Azadi Ka Amrit Mahotsav

DOUBLING FARMERS INCOME

Statewise Synthesis

भाकृअनुप
ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
Krishi Bhawan, New Delhi
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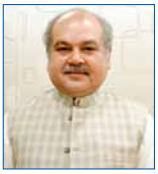

MESSAGE

Our country has a strong agricultural system which has transformed the country from a food deficient to a food exporter. Today the whole world is expecting India to ensure the availability of food grains even though India has only 2.4% of the global geographical area and 17.7% of the global population to feed.

The National Agricultural Research, Education and Extension System of the country is well equipped to meet the national food security requirements of the country, yet the rapidly declining land holdings, lack of infrastructure and market-related issues have remained a cause of concern. Hon'ble Prime Minister of India, Shri Narendra Modi ji understood the nuances of the problem and gave a clarion call for doubling the income of farmers.

The Ministry of Agriculture and Farmers' Welfare, Government of India adopted a 7-point strategy to protect the interests of farmers and encourage them to move forward on the path of higher income and sustainable agriculture. Government of India enhanced the Minimum Support Price at levels of 1.5 times of the cost of production and implemented various schemes like PM Kisan Samman Nidhi, e-NAM, Pradhan Mantri Fasal Bima Yojana, Agri Infrastructure Fund, FPO, PKVY, Micro Irrigation, etc.

Indian Council of Agricultural Research activated its entire network of Institutes, ATARIs and 731 KVKs to ensure effective implementation of the various schemes and initiatives from 2016-17. This has led to substantial increase in the incomes of farmers across the country.

I am happy to learn that ICAR has come out with collection and compilation of experiences of 75000 successful farmers who have doubled their income during 2016-17 and 2020-21. I am sure that the successful stories of these farmers will motivate and encourage fellow farmers to increase their income. I congratulate all concerned in ICAR and Agricultural Extension Division for bringing out such a useful document for the benefit of the farmers as well as the policy makers.

(Narendra Singh Tomar)

कैलाश चौधरी
KAILASH CHOUDHARY

सत्यमेव जयते

कृषि एवं किसान कल्याण
राज्य मंत्री
भारत सरकार
MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVERNMENT OF INDIA

MESSAGE

Doubling Farmers Income has become an agenda of the nation ever since its announcement by Hon'ble Prime Minister of India in February 2016. Government of India has strongly pursuaded the vision of the Prime Minister and has extended every possible support needed for achieving the ambitious goal. The country has all the necessary natural resources and climate for agri-based activities.

The central and state governments have launched and implemented several farmer-friendly programmes and schemes to support the dreams of the farmers and their livelihoods. These programmes and schemes have created the much needed input and output related supportive mechanisms and infrastructure on the ground. Equally important is the strong human resource of agricultural scientists, extensionists and educationists nurtured over the years for developing and transferring agricultural technologies suitable for diverse agro-climatic and natural conditions.

I am extremely happy to note that the Indian Council of Agricultural Research has always led the nation in its pursuit of science and technology driven development of agriculture. Its frontline extension system of Krishi Vigyan Kendras has been the most dynamic, vibrant and credible cutting-edge level farm science institution that is shaping the lives of farming community. The technology driven doubling of farmers income has always been a possibility and is proved beyond doubt by this document based on 75000 farmers success stories. I would like to congratulate every farmer and their family members for joining hands in this great achievement. My sincere appreciations to all the scientists of KVKs and ATARIs for guiding and supporting farmers with all their might.

I am sure that the document will inspire many more thousands and lakhs of farmers to achieve higher income, not just double, but manifold.

(Kailash Choudhary)

शोभा करांदलाजे
SHOBHA KARANDLAJE

सत्यमेव जयते

राज्य मंत्री
कृषि एवं किसान कल्याण
भारत सरकार
Minister of State for
Agriculture & Farmers Welfare
Government of India

D.O. No. .....796..... MOS (A&FW)/VIP/2021-22

Dated: 30 June, 2022

MESSAGE

India is one of the fastest growing economies in the world. Agriculture, though, contributes less than one sixth to the national economy, yet it directly or indirectly provides employment to about half of our population. The average land holding size of an India in farmer is decreasing very fast making the proportion of small and marginal farmers almost 90%.

The Prime of India Sh. Narendra Modi ji, experienced the pain of an average Indian farmer and raised a pertinent issue on 28 February 2016 at Bareilly, "Can we double farmers' income by 2022". The government system responded to this with full enthusiasm and energy. The highly vibrant network of Krishi Vigyan Kendras (KVKs) also shouldered the responsibility to support this noble idea in a big way.

I am happy to note that KVKs designed and adopted multipronged and location specific strategy to facilitate doubling farmers' income during 2016-17 which included enhancing farmers' income through augmentation of productivity by facilitating use of healthy seeds of best varieties and other farm-inputs scientifically; facilitating reduction of cost of cultivation through resource use efficiency and resource conservation options; and capacity building of farmers for diversification from low income crops to high income crops and enterprises.

The document based on the evidences of more than 75000 farmers who doubled their net income in the short period of four years i.e., 2016-17 and 2020-21 will be of great inspiration to farmers & stakeholders. I congratulate ICAR for this innovative idea of documenting experiences of such a large number of successful cases for the benefit of other farmers and policy makers in the country. I am confident that this publication will act as a lighthouse for other farmers who also want to emulate the successful experiences and strategies in addition to the persons associated in the research and development of agriculture in India.

Shobha Karandlaje

(Shobha Karandlaje)

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सचिव एवं महानिदेशक
TRILOCHAN MOHAPATRA, Ph.D.
SECRETARY & DIRECTOR GENERAL

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FOREWORD

The Government of India announced during 2016 to double Farmers' Income by 2022. The Doubling of Farmers' Income (DFI) has been approached through multipronged strategies such as (i) development initiatives (ii) technology interventions and (iii) policy reforms. The approach was taken to increase farmers' income in a manner sustained over the years.

Indian Council of Agricultural Research (ICAR) swung into action by setting up pathways for different stakeholders and provided the technological support for achieving goal. ICAR prepared state specific DFI documents and the Krishi Vigyan Kendras (KVKs) in the country were assigned the responsibility of planned frontline extension activities to achieve the target. The KVKs of the country actively participated by responding to the call of the nation with full vigour. The KVKs took the technology-backstopping route to augment farmers' income in the existing cropping patterns and guided farmers to diversify into high value crops, intensive livestock production and agri-business enterprises. It has been observed that farmers are getting the benefit from the technologies made available to them at the right time using the right approaches. It is heartening to note that the field crops, horticulture, livestock, fisheries and supplementary enterprises have contributed to farmers' income. The sector-wise contribution to farmers' additional income in different states stands testimony to the overall efforts. The inclusive nature of the efforts could also be seen from the fact that all classes got benefited from the technological support. It is gratifying to note that the income levels of landless, marginal and small holders have substantially increased due to technological interventions backed by appropriate government policies and schemes.

The results are overwhelmingly convincing about the possibilities for increasing farmers' income in various parts of the country. It is time to appreciate the hard work of everyone concerned in this mission. The council salutes untiring efforts of the farmers in producing every grain of food that the countrymen eat. I congratulate the authors for bringing out the publication as part of our activities under Azadi ka Amrut Mahotsav.

Dated the 04th July, 2022
New Delhi

(Trilochan Mohapatra)

CONTENTS

SUMMARY

Indian Council of Agricultural Research (ICAR) prepared state specific plans for doubling farmers' income and entrusted KVKs to take up the challenge of achieving doubling farmers' income. KVKs adopted villages and worked with a technology-centric approach to guide farmers in adopting innovative technological options and good agricultural practices. The impacts have transformed the livelihood of hundreds of farmers and farm families in the jurisdiction of each KVK. As part of the Platinum Jubilee celebrations of the country, an attempt has been made to document cases of 75000 successful farmers across the country keeping 2016-17 as the benchmark year and 2020-21 as the impact year. Brief summary of the same is presented here.

Increase in income was evident across all the sectors of agriculture including field crops, horticulture, livestock, fisheries and farm/non-farm enterprises.

The overall increase in income ranged from 125.44% in Ladakh to 271.69% in Andaman and Nicobar Islands. Uttarakhand, West Bengal, Chhattisgarh and Puducherry recorded more than 200 per cent increase in income. Most of the other states recorded overall increase in income in the range of 150 to 200 per cent.

