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Role and impact of KVK for rural communities: A review

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Abstract
KVK is an integral part of the National Agricultural Research System (NARS), established at the district level throughout the country, and is playing an important role in the "lab to land" transfer of technologies. The KVK aims to assess location-specific technology modules in agriculture and allied enterprises through technology assessment, refinement, and demonstrations. The KVK is a medium between farmers and researchers to develop suitable agricultural practices for different agro - climatic zones. KVKs act as the Knowledge and Resource Centre of agricultural technology of the district. After its inception in 1974, it has become more proactive, farmer-centered, efficient, actively involved in entrepreneurship and skill development through various programs, and provides required advisory services whenever needed through various means of ICT. It works at the grassroots level with a team of multi-disciplinary subject matter specialists to implement suitable location-specific technologies through innovations, refinement, and diffusion, which is the need of the hour for the socio-economic upliftment of the farmers. The KVK is involved in the assessment of productivity performance, adoption of technologies introduced, and its horizontal spread. There has been a positive impact of the KVK activities on the farming communities, which has led to improvements in skills, better productivity, and entrepreneurship development among youths and farm women. The review provides insight into the programs organized by the KVKs and their impact on rural communities.

Keywords: Krishi Vigyan Kendra, Agricultural extension, Entrepreneurship, training, skill development

Introduction
India has a predominantly agrarian economy, where 58 percent of the population (IBEF, 2021) [6] and approximately 70 percent of the rural households depend on agriculture only. Traditional farming practices coexist with modern and technology-driven agriculture. It plays an important role in the process of socio-economic development. The agriculture industry accounts for around 20.19% (DAC&FW Annual Report, 2020-21) of the Gross Domestic Product (GDP)in the Indian economy, and around 62 percent of India's population is reliant on it for survival (Gupta & Nagar, 2017) [4].

Presently Indian agriculture system is under stress due to the growing population and climate change. There is a need to increase world food production by 60 percent to meet the global food demand in 2050 (Hunter *et al.*, 2017) [5]. The farmer's numbers are decreasing day by day, and movement from rural to urban areas is increasing. There has been diversion of agricultural land and water resources for non-agricultural purposes, which has put a lot of pressure on natural resources. Despite the tremendous progress of Indian agriculture over the years, productivity continues to be very low compared to other countries.

The Education Commission (1964-66) and discussion of the Planning Commission and Inter-Ministerial Committee as well as recommendation by the committee headed by Dr. Mohan Singh Mehta appointed by ICAR in 1973 the idea of establishment of Farm Science Centre (Krishi Vigyan Kendra) was developed and the first KVK, on a pilot basis, was established in 1974 at Pondicherry under the administrative control of the Tamil Nadu Agricultural University, Coimbatore.

About KVK
Presently we have 731 KVKs across the country under 11 ATARI (Agricultural Technology Application Research Institute) sanctioned to Agricultural universities (central and state), ICAR institutes, related government departments, and NGOs (non-governmental

organizations) working in agriculture to ensure that the technology developed at lab is being taken at farmers field for diffusion to increase the efficiency of farming, leading to higher yields and profits. It is an important part of the National Agricultural Research System (NARS) and acts as a knowledge and resource center of Agricultural Technology. It is the only institution at the district level in India for technological support to agriculture and allied activities, acts as a two-way link between farmers and researchers, and helps in the refinement of technologies in location-specific conditions. The main mandate of the KVKs is the application of technology/products through assessment, refinement, and demonstration. 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) [16]. The number of KVKs is increasing day by day from 1 KVK in the IV plan to 731 KVKs in the XII plan. To make KVK more effective and relevant under changing scenarios, various committees were formed to review the progress and suggest much-needed improvements for their functioning. Based on their suggestions and keeping in view the emerging challenges before Indian agriculture, like slow productivity growth rate, diminishing returns, degradation of natural resources, climate change, competitive trade regimes, changing consumer demands, etc., it has become of paramount importance to further strengthen the KVK system (Report of the High power committee management of KVK, 2014).

The present mandate of KVK is "Technology Assessment and Demonstration" for its "Application" and "Capacity Development" (TADA-CD) (ICAR 2021). 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 the 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 center:** 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.

