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Empowering farmers: The socio-economic impact of Krishi Vigyan Kendra's need based technological interventions

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Abstract

Frequently changing environmental conditions, frequent occurrence of Pest and disease attack, lack of availability of inputs, knowledge & precised recent information about the recently developed advanced technologies in the crops, low productive lands, farmers are facing the major yield losses. So, in this milieu Krushi Vigyan Kendra, Baramati initiated to work & implemented need based interventions which were designed as per the need of farmer in Baramati, Indapur, Purandar, Daund, Hveli, Bhor & Velha tehsils of Pune district for sustainable development in agriculture. Interventions were mostly focused on Field crops, Horticultural crops and Animal husbandry in accordance with the Marginal (less than 1.0 ha) Small (1-2 ha) Medium (2-4 ha) & Large (greater than 4) classes of farmer. Results showed that due to new interventions & adoption of proper innovative technologies the household income of farmer were increased up to 128.92 per cent. Total change in house hold income percent from 2016 to 2021 was observed to be 77.27%. So, it can be concluded that all interventions carried out during 2016 to 2021 by KVK proved to be beneficial for amplifying income among Marginal, Small, Medium & Larger categories farmers. Besides, all the interventions carried out by KVK played a crucial role in uplifting of socioeconomic status of farmers under investigation. It had helped in increasing production, productivity and income from agriculture and allied sectors.

Keywords: Technological interventions, capacity building, socio-economic impact, sustainable development

Introduction

In India Agricultural Science Centers commonly known as Krishi Vigyan Kendra (KVK) were established in 1974 during last fifty years of journey KVK system successfully disseminated the knowledge through the On Farm Trials (OFTs), Front Line Demonstrations (FLDs), farmers training based on principle of 'Seeing is believing' & 'Learning by Doing'.

The Krishi Vigyan Kendra (KVK), Baramati is a Hi-tech, National & International Award Winning KVK, working since August 1992, and has completed the three decades of dedicated services for farming community. Total geographical area of Pune District is 15.62 lakh ha out of which cultivable area is 11.73 lakh ha. Rainfall in various talukas of Pune district is extremely different ranging from 750 mm in 45 days in Scarcity zone to 3000 to 6000 mm in Ghat zone. So major cropping patterns observed are Rain-fed Mixed, Semi-arid Rain-fed, Cannel Irrigated Sugarcane- Horticulture-Livestock based, River Irrigated Sugarcane-Horticulture-Livestock based, Rice based Farming System, Rainfed Sorghum-Livestock based etc. But due to the frequently changing environmental conditions, Pest and disease attack, lack of availability of inputs, knowledge & precised recent information farmers are facing the yield losses. So, in this milieu KVK, Baramati works in Baramati, Indapur, Purandar, Daund, Hveli, Bhor & Velha tehsils of Pune district for sustainable development in agriculture by reducing the time lag between technology transfers from research institutions to farmer's field. More focused interventions were designed on field crops, Horticultural crops and animal husbandry as per Marginal (less than 1.0 ha) Small (1-2 ha) Medium (2-4 ha) & Large (greater than 4) class of farmer. It had helped in increasing production, productivity and income from agriculture and allied sectors.

Moreover, KVK has established different demonstration units such as Agriculture Technology Information Centre (ATIC), Integrated Fish Poultry Unit, Plant Health Clinic & Bio-Control Laboratory, Soil, Leaf, Petiole & Water Testing Laboratory, Hi-Tech Green houses, Apiculture Unit, Hydroponics Unit, Automation Unit, Farmers Hostel cum Guest House, Dairy (Modern Loose Housing System) Unit, Poultry & Hatchery Unit, Sheep & Goat Unit, Vermicomposting Unit, 4-Star Nursery, Seed & Fruit Processing Unit, Agri & Eco-Tourism established for demonstration purpose. KVK, Baramati has also implemented some innovative projects like Centre of Excellence for Vegetables (Indo-Dutch Project funded by National Horticulture Mission) & National Fodder Development (NDDDB, Anand & World Bank), etc. on its 110 acres of instructional farm for farmer's point of view. In addition to this, KVK, Baramati had under taken sector specific interventions for uplifting the socio economic status of farmers in varying conditions. Present investigation deals with the study of change in Socio-Economic status of farmers due to sector specific technological interventions implemented by Krishi Vigyan Kendra, Baramati.

