

Empowering farmers' community through digital media for achieving Sustainable Development Goals (SDGs) in India

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Abstract:

Indian agricultural system is the largest national agricultural system in the world. The ICAR is the apex body for coordinating, guiding and managing research and education in agriculture sciences in India. About 67% Indian population of India is directly or indirectly dependent on Agriculture. Agriculture extension is one of the most important activities in agriculture sector to transfer of agricultural research and technology to the Indian farmers. The paper highlights present status of rural and urban agriculture. The Indian agriculture extension system and its activities have been discussed in the paper. The paper has been advocated empowering farmers community through digital media to achieve the SDGs in India. The authors discussed and suggested to use of various digital media including social media, web-based services, mobile based services etc. in agriculture extension services for farmers. The authors also discussed development of urban agriculture in India through digital media.

Keywords: Farmers, Digital Media, Sustainable Development Goals, SDG, India

1. Introduction

Agriculture is the core sector in India for food & nutritional security and sustainable development & poverty alleviation. It contributes approximately 16% of GDP. The Indian Council of Agricultural Research (ICAR) is the apex body under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, for coordinating, guiding and managing research, education and extension in agriculture sciences in India. An Indian National Agricultural Research & Education System (INARES) is the largest National Agricultural System in the world with 101 ICAR institutes, 64 State agricultural universities (SAU), 3 Central Agricultural Universities (CAU), 4 Deemed Universities (DU), 4 Central Universities (CUs) with Agricultural faculties, 44 Agricultural Technology Information Centers (ATIC) and 690 Krishi Vigyan Kendras (KVKs) (i.e. Farm Science Centres). KVKs and agriculture extension experts/workers have been working for agriculture extension (i.e. transfer of agricultural research and technology to the farmers) (Indian Council of Agricultural Research, 2018). Every ICAR institute, SAU, CAU and DU has a library and agriculture extension unit.

Currently, the population of India is approximately 1.34 billion. India's population is projected to continue growing for several decades to around 1.5 billion in 2030 and approaching 1.66 billion in 2050. Presently, about 67 percent population lives in rural areas most of which are dependent on agriculture. By 2050, more than 800 million people (50%) of India will be residing in the urban areas (United Nations, Department of Economic and Social Affairs, 2017).

2. Sustainable Development Goals (SDGs): In 2015, leaders from 193 countries created a plan of 17 Sustainable Development Goals for 15 years. The plan is started in January 2016 and the United Nations Development Program (UNDP) is one of the leading programs working to fulfill the SDGs by the year 2030. The following 17 SDGs are with the main aim to rid of poverty and hunger, and safe from the worst effects of climate change (United Nations, Department of Economic and Social Affairs, 2018):

Goal 1: End poverty in all its forms everywhere;

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture;

Goal 3: Ensure healthy lives and promote well-being for all at all ages;

Goal 4: Ensure inclusive and equitable quality education and promote life-long learning opportunities for all;

- Goal 5: Achieve gender equality and empower all women and girls;
- Goal 6: Ensure availability and sustainable management of water and sanitation for all;
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all;
- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;
- Goal 10: Reduce inequality within and among countries;
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable;
- Goal 12: Ensure sustainable consumption and production patterns;
- Goal 13: Take urgent action to combat climate change and its impact;
- Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development;
- Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss;
- Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all Levels;
- Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

According to United Nations Conference on Trade and Development (UNCTAD, 2014), total investment needs at the global level are USD 5 to 7 trillion per year. Total investment needs in developing countries alone could be about USD 3.9 trillion per year, mainly for basic infrastructure (roads, rail and ports, power stations, water and sanitation), food security (agriculture and rural development), climate change mitigation and adaptation, health, and education. Current investment in these sectors is around USD 1.4 trillion leaving a gap of around USD 2.5 trillion and implying an annual investment gap between USD 1.9 and USD 3.1 trillion. study conducted for assessing the financial estimates and shortfall to achieve SDGs in India found that “The first level of estimates indicate a financial shortfall of INR 533 lakh crores (USD 8.5 trillion) over the mandated 15 years for achieving SDGs. Per year, on an average, this works out to INR 36 lakh crores or USD 565 billion. (This is only the gap in

finance to achieve the SDGs, not the overall financial requirement.)” (Bhamra, A. and others, 2015).

