

Role of Krishi Vigyan Kendras in Strengthening Agriculture Extension in India

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ABSTRACT: Krishi Vigyan Kendras (KVKs) are an important component of the agricultural extension services in India. The network of KVKs, established throughout the country, has played an important role in the “lab-to-land” transfer of technologies. It helps in the innovation, refinement and diffusion of technologies and knowledge to the farming community. It acts as an interface between researchers and farmers, and thus, helps in the development of agricultural practices suitable for specific agro-climatic zones. Besides its core activities, it also encourages entrepreneurship among the rural workforce through various vocational/skill training programmes. It is working in sync with the various government initiatives, and helping to enhance farmers’ income. Ever since its inception, it has undergone various changes to become more pro-active and efficient. Since it works at the grass-roots level, with each district having at least one KVK, it is critical for the evolution of Indian agricultural system, which needs to be future-ready, sustainable as well as profitable for the farmers. This communication provides an insight of KVKs along with its possible advancement and opportunities to handle the current as well as upcoming challenges in Agriculture sector.

Keywords: Krishi Vigyan Kendras, Agricultural system, Agricultural extension, Information and Communication Technology.

INTRODUCTION

Agricultural systems are under a lot of stress due to growing population, coupled with climate change. The world food production needs to increase by 60 percent to meet the global food in 2050 (Hunter *et al.*, 2017). The agriculture industry plays a significant part in the Indian economy, accounting for approximately 20% of GDP. Around 62 percent of India's population is reliant on it for survival (Gupta & Nagar, 2017). The task is enormous considering the depleting agricultural resources, like arable land and water for irrigation. The situation is even more serious for India. According to United Nations projections, India's population is expected to reach 1.64 billion by 2050, surpassing China as the most populous country (United Nations, 2019). The number of farmers has declined, and a variety of reasons contribute to the low yield of existing farmland. Non-agricultural vocations and employment in non-agricultural industries are becoming more popular among the youth. As a result, urbanising populations face urbanisation, changing lifestyles, and food security issues (Agarwal & Sinha, 2017). The divergence of agricultural land and water resources for non-agricultural purposes has put tremendous pressure on natural resources. Arable land is continuously shrinking in India with only 0.3 hectares per farmer in 2005, compared to 0.32 hectares per farmer available in 1995 (FAO, 2007). Similarly, only 32.9 percent of the total agricultural land was irrigated in 2003 (FAO, 2007). In order to ensure food and nutritional security

of this growing population, India needs to make rapid improvements in agriculture. Besides, being an agrarian society with 55 percent of the population involved in agriculture and allied activities, India needs to enhance the profitability of the agricultural sector. The Indian government has set an ambitious target of doubling farm income by 2022 (IBEF, 2021). In order to achieve this objective, the government is investing heavily in agriculture and has launched a number of initiatives (IBEF, 2021). Since the scope of increasing agricultural production through expansion of cultivated land is limited, the focus should be on increasing the productivity. Despite of tremendous progress of Indian agriculture over the years, the productivity remains very low compared to other countries. Besides, agriculture has become resource intensive, which is not good for the environment. The situation is worsened due to climate change, which has increased the frequency, intensity and impact of extreme weather events (Seneviratne *et al.*, 2012). Besides, the changing life-style and food habits has led to nutritional deficiency and many life-style diseases (Sharma and Majumdar, 2009). Hence, to ensure food and nutritional security in the coming decades, it is imperative to increase the productivity and profitability of Indian agriculture in a sustainable manner and make agriculture climate resilient.

Agricultural innovations and diffusion of these innovations to farmers is necessary to ensure food security for the country. Besides, these innovations increase the efficiency of farming, leading to higher

yields and profits. A large number of research institutes are developing technologies for agriculture and allied sectors, such as high-yielding crop varieties. However, these modern agricultural innovations should reach the farmers. The “lab to land” transfer of technology is necessary to realize the full potential of these innovations. Farmers must be given access to modern agricultural technologies, along with the necessary inputs and related information. The Government of India through the Indian Council of Agricultural Research (ICAR) has established a network of Krishi Vigyan Kendras (KVKs) throughout the country for transfer of agricultural technologies and knowledge to the farmers. This objective of this review is to analyse the role of KVKs in advancing Indian agriculture, and its evolution according to the current agricultural scenario.