Horticulture had the dominant share in total income during 2016-17 as well as 2020-21 in 14 states like Jammu and Kashmir, Himachal Pradesh, Ladakh, Jharkhand, Sikkim, Meghalaya, Mizoram, Tripura, Goa, Gujarat, Maharashtra, Tamil Nadu, Karnataka and Kerala. Himachal Pradesh, Kerala and Goa are the top three states with a share of more than 60 per cent in total income.

Field crops, although the share in total income is declining from 2016-17 to 2020-21, it still remained as the dominant source of income in 11 states viz., Punjab, Uttarakhand, Haryana, Rajasthan, Uttar Pradesh, Bihar, Chhattisgarh, Madhya Pradesh, Andhra Pradesh, Puducherry and Telengana. Madhya Pradesh, Chhattisgarh and Haryana are the top three states in this category.

Livestock continued to be the dominant source of total income in the states of Assam, Arunachal Pradesh, Manipur and Nagaland during 2016-17 as well as 2020-21. Fisheries was the dominant source of income for farmers in Odisha and Andaman and Nicobar Islands. Farm and non-farm enterprises constituted the major source of income in West Bengal, both in total income as well as additional income.

In terms of additional income generated during the intervention period, horticulture was the dominant component in 17 states, including the three north-eastern states of Sikkim, Meghalaya and Mizoram. The percentage share in additional income from horticulture was as high as 67.72% in Himachal Pradesh followed by 61.11 % in Ladakh, 60.15% in Delhi, 59.15% in Kerala, 58.06% in Karnataka, 57.33% in Goa and 55.89% in Gujarat.

Field crops constituted the dominant source of additional income in Punjab (30.13%), Uttar Pradesh (36.92%), Haryana (39.35%), Bihar (40.39%), Rajasthan (42.06%), Madhya Pradesh (48.46%) and Chhattisgarh (49.01%).

Livestock is the major source of additional income in the states of Assam (27.17%), Uttarakhand (29.97%), Arunachal Pradesh (36.55%), Nagaland (42.37%), Tripura (44.49%) and Manipur (49.01%).

All land classes were benefitted by the KVK interventions. Landless category had the highest increase in income in the states of Ladakh (390.6%), Jharkhand (366.59%), Andhra Pradesh (342.97%) and Goa (303.02%).

Marginal farmers realized increase in income up to 298.10% in Haryana. Marginal farmers in Uttarakhand, Chhattisgarh, Rajasthan and Assam also got increased income of more than 200 per cent.

Small farmers in the states of Andaman and Nicobar Islands, Puducherry, Uttarakhand, Assam and Himachal Pradesh obtained maximum increase in income. The increase in income level was the highest for small farmers in Andaman and Nicobar Islands (273.86%).

Large farmers recorded highest increase in income in Puducherry (405.26%) and West Bengal (377.39%). Very high levels of increase in income was also recorded by the large farmers in Arunachal Pradesh (274.95%), Maharashtra (234.38%), Jammu and Kashmir (218.75%) and Jharkhand (216.00%).

The results reiterate the fact that doubling farmers income is possible across agricultural sectors, across the nation and across the land classes. Science and technology driven increase in income is a reality and could be pursued nation-wide with necessary back-up from administrative and policy support.

INTRODUCTION

In India, the early agricultural development strategies focused primarily on raising agricultural output for attaining food security. The announcement for doubling farmers' income (DFI) by the Prime Minister of India on 28 February 2016, and its subsequent inclusion in the budget speech of the Union Finance Minister on 29 February 2016, propelled the momentum towards enhancing farmers' income. Since then, doubling farmers' income has been at the centre stage in the debates on agriculture. On 13 April 2016, the Government of India constituted a committee on DFI under the chair of Mr. Ashok Dalwai, Additional Secretary, Ministry of Agriculture and Farmers Welfare, Government of India. The Inter-Ministerial Committee examined issues related to farmers' income, and submitted its report in September 2018 detailing strategies for doubling farmers' income by 2022. It suggested a 7-point strategy: (i) enhancing production of crops and livestock through intensification; (ii) raising productivity through better management and irrigation; (iii) reducing cost of production through adoption of technologies and conventional practices; (iv) higher realization of net income through modern/ electronic marketing; (v) processing and value addition to farm produce; (vi) diversification into high-value crops; and (vii) adoption of supplementary agricultural/ non-agricultural enterprises backed by skill development programs. The government initiated several steps in this direction with a focus on intensification, diversification, shift from subsistence to commercialization and business orientation towards agro-based small-scale enterprises.

The ICAR, being the premier organization in the field of agricultural research, education and extension, initiated efforts to develop State-specific DFI strategy documents focusing on technologies, technology delivery mechanisms and market linkages. The State Coordination Committees (SCCs) were constituted under the chair of a Vice Chancellor of an Agricultural University in the State with a Director of an ICAR Institute as convener. The members of the SCC included all other Vice Chancellors and Directors of ICAR Institutes in the State, nominees from the Department of Agriculture and Farmers Welfare, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Food Processing Industries and Ministry of Water Resources, and senior officers of the State Development Departments. Besides, representatives from CGIAR system, Commodity Boards and Farmer Organizations were co-opted as additional members as per the need. In devising the strategy, the SCCs took into consideration the agro-ecologies, natural resource endowments, land use and cropping patterns, productivity gaps, biotic and abiotic constraints, development indicators, infrastructure and government programs. The State-specific documents provided the roadmap for extension system to ensure delivery of technologies and good agricultural practices.

Towards achieving the goal of DFI, the ICAR utilized its network of KVKs. To operationalize the goal-achieving efforts on ground by the frontline extension system, the Agricultural Extension Division of ICAR guided each KVK to identify at least two villages in a contiguous area and develop a plan for DFI through interaction with farmers and other stakeholders. Baseline surveys were conducted by the KVKs in the identified villages to record the status of the existing crops, varieties, farming systems, productivity levels, and accordingly made the interventions. By virtue of having a multi-disciplinary team of scientists, the KVKs devised and standardized location-specific models for overall agricultural development. Agriculture, horticulture, livestock production, sericulture, supplementary enterprises, processing and value addition, and farm-based income generating activities comprised the focus of the KVKs. Improved crop varieties, soil and water management practices, low-cost and no-cost production technologies, eco-friendly and effective pest management strategies, farm mechanization, alternative crops and cropping patterns, integrated farming systems, low-cost processing technologies, intensive/semi-intensive livestock production, fisheries, and diversification into high-value crops like vegetables, fruits and flowers, were the major interventions. Small-scale processing and value addition, vermi-composting, mushroom production, nursery raising and beekeeping were promoted as per the needs and interests of the farming community.

In each KVK, the specialists organized and conducted series of need-based capacity development programs at regular intervals to bridge the knowledge and skill gaps of farming communities and other stakeholders. KVKs engaged with farmers, individually and collectively, at all stages of agricultural production and post-harvest management. KVKs facilitated farmers in procurement of inputs, grading, packaging and selling farm produce by linking them with specific agencies. In select cases, individual farmers, farmwomen and rural youth were provided with incubation support and initial handholding. KVK laboratories, production units and farm resources were shared in the incubation process to enable the budding entrepreneurs to engage in production, packing, labelling and marketing of technological products.

The Prime Minister set the goal of doubling farmers' income by 2022, the year when the nation celebrates the Platinum Jubilee of its Independence. To celebrate 75th anniversary of Independence in a befitting manner, a document of 75,000 success stories of farmers whose incomes have been doubled was considered just and apt. A format was designed and shared with all the KVKs for creating database of successful farmers. The format consisted of three parts: (i) profile of a farmer including name, address, age, education, landholding size and a passport size photograph; (ii) information related to crops grown, livestock reared and enterprise activities and the production and income details at bench mark year 2016-17; and (iii) the information on the same after KVK interventions (2020-21).

Based on the individual farmer's data, two documents are prepared, one as an e-document consisting state- and district-wise presentation of successful farmers and the other as synthesis and analysis of data. The household income in 2020-21 has been compared with that in the 2016-17

to know the extent of change in income and in its constituents. Annual net income during 2020-21 as well as during 2016-17 are estimated at nominal prices. Price effect because of higher minimum support price or enhancement in general prices is also there in the estimates.

A summary statement on technological and other interventions and their impact on household income is highlighted in this document for each State and Union Territory.