3. Rural and Urban Agriculture in India

India is the seventh largest country in the world and ranks second in population. It has 29 states and 7 union territories. It covers an area of 3287263 sq. km. The population of India as on March 1, 2011 stood at 1210.9 million (623.2 million males and 587.6 million females. The population density of India in 2011 was 382 per sq. km-decadal growth 17.72 per cent. The sex ratio is 919 per thousand male. The literacy rate in the country is 73.0 per cent, 80.9 for males and 64.6 for females. There are 22 official languages in India (*India, Ministry of Information and Broadcasting, 2018*). As per the 2011 Census, 68.8 per cent of country’s population and 72.4 percent of workforce resided in rural areas. The rural area population is directly or indirectly dependent on agriculture. Between 2001 and 2011, India’s urban population increased by 31.8 percent as compared to 12.18 percent increase in the rural population (Ramesh Chand and others, 2018). Agricultural statistics of India shows that in the year 2011-12, 25.7 percent rural population was below the poverty line while urban population was 13.7 percent below the poverty line (India, 2017).

Department of Agricultural Research and Education (DARE) and Indian Council of Agricultural Research (ICAR) are working towards enabling “Doubling of Farmers’ Income by 2022” on a mission mode. As per Union Budget 2017-18, allocation of USD 148.74 billion was made for agriculture sector and welfare of farmers. The INARES has been working for development of rural agriculture sector and farmers through agricultural research, education and extension. In view of importance of agriculture sector, Government of India took several steps i.e. to improve the soil health, to provide improved access to irrigation and enhanced water efficiency, to support organic farming, to support for creation of a unified national agriculture market, to mitigate risk in agriculture sector through crop insurance etc. for its sustainable development (India, 2018). Green revolution, Evergreen revolution, Blue revolution, White revolution and yellow revolution are known as milestones in Indian Agriculture. All these steps have been focused for development of the rural agriculture sector.

Recently on 20 June 2018, the Prime Minister Narendra Modi interacted with farmers via video conferencing. The Prime Minister highlighted the Government of India’s major schemes for boosting farmers’ income and other issues related to the farmers. He mentioned that the government has doubled the budget for agriculture to achieve its objective of doubling farm

income by 2022. Further he emphasised on the government policy for cutting input cost, fair price for the crop, preventing the produce from rotting and creating alternate sources of income for farmers.

The Government of India with private sector is planning to harness the big data in agriculture sector through big data analytics, artificial intelligence and internet of things for precision agriculture. Under the pilot project, crop yield prediction model will be developed using artificial intelligence in selected 10 districts so that real time advisories can be provided to the farmers. Government has been working on smart agriculture system like poly-house monitoring system that can create automatic SMS alerts for any change in temperature, humidity and soil moisture. (Haq, 2018).

With food prices rising and increasing incidents of extreme climatic events, the Food and Agricultural organisation of the United Nations (FAO) has identified Urban and Peri-urban Agriculture as a farming system. It can contribute to domestic food & nutritional security, jobs, improving urban ecology, sanitation, and sustainable urban development. The FAO defines urban and peri-urban agriculture as an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows and raises, processes and distributes a diversity of agriculture products, using largely human, land and water resources, products and services found in and around that urban area.