Objectives of KVK

1. To demonstrate the new improved technology to the farmers as well as to the extension agency directly in the farmer's field with their active participation.
2. To identify the area-specific problems of the farmers and prioritize the identified problems according to their importance.
3. To collect feedback from farmers and extension agencies and to provide linkages with scientists for the modification or refinement of technology.
4. To impart training to the practicing farmers, rural youth, and extension functionaries for capacity building.
5. To provide new and important information on agriculture and allied sectors to the extension agencies or NGOs for wider circulation to improve their economic condition.
6. To prepare different extension models and verify these models in the farmer's field with their participation to create confidence among them.

Role of KVK for rural communities

KVKs play a crucial role in the development of rural communities, particularly in the agricultural sector. KVKs are agricultural extension centers that have been established by the Indian Council of Agricultural Research (ICAR) to bridge the gap between agricultural research and the farming community. The major key roles of KVKs for rural communities are as follows:

A. Transfer of Technology

KVKs act as a conduit for transferring agricultural technologies from research institutions to farmers. Location-specific research findings and innovations are chosen and disseminated to farmers at the grassroots level so that it has an impact. Transfer of technologies is done through demonstrations and field visits to empower the farmer with the required knowledge and skills to improve productivity. The various technology transfers are being promoted by KVK.

1. **HYV:** HYVs of crops are introduced that are suited to local agroclimatic conditions.
2. **IPM:** Use of Biological control, cultural practices, and pesticides in a judicious manner to manage pests and diseases.
3. **Crop management practices:** Use of a proper package of practices for crops.
4. **Livestock management:** It includes the following: better animal husbandry practices, breed improvement, nutrition, housing, and disease management
5. **Soil health management:** Soil testing, Soil management, fertilizer use, and methods of organic amendments.
6. **Water Saving Technologies:** Drip irrigation, Sprinkler system, and methods to increase water efficiency.
7. **Aquaculture:** Fish farming, Pond management, fry/fingerling production.
8. **Farm mechanization:** Introduction of farm machinery based on local needs to improve efficiency and reduce labor costs
9. **Organic /Natural Farming:** Vermicomposting and use of the cow-based farming system
10. **Sericulture/ Apiculture:** Rearing of Muga /Eri silkworms / Honeybees for honey for additional income.
11. **Climate-smart agriculture:** Use of climate-resilient technologies

B. Training and Capacity Building: Training and capacity building are integral components that are aimed at enhancing the knowledge and skills of farmers, farm women, rural youth, and other stakeholders in the agriculture sector

- **Training for farmers, youth, and women empowerment**: KVKs organize various training programs for farmers, youth, and women empowerment to enhance their knowledge and skills in modern agricultural practices for generating income. Training and capacity development programs cover crop cultivation, animal husbandry, horticulture, agro-processing, organic farming, and the use of modern agricultural technologies
- **Vocational training programs.** The vocational training program helps in upgrading the required skills for entrepreneurship development.

- **Technology Awareness Workshops:** Organized to create awareness about new and advanced agricultural technologies among farmers, like ICT, precision farming, and sustainable farming.
- Collaboration with different stakeholders and capacity building of extension workers

C. Demonstrations: KVKs conduct on-farm demonstrations to showcase new and improved agricultural practices, technologies, crop varieties, different breeds of livestock, aquaculture, apiculture, mushroom production, post-harvest management of crops, and processing of various fruits and vegetables etc. Demonstrations make it easier for the farmers to adopt the technology at their households/farms.

For a successful demonstration, the following methodology is involved:

1. Technology selection as per the needs of local agroclimatic conditions.
2. Identification of suitable sites along with the farmers.
3. Preparation of demonstration plots, sowing, and monitoring.
4. Observation by technical staff and farmers, and finding the solution if any problem arises.
5. Data collection and feedback.
6. Scaling up for the spread of the technologies to be adopted by a large number of farmers

D. Seed Production and Distribution: KVKs have facilities for seed production and contribute to the production and distribution of quality seeds, which helps farmers access better seeds, leading to improved crop productivity. KVKs that have land provide training programs on quality seed production, which include:

1. Selection of the right crop/varieties.
2. How to grow crops for seed production.
3. Seed harvesting, processing, and grading.
4. Moreover, in the absence of seed production facilities, farmers are provided with quality seeds purchased from reputed seed companies. The seeds so distributed are monitored for their yield performances, and feedback obtained is studied for further research and innovation. In case of natural calamities, KVK provides some amount of seeds to the farmers as contingency measures.