A. Evolution of KVKs

The idea for the establishment of Farm Science Centre or KVKs was developed in 1973 (Singh *et al.*, 2019). The first KVK was started on a pilot basis at Pondicherry in 1974 under the aegis of Tamil Nadu Agricultural University, Coimbatore. Over the next 10 years, more KVKs were established in different parts of the country. In 1984, after a performance evaluation of the KVKs, the ICAR strongly recommended the creation of more KVKs throughout the country (Singh *et al.*, 2019). At present, there are 719 KVKs in the country sanctioned to agricultural universities (central and state), ICAR institutes, related government departments, and NGOs (non-governmental organisations) working in agriculture (Fig. 1, 2). It has been developed to reduce the time taken for transfer of technology from the research institutes to fields.

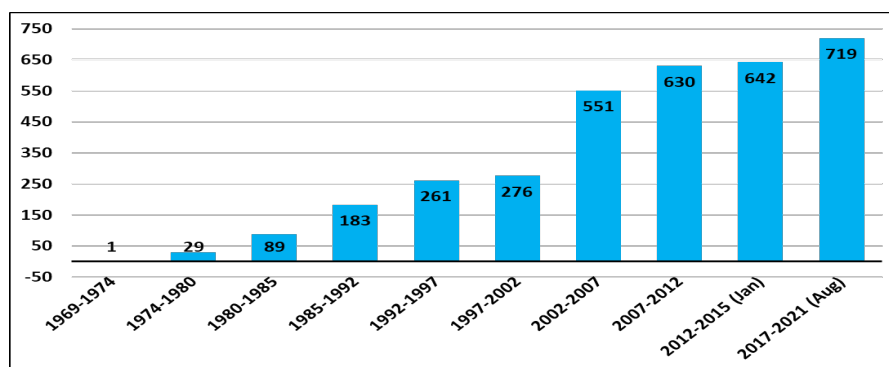


Fig. 1. Growth of KVKs in India.

KVKs are an important part of the National Agricultural Research System (NARS). It acts as knowledge and resource centre of agricultural technology. It is the only institution at district level in India for technological support to agriculture and allied activities. It acts as a two-way link between farmers and

researchers, and helps in the refinement of technologies to specific conditions. The main mandate of the KVKs is the application of technology/products through assessment, refinement and demonstration. It is expected to perform certain functions, like on-farm testing, frontline demonstrations and training.