Materials and Methods

Since, inception of The Krishi Vigyan Kendra (KVK), Baramati, KVK is working for farmer's welfare. Present investigation was under taken to study the impact of major interventions carried out by KVK during 2016 to 2022 in Baramati, Indapur, Purandar, Daund, Hveli, Bhore & Velha tehsils of Pune district. Farmers need based interventions were finalized on the basis of Participatory rural appraisal (PRA) survey conducted in above mentioned seven tehsils. Further, data from 110 farmers which were under major sector specific interventions was collected through well-structured interviews & survey questionnaires. Collected data was analyzed through statistical methods and procedure.

Results and Discussion

KVK, Baramati had carried out the following interventions in different sectors as per the type of farming followed in respective talukas places. Similarly results were recorded for interventions.

A. Major Interventions implemented during (2016 to 2021)

1. In Field Crops

- Introduced Integrated Nutrient and Integrated Pest Management practices in Soybean and Chickpea^[4], Used of BBF technology^[8].
- Introduced new high yielding & resistant varieties like MACS-1188 and KDS-726 which has increased the yield by 33%^[9].
- Conducted the Intervention on Integrated Farming System (IFS) with Agri-Hort-Dairy farming system model. It consists of HF cow, Use of silage technology; loose housing in Pomegranate orchards and Rabi sorghum based farming system components which has doubled the farmer's income.
- In Sugarcane farming intervention consisting of use of settling with INM, drip fertigation techniques and use of in situ trash decomposing along with 2 ratoon crops was followed it was found helpful for increasing the Productivity^[11].
- Introduction of *Biofortified* Groundnut variety Girnar-4, having more than 80% of oleic acid content was proved to be a business opportunity for farmers for production of cold pressed oil from it.

- In Rice cultivated areas, intervention based on use of SRI technology and use of certified seed of Indrayani variety was found to be economical to the farmers of Bhore Taluka in Pune district
- **IPM Technology:** Intervention based on use of integrated pest management technology to reduce the incidence of pests and diseases in field was useful in reducing excessive use of chemicals in the field^[5].
- Use of advanced Mechanization on fields of farmer enabled the farmer for efficient and effective use of all inputs including water, seeds, pesticides, and fertilizers. It has also reduces spoilage and harvest losses which eventually resulted into cost reduction. The fertilizers were applied directly to the root zones of the plants & the total amount of fertilizer applied was reduced, resulting in average saving of 25-50% of the total cost of cultivation.
- **Bio fertilizer & Bio pesticides:** Due to awareness program initiated by KVK farmers were able to minimize the cost of production^[3].
- **Irrigation System:** use of drip irrigation system in their fields saved water & reduced soil erosion. Also proved to be cost effective.
- **Technical Guidance:** Krishi Vigyan Kendra, Baramati helped the Farmers Producer Companies, Self Help Groups, Startups and even individual farmers through providing technical guidance as per requirement as consequence of which Group of farmers/farmers in contact not only improved their package of practices for high quality production but also started to export their produce in other state & countries.