E. Soil Health Management/ Natural Farming: KVKs offer guidance on soil health management practices, including soil testing, nutrient management, and the use of organic and green manures. This helps farmers maintain soil fertility and optimize crop yields.

1. **Soil Testing Services:** KVKs provide soil testing advice services to farmers, enabling them to understand the nutrient status, pH levels, and other important characteristics of their soils and inform them regarding nutrient management and fertilizer application doses.
2. **Nutrient Management:** KVKs give the farmers recommendations regarding balanced nutrient management to meet the demand of the plants /crops without causing imbalances.
3. **Natural farming**: A new introduction and mainly cow-based, where Beejamrit (treatment of seeds using cow dung, urine, and lime-based formulation), Jeevamrit (a rich source of NPK),whapsa (Process which involves activation of earthworms in the soil to create water vapor), Mulching (use of biomass to conserve moisture), and plant protection. (Spraying of biological concoctions that prevent weeds, pests, and diseases protects the plants and improves soil fertility) are used.

F. Livestock production and management: Livestock is an important component for rural farmers as it supports them in improving the socio-economic conditions by selling their livestock and nutritional benefits by consumption of meat, milk, and eggs. Some important activities under livestock include.

1. **Breed Improvement/ introduction:** KVKs advise farmers on selecting and breeding high-yielding and disease-resistant livestock breeds
2. **Nutrition Management:** Educates the farmers on balanced nutrition for livestock.
3. **Feed Management:** Even the farmers are encouraged to include location-specific crops / locally available crops in the animal feed to reduce the cost of feeds.
4. **Healthcare Practices:** KVKs promote good healthcare practices for livestock, which include vaccination, deworming, and disease management. Information on reproductive health management, including estrus synchronization, artificial insemination, and breeding techniques to enhance livestock productivity.
5. **Housing and Shelter:** Information on proper housing is crucial for providing comfort, protection from adverse weather conditions, and minimizing stress on animals.
6. **Disease Control**: KVK provides information on various quarantine procedures, proper sanitation, and hygiene practices in livestock management. This is done to ensure that the farmers and consumers get quality meat.
7. **Management of Livestock Wastes:** KVK provides information on the use of manure for organic farming / natural farming and biogas production. Proper waste management is required for environmental sustainability.
8. **Value Addition and Dairy Processing:** KVKs promote value addition in the dairy sector by providing training on dairy processing techniques. This includes activities such as milk processing, cheese making, and other value-added products.
9. **Demonstration Farms:** KVKs have animal demonstration farms where farmers are made to visit to adopt best practices in livestock management. These farms serve as learning centers for hands-on training and practical demonstrations.
10. **Livestock Insurance:** KVKs help by providing information on livestock insurance schemes to help farmers mitigate financial risks associated with livestock farming, which includes coverage for diseases, accidents, and other unforeseen events.

G. Fisheries Management: KVK provides the required training and demonstration along with a package of practices for fish farming so that farmers can harvest more benefits from a small area.

1. **Training and Capacity Building:** KVKs provide training on pond preparation, stocking, feeding, water quality management, disease control, and other aspects of fish production to educate farmers, aquaculturists, and fishermen about modern and sustainable fish farming practices.
2. **Demonstrations and On-Farm Trials:** Farmers are

provided with hands-on experience and practical knowledge by observing best practices in pond management, fish stocking, and harvesting through conducting demonstrations and OFT.

3. **Fish Seed Distribution:** KVKs facilitate the distribution of quality fish seeds to farmers so that they have access to good-quality fingerlings.
4. **Disease Management:** Guidance on disease prevention and control measures in fish farming is provided.
5. **Water Quality Management:** Advice on maintaining proper water quality in fish ponds, including parameters like dissolved oxygen, pH, and nutrient levels, is provided to ensure a healthy pond environment.
6. **Market Linkages:** KVKs help fish farmers in identifying markets and providing information on the market rate for their produce.
7. **Research and Development:** KVKs collaborate with different research institutions to adopt and disseminate new technologies, breeding methods, and sustainable practices so that the latest information is passed to the fish farmers.
8. **Integrated Farming System:** Promotes integrated farming systems which incorporate fish farming with other agricultural activities, such as poultry or horticulture, for enhanced overall farm productivity and increasing income from a small area.