The rapid urbanization in India has been accelerated the demand for higher quantity of quality food such as fruits, vegetables, milk, meat and eggs, from the shrinking land, water and biodiversity resources. The urban and peri-urban agriculture is important in the context of an eco-friendly, productive and rising rate of urban poverty and population in India. The urban and peri-urban agriculture has significant scope in India in horticulture, aquaculture and livestock. In India various programs on urban and peri-urban agriculture were started in the last decade. In 2011-2012, the Government launched a scheme on Vegetable Initiative in Urban Clusters. In 2011, Department of Agriculture and Cooperation under Ministry of Agriculture issued guidelines for the vegetable initiatives for urban clusters. The scheme was launched in 2011–2012 under the Rashtriya Krishi Vikas Yojana or National Agricultural Development Scheme. The aim of this scheme is fulfilling the supply of vegetables in urban clusters from the nearby villages and peri-urban areas. The scheme has been implemented in one city in each of 30 states of India (Marshall and Randhawa , 2017). But it is also mentioned by Marshall and Randhawa (2017) that “In India, peri-urban areas are too often neglected. They are fraught with institutional ambiguity, unplanned growth, poor infrastructure and environmental degradation. Many people live in poverty and face increasing marginalisation and food insecurity. Yet peri-

urban agriculture could be a major contributor to poverty alleviation and food security.” Various case studies conducted on urban and peri-urban agriculture e.g. on the three largest urban areas of India i.e. Mumbai (18.4 million), Delhi (16.3 million) & Kolkata (14.1 million) and other big cities e.g. Bangalore, Chennai, Hyderabad, Udaipur etc. The Kerala state department of horticulture provides training to the farmers for promoting roof-top cultivation of vegetables in urban as well as Peri-urban areas. “Each district in Kerala has a minimum of 20000 roof-top cultivators” says K. Prathapan, Director, State Horticulture Mission (Agarwal and Sinha, 2017).

In 2013, the importance of urban and peri-urban agriculture is emphasised in the National Academy of Agricultural Sciences policy paper that urban and peri-urban agriculture should be viewed as an integral component of the national agricultural system to meet the changing food and livelihood demands and to balance the competitive uses of the natural resources (water, land, biodiversity, wastes).

4. Agriculture extension work in India

There are 690 KVKs, i.e. Farm Science Centers for agricultural extension work i.e. transfer of agricultural research and technology to the farmers in INARES. The 44 Agricultural Technology Information Centres (ATIC) established under ICAR institutes and SAU in various states of India employ thousands of Agricultural Extension Workers/Officers (AEW). Agricultural Extension Subject experts (AES) have been working in KVKs for providing agriculture extension and training to the farmers and AEW. There are more than 250 Agricultural Technology Management Agency (ATMA) at district level which are set up by Central Government to operate the extension reforms with active participation of farmers, NGOs, KVKs and other Stakeholder operating at district level and below. In each state, a State Agricultural Management and Extension Training Institutes (SAMETI) have been established. The SAMETI provides training and undertakes human resource development on the concepts and processes of ATMA to the extension functionaries. SAU plays major role in Indian agriculture extension system through Directorate of Extension, AES, KVK, SAMETI, ATMA, etc.

In 2010, Indian agricultural extension activities were reviewed with special reference to the farmers’ information needs. The study found that in the conventional approach of agriculture extension system, research is performed by researchers and the results are intimated to extension staff for dissemination to farmers, has produced numerous success stories, but it

has serious limitations for sustained agricultural growth and poverty reduction. It has failed to reach many of the farmers/actors who need information to improve their productivity and production, achieve food security, and create wealth. The study also mentioned that “the success of an extension approach will depend on how it enhances the information flow along the agriculture value chain” (Rezai, G. and others, 2016). Indian Farmers need information in their local language at the time of pre- cultivation, cultivation and post cultivation stages of agriculture farming.