2. Horticulture Crops

- Intervention based on demonstration of Low-Cost Shade Net House Vegetables Production Technology like Capsicum & other Vegetables crops supported the farmers to harvest quality yield at low cost of production.
- Introduction & Demonstration of Grafted Vegetables seedlings technology especially in Brinjal & Capsicum crops resulted in reduction of percent infestation of soil borne diseases like *fusarium* & *pythium* and duration of the crops is increased by 30-45 days^[2 & 10].
- Introduction of High Value Vegetables crops like Tomato, Chilli, Capsicum & Drumstick with their advanced Production Technology like planting on 30 microns plastic mulching paper etc. benefited farmers in getting quality vegetables production for export market.
- Promotion & assessment on Integrated Crop Management including the Integrated Nutrient and Pest Management in the crops like Watermelon & Muskmelon for off season production directly benefited in getting more income in less cost of production of these crops and supported for the doubling the farmer income.
- Through Skill training programme & Farmers Field School Approach pertaining to the Protected Cultivation of Vegetables Crops & residue free vegetables crops Production is helpful for getting good quality of vegetables crops helped in doubling the farmer income.

3. Animal Husbandry

- Intervention consisting of Animal Health and Nutritional Management^[7] for improving the productivity of milch animals through Assessment and Demonstration of Area specific Minerals mixture, CMT kits for prevention of mastitis was carried out for quality milk production.

- Demonstration and promotion of Silage making Technology for *rainfed* area, Supply of silage bag, silage culture etc. also Green fodder was made available throughout the year. This dry matter intake helped to increase in Milk Production by 16%-24%.
- Promotion of Backyard poultry and supply of vaccinated Birds like Vanraja, Kaveri helped in generating additional source for livelihood of rural women farmers.
- Demonstration & introduction of fodder varieties like Phule Gowardhan of Marvel, Hybrid Napier varieties like RBN-13, BHN-10, COBN -5, Super Napier, Multi-cut-Sorghum varieties like COFS-29, Lucerne RLS-88, Hedge Lucerne and Marvel for Alkaline soils which helped to improve the productivity and milk yield [9].
- Assessment and Promotion of Loose Housing System for dairy animal had helped to reduce labours cost and mastitis, Awareness campaign & Training for promotion of loose housing system helped to improve milk yield by 17% and reduce labour by 50%.
- Capacity building program for scientific management of Cross breed dairy Animals, Goat like Osmanabadi and Beetle, Supply of breeding bucks also helped in income generation.

4. Fisheries

- Promotion of Fish farming with improved breeds like Rohu, Cyprineus, & other varieties like Catla, Mrugal, Tilapia through demonstration activities.
- Capacity building training programs in Bio-flock fish farming, Fish farming in Farm pond, Aquaponics opened new horizons for fish farmers in area. By using this Fish water to farm helped to increase Avg. yield 20 % - 30 % and also reduced fertilizer cost by 30% [6].

5. Non-Farming Enterprises

- Encouraged Women members of Self Help Groups to get involved in income and employment generating activities like marketing & branding of processed products, Value added products.
- Guidance regarding FPO, Startup helped to farmers magnifying the income & move to next level.
- Promotion of Millet & Natural farming like interventions helped the farmers for Climate Resilient Crop production which has indirectly helped in amplifying the income of farmers.

Fig. No 1 to 8 shows the some of the various activities carried out for bringing awareness about interventions & capacity building.



Fig 1: Silage making Technology for rainfed area



Fig 2: Promotion of Backyard poultry & supply of vaccinated Birds



Fig 3: Field Day on Bangal gram Seed production



Fig 4: Introduction of new Soybean variety MACS-1188



Fig 5: Crop Diversification in *rainfed* areas : Castor



Fig 6: Low-Cost Shade Net House Vegetables Prod. Technology



Fig 7: Demonstration of Grafted Vegetables seedlings technology



Fig 8: FPO related activities

While, Fig. No. 9 depicts the process of capacity building and how forward-backward linkages were created for promoting the farmers for quality production which had ultimately resulted into production of export quality residue free produce by these farmers to foreign countries like UK & European Union. It had not only built the confidence among the farmers to grow their crops technically but also encouraged them for group marketing by establishing their own farmer producer companies & self-help groups.

