than traditional media	48.9	52.1
It is better means to reach young farmers	39.9	51.3
Social media is more conversational than traditional media	36.7	30.9
Other	8.5	4.9

Table 10 Training need of respondents in social media use

Training need of respondents	Global (%)	India (%)
Integration of different types of social media platforms	77.6	70.3
Creating content on social media	60.3	66.3
Technicalities of social media use	66.0	61.6
Use of social media in general	43.6	29.1
Other	3.8	2.3

media topped the list followed by less importance given to social media and lack of policy reforms though these can be overcome easily through proper policy framework.

Since the technology and concept of social media is of recent origin, most of the respondents (72% in the global survey and 70.3% in Indian survey) said that they require training in social media usage in the areas of integration of different types of social media, content creation, technicalities of social media, etc., to help them handle social media effectively. Through proper and stakeholder oriented training in social media, effective agricultural communication can be done through social media (Table 10).

Selection of right content is crucial for increased user engagement and user satisfaction with social media platforms of the organizations. Major content shared by the organizations on social media is discussed in Table 11.

Social media policies and guidelines are some broad outlines about how to behave and maintain decorum when representing the organization online. They are important to help the employees understand how and what to share online and also protects the image as well as rights of the organization as well as the employees. Among the respondents of the global survey, 31.3% said their organization had a social media policy guideline, 49% said their organization didn't, while 19.7% were unaware of it. Among the respondents of the Indian survey, only 25% said their organization had a social media policy, 46.2% said their organization didn't, and the rest 28.8% were unaware.

The hurdles in using social media by organizations can be institutional as well as infrastructural. While infrastructural difficulties are easier to fix, institutional difficulties require a more strategic approach to change attitude towards social media use by organizations. The difficulties are discussed in Table 12.

Table 11 Information shared through organizational social media platform

Type of information shared	Global (%)	India (%)
Recent development in agricultural technology	64.5	71.6
Farmers fairs/conference/seminars and other news feeds	55.9	69.8
Videos/podcasts/pictures related to agricultural technology and practices	55.9	61.7
Publications in agricultural/agricultural extension	65.1	53.6
Communication and engagement with other members	46.2	47.3
Recruitment of new members/clients for the organization	26.3	32.9
Influencing key member's/opinion leaders through their social media accounts	23.7	23.9
No specific objective	6.5	17.7
Crisis communication	9.7	16.7
Other	4.3	1.8

Table 12 Institutional and infrastructural difficulties in organizational social media use

	Global (%)	India (%)
Institutional difficulties		
Social media use by employees are restricted in the organization	23.8	32.2
Social media is not deemed important by higher authority	45.6	31.8
Social media policy in the organization is not flexible towards its use	18.1	24.1
Others	28.1	11.9
Infrastructural difficulties		
Network connections are bad in rural areas	70.1	66.9
Illiteracy is a problem in using social media	43.7	57.2
Subscribing to internet is a costly affair for poor farmers	52.3	49.1
Clients are not interested in using social media	16.1	41.9
Clients are not registered to social media	36.8	23.7
Others	04.0	8.9

Most of the respondents said that they won't get any financial support for using social media from their organizations to reach clients. A very few employees will be willing to spend personal money on such activity but organizations with little flexibility and provision of required facilities to their employees can make a huge impact in reaching the clients and generate multiple times in output.

5 Recommendations

While it was evident from the study findings that the respondents unanimously felt the importance of social media in agricultural extension and communication, it was also evident that it is as yet an unexplored territory, especially for extension professionals who formed majority of the respondents group. As they were still learning the ropes in effective social media use for agricultural communication, a set of steps needs to be taken to encourage its use within the organizational rules and regulations:

- a. *Skill and competence building* Encouraging the agricultural stakeholders and skill and competence building through awareness programmes, training sessions, and workshops on effective social media content creation and use. Social media platforms are constantly evolving to make them more user friendly and so, building necessary skills and competence among the stakeholders, especially middle and field level extension functionaries is a necessity for effective communication and forming functional networks.
 - b. *Attitude change towards social media* As there is still a lack of understanding about how social media works and with increased privacy concerns, many are getting skeptical in using social media for personal purposes, which ultimately impact their professional use as well. While social media can be a good platform for networking, any of the stakeholders if missing, can break the links too, resulting in uncoordinated communication and loss of information. Popularizing social media does not just entail informing about its advantages, but rightly highlighting its disadvantages as well and how an user can take proper precautions so as not to fall prey to those. Organizations can play the most important role here in bringing out a positive attitude about social media in the employees with the right information about the advantages and the disadvantages.
 - c. *Organizational policy in social media use* In an age of technology where information is power and data one of the most important intellectual property, organizations need to be active stakeholders in social media use for better communication in the agriculture sector. But that
- d. *Grassroots involvement* As internet and social media penetration increases across the globe and more and more people engage online, the rural population is not very far in this aspect too. To utilize this potential and engage with the largest and most important stakeholder in agriculture sector, stakeholders at research, education, and service sectors needs to actively engage with the grassroots and social media can be the best platform to do so. Identifying the correct audience like youth and engaging them will not just increase information flow to the bottom of the pyramid of farmers, but will also engage more youth in remunerative agriculture.
 - e. *Infrastructure development* With all the information at our fingertips, it all boils down to the infrastructure available to make the best of it. In terms of internet connectivity, mobile services, cost of internet services, input availability, market facilities, transportation, and so on actually help in transforming the information gained online into knowledge and transform it into tangible income and better livelihood. In many middle income and low income economies as well as in rural areas of high income economies, the infrastructure still does not exist to support producers and in such cases, information gained through social media is of little help. Establishing a support structure of necessary infrastructure needs to be the priority for making social media a part of the extension system in agriculture sector.
 - f. *Policy dialogue and advocacy* With increased representation of the masses, social media is a useful tool for policy makers to understand the needs, engage with stakeholders, and make policies more inclusive and effective in favour of the sector and its sustainability. Numerous examples in the Asia–Pacific and African countries [30] have shown how social media has helped shape agricultural policy in the region.

6 Conclusions

There is a large demand for agricultural information at the grassroots and to meet that demand; the stakeholders at top and middle level need to use social media in an organized and effective way to meet the region specific needs of

clients. Social media can be used to communicate all forms of information in relatively less time through various user friendly features of mobile phones, laptops and other electronic devices; but there is need to increase the usage of social media platforms at organizational level to meet the information needs of various stakeholders. Through capacity building of employees in social media usage, effective relationship can be built among different stakeholders and the existing gap between research extension and farmers can be filled by using social media.

Social media is serving the basic objective and aim of agricultural extension but there is a need to ensure that the majority of the agricultural stakeholders across middle and low income economies become active users of social media for agricultural purposes. There is also a requirement to better regulate the content, authenticity and relevance of information that floats in social media, thus increasing the need for organizational participation. Findings show that there is a need to have certain organization to client ratio for social media usage because the existing organizations are reaching very few clients through social media.

Also, there is an urgent need to promote Farmer and Farm Women Knowledge Groups (FFWKGs) in the rural areas, may be on a pilot basis through Krishi Vigyan Kendras (KVKs), Agricultural Technology Management Agencies (ATMAs) and professional NGOs working in farm sector for accessing, assimilating, and sharing the information promoted by social media. These agencies, in collaboration with State's/provincial development departments (agriculture and allied) and agricultural universities may consider appropriate mechanisms for ensuring authenticity and applicability of technical information disseminated through social media in a specific agro-ecological situation.

The findings strongly suggest that social media can be effectively used among agricultural stakeholders for agricultural communication with proper and organized training and policy at individual, organizational, regional and national level. However it also needs to be remembered that technology effectively reaches people only with adequate infrastructure. India attained cent percent electrification only in 2018. There are many low income countries across the globe where that is yet to be achieved, along with roads, markets, or other agricultural technology. In such scenarios, social media can be more of an enhancer of digital, social, and economic inequality rather than a bridge. It is in judicial and pragmatic use of technology that success lies and social media is no different. It is a complementary tool to extension services and needs to be used as such to reap benefits.