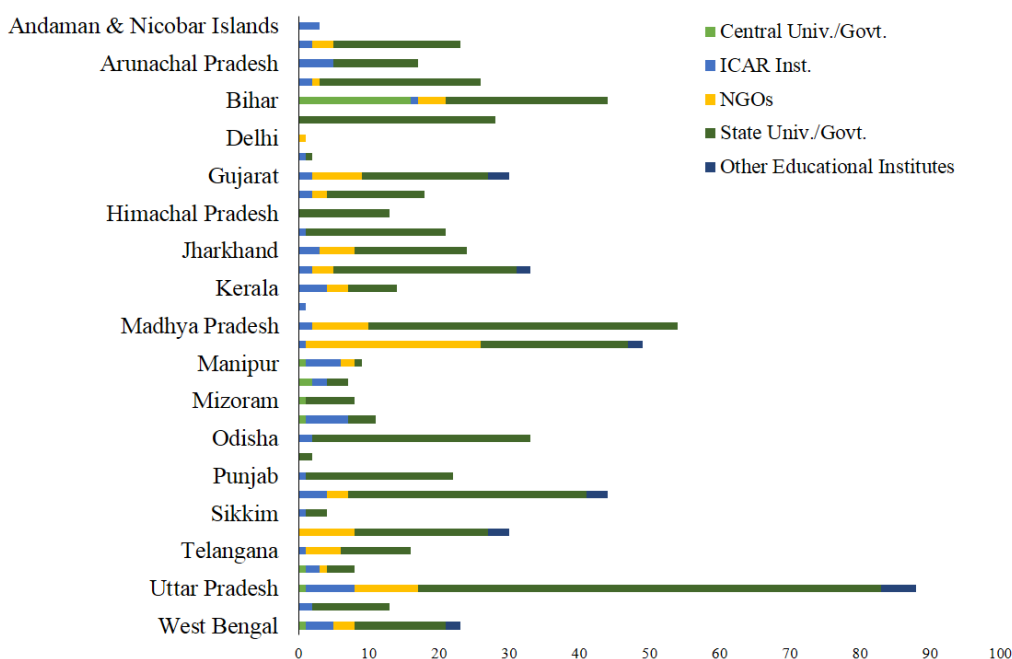


Fig. 2. Geographical distribution of KVKs in India.

Performance audit of agricultural extension activities in the ICAR found many irregularities in the functioning of the KVKs (Comptroller and Auditor General of India, 2008). While some KVKs were performing effectively, many were plagued with various problems. There were variations in the diffusion of knowledge and technology. Many KVKs did not have proper infrastructure, while those with proper facilities did not utilise them. Many KVKs did not conduct trainings or location-specific trainings. Many filed demonstrations were done using older crop varieties (Comptroller and Auditor General of India, 2008). In order to overcome the shortfalls and improve the functioning of the KVKs, a review committee was constituted by ICAR in 2014 (ICAR, 2014). According to the recommendation of the committee (ICAR, 2014), the vision, mission and mandate of the KVKs were redefined. The present mandate of KVK is “Technology Assessment and Demonstration” for its “Application” and “Capacity Development” (TADA-CD) (ICAR 2021). In order to implement the mandate effectively, the KVKs are expected to perform the following activities:

- 1. On-farm testing:** Assess the location specificity of agricultural technologies under various farming systems.
- 2. Frontline demonstration:** Establish production potential of technologies on the farmers’ fields.
- 3. Capacity building:** Farmers and extension personnel are trained to update their knowledge and skills on modern agricultural technologies.
- 4. Knowledge and resource centre:** Hub for agricultural technologies for supporting public, private and voluntary sector initiatives in improving the agricultural economy of the district.
- 5. Extension services:** Farm advisories using ICT and other media means on varied subjects of interest to farmers.

B. Challenges in agricultural extension

Agricultural extension in India is a challenging job (Kaegi, 2015). It is faced with many challenges, such as lack of qualified professional who are ready to do field work in remote areas of the country. In addition, they are often burdened with a broad range of responsibilities covering different aspects of agriculture.



Fig. 3. Challenges in public agricultural extension.

Fig. 3 highlights the challenges of public agricultural extension services in a more comprehensive manner. One of the biggest challenges for agricultural extension in India is the lack of desired strength of technically competent workforce. The government employs around 1.2 lakh extension professionals around the country. If the number of vacant positions (around 30 percent) are considered along with workforce of the ICAR, Central and state agricultural universities and KVKs, then public extension employs the maximum number of people engaged in the service of farmers in India. However, supervisory and administrative positions make up around 15 percent of the workforce who are not available for field level extension services, affecting the ratio of farmers to extension personnel of 1156:1 even further. Besides, extension services are required to cover broad spectrum of agriculture, including horticulture, animal husbandry, fisheries and others. However, there is a shortage of technically competent extension professionals and proper infrastructure in sub-sectors of agriculture. Other sectors of agriculture, such as horticulture, animal husbandry, fisheries, livestock and dairy, and plantation, are expected to be the drivers of change for the agricultural sector in India in the coming future.