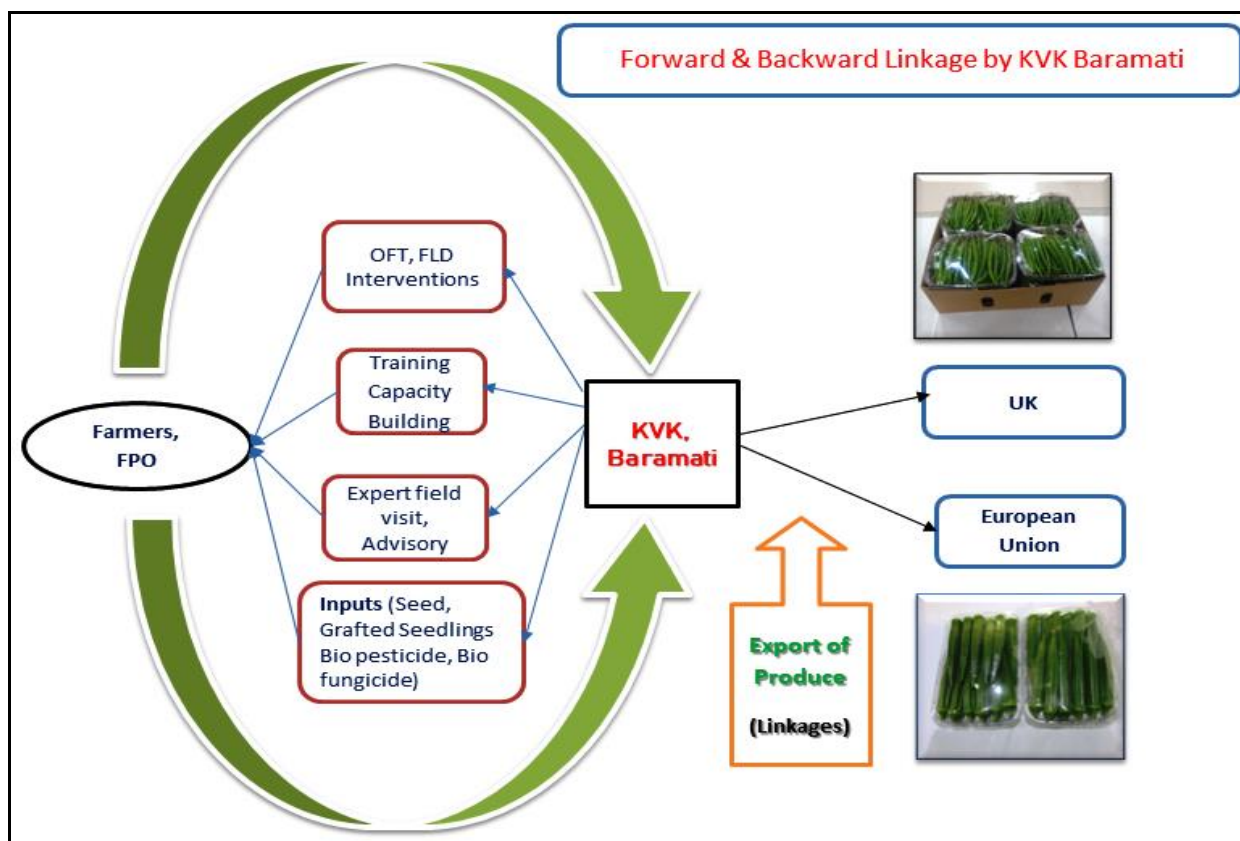


Fig 9: Forward & Backward linkage by KVK, Baramati

B. Impact on household income

Data and information in Table No. 1 obtained from diversified areas of Krishi Vigyan Kendra, Pune-I (Baramati) indicate that farmer's income from field crops has been increased up to

137.77 per cent and share in additional income was found to be 47.78 per cent. This is due to the use of technologies like ICM, IPM and introduction of new varieties etc. In horticultural crops, farmer's income has been increased up to 116.36 per cent and

the share in additional income was reported to be 35.14 percent. Besides field & horticultural crops income, famers were also benefited with 134.60 per cent increase in income due to livestock with an additional income of 17.08 per cent. KVK trained & encouraged the SHG, Rural youth & farmers for processing of fruits and vegetables, value addition of millets and

entrepreneurship development which increased their income by 100 percent which led to additional income. Due to new interventions & adoption of proper innovative technologies the farmers witness the overall increase their income up to 128.92 per cent ^[11].