Documentation of success stories was taken up to infuse confidence that doubling of farmers' income is possible through technology adoption. It justifies that scientific knowledge, when integrated with farmers' experience, can accelerate the agricultural development process. The document can serve as reference material in identifying possible pathways and strategies for further enhancement in farmers' income. The cases have symbolized the approaches in change of cropping pattern from food crops to cash crops, intensification through intercropping, mixed cropping, diversification into high-value crops and cultivation of more crops in a single parcel of land. There are cases of farmers who have adopted cost reduction and cost-saving mechanisms to boost their savings thus indirectly improving incomes.

The document is a tribute to all the hardworking farm families of the nation amidst the rampaging COVID-19 pandemic that hit the economy hard. While most sectors failed to support the livelihoods of those dependent on them, the agriculture sector in those dark days was the silver line that supported everyone who were dependent on it directly and indirectly.

HIMACHAL PRADESH

Implementing agency : 11 KVKs

Number of farm households covered : 1,298

1. Sector-specific interventions

1.1 Field crops

- Promotion of high yielding varieties of wheat (HPW 360 and 368), rice (HPR 2612, US 312, Arize Swift) and maize (Kanchan, Pro Agro 4642, Girija, Bajaura Makka, Palam Sankar Makka 2).
- Integrated management of nutrients, pests and weeds especially the management of white fly and fall armyworm.
- Promotion of precision farming techniques such as drip/ sprinkler irrigation and laser labelling.
- Special capacity building programs for the farmers to handle electronic marketing through popular e-commerce platforms like e-NAM etc.
- Cost reduction through conservation agriculture (organic/ natural farming, direct seeded rice and no till agriculture).

1.2 Horticultural crops

- Large-scale promotion of protected cultivation of fruits (strawberry, muskmelon), vegetables *viz*., red-yellow capsicum (Orrovill, Asha, Tanvi, Indira), parthenocarpic cucumber (Kyan, Hilton, Isatis) and flowers (gerbera and carnation) especially in mid and low hills.
- Diversification into high value vegetable production especially the off-season tomato (Solan Lalima, Avtar, Abhimanyu), cauliflower, cabbage, onion (Palam Lohit), spinach (Pusa Harit), carrot, okra (P 8), brinjal (Pusa Purple Long and Cluster), cherry tomato (Solan Red Round), capsicum (Solan Bharpoor), peas (G 10, Azad P 1 and P 3, PB 89) and exotic vegetables (broccoli, kale, brussels sprout, asparagus, celery, lettuce and knol-khol).
- Promotion of high and ultra-high-density plantation of apple (M9, MM111, Early Red 1, Gale Gala, King Roat, Adam, Red Lum Gala, Red Kan, Decarli, Mema Gala, Vance Delicious, Super Chief, Gala Val Gala, Fengai Gala, Jeromine, Red Vilox) in higher reaches and mango, citrus and guava in lower hills and plains.
- Delivering latest scientific know-how among the farmers on growing off-season vegetables in mid and high hill regions.
- Promotion of marigold, carnation, chrysanthemum, lilium, gladiolus and gerbera.
- Promotion of pomegranate (Kabuli Kandhari, Kabuli Sindhuri) in areas where apple farming is being abandoned due to climate change.

- Capacity building of farmers for raising quality nursery of fruits, vegetables and flowering plants.
- Promotion of low chilling apple (Anna Dorset) in lower areas of the state and expansion of mango, guava, cherry (Ving Cherry, Lapins Cherry, Van, Stella), persimmon (Fuju), litchi, kiwi (Allison, Hayward), peach (Sun crest, Glo Heaven), apricot (New castle, Kaisha) and plum (Black Amber, Red Beaut) for higher farm income.

1.3 Animal husbandry

- Promotion of goat farming (Chinch, Beetal, Jamba and Sirohi) in lower hills.
- Popularisation of Nili Ravi buffalo.
- Provision of high-quality male sheep and goats for breed improvement.
- Integrated nutrient, disease and fertility management.
- Promotion of urea molasses, mineral blocks and area-specific mineral mixtures.

1.4 Fisheries

- Facilitation of establishment of trout (cold-water fishery) units.

1.5 Farm and non-farm enterprises

- Promotion of entrepreneurship on raising nurseries of fruits, vegetables and flowers.
- Popularisation of button and oyster mushroom.
- Backyard poultry with Kadaknath and Rhode Island Red breeds.
- Promotion of Him Palam Samridhi breed of poultry.
- Value addition and processing of farm produce.
- Scientific apiculture for higher production of quality honey and its value addition.

2. Impact on Household Income

The net income enhancement for the respondent farmers during the period of 2016-17 and 2020-21 was 2.91 times (Table 1). Fishery sector had the highest rate of growth (21 times) in the net income followed by livestock (3.9 times), enterprises (3.71 times), horticulture (2.87 times) and field crops (1.99 times). Horticulture was the predominant sector contributing to the net income during base year (68.93%) as well as evaluation year (68.14%). With 67.72 per cent

share in the additional income, horticulture was the most important contributor to the additional net income of the respondents followed by livestock (15.35%), enterprises (8.54%), field crops (7.76%) and fisheries (0.64%).

Table 1. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	29527	58944	99.63	14.86	10.20	7.76
Horticulture	137011	393813	187.43	68.93	68.14	67.72
Livestock	20148	78355	288.90	10.14	13.56	15.35
Fisheries	116	2535	2085.34	0.06	0.44	0.64
Farm/ non-farm enterprises	11962	44334	270.62	6.02	7.67	8.54
Total	**198763**	**577981**	**190.79**	**100.00**	**100.00**	**100.00**

More than 86% of the successful farmers in the state belonged to marginal and small farmers (Table 2). Landless households realized the highest income (265.45%) followed by small (202.29%), marginal (196.58%), large (190.71%) and medium farmers (163.55%).

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

Land class	No. of households	% share in total household	Net Income (Rs/household)		% change in household income
			2016-17	2021-22	
Landless	13	1.00	87412	319451	265.45
Marginal (<1.0 ha)	868	66.87	95224	282416	196.58
Small (1-2 ha)	261	20.11	326283	986318	202.29
Medium (2-4 ha)	110	8.47	514013	1354683	163.55
Large (>4 ha)	46	3.54	706568	2054039	190.71
Total	**1298**	**100.00**	**198763**	**577981**	**190.79**

JAMMU AND KASHMIR

Implementing agency : 15 KVKs

Number of farm households covered : 1,714

1. Sector-specific interventions

1.1 Field crops

- Promotion of high yielding varieties of wheat (HD 2967, HD 3086, PBW 550, WH 1080), rice (PB 1121, PB 1509, PB 1612, Basmati 370), maize (DD 9141) and canola sarson (GSC 6, GSC 7).
- Integrated management of nutrients, pests and weeds especially the management of white fly and fall armyworm.
- Precision farming techniques such as micro-irrigation and laser levelling.
- Special capacity building programs of farmers to handle electronic marketing through popular e-commerce platforms like e-NAM.
- Cost reduction through conservation agriculture (organic/ natural farming, direct seeded rice, no till agriculture).
- Diversification into high value vegetable production especially the off-season exotic vegetables (broccoli, kale, celery, lettuce, knol-khol, etc.)

1.2 Horticultural crops

- Large-scale promotion of protected cultivation of fruits (strawberry and muskmelon), vegetables (red-yellow capsicum and parthenocarpic cucumber) and flowers (gerbera and carnation).
- Promotion of adoption of high and ultra-high-density plantation of apple.
- Capacity building of farmers for raising quality nursery of fruits, vegetables and flowering plants.

1.3 Animal husbandry

- Facilitation of scaling up of stock of Kangni/ Pashmina goat.
- Promotion of Merino sheep for higher income.
- Integrated nutrient, disease and fertility management of animals.
- Promotion of urea molasses mineral blocks and area-specific mineral mixtures.

1.4 Fisheries

- Composite carp culture with a focus on grass carp.

- Aquaculture for ornamental fish.

1.5 Farm and non-farm enterprises

- Promotion of entrepreneurship in cultivation of lavender and lemon grass for essential oil extraction.
- Popularisation of button and oyster mushroom on marginal farms.
- Backyard poultry with emphasis on Kadaknath and Rhode Island Red breeds.
- Value addition and processing of farm produce.
- Scientific apiculture for production of quality honey and value addition.