Further, there are many limitations of the KVKs at present, such as poor utilization of resources, and lack of suitable infrastructure. Besides, there is a lack of linkage with research and marketing system. Post-production technologies and secondary agriculture are neglected in the extension services. The training and knowledge imparted is often generalised, outdated and repetitive with, no emphasis on innovation. Hence, there is an imperative need to strengthen the extension services in all sectors of agriculture. Extension services need to be upgraded according to the latest developments, with special focus on the neglected sub-sectors. The strategy of the extension services should be in sync with the national policy of doubling farmers’ income.

C. Role of private institutions in agricultural extension

The private sector caters to different requirements of the agricultural sectors, such as input and services. Crucial inputs of agriculture, such as seeds, fertilizers, pesticides and farm machinery are provided by the private sector. Besides, they are also providing various agricultural services, such as credit facilities, insurance, contract farming, export and others. Various private stakeholders, such as progressive farmers, farmers’ organisations, and cooperatives are involved in extension services. Similarly, the private sector is also involved in extension services through agri-entrepreneurs, input businesses, NGOs, private banks, donor agencies, private media agencies and consultancy firms. The involvement of the private sector is often theme/area-specific, with its operation being market and profit oriented. Hence, the extension services provided by the private sector is often more result-oriented, but limited in area and reach. The private extension services are more active in irrigated areas with intensive cultivation of commercial and plantation crops. It often deals with big farmers,

catering to their specific needs while promoting their own products and services. As a result, a large majority of farmers, especially small and marginal farmers in rainfed areas, are devoid of extension services by the private sector. Hence, it is imperative for the public extension services to continue their services, with special focus on the small and marginal farmers.

There are numerous concerns and challenges regarding the involvement of private agencies in agricultural extension service in India (Sajesh and Suresh, 2016). For instance, accountability to farmers and after sales services. The exploitive tendency of private agencies with emphasis on profits and market share is a cause of concern. Similarly, the private sector is driven by incentives which are not much with limited policy support of the government. In addition, the scale and reach required to cover the entire country is not available with the private sector. The linkage and coordination between private and public extension services is almost negligible. It needs to be supported and coordinate with private extension service providers through PPP models for delivering end-to-end solutions to the farmers. The government needs to identify the scope and areas of partnership with proper delineation of operational areas to ensure the universal reach of extension services. KVKs and private extension services should supplement and complement each other by working together. While the public extension services can focus on the majority of small and marginal farmers, the private extension agencies can concentrate on the small number of resource-rich large farmers.

D. Role of ICT in extension services

Information and Communication Technology (ICT) is an important technological development that has revolutionized almost all sectors of the economy. Information dissemination to every nook and corner of the country using different tools of the ICT, such as print media (newspapers, magazines), electronic media (television and radio) and information technology tools (internet and mobile-based technologies), has become possible. It can be done in real-time and in a cost-effective manner. It eliminates communication distortion which is very common in human-based extension. As a result, it is even suggested that that ICT can substitute manpower in extension services to a large extent. Hence, the strengths and limitations of ICT in agricultural extension needs to be analysed critically for its optimum utilization.

Human-based extension services are backed by institutions and help in changing the perception of farmers through confidence building measures, whereas ICT emphasizes on transfer of messages rather than adoption by the farmers. In addition, the farmers always doubt the source and intention of information delivered through ICT tools. Besides, information received through different ICT-mediums causes overlap, leading to doubts over the credibility of such information.

Scientific studies have established better learning outcomes through human intervention when multiple senses are involved. Hence, ICT tools can be used effectively to create awareness, interest and desire among the farmers during adoption stages. ICT can supplement the manpower-based extension efforts of both public and private agencies, and contribute in the delivery of credible extension services in real-time in a cost-effective manner.

E. Impact of KVKs

The impact of KVKs can be gauged by the advancement of agriculture in the country. The National Commission of Farmers has described knowledge deficit as a serious issue directly affecting agricultural productivity (NCF, 2004). Significant gaps were found in forward and backward linkages between farmers and agricultural research institutes, leading to improper technology transfer. The 10th & 11th Five Year Plans of the Government of India emphasized for effective agricultural extension services while stating, "In the longer run, growth in agriculture productivity can be sustained only through a continuous technological progress". Thus, high priority should be given to research as well as transfer of its results to farmers (ICAR, 2015).