Agriculture extension literature is produced by INARES in different forms (i.e. bulletins, popular articles, talks, training material), different formats (i.e. print/ digital/ audio/ video) and different languages (i.e. English, Hindi and various regional languages). Some important agriculture extension magazines/ periodicals/ bulletins published in India by various organizations are Indian Farming (English-Monthly), Indian Horticulture (English-Quarterly), Kheti (i.e. Farming) (Hindi-Monthly), Phal-Phool (i.e. Fruit-Flower) (Hindi-Quarterly), Krishi Chayanika (Hindi-Quarterly); Indian Farmers Digest (English-Monthly), Purvanchal Kheti (Hindi-Monthly), Unnat Krishi (Hindi bimonthly), Krishi Vistar Samiksha (Hindi-Bimonthly) etc. Training programs, AES lectures/talks, radio & TV talks etc. have also been organized for agriculture extension in India.

In the context of ICT, information has become vital source for world economy, science, technology, education, research and development, etc. In India, most of the villages are connected through telephone/mobile phone and millions of villagers are connected through Internet. Community Radio has also been started in agricultural extension by the SAUs for Indian farmers. In India, various initiatives have been taken in the area of ICT applications in agriculture extension by the Government. A comprehensive study conducted by Indian Council of Agricultural Research (2014) on development and analysis of ICT initiatives in agriculture to meet the information need of the Indian farmers covered 26 ICT initiatives in agriculture. The study found wide information gaps between agricultural research and farmers in India. The study also found that Mobile is the most popular ICT gadget followed by TV and Radio. Further, the study suggested a need to provide farmer queries in multimedia mode i.e. audio mode (in local language) along with digital mode i.e. text, image and video.

In India, it is observed that most of the SAUs, CUs, ICAR Institutes, KVKs, etc. are situated near the urban areas. Therefore, urban farmers have more advantages in terms of easy accessing the physical as well as technological facility/resources of national agricultural system as compared to the rural farmers. It is also a fact that literacy rate is high in urban areas in comparison to rural area. The ICT infrastructures are also developed in urban area than rural

areas. All these circumstances leads to the conclusion that urban farmers are more benefited through the digital agriculture extension services than rural farmers.

5. Indian Farmers and Digital Media

The Government of India is working hard on poverty alleviation & economic growth and to provide employment, food, water, electricity, rail, road, etc. to its citizen. It is also working on restoring its natural resources and agricultural development. The SDGs are an opportunity to renew and integrate efforts in order to meet the national challenges at a significant level in a defined time frame. Empowering farmers is one of the important contributions in growth and development of about 67% population of the country.

Traditionally, farmers are mostly depending upon ‘fellow farmers’ as the preferred source of information in India. Digital technologies play an important role in disseminating information to the farmers enabling them to decide on the cropping pattern, use of high-yielding seeds, soil testing, fertilizer application, plant disease, pest-management, marketing, etc. The Digital India is a flagship programme of Government of India with a vision to transform India into a digitally empowered society and knowledge economy. Under this program various projects e.g. Open Data, Soil Health Card, mKisan (mFarmer), Farmer Portal, Agrimarket app, etc. have been launched for farmers. Other programs e.g. KisanSuidha, e-PusaKrishi, AgriApp, KrishiGyan, *agropedia*, *e-krishi*, *e-chaopal* etc. based on digital information for farmers *have been started in India* (Digital India, 2018). The recent developments in the mobile, computing and networking technologies provide new ways of technology transfer. In India, total wireless mobile subscribers are 1162.47 million at the end of Oct. 2017. The Wireless subscriptions in urban areas are 664.94 million and in rural areas are 497.53 million in Oct. 2017. The number of broadband subscribers are 350.70 million (332.40 million on mobile devices) in 2017. India’s internet users grew by 40 percent while globally the growth was of 9 percent. In 2016-2017, growth of social media users in India was 40 percent (55 million), which was second highest in the world (Telecom Regulatory Authority of India, 2018). In last three years from 2014 to 2017, the monthly data usages in India increased 15 times. It was also found that the 4G data prices have fallen from an average of Rs 269 per GB in 2014 to Rs 19 in present time (Doval, 2018).