1 Impact on Household Income

The net income of farm households increased by 2.89 times between 2016-17 and 2020-21 (Table 3). Farm and non-farm enterprises had the highest increase (5 times), followed by fisheries (4.3 times), livestock (3.8 times), horticulture (2.7 times) and field crops (2 times). Horticulture had the highest share in the net income of the respondents during base year (55.9%) as well as evaluation year (52.61%) while, field crops and livestock were two other important sectors having higher share in farmers' net income. In terms of additional income generated, horticulture was the most important sector (51%) followed by livestock (24.04%), farm and non-farm enterprises (12.42%) and field crops (12.29%).

Table 3. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	33741	69642	106.40	21.86	15.60	12.29
Horticulture	86295	234854	172.15	55.90	52.61	50.87
Livestock	24912	95124	281.84	16.14	21.31	24.04
Fisheries	331	1424	330.21	0.21	0.32	0.37
Farm and non-farm enterprises	9096	45371	398.80	5.89	10.16	12.42
Total	**154375**	**446415**	**189.18**	**100.00**	**100.00**	**100.00**

A large proportion of successful farmers (69%) in Jammu and Kashmir are marginal farmers, followed by small (18%), medium (6%), large (5%) and landless farmers (2%) (Table 4). Increase in the income was the highest for landless households (244.32%) followed by large (219%), medium (210%), marginal (183%) and small (180%) farmers. The higher growth in income of medium and large farmers was mainly due to the successful adoption of technologies like high-density and ultra-high-density plantation in apple.

Table 4. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net Income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	31	1.81	90499	311608	244.32
Marginal (<1.0 ha)	1189	69.37	125354	354704	182.96
Small (1-2 ha)	307	17.91	194982	546194	180.13
Medium (2-4 ha)	106	6.18	259986	804999	209.63
Large (>4 ha)	81	4.73	312719	996805	218.75
Total	**1714**	**100.00**	**154375**	**446415**	**189.18**

LADAKH

Implementing agency : 3 KVKs

Number of farm households covered : 372

1. Sector-specific interventions

1.1 Field crops

- Healthy seed of improved/ high yielding varieties of wheat (Kailash, Mansarovar, Singhchen), barley (Nimmo, Hanley, Chumathang, Spangmik), alfa-alfa, mustard (RLM 514), peas (Arkel, PS 1100, AZ-32) and rajmash (Contender).
- Integrated management of nutrients, pests and weeds mainly under near-organic system of agricultural production along with limited non-organic farming of crops.

1.2 Horticultural crops

- Large-scale promotion of adoption of Rakshey Karpu Halmond variety of apricot among the farmers.
- Promotion of apple varieties such as Golden Delicious, Royal Delicious, Red Delicious and Kerkechoo Tha Mongol.
- Promotion of protected cultivation of vegetables such as carrot (Early Mantis), brinjal (Dev Kiran, Nav Kiran, Janak), leafy vegetables, capsicum (Solan Bharpoor, Orogale) and chillies (KL 1).
- Capacity building of farmers in raising quality nurseries of apple and apricot.

1.3 Animal husbandry

- Facilitation of scaling up of the stock of Pashmina goat, Changluck sheep and local yak.
- Promotion of Merino sheep.
- Scientific management of Bactrian (double humped) camels for higher milk and tourism.
- Integrated nutrient and disease management.

1.4 Farm and non-farm enterprises

- Provision of solar driers for dehydration of apricots, vegetables and chhurpi (fermented home-made cheese) for better shelf life.
- Promotion of Dhingri (Pleurotus) mushroom.
- Provision of wool spinning machines.

2. Impact on Household Income

During the period of 2016-17 and 2020-21 the average household net income of the respondent farmers in Ladakh increased 2.25 times (Table 5). Farm and non-farm enterprises showed the highest growth (8 times) in the net income of the respondents followed by the horticulture sector (2.76 times), livestock (2.07 times) and field crops (1.3 times). Horticulture sector was the highest contributor to the average net income of the respondents followed by livestock, field crops and farm/ non-farm enterprises. Horticulture was the most important farming component that added to farmers' net income by 61.11 per cent followed by livestock (28.46%), field crops (5.57%) and enterprises (4.86%).

Table 5. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	13846	18153	31.11	22.44	13.05	5.57
Horticulture	26918	74212	175.70	43.63	53.36	61.11
Livestock	20393	42416	107.99	33.06	30.50	28.46
Fisheries	0	0	0.00	0.00	0.00	0.00
Farm/ non-farm enterprises	536	4299	702.05	0.87	3.09	4.86
Total	**61693**	**139080**	**125.44**	**100.00**	**100.00**	**100.00**

Agrarian economy of Ladakh is dominated by marginal farmers (90.59%). The landless households experienced the highest increase in income (390.6%) followed by marginal farmers (125.86%) and small farmers (120.67%).

Table 6. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	2	0.54	15695	77000	390.60
Marginal (<1.0 ha)	337	90.59	57724	130376	125.86
Small (1-2 ha)	33	8.87	105011	231733	120.67
Total	**372**	**100.00**	**61693**	**139080**	**125.44**

PUNJAB

Implementing agency : 20 KVKs

Number of farm households covered : 2,043

1. Sector-specific interventions

1.1 Field crops

- Healthy seeds of improved/ high yielding varieties of rice (PR 126, PR 121, PB 1121, PB 1637, PB 1718, PB 1509), wheat (HD 2967, HD 3086), canola sarson (GSC 6, GSC 7), sugarcane (COPB 92, CO 118), potato (Kufri Khyati, Kufri Pushkar), maize (PMH 1), cotton (PAUBT 1), peas (Punjab 89, AP 3), tomato (Punjab Swarna, Punjab Sona Cherry) and chilli (CH 27, Punjab Sindhuri).
- Integrated nutrient and pest management (white fly, pink ball worm and fall armyworm), improved agronomic practices (direct seeded rice), precision farming (laser levelling, drip/ sprinkler irrigation) and regenerative farming (Happy Seeders for no tillage).
- Intercropping of vegetables in sugarcane and wheat, and turmeric in poplar.
- Cost reduction through natural farming, conservation agriculture and fertilizer application as per the recommendations.

1.2 Horticultural crops

- Promotion of high value crops under protected horticulture (red-yellow capsicum, cucumber, tomato, English rose, carnation, gerbera and muskmelon/ chillies in low tunnel and open fields) dragon fruit, strawberry, gladiolus, cucumber, broccoli and onion-garlic seed production.
- Advisories on marketing management of inputs, promotion of self-marketing and brand building for e-marketing/ direct marketing.
- Aeroponic seed potato production and hydroponic production of high-value vegetables such as parthenocarpic cucumber, lettuce, strawberry and cherry tomato.
- Nursery production of fruits, vegetables and flowering plants.

1.3 Animal husbandry

- Integrated management of animal diseases, integrated nutrient management including urea molasses, mineral blocks, area specific mineral mixture, feed and fodder management, scientific breeding practices, popularization of silage/azolla feeding and stress management.

1.4 Fisheries

- Integrated piggery-fishery model, advisories on construction and management of fishponds, scientific feeding and pest management.

1.5 Farm and non-farm enterprises

- Mini-food processing units for honey, turmeric, paddy, wheat flour, oil extraction, spices, grading of pulses, splitting and de-husking of pulses.
- Capacity building by linking entrepreneurs to various agencies and networks, promotion of FPOs and promotion of entrepreneurship in piggery, fishery, goatery, poultry, vinegar and jaggery making, integrated apiculture, mushroom production and vermi-composting.
- Household-level processing for pickles, jam, jelly, squash, fruit candy, ice cream, ghee and cheese.
- Non-farm enterprises such as bakery, apparel making, candle making, phulkari making and beauty services.
- Promotion of custom hiring centres, especially for crop residue management and general farm machines.

2. Impact on Household Income

The overall household income increased by 2.34 times between 2016-17 and 2020-21 (Table 7). The highest increase was observed in farm and non-farm enterprises followed by livestock, horticulture, fisheries and field crops. The share of field crops decreased from 76.31 per cent to 49.85 per cent. Nevertheless, field crops contribution was the most (30.13%) to additional income followed by livestock (26.25%), horticulture (22.40%) and farm/non-farm enterprises (20.18%).