References

1. McNab C (2009) What social media offers to health professionals and citizens. *Bull World Health Organ* 2009(87):566–566. <https://doi.org/10.2471/BLT.09.066712>
2. Brown K (2017) 9 Ways social media is transforming developing countries. <http://dobusinessjamaica.com/blog/9-ways-social-media-is-transforming-developing-countries/>. Accessed 22 May 2018
3. Kemp S (2018) Digital in 2018: World's internet users pass the 4 billion mark. <https://wearesocial.com/blog/2018/01/global-digital-report-2018>. Accessed 22 May 2018
4. Smith R (2018) A million WhatsApp messages were sent in the time it's taken you to read this headline, World Economic Forum. <https://www.weforum.org/agenda/2018/03/internet-minute-what-sapp-facebook-emails/>. Accessed 9 April 2018
5. Mitchell A, Simmons K, Matsa KE, Silver L (2018) People in poorer countries just as likely to use social media for news as those in wealthier countries. <http://www.pewglobal.org/2018/01/11/people-in-poorer-countries-just-as-likely-to-use-social-media-for-news-as-those-in-wealthier-countries/>. Accessed 22 May 2018
6. Global NGO Technology Report (2018) http://www.nptechforgood.com/2018/02/11/2018_global_ngo_technology_report/. Accessed 22 May 2018
7. Global Diffusion of eHealth: Making Universal Health Coverage Achievable (2016) Report of the third global survey on eHealth. Geneva: World Health Organization; 2016. Licence: CC BY-NC-SA 3.0 IGO. <http://apps.who.int/iris/bitstream/handle/10665/252529/9789241511780-eng.pdf;jsessionid=8BC7D48D5A1AF7B1491BC2E9CD8BC3D0?sequence=1>. Accessed 20 May 2018
8. Jurgenson N (2012) When atoms meet bits: social media, the mobile web and augmented revolution. *Future Internet* 4:83–91
9. Schivinski B, Christodoulides G, Dabrowski D (2016) Measuring consumers' engagement with brand-related social-media content—development and validation of a scale that identifies levels of social-media engagement with brands. *J Advert Res* 56(1):1–18. <https://doi.org/10.2501/JAR-2016-000>
10. Schivinski B, Dabrowski D (2014) The effect of social media communication on consumer perceptions of brands. *J Mark Commun* (ahead of print). <https://doi.org/10.1080/13527266.2013.871323>
11. Bruhn M, Schoenmueller V, Schäfer DB (2012) Are social media replacing traditional media in terms of brand equity creation? *Manag Res Rev* 35(9):770–790
12. Laroche M, Habibi MR, Richard MO, Sankaranarayanan R (2012) The effects of social media based brand communities on brand community markers, value creation practices, brand trust and brand loyalty. *Comput Hum Behav* 28(5):1755–1767
13. Schau HJ, Muniz JRAM, Arnould EJ (2009) How brand community practices create value. *J Mark* 73:30–51
14. Algesheimer R, Dholakia UM, Herrmann A (2005) The social influence of brand community: evidence from European car clubs. *J Mark* 69(July):19–34
15. Suchiradiptha B, Saravanan R (2016) Social media: shaping the future of agricultural extension and advisory services, GFRAS interest group on ICT4RAS discussion paper. GFRAS, Lindau
16. Nelson GC, Rosegrant MW, Koo J, Robertson R, Sulser T, Zhu T, Ringle C, Msangi S, Palazzo A, Batka M, Magalhaes M, Valmonte-Santos R, Ewing M, Lee D (2009) Climate change: impact on agriculture and cost of adaptation. Food Policy Report, IFPRI, Washington DC
17. Rosenberg T (2014) A Green revolution, this time for Africa, The New York Times. <http://opinionator.blogs.nytimes.com/2014/04/>

- 09/a-green-revolution-this-time-for-africa/?_r=0. Accessed 10 May 2018
18. FAO (2015) A body of evidence: what climate change implies for global food security and trade, <http://www.fao.org/news/story/en/item/293954/icode/>. Accessed 10 May 2018
 19. Woods K, Langcuster JC (2014) The use of digital technology in extension. *J Ext.* Article5COM3, <http://www.joe.org/joe/2014october/comm3.php>
 20. Carr CT, Hayes RA (2015) Social media: defining developing and divining. *Atl J Commun.* <https://doi.org/10.1080/15456870.2015.972282>
 21. Varner J (2012) Agriculture and social media. Mississippi State University Extension Service, Mississippi
 22. Arnold S, Hill A, Bailey N, Meyers C, (2012) Extension's online presence: are land grant universities promoting the tripartite mission? *J Ext.* Article number 6RIB1
 23. Saravanan R, Suchiradipta B (2014) Social media: New generation tools for agricultural extension? <http://www.aesa-gfras.net/Resources/file/Saravanan%20Final%20blog%2042.pdf>
 24. Kinsley J (2010) Five social media tools for the extension toolbox. *J Ex.* Article number 5TOT7
 25. Gharis LW, Bardon RE, Evans JL, Hubbard WG, Taylor E (2014) Expanding the reach of extension through social media. *J Ext* 52(3):1–11
 26. Newman N, Fletcher R, Kalogeropoulos A, Levy DAL, Nielsen RK (2017) Digital News Report 2017, Reuters Institute for the Study of Journalism. https://reutersinstitute.politics.ox.ac.uk/sites/default/files/Digital%20News%20Report%202017%20web_0.pdf. Accessed 20 May 2018
 27. Chowdhury A, Hambly Odame H (2013) Social media for enhancing innovation in agri-food and rural development: current dynamics in Ontario, Canada. *J Rural Community Dev* 8(2):97–119
 28. Daily time spent on social networking by internet users worldwide from 2012 to 2017 (in minutes). <https://www.statista.com/statistics/433871/daily-social-media-usage-worldwide/>. Accessed 20 May 2018
 29. Langer E (2014) What's trending? Social media and its effect on organizational communication. *J Undergrad Res.* <http://www.uwlax.edu/urc/JUR-online/PDF/2014/Langer.Emily.CST.pdf>. Accessed 22 May 2018
 30. Pedrick C (2015) Embracing Web 2.0 and Social Media: a life changing pathway for agricultural development actors. CTA, Netherlands. <https://publications.cta.int/en/publications/publication/1816/>. Accessed 22 May 2018