Table 1: Level and change in income of farmers under DFI

Crop and Enterprises	Net income (Res/Household at current Prices)		Increase in income (%)	Shear in total income (%)		Share in additional income (%)
	2016-17	2020-21		2016-17	2020-21	
Field Crop	117860.3	280226.8	137.77	44.71	46.44	47.78
Horticultural Crop	102640	222069.6	116.36	38.93	36.80	35.14
Livestock	43127.37	101175.6	134.60	16.36	16.77	17.08
Overall	263627.6	603472	128.92	100	100	100.00

Among the benefited farm households, medium farmers having land holding between 1 to 2 ha were accounted for highest percent i.e. 47.3 followed by small land holding framer (1-2 ha) i.e. 35.5 percent. Whereas large farmers who were having more than 4 ha of land holding was accounted to be 11.8 percent. The percent change in household income was found to be highest (i.e. 88.27%) in Medium land class farmers (1 to 2 ha) followed by medium Large land class farmers (i.e. 82.16 %) and Marginal class farmers (>4 ha) i.e. 71.94 per cent. While, minimum increase among the land classes of farmers in household income

percent was found in small land class farmers (i.e. 43.36%) (Table No. 2). Total change in house hold income percent from 2016 to 2021 was observed to be 77.27%. This indicates that interventions carried out by KVK played important role in amplifying the famer's income among Marginal, Small, Medium & Large farmers. Moreover, with financial assistant from government policies, through such need based interventions & technological back stopping socioeconomic status of farmers can be uplifted through increasing production, productivity and income from agriculture and allied sectors ^[11].

Table 2: Income level and change in household income by land class

Land class	house hold (No.)	Share in total House hold (%)	Net Income (Rs/House hold)		Change in household income%
			2016-17	2020-21	
Marginal (less than 1.0 ha)	6	5.5	144280	248082	71.94
Small (1-2 ha)	39	35.5	130937	187710	43.36
Medium (2-4 ha)	52	47.3	263896	496831	88.27
Large (greater than 4)	13	11.8	472427	860581	82.16
Total	110	100	1011540	1793204	77.27

Conclusion

Empowerment of farming community towards sustainable development can be achieved through thoroughly studied, well designed need based innervations, campaign, and advisories. In present investigation result signifies that the incomes of farmers were almost doubled from 2016 to 2022 due to adoption of new technologies. Introduction of new high yielding resistant varieties of plants, breed of livestock and poultry helped the farmers to withstand the changes in climate as well as in market conditions. Most importantly, agriculture allied subsidiary enterprises such as Fishery, Backyard Poultry Farming, Sheep, Goat farming, Vegetable cultivation etc will be an extra source of daily, monthly & seasonal income. Use of advanced high-tech technologies such as grafted technology in vegetables & fruit crops in protected structures is the future of agriculture for getting assured returns like other businesses. Additionally, use of technolgies like drip irrigation results in cost reduction through minimizing excessive use of important inputs like water and fertilizers. Likewise, interventions such as use of INM, IPM, Bio fertilizers, and Bio pesticides can be the key for residue free export quality farm produce. It also ensures the health of degrading soil and has the potential of increasing carbon content in the soil. Besides, awareness and incorporation of concept about FPO, SHG, and startups holds the great potential for group farming & marketing which will give higher income from regular produce. Socioeconomic status of farmers can be uplifted through empowerment of farmers through well designed need based programs.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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