Table 7. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	328978	503299	52.99	76.31	49.85	30.13
Horticulture	38261	167844	338.68	8.88	16.62	22.40
Livestock	39038	190877	388.95	9.06	18.91	26.25
Fisheries	2137	8150	281.38	0.50	0.81	1.04
Farm and non-farm enterprises	22666	139442	515.20	5.26	13.81	20.18
Total	**431080**	**1009612**	**134.21**	**100.00**	**100.00**	**100.00**

Between 2016-17 and 2020-21 the landless experienced the highest increase in their income (3.22 times) and the large farmers the least (2.2 times) (Table 8). This reflected on the scale-neutrality and inclusiveness of the interventions by the KVKs.

Table 8. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	143	07.00	119223	383852	221.96
Marginal (<1.0 ha)	414	20.26	135885	420510	209.46
Small (1-2 ha)	488	23.89	229177	565275	146.65
Medium (2-4 ha)	493	24.13	381551	886797	132.42
Large (>4 ha)	505	24.72	1004848	2219030	120.83
Total	**2043**	**100.00**	**431080**	**1009612**	**134.21**

UTTARAKHAND

Implementing agency : 11 KVKs

Number of farm households covered : 1,339

1. Sector-specific interventions

1.1 Field crops

- Promoting/ providing healthy seed of improved/ high yielding varieties of rice (HKR 47, Pant Dhan 26, PR 113, Pusa 1, Pant Sugandh Dhan 16 and 17, VL Dhan 156, VL Dhan 158), wheat (UP 2628, UP 2684, HD 2687 and 2967, PBW 550, VL 892, VL 953, VL Gehun 907), finger millet (VLM 352), canola sarson (GSC-6), sugarcane (CO Pant 94211 and 84211), potato (Kufri Khyati, Kufri Pushkar), maize (Pant Sankar Makka-1, Gaurav, Surya), peas (Vivek Mattar 13, Vivek Mattar 15), okra (Pusa Sawani, Arka Anamika), tomato (Pusa Hybrid 2 and 4, Pusa Divya), brinjal (Pusa Purple Long and Pusa Purple Cluster) and chilli (CH-27).
- Maize + rajmash and ragi + pigeonpea intercropping.
- Integrated nutrient/ pest/ weed management (especially management of white fly, pink boll worm and fall armyworm), improved agronomic practices (direct seeded rice), precision farming (laser levelling, drip/ sprinkler irrigation) and regenerative farming (Happy Seeder technology for no till agriculture).
- Intercropping of vegetables in sugarcane crop and wheat/ turmeric in poplar crop.
- Cost reduction through natural farming, conservation agriculture and fertilizer use as per soil health cards.

1.2 Horticultural crops

- Promotion of high value crops under protected horticulture (red-yellow capsicum, cucumber, tomato, carnation) and off-season cultivation of cauliflower, radish, carrot, cabbage and other exotic vegetables.

- Scaling-up and scaling-out the cultivation of apple, litchi, guava, mango, pear, peach, almonds and plum throughout the state.
- Promotion of dragon fruit, strawberry, cucumber, broccoli and seed production of onion/ garlic.
- Encouraged farmers to grow gladiolus, lilium, gerbera, roses, carnation, rajnigandha and marigold flower crops.
- Hydroponic production of high value vegetables such as parthenocarpic cucumber, lettuce, strawberry and cherry tomato.
- Nursery production of fruits, vegetables and flowering plants.

1.3 Animal husbandry

- Integrated management of animal diseases and integrated nutrient management of dairy animals.
- Popularisation of urea molasses mineral blocks, area-specific mineral mixture, feed and fodder management, scientific fertilization practices, popularization of silage/ azolla feeding and stress management among animals.
- Promotion of goatery, sheep rearing, broiler farming and backyard poultry for supplementation of family income.

1.4 Fisheries

- Promote composite fish farming with special focus on grass carp, rohu and catla.
- Integrated piggery-fishery model, advisories on construction and management of fishponds, scientific feeding and pest management. IFS model with fishery as a major component.

1.5 Farm and non-farm enterprises

- Promoted mini-food processing units for honey, turmeric, paddy, wheat flour, oil extraction, spices, grading of pulses, splitting and de-husking of pulses.
- Capacity building of farmers and entrepreneurs in piggery, fishery, goatery, poultry, vinegar making, jaggery making, integrated apiculture, mushroom production and vermi-composting.
- Popularisation of button and oyster mushroom production.
- Household processing for pickles, jam, jelly, squash, fruit candy, ice cream, ghee and cheese.
- Non-farm enterprises such as apparel making, candle making, handicraft making and beauty services.

2. Impact on Household Income

The average net income of the respondent farmers in Uttarakhand increased 3.11 times during 2016-17 and 2020-21 (Table 9). Fisheries, though on very small base, showed the highest enhancement in net income (10.71 times) followed by horticulture (4.67 times), livestock (3.81 times), enterprises (2.97 times) and field crops (2.15 times) during the period of 2016-17 and 2020-21. The share of

field crops in the household income fell to 33.68 per cent in 202-21 from 48.73 per cent in 2016-17, while the share of horticulture, livestock and fisheries increased. Livestock added the most to the additional income (29.97%) followed by horticulture (28.70%) and field crops (26.55%).

Table 9. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	40542	87186	115.05	48.73	33.68	26.55
Horticulture	13749	64159	366.64	16.52	24.79	28.70
Livestock	18753	71391	280.69	22.54	27.58	29.97
Fishery	773	8281	971.28	0.93	3.20	4.27
Farm and non-farm enterprises	9388	27841	196.56	11.28	10.76	10.51
Total	**83206**	**258858**	**211.10**	**100.00**	**100.00**	**100.00**

More than 90 per cent of the respondents in this survey were marginal and smallholders (Table 10). The income of marginal farmers increased the most (224.81%), followed by small farmers (217.65%) and large farmers (205.40%). The increase in income was the least (102.45%) for the landless class.

Table 10. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	4	0.30	136562	276473	102.45
Marginal (<1.0 ha)	1012	75.58	47829	155353	224.81
Small (1-2 ha)	200	14.94	121268	385208	217.65
Medium (2-4 ha)	90	6.72	256509	722839	181.80
Large (>4 ha)	33	2.46	458309	1399698	205.40
Total	**1339**	**100.00**	**83206**	**258858**	**211.10**

DELHI

Implementing agency : 01 KVK

Number of farm households covered : 110

1. Sector-specific Interventions

1.1 Field crops

- Introduction of improved varieties of paddy (Pusa Basmati 1121) and integrated crop management (ICM) practices.
- Resources conservation practices in rice-wheat cropping system, wheat sowing by zero tillage and Happy Seeders.
- Introduction of new varieties of chickpea (GNG 1958) and greengram (MH 421).
- Crop diversification through introduction of greengram and chickpea crops in rice- wheat cropping system.
- Integrated pest management (IPM) of Bakanae disease and sheath blight in paddy crop.
- Integrated nutrient management in paddy and wheat crops.
- Promotion of improved varieties of wheat crop viz., HD2967 and HD 3226.
- Soil-test based fertilizers recommendation in field crops.

1.2 Horticultural crops

- Introduction of new varieties of onion *viz*., NHRDF Red, NHRDF 4, L 883 and integrated pest and disease management practices.
- Introduction of off-season vegetable production like rising of cucurbits nursery in low tunnel, early cucurbits nursery raising, coriander, and spinach under shade net.
- Nutrient management in cauliflower, tomato and cucurbits.
- Cultivation of low volume high value crops like strawberry.
- Integrated pest management (IPM) of DBM in cauliflower, shoot and fruit borer in brinjal and okra, and fruit borer in tomato.

1.3 Animal husbandry

- Introduced balanced feed and preparation of economic ration using low-cost ingredients.
- Regular use of mineral mixture and timely deworming.
- Timely vaccination against diseases like FMD and HS.
- Clean milk production practices.

1.4 Farm and non-farm enterprises

- Seed production of cereals and pulses through farmer producer organizations.
- Vegetable nursery for seedlings.
- Mushroom production.
- Processing and value addition in pearl millet.
- Value addition to onion, aonla, chilli, bajra and tomato.

2. Impact on Household Income

Comparison of household income before and after the interventions is shown in Table 11. The average income of farm households more than doubled (2.4 times) between 2016-17 and 2020-21. The horticulture experienced 4.6 times increase and became the most important source of household income (45.56%) replacing field crops whose share fell to 31.94%. Farm and non-farm enterprises, the third important contributor to household income, experienced 3.3 times increase. Livestock, the least contributor to the household income, increased by 3.1 times, consolidating its share in the household income to 7.98% in 2020-21 from 6.34% in 2016-17. Notably, horticulture accounted for 60 per cent of the income added during this period.