In 2015, Government of India launched ‘Digital India’ programme which has three core components i.e. creation of digital infrastructure, delivering services digitally and digital literacy. According to recent report of the United Nations e-Government Survey 2016, India’s

rank has improved in the UN e-governance index. The Survey has shown India's all progress on the e-government Development Index, with a ranking of 107 out of 193 countries as against 118 in 2014. In e-participation, India ranks 27 as against 40 out of 193 in 2014. Digital India envisions empowering citizens with e-accessibility. Mobile phone is the preferred delivery medium under Digital India with focus on mAgriculture and mGramBazar. The Government of India started KisanSuidha mobile app is developed to provide relevant information to the farmers. This app covers information on weather of current day and next 5 days, market prices, agro advisories, plant protection, and Integrated Pest Management practices. According to ICRISAT, the greatest need is to deliver targeted and timely information to farmers based on their needs. ICRISAT has developed KrishiVani – Voice message based agro-advisory. Under this service a special SIM card for mobiles is used to send up to 35 voice messages per week free by subject specialists to the farmers in the regional language. The messages are related to weather, market, crop information, government schemes, livestock, etc. This model is being implemented in Karnataka, Telangana and Andhra Pradesh states of India with the help of Airtel and IFFCO Kisan Sanchar Limited (ICRISAT, 2018). Following are some useful websites for Indian farmers.

- Farmer portal <http://farmer.gov.in/>
- Extension Reform Monitoring System <http://extensionreforms.dacnet.nic.in/>
- State Institute of Agriculture Extension and Training <http://siaet.nic.in/>
- Agropedia <http://agropedia.iitk.ac.in/>
- Gyandoot Project (Cyber café cum Cyber Offices)
<http://www.dhar.nic.in/gyandoot.htm>
- e-Sagu (i.e. e-cultivation) <http://www.esagu.in/>
- Rice Knowledge Management Portal <http://rkmp.co.in/>
- Agmarketnet <http://agmarknet.nic.in/>
- mKisan: A Portal of Government of India for Farmer <http://mkisan.gov.in/>
- KrishiVigyan Kendra <https://kvk.icar.gov.in/>
- Knowledge Innovation Repository of Agriculture in North East
http://www.kiran.nic.in/about_us.html
- ICAR – Query Management System <https://qms.icar.gov.in/etc>.

6. Empowering Indian Farmers to Achieve SDGs in India:

The developments in digital technologies have been opened up new avenues for improving reach of agricultural extension services to urban and rural farmers through digital media. There is an urgent need to do efforts to utilise the already developed agriculture extension

infrastructure for urban farmers also through digital media. The use of latest digital media in agriculture extension will be beneficial for both urban and rural farmers of India. The main focus of national agriculture extension system of India is to disseminate advice, information and knowledge, and transfer technology to the rural farmers using KVK and ICT. Agriculture extension activities need to be more emphasised through digital media to easy and cost effective access of information. So that present agriculture extension system can be utilized for both rural and urban farmers. The global case-studies discussed how wireless broadband plays a key role in rural society, impacting GDP, productivity and employment. The study undertaken across 26 Latin American countries between 2003 and 2009, it was observed that a 10 percent increase in broadband penetration resulted in an average increase of 3.19 percent in per capita GDP (Soni Kumari, 2016). The advantages of using social media in agricultural extension are mentioned below (Saravanan et al., 2015):

- Highly cost effective;
- Simultaneously reaches large numbers of clients;
- Location and client specific, problem-oriented;
- User-generated content and discussion among the community members;
- Easily accessed from mobile phones;
- Increases internet presence of extension organizations and their client reach;
- Democratization of information by making it accessible to all;
- Brings all stakeholders into a single platform;
- Can measure reach and success by tracking number of visitors, friends, followers, mentions, Facebook 'likes', conversation index and number of shares.