A study by ICAR to evaluate the impact of KVKs on the dissemination of improved practices and technologies in 2015 found significant differences in the performance of different KVKs (ICAR, 2015). Many KVKs were found to be deficient in capacities, in terms of knowledge about emerging technologies, scientific equipments, and human resource. Various KVKs were plagued by inadequate infrastructure, low visibility and locational constraints that led to limited farmer outreach. Adequate measures are needed to develop KVKs as one stop resource centre for all agricultural and allied activities, providing a wholesome package to farmers.

The main objective of agriculture extension services is technology transfer through upgradation of knowledge and skills of the farmers. After the introduction of KVKs in 1974, the agricultural sector has shown significant growth. The much-celebrated Green Revolution in India was not just a result of high yielding varieties and increased use of fertilizers, but also the effective extension services. In fact, the agricultural sector has continued its growth trajectory as is evident from the growth in various indexes, such as crop, food and livestock (Fig. 4).

Agriculture is highly dependent on inputs which determine the outcome of the agricultural production to a large extent. The use of high-quality crop varieties, coupled with the judicious use of fertilizers and biocides help unlock the full potential of the agricultural process. Similarly, farm machineries bring efficiency in agricultural operations. In addition, increase in coverage of irrigation allows agriculture independent of rainfall conditions.

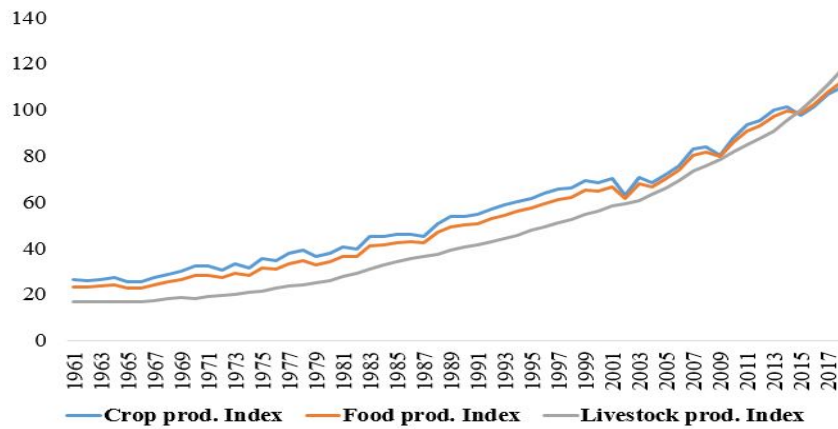


Fig. 4. Increase in agriculture & allied activities (*Base year: 2014-2016 = 100) (The World Bank, 2021).

The growth in use of agricultural input gives an indirect indication of the growth of the agricultural sector, which in turn points to the impact of KVKs in adoption of quality agricultural inputs and management practices (Fig. 5). The KVKs played an important role in the popularization of farm machinery among farmers through demonstrations and trainings. Similarly, the use of high-quality crop varieties and fertilizers was encouraged by the KVKs through field-level demonstrations. The net irrigated area under cultivation was increased through the use of groundwater resources, along with construction of canals and other

measures. All these measures by the KVKs have led to drastic improvement in agricultural yields (Fig. 6). Apart from making the country self-sufficient in food production, success of the extension services can be gauged from the fact that India is now a leading exporter of many agricultural commodities, including rice, wheat, cotton and others. In addition, socio-economic status of farmers has improved in the country with increase in per capita income. However, the changing climatic conditions as well as the stagnation in agricultural growth, demands for innovation in extension services to make agriculture future ready.