Table 11. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	138036	183034	32.60	58.67	31.94	13.25
Horticulture	56818	261095	359.53	24.15	45.56	60.15
Livestock	14914	45723	206.58	6.34	7.98	9.07
Farm and non-farm enterprises	25491	84993	233.42	10.83	14.83	17.52
Total	**235259**	**574845**	**144.35**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. However, the households at the bottom of land distribution benefitted relatively more. Marginal farmers realized the maximum benefit, an increase in income by 2.6 times. The income of the landless families, small and medium farmers increased 2.4 times, whereas the income of large farmers increased 2.3 times.

Table 12. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	01	0.91	98000	240000	144.90
Marginal (<1.0 ha)	31	28.18	131372	339143	158.16
Small (1-2 ha)	43	39.09	227776	557603	144.80
Medium (2-4 ha)	25	22.73	279259	689380	146.86
Large (>4 ha)	10	9.09	493210	1126809	128.46
Total	**110**	**100.00**	**235259**	**574845**	**144.35**

HARYANA

Implementing agency : 18 KVKs

Number of farm households covered : 1,980

1. Sector-specific Interventions

2.1 Field crops

- Introduction of short duration rice variety, Pusa Basmati 1509.
- Introduction of wheat varieties, HD 2967, HD 3298 and DWD 187.
- Introduction of bio-fortified varieties of wheat *viz.* DBW 48 and DBW 303.
- IPM for management of pink boll worm in cotton.
- Introduction of *zaid* moong cultivation in potato/mustard based cropping system.
- Introduction of agro-forestry system.
- Introduction of mustard varieties RH 0749 and RH 725 along with balanced use of fertilizers.
- Introduction of intercropping of chickpea and onion with sugarcane.
- Introduction of sweet corn/baby corn in peri-urban eco-system.
- Management of sucking pests in green gram.

2.2 Horticultural crops

- Introduction of new varieties of vegetables and bio-intensive pest/disease management.
- Introduction of new hybrids of tomato along with integrated pest disease management.
- Popularization of onion variety N53 and management of pests and diseases.
- Promotion of cultivation of guava, litchi, strawberry with improved practices and management.
- Introduction of marigold variety Pusa Narangi.
- Promotion of processing and value addition of horticultural produce.

2.3 Animal husbandry

- Promotion of rearing of Murrah breed of buffalo (black gold of Haryana), cross-bred and indigenous/desi cattle.
- Promotion of balanced nutrition, green fodder cultivation, area-specific mineral mixture and clean milk production practices.
- Feeding and breeding management in buffaloes and cattle.
- Promotion of poultry with improved breeds and management practices for sustainable income generation.

2.4 Farm and non-farm enterprises

- Hi-tech nursery of vegetable/fruit plants and marketing arrangements.
- Promotion of mushroom production and marketing.
- Promotion of processing and value addition.
- Promotion of vermi-compost production.

3. Impact on Household Income

A comparison of the household income before and after the interventions shows 2.6 times increase (Table 13). The share of horticulture in the household income increased from 8.82 per cent to 18.52 per cent. The share of livestock too increased considerably. On the other hand, there was a considerable decline in the share of income from field crops (from 73.1% to 52.4%).

Table 13. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	220788	409521	85.48	73.10	52.40	39.35
Horticulture	26627	144787	443.77	8.82	18.52	24.64
Livestock	36565	159899	337.30	12.11	20.46	25.72
Farm and non-farm enterprises	18048	67390	273.41	5.98	8.62	10.29
Total	**302027**	**781598**	**158.78**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. However, the households belonging to marginal farmers benefitted relatively more (four times). The income of the landless families and that of the small farm households increased by 2.7 times. The medium and large farm households could realize 2.5 and 2.4 times increase in their household income, respectively.

Table 14. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	44	2.22	64067	170991	166.89
Marginal (<1.0 ha)	306	15.45	114485	455771	298.10
Small (1-2 ha)	644	32.53	170744	467578	173.85
Medium (2-4 ha)	593	29.95	315320	784151	148.68
Large (>4 ha)	393	19.85	669767	1614383	141.04
Total	**1980**	**100.00**	**302027**	**781598**	**158.78**

RAJASTHAN

Implementing agency : 44 KVKs

Number of farm households covered : 4,926

1. Sector-specific Interventions

1.1 Field crops

- Introduction of improved variety of pearl millet (MPHMH 17).
- Popularization of new varieties of green gram viz., IPM 02-3, IPM 205-7 and GAM 5.
- Introduction of blackgram varieties, *viz*., Pant Urd 31 and Pratap Urd 1, which are disease resistant and high yielders.
- Introduction of soybean varieties, *viz*., JS 2034 and JS 20-216, as both varieties are yellow mosaic virus resistant and high yielders.
- IPM for management of pod borer in chickpea and white grub in groundnut.
- Introduction of new high yielding (25-30 q/ha) mustard variety Giriraj.
- Introduction of improved short duration variety of sesame (RT 351).
- Introduction of new varieties of wheat *viz*. Raj 4079, Raj 4238, and scheduling of irrigation.
- Promotion of chickpea improved varieties *viz*. GNG 1581 and GNG 2144.
- Introduction of post-emergent herbicide (Imazethapyr) in green gram, black gram and soybean.
- Introduction of dual-purpose hybrid varieties of maize during kharif and rabi.
- Introduction of *Bt* cotton varieties/hybrids.

1.2 Horticultural crops

- Introduction of Bhagwa variety of pomegranate with drip irrigation.
- Introduction of new hybrids of chilli and tomato along with integrated pest and disease management.
- Promotion of onion variety N 53 for kharif cultivation and management of pests and diseases.
- Promotion of cumin variety GC 4.

1.3 Animal husbandry

- Promotion of indigenous high yielding cattle breeds of Tharparkar and Rathi, crossbreed cattle and buffalo along with improved management practices like balanced nutrition, area-specific mineral mixture and clean milk production practices.

- Introduction of backyard poultry with improved breeds (Kadaknath and Pratap Dhan) along with feed supplementation with azolla and locally prepared feed formulations.
- Promotion of goat rearing with improved breeds *viz.*, Sirohi/Marwari along with micronutrient supplementation and deworming practices.

1.4 Farm and non-farm enterprises

- Mushroom production and marketing.
- Vermi-compost production.
- Processing and value addition of farm produce.
- Horticultural nursery for seedlings of fruits, plantation crops and vegetables.
- Seed production of pulses.
- Bee keeping for honey production and its value addition.

2. Impact on Household Income

Household income before and after the KVK interventions in the state was more than doubled (2.7 times) between 2016-17 and 2020-21 (Table 15). The household income from farm/non-farm enterprises, horticulture and livestock increased considerably. The share of field crops although declined but continued to be the dominant source of household income. Notably, 42.06 per cent of the additional income came from the field crops followed by livestock (28.57%) and horticulture (26.11%).

Table 15. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total Income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	131621	272099	106.73	66.62	51.19	42.06
Horticulture	23256	110454	374.94	11.77	20.78	26.11
Livestock	41350	136770	230.76	20.93	25.73	28.57
Farm and non-farm enterprises	1329	12225	819.73	0.67	2.30	3.26
Total	**197556**	**531548**	**169.06**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. The households at the bottom of land distribution benefitted relatively more (Table 16). The income of the landless families increased 3.5 times, and of the marginal and small farm households by 3.2 and 2.8 times, respectively. The medium and large farm households could realize a 2.7 and 2.6 times increase in their household income, respectively.