H. Mushroom Production and Management

1. **Demonstrations and On-Farm Trials:** KVKs conduct on-farm trials and demonstrations to showcase successful mushroom cultivation practices where farmers have an opportunity to witness the entire cultivation process, from substrate preparation to harvesting, on their farm.
2. **Seed and Spawn Distribution:** KVKs facilitate the distribution of quality mushroom seeds and spawns to farmers from reputed sources.
3. **Problem Solving and Advisory Services:** KVKs provide advisory services to farmers, addressing their queries and concerns related to mushroom cultivation.
4. **Market Linkages:** KVKs assist farmers in identifying potential markets for their mushroom produce, i.e., market trends, pricing of mushrooms.
5. **Research and Development:** KVKs contribute to the adoption of new research and development activities related to mushroom cultivation, which will benefit the farming communities.
6. **Awareness Programs:** KVKs organize awareness programs to promote the nutritional benefits of mushroom consumption and its economic potential.

I. Honey Bee and management

1. **Training and Capacity Building:** KVKs organize training programs to educate beekeepers and farmers about modern and sustainable beekeeping practices, along with hands-on training on hive management, beekeeping equipment, honey extraction, and pest and disease control in apiaries.
2. **Demonstrations and On-Farm Trials:** On-farm demonstrations and trials are conducted to showcase successful beekeeping techniques.
3. **Technology Dissemination:** KVK helps beekeepers to adopt improved hive designs, bee breeds, and management practices for better honey production.
4. **Bee Breed and Queen Distribution: The** Distribution of quality bee breeds and queen bees is done so that quality honey can be produced.
5. **Disease and Pest Management:** Information on the prevention and control of diseases and pests affecting honeybees is provided.
6. **Honey Quality Assurance:** KVKs assist in maintaining and improving the quality of honey produced so that it fetches premium prices in the market.
7. **Market Linkages:** Linkages are identified by KVK and facilitated by improving connections with buyers and retailers.
8. **Integration with Crop and Horticulture Systems:** Bees help to enhance overall farm productivity through pollination services and demonstrations, and training KVKs promote the integration of apiculture with crop and horticulture systems.
9. **Awareness Programs:** KVKs organize awareness programs to educate farmers and the community about the benefits of beekeeping, both in terms of honey production and pollination services for agriculture.

J. Entrepreneurship Development: Entrepreneurship development is an important aspect of the development of progressive farmers, and KVK plays an important role by

1. **Training Programs on Entrepreneurship Development:** These programs cover various aspects of agribusiness, including business planning, financial management, marketing, and value addition for Rural Youths, SHGs, and other interested groups.
2. **Identification of Opportunities:** Since KVK works at a grassroots level, it helps in identifying potential entrepreneurs and entrepreneurial opportunities in agriculture and allied sectors such as organic farming, agro-processing, floriculture, poultry farming, dairy, etc.
3. **Creating Market Linkages:** KVKs facilitate market linkages by connecting entrepreneurs with potential buyers, retailers, and markets. This ensures that the entrepreneurs have access to a market for their products and helps in creating sustainable business models.
4. **Incubation Centers:** Some KVKs establish incubation centers to nurture and support budding entrepreneurs. These centers provide infrastructure, training, and mentorship to individuals or groups interested in starting their agribusiness ventures.
5. **Financial Assistance:** Information about various government schemes and financial assistance programs available for entrepreneurs in the agricultural sector is provided, which includes details about subsidies, grants, and loans that can help initiate and sustain agribusiness ventures. Ex. RKVY programme (Agriculture Accelerator Fund) under which 5 lakhs at the idea/pre-seed stage and Rs. 25.00 lakhs at the seed stage.
6. **Networking Opportunities:** KVKs help to create platforms for entrepreneurs to develop networks with each other, industry experts, and potential collaborators. Networking helps in knowledge exchange, partnerships, and business growth.

K. Advisory Services: KVKs serve as advisory centers, offering farmers timely information and advice on crop planning, weather forecasts, market trends, and other relevant issues, which helps farmers make better decisions for their

agricultural practices. KMAS through messages on crops, animals, weather, etc., Whatsapp, Agrometeorological Advisory Services under Gramin Mausam Seva for weather forecasting, Kissan Sarathi, CSC, etc.