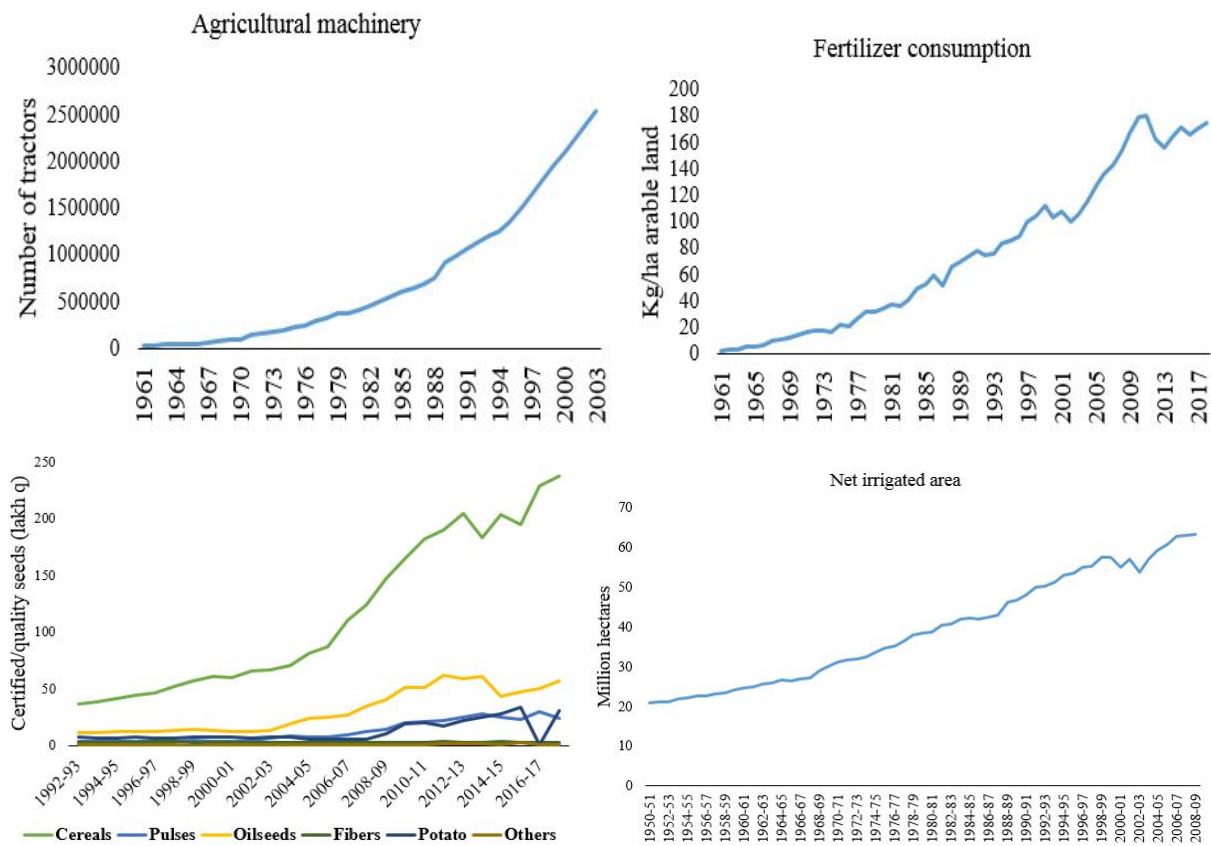


Fig. 5. Increase in the use of agricultural inputs (FAO, 2019).