Digital media can be created, viewed, distributed, modified and preserved on digital electronics devices. Examples of digital media include software, digital images, digital video, video game, web pages and websites, including social media, data and databases, digital audio (such as MP3), digital text and electronic books. The following steps may contribute to empower the urban and rural farmers to achieve the SDGs:

- Agricultural extension literature should be produced as digitally born and also with multimedia forms i.e. audio, video and text;
- Agricultural extension literature should also be produced in multilingual forms including local /regional language so that local farmers can understand and utilize the literature;

- Digital audio/video form of the literature should be created through software with the help of AES;
- Audio/video form of agricultural extension literature is more useful for farmers to understand easily by both literate and illiterate farmers;
- Some equipment and software which are used in braille library may be useful to convert the printed literature in digital form and digital literature in audio form;
- Libraries of agricultural universities and ICAR institutions can contribute in digitisation, organisation and management of agricultural extension literature in digital media;
- Agriculture extension services may be provided by agriculture extension unit of national agriculture system through digital literature;
- Mobile based agriculture extension literature can be accessed easily in urban India;
- Web-based agriculture extension literature may be more beneficial for urban farmers;
- Social media/ appservices should be launched through smart phones for agriculture extension services. It is found that WhatsApp has become very popular among rural and urban India. WhatsApp can be utilized for effective agriculture extension services. It can play a very significant role among rural and urban farmers;
- AES and Agricultural extension workers may play significant role to engage farmers through social media. Sharing of authentic and relevant digital information is required to build the trust among farmers community;
- Agriculture marketing system needs to be strengthened using social media / apps in local as well as regional areas. So that farmers may get competitive price of their products;
- Digital media and ICT infrastructure should empower officers and extension workers of government, which may utilize these infrastructure for providing information services to the farmers;
- Agriculture extension trainings are organized by SAMETI/KVK/SAUs for few selected farmers only. Digital video recording of these training sessions may also be made available to farmers through digital media to the larger community of farmers;
- Digital and information literacy are required for rural as well as urban farmers;
- Internet facility should be provided free of cost or at nominal rates to the rural farmers to encourage the use of digital information, social media, etc;
- Urban agriculture should be included in smart city program of the Government;

- A policy initiative at the government level is required to use the digital media and digital information through mobile, web, social media, etc. for agricultural extension.
- Overall, digital information/ digital media will improve productivity and also income of farmers for achieving SDGs in India.

7. Conclusion

Several measures have been taken by Government of India and INAERS for encouraging Indian farmers to be more ICT friendly. It is also a fact that modern agricultural research and technology is out of reach of most of the farmers due to limited manpower for agricultural extension system in India. The Government of India launched the Digital India Programme to transform India into digital empowered society and knowledge economy. By 2019, the 'Digital India' program envisages that 250000 Indian villages will be connected through broadband. The digital media is one of the important tools to literate and provide information to the farmers about modern agricultural research and technology (Soni Kumari, 2016). Until December 2017, 100000 gram panchayats (Village Government) connected through optical fiber cable under Phase I of the project (Das Gupta, 2018). Therefore, the Digital India has been reaching in Rural India. The problems and queries of farmers can easily be solved using digital media in agricultural extension system. The multimedia and multilingual digital literature is easy to understand by the literate as well as illiterate farmers. The digital media can play a vital role in improving the economic & social conditions as well as poverty alleviation of Indian farmer community by providing agriculture extension information services and AES support. Encouraging organic farming in urban areas may fulfill the demand of fresh and healthy fruits and vegetables in urban areas. The key players in transforming the agricultural information and technology are agricultural extension workers and AES of INAERS. Use of digital media / apps and social media should be encouraged in KVKs and INAERS. The library professional working in INAERS may play an important role in digitization and management of agricultural extension literature. There is an urgent need for planning of agriculture extension work using digital media through agricultural extension workers, AES and library professionals of INAERS. The end of poverty and hunger are directly or indirectly related to all SDGs of United Nations. Therefore, the role of digital media is very important for transferring agricultural information and knowledge among Indian farmers to achieve SDGs in India.

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