L. Extension activities: Field Day, Technology week, Krishi Mela, Kisan Mela, Scientists visit farmers' field, farmers' scientist interaction, CFLDS, etc.

M. Convergence programmes: KVK works in close association with all Agri and allied departments of the district, ATMA, NABARD, Agricultural Universities, and research institutes.

In summary, Krishi Vigyan Kendras play a pivotal role in transforming and uplifting rural communities by providing them with the necessary knowledge, skills, resources, and other facilities to enhance agricultural productivity and improve livelihoods.

Impact of KVK activities

Some of the studies conducted on the impact of KVK activities are as follows.

Krishi Vigyan Kendra has introduced a multi-enterprise model to enhance income and employment. This model resulted in higher productivity than the conventional method. Animal and plant wastes helped in upgrading the soil health, which increases productivity over a longer period with fewer environmental hazards (Sahu *et al.*, 2017) [13]. A study on the effectiveness of training programs by KVK in Meghalaya found that it enhanced social recognition, improved the material possession, level of knowledge and skills, economic condition, the extent of adoption, productivity, and self-confidence, respectively, of the farmers (Medhi, S. 2017) [11]. KVK initiated a program on climate-resilient agricultural technologies in the Budelkhand region of MP, increased the productivity of farmers and adoption level, and motivated the other farmers to adopt appropriate production technologies (Singh *et al*., 2018) [15]. In a study conducted in Nagaland, it was reported that the overall annual income in the KVK's adopted villages increased after taking the different schemes/programs and there was an increase in employment generation in man-days in KVK adopted villages, even the impact of KVK's training/program on their overall knowledge level was enhanced with 22.00 percent, which was found to be positive and statistically significant (Jamir *et al*., 2018) [8]. Krishi Vigyan Kendra organizes different types of vocational training programs for women, like vermin compost, kitchen gardening, tailoring, production of fruits and vegetables, and nursery, so that they can earn and survive. Krishi Vigyan Kendra has clear-cut mandates for upgrading farm women (Acharya *et al.*, 2019) [1]. The meta-analysis study (Bhuvana *et al.*, 2019) [2] revealed that the farmers who are beneficiaries of KVK activities like 'on farm testing', 'front line demonstration', 'training' and other KVK activities are 2.62 times, 3.40 times, 1.37 times and 2.01 times more probable to fall in high socio-economic status, knowledge level, the extent of adoption and farmer's income score category, compared to non-beneficiary farmers and the KVK's activities have a positive impact on farmers of India to have higher socio-economic status with improved knowledge level, the extent of adoption of scientific technologies and farmer's income. KVK activities in Palgarh, Maharashtra, among the tribal women in terms of Poultry management. Goat keeping and jasmine production have come out as an additional source of living who are not getting income from agriculture because of fragmented landholdings (Jadhav *et al*., 2019) [7].

As per the ICAR report 2019, there were 4280 youths in different types of entrepreneurial groups; they have been oriented toward establishing micro-entrepreneurial units, and 49.5% of them established their enterprises. It was also stated that KVK acts as capacity building center for improved agriculture and allied activities to empower rural youth, farming communities, and grass-level extension workers in knowledge skill upgradation, single window system in supplying critical inputs, agro-consultancy service provider, water and soil testing center, crop cafeteria, live demonstration units for inspiring farmers, knowledge resource center in agriculture of a district. (Sahoo *et al.*, 2021) [13]. A study on the impact of empowering rural women in agriculture through training, demonstration, and input distribution in Kargil UT Ladakh (Dolker *et al.*, 2022) [3] found that the farm women recorded a 33% increase in annual income from mushroom production as an additional enterprise and 69-169% increase in income in the same area with adoption of modified method of winter vegetable production and 25- 50% increase in yield of vegetables using mulching technology. The results indicated greater possibilities of increasing the productivity and profitability of crops with the adoption of improved techniques and scientific knowledge. A study by Rathore and Sadana (2023 [12] concluded that Krishi Vigyan Kendra is contributing a lot to rural development its multidisciplinary teamwork in a participative mode with different farming communities and provides training and proper guidance to improve the skills of rural people.

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