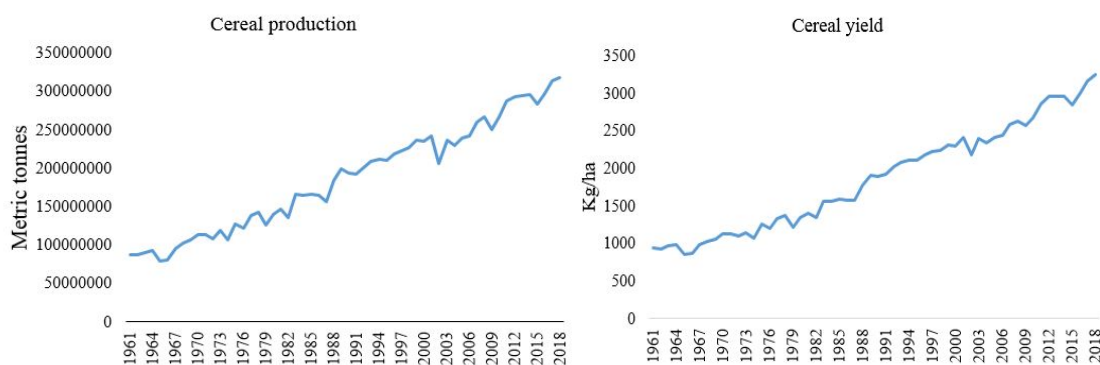


Fig. 6. Increase in production of cereals (FAO, 2019).

F. Reorientation of KVKs

Agricultural extension has evolved in terms of scope, well beyond the traditional role of increasing production for national food security. It has to innovate to meet the challenges of the future and align with the national policy of doubling farmers' income. Hence, agricultural extension needs to be re-defined as a techno-social support system for development of farmers to achieve enhanced incomes from farm, off-farm and non-farm activities.

The (DFI_Committee, 2017) defines agricultural extension as “a system of empowering farmers with information, knowledge, technology, skills, risk & farm management practices, across all sectors and stages of agriculture, for increased profitability in a sustainable manner”. Accordingly, the KVKs must focus on empowering farmers through better transfer of technologies. In addition, it should impart knowledge for better farm management practices to make judicious use of resources and mitigate risk during all stages of agriculture. In addition, it should cover all the sectors of agriculture, including crops, horticulture, animal husbandry, fisheries, milk & dairy, plantation and others. Secondary agriculture should be the prime focus of agricultural extension for value addition. Besides, farmer should be made an active and legitimate stakeholder at every stage of value addition. Overall, the KVKs should focus on ensuring the sustained growth of farmers' income.

The existing network of KVKs should be strengthened for real-time delivery of information using various ICT tools, such as television, radio, internet, and mobile. All the sectors of agriculture should be given equal focus, with upgradation of extension services offered for crops. Similarly, extension services for other sub-sectors, such as horticulture, animal husbandry, fisheries and others, should be supported with better infrastructure facilities. Farmers should be integrated with agri-value chain systems, offering ease of access to different facilities, like logistics, storage warehouses, and post-harvest marketing. The KVKs should introduce new technologies to the farmers, along with different promotion schemes of the government, for faster adoption. For instance, the micro-irrigation techniques, and precision agriculture align with the government's call for increased productivity via “more crop, per drop”. The KVKs must act as a link between the farmers and governments. Effective use of

agricultural inputs, such as fertilizers and pesticides, should be encouraged through introduction of scientifically-validated technologies. In addition, agro-processing industries should be promoted to supplement the income of farmers. Farming must be developed as an enterprise with focus on developing the entrepreneurial skills of farmers for better management of their farms, as well as small-scale agro-industries. The whole effort of the KVKs should be on the intensification and diversification of agricultural activities for higher income generation through farm, off-farm and non-farm activities. Hence, the KVKs must aim to increase production, productivity and farm income in a sustainable manner with a farmer-centric approach.

CONCLUSION AND FUTURE SCOPE

The changing dynamics of agriculture in the country necessitates a fresh approach to agricultural extension in the country. A farmer-centric approach should be adopted to make agriculture viable. Climate change and depleting agricultural resources will challenge the food and nutritional security of the county in the coming decades. Hence, the need of the hour is to make agriculture future-ready through the innovation use of various resources. KVKs will play a major role in this endeavour by being at the forefront of change. It will be the crucial link between researchers and farmers for the translation of modern agricultural technologies to the farm. Similarly, through emphasis on various sub-sectors of agriculture and secondary agriculture, KVKs will ensure more income for the farmers and help in doubling their income.

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Conflict of Interest. The authors declare that they have no conflict of interest regarding this study.

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