Table 16. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	6	0.12	159702	554329	247.10
Marginal (<1.0 ha)	1108	22.49	72623	231215	218.38
Small (1-2 ha)	1326	26.92	114881	318151	176.94
Medium (2-4 ha)	1241	25.19	196994	532423	170.27
Large (>4 ha)	1245	25.27	397538	1025131	157.87
Total	4926	100.00	197556	531548	169.06

UTTAR PRADESH

Implementing agency : 67 KVKs

Number of farm households covered : 7431

1. Sector–specific Interventions

1.1 Field crops

- Introduction of improved varieties of wheat *viz.*, Shatabdi, HI 8137, Raj 4120, K 1317 and HD 2967, DBW 187 and replacement of old seeds with latest one for higher yield.
- Integrated crop management, direct sowing and mechanization in agricultural crops.
- Bio-fortified K 1006 and Pusa Ujala wheat varieties rich in iron, protein and zinc were introduced
- Introduction of salt-tolerant paddy varieties CSR 36 and CSR 43 and Basmati rice PB 1509 and PB 1617.
- Introduction of improved varieties of pearl millet and maize in *kharif* for water-stressed areas.
- Introduction of trench farming technology in sugarcane along with intercropping of lentil, mustard, coriander, etc.
- Introduction of new varieties of pigeon pea (Narendra Arhar and IPA 203), field pea (Prakash, IPFD12-2, IPFD, 10-12, IPFD 11-5 and Vikas), chickpea (RVG 202 and RVG 203), summer green gram (Virat and Shikha) and blackgram (Azad Urd 3) along with improved production practices including seed treatment by rhizobium.
- Introduction of resource conservation technologies.
- Improved oilseeds cultivation practices including recommended seed rate, thinning, use of sulphur in mustard and improved high oil containing, heat-tolerant verities (RH 725, Peetambari, and Azad Mahak) with micronutrient and pest management.
- Introduction of summer groundnut varieties (DH 86, TG 37A).
- Introduction of hybrid napier grass CO 5 for reducing cost of green fodder.

1.2 Horticultural crops

- Introduction of new varieties of okra (NS 819), brinjal (Navkiran), chilli (Kashi Anmol) and weed management.
- Introduction of *kharif* onion varieties (Bhima Shankar, ADR and Line 883).
- Introduction of bio-fortified verities of radish, cabbage, cauliflower and potato.
- Training on scientific cultivation of broccoli and capsicum.

- Provision of bio-control agents for pest management.
- Introduction of machan training system in cucurbits.
- Promotion of mulching and micro-irrigation in orchard and vegetable crops.
- Management of black scurf and common scurf disease of potato through sand and soil treatment and use of bio-pesticides.
- Introduction of new potato varieties Kufri Sukhyati, Kufri Neelkanth, Kufri Mohan, Kufri Sangam, Super 6 and Kufri Lowkar.
- Diversification into medicinal crops like tulsi, satavar and lemon, and flower crops like gladiolus, marigold and jasmine cultivation.

1.3 Animal husbandry

- Replacement of local, low yielding breeds with high yielding cattle and buffalo breeds, *viz.*, Sahiwal, Gir and Sindhi of cow and Murrah and Bhadawari of buffalo.
- Improved feeding practices including mineral mixture, nutrient supplementation and balanced feeding using locally available resources.
- Clean milk production techniques.
- Colostrum feeding, weaning of calves, shed for animal with loose housing system, vaccination against FMD, septicemia and other diseases.
- Introduction of poultry breed Kadaknath and promotion of contract farming.
- Deworming, proper nutrition, micronutrient supplementation for intensive and semi -intensive goat farming.
- Rejuvenation of old ponds and scientific fish production.
- Composite fish farming of rohu, catla, mrigal, silver carp, common carp and grass carp.

1.4 Farm and non-farm activities

- Introduction of mushroom, honey, nurseries of fruits and vegetables, seed production of vegetables and establishment of village seed banks.
- Value addition and processing of grains, millets, fruits, vegetables, mushroom and spices.
- Formation of SHGs, FPOs, FIGs, and building forward and backward linkages.
- Capacity building on stitching and tailoring, linkages with MSMEs, NGOs, TTC and SAMETI for sale of bags, masks, garments and uniforms.
- Seed production of cereals, pulses, oilseeds and fodder crops.
- Custom hiring and pooled machinery system.
- Promotion of Kitchen gardens.

2. Impact on Household Income

The household income before and after the interventions (Table 17) revealed that the average income of farm households more than doubled (2.71 times) between 2016-17 and 2020-21. The share of enterprises in the household income, although small, increased 5.84 times, whereas, livestock income increased by 3.69 times. Field crops was the dominant source of additional income with 36.92% contribution.

Table 17. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	82650	163487	97.81	64.64	47.14	36.92
Horticulture	20204	84131	316.41	15.80	24.26	29.20
Livestock	21793	80440	269.11	17.04	23.19	26.78
Farm and non-farm enterprises	3215	18762	483.58	2.51	5.41	7.10
Total	**127862**	**346820**	**171.25**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. Landless category households realized 2.53 times increase in net income. Large farm households could realize 2.62 times increase in their household income. Increase in income was equally significant for smallholders and medium farmers with 2.70 times increase. The increase in income of marginal farm households was the highest by 2.75 times.

Table 18: Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	76	1.02	157351	397851	152.84
Marginal (<1.0 ha)	3203	43.10	122355	336128	174.72
Small (1-2 ha)	2286	30.76	126918	343261	170.46
Medium (2-4 ha)	1297	17.45	133163	360341	170.60
Large (>4 ha)	569	7.66	146636	383668	161.65
Total	**7431**	**100.00**	**127862**	**346820**	**171.25**

BIHAR

Implementing agency : 38 KVKs

Number of farm households covered : 4,279

1. Sector-specific Interventions

1.1 Field crops

- Promotion and cultivation of high yielding varieties of paddy with best management practices *viz*., Swarna Sub 1, Swarna Sreya, Rajendra Sweta, Rajendra Kasturi (scented), Pusa Basmati 1121 (export quality), Katarni, Sahbaghi for rainfed, and wheat var. HD 2967, PBW 502, DBW 187, hybrid maize, jowar and bajra crop with integrated crop management (ICM).
- Intercropping of wheat with mustard; maize with blackgram; okra with pigeonpea; sugarcane with potato, and chickpea with linseed through mechanized sowing or zero/ minimum tillage.
- Promotion of integrated pest management (IPM) practices in maize for fall armyworm (FAW) and *Helicoverpa* spp.
- Inclusion of pulses in rice- wheat cropping system to increase crop intensity and maintain soil fertility.
- Cultivation of cash crop like tobacco, sugarcane, potato and makhana.
- IPM/IDM for early shoot borer, top borer and red rot in sugarcane.

1.2 Horticultural crops

- Bio-intensive management of pests of vegetables *viz*., brinjal, okra, cauliflower, cabbage, potato and tomato, chili, bottle gourd and capsicum.
- Protected vegetable cultivation in off-season.
- Integrated pest management of fruit borer in litchi, fruit fly in mango and guava, fruit drop in mango and wilt in banana.
- Cultivation of high value crops like broccoli, capsicum, strawberry and dragon fruit.

1.3 Animal husbandry

- Introduction of Sindhi and Sahiwal breeds of cattle, good pasture management; artificial insemination and clean milk production.
- Promotion of backyard poultry breeds (Vanaraja, Gramapriya) duck (Khaki Campbell), cost-effective locally prepared feed formulations and mineral mixtures.
- Emphasis on goat farming for high quality meat (Barbari and Black Bengal) through nutrient supplementation and deworming.

- Promotion of fish farming in lowland areas, supply of quality fish seed and support for establishment of hatcheries.

1.4 Farm and non-farm enterprises

Mushroom and spawn production, horticultural nursery for seedling propagation, bee keeping for honey production, value addition in horticultural crop and custom hiring of farm equipment were promoted.

2. Impact on Household Income

The household incomes of farmers before and after the interventions were compared (Table 19). Among the different components, maximum per cent increase in income was recorded in enterprises (419.12%) like mushroom, bee keeping, vermi-composting, value addition and processing. The net income from livestock increased from Rs 23,659 in 2016-17 to Rs 94,827 in 2020-21. Income from horticultural crops also increased more than three times during this period. However, field crops remained the main driver of income contributing 40.39% to the additional income.

Table 19. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	81547	177193	117.29	60.25	47.61	40.39
Horticulture	26186	83346	218.29	19.35	22.39	24.14
Livestock	23659	94827	300.80	17.48	25.48	30.05
Enterprises	2591	13450	419.12	1.91	3.61	4.59
Others	1360	3356	146.71	1.01	0.90	0.84
Total	**135343**	**372172**	**174.98**	**100.00**	**100.00**	**100.00**

All classes of farmers benefitted from the technological interventions (Table 20). Out of 4,279 households, 1,543 households belong to smallholder categories (36.06 %) followed by marginal (1,393) with 32.55% share. However, the maximum change (217.89%) in household income was with landless category followed by marginal (201.07%) and smallholders (179.37 %).

Table 20. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/ household)		% change in household income
			2016-17	2020-21	
Landless	20	0.47	61833	196564	217.89
Marginal (<1.0 ha)	1393	32.55	59967	180544	201.07
Small (1-2 ha)	1543	36.06	111594	311760	179.37
Medium (2-4 ha)	882	20.61	186614	505822	171.05
Large (>4 ha)	441	10.31	357321	929510	160.13
Total	**4279**	**100.00**	**135343**	**372172**	**174.98**

JHARKHAND

Implementing agency : 23 KVKs

Number of farm households covered : 2,765

1. Sector-specific Interventions

2.1 Field crops

- Improved varieties of paddy (Sahbhagi, Swarna, IR 64 and Kanak), maize (Shaktiman-1, 2, Suwan and hybrid maize 3) and wheat (HD 2967).
- Integrated crop management (ICM), direct seeding of rice (DSR) and SRI practices.
- Introduction of less water requirement crops like pearl millet, finger millet, foxtail millet and kodo millet.
- New varieties of pigeonpea (IPA 205 and Pusa 9), chickpea (Pusa 256 and Birsa Chana 3) and black gram (WBU 109 and Birsa Urd 1).
- Introduction of improved mustard varieties (PM 30, Varuna and Pusa Bold).
- Integrated pest management practices in maize for fall armyworm and aphid in oilseed crops like mustard and safflower.

2.2 Horticultural crops

- Introduction of high value fruit crops (strawberry and dragon fruit), broccoli, *kharif* onion and early variety of cabbage and cauliflower.
- Introduction of new hybrids in tomato (Pusa Ruby, Pusa Hybrid 2 and NS 55) and capsicum (yellow wonder, Arka Mohini, Arka Gaurav and Arka Basant), okra (Pusa A 4 and Parbhani Kranti), cauliflower (Ketki, Pant Gobhi 3 and Patna Early) and brinjal (Arka Kusumakar, Arka Harshitha Kashi Sandesh, VNR-218 and Arka Rakshak).
- Integrated pest management for onion thrips, okra shoot and fruit borer, DBM in cauliflower, cabbage and tomato fruit borer; and bio-intensive disease management techniques.
- Polythene mulch in vegetable crops like capsicum, potato and watermelon, and drip irrigation in fruit crops like papaya and banana.
- Off-season cultivation of capsicum and cucumber under green house or protected structures.
- Integrated pest and disease management in fruit crops like mango, litchi, papaya and banana.
- Cultivation of marigold, making garlands and value-added products.

2.3 Animal husbandry

- Balanced nutrition, fodder cafeteria, area-specific mineral mixture and clean milk production practices.

- Introduction of breeds of pig (Jharsukh), goat (Barbari), backyard poultry (Vanaraja and Gramapriya) and duck (Khaki Campbell).
- Promotion of Sindhi and Sahiwal breeds of local cow.
- Fish farming in low -land rice field.
- Use of artificial insemination and clean milk production practices.
- Cost-efficient nutrition management with locally prepared feed formulations.
- Semi-intensive and intensive sheep and goat farming, micronutrient supplementation and deworming practices.

2.4 Farm and non-farm enterprises

- Seed production of pulses, oilseed and cereals crops.
- Nursery raising for propagation of planting materials of fruits, plantation crops and vegetables crops.
- Cultivation of button and oyster mushroom and value addition.
- Bee keeping, lac farming and its processing, value-added products like mango squash, and jam, pickle of mango, green chilli, bamboo and amorphophallus.
- Custom hiring of farm machinery, tailoring, soft toys making, bamboo crafts and leaf plates making.

3. Impact on Household Income

Net income of farm household before and after the interventions is presented in Table 21. The average farm household income increased from Rs.84,897 (2016-17) to Rs.2,53,656 (2020-21). Among different farming components, maximum change was observed in horticultural crop (Rs.83271) followed by enterprises (Rs.41037) and field crop (Rs.39382). Maximum per cent increase in income was recorded in livestock (428.89%) followed by enterprises (266.17%). Per cent share in additional income among different components was highest in horticultural crops (49.34%) followed by enterprises (24.32 %) and field crops (23.34 %).

Table 21. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	29686	69068	132.67	34.97	27.23	23.34
Horticulture	37826	121097	220.14	44.56	47.74	49.34
Livestock	633	3349	428.89	0.75	1.32	1.61
Enterprises	15417	56454	266.17	18.16	22.26	24.32
Others	1335	3688	176.32	1.57	1.45	1.39
Total	**84897**	**253656**	**198.78**	**100.00**	**100.00**	**100.00**

Out of 2765 households, 1200 households belong to small category (43.40 %) followed by marginal farmers (895) with 32.37% share. The maximum per cent change in household income was found in landless category (366.59%) followed by large (216.00 %) farmers. Change in income among marginal farmers (200.26%) was higher than small farmers (193.80%) and medium farmers (191.36%).

Table 22. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	6	0.22	27683	129167	366.59
Marginal (<1.0 ha)	895	32.37	59085	177407	200.26
Small (1-2 ha)	1200	43.40	74233	218093	193.80
Medium (2-4 ha)	463	16.75	110171	320997	191.36
Large (>4 ha)	201	7.27	206986	654080	216.00
Total	**2765**	**100.00**	**84897**	**253656**	**198.78**

ODISHA

Implementing agency : 33 KVKs

Number of farm households covered : 3154

1. Sector-specific Interventions

1.1 Field crops

- Introduction of improved varieties of non-aromatic (GB 1 and Vijoy Swarna) and aromatic rice (Kalajira), integrated crop management practices, mechanical sowing/ transplanting and DSR.
- Promotion of improved variety of maize (Pioneer 3041) and effective control of fall armyworm.
- Introduction of Tulasi variety of cotton.
- Introduction of small and coarse millets varieties (Bhairavi, Chillika, Arjun and Sabara).
- Introduction of short duration varieties of pigeonpea (UPAS 120, LRG 52 and PRG 176).
- Introduction of greengram and blackgram varieties (PU 30, IPM 02-14, IPM 205-7, Ujala and PU 32) with package of practices.
- Introduction of oilseeds varieties (TG 38, Dharani and Devi of groundnut; Parvati and PM 28 of mustard; Deomali, Utkal and Niger-150 of niger, and KBSH 41 and LSFH 171 hybrids of sunflower).

1.2 Horticultural crops

- Large-scale cultivation of off-season vegetables like tomato, chilli, cauliflower, cabbage with disease free planting material.
- Protected cultivation of high value vegetables like colored cauliflower, cabbage, broccoli, pochoy, celery, parsley, lettuce, brussels sprouts etc., in low-cost structures.
- Cultivation of betelvine in shade net.
- Nutrient management and mulching in vegetables.
- Micro-irrigation for water management in vegetables.
- Introduction of proper management in orchards of mango, litchi, cashew, banana and pineapple like canopy management, appropriate irrigation schedule etc.
- Introduction of *kharif* onion.
- Intercropping in the orchards with turmeric, yams and ginger.
- Nutrient, disease and pest management in fruit crops.
- Minimizing post-harvest losses.

1.3 Animal husbandry

- Introduction of balanced nutrition, fodder cultivation, vaccination schedule and clean milk production practices.
- Introduction of improved breed of poultry like Vanaraja, Kaveri, Kadaknath and proper management practices.
- Improved breeds of small ruminants like Sirohi and Beetal of goat.
- Location-specific mineral mixture preparation and popularization.
- Introduction of semi-intensive poultry rearing practices.

1.4 Fisheries

- Introduction of proper stocking density in IMC production.
- Scientific pond eco-system for higher fish production.
- Introduction of ornamental fishery as commercial venture.
- Improved feeding and disease management practices.
- Introduction of production technology for stunted yearling.

1.5 Farm and non-farm enterprises

- Seed production of rice, oilseeds and pulses.
- Production of vegetable seedlings and fruit crop saplings.
- Mushroom and spawn production.
- Bee keeping and azolla production.
- Vermi-compost production.
- Processing and value addition.

2. Impact on Household Income

Farmers income increased from Rs.120909 to Rs.339262 during 2016-17 to 2020-21 (Table 23). Income from fisheries increased by 220.10% (from Rs 49606 to Rs 158787) and in the livestock sector, income increased from Rs.17755 to Rs.42499 (139.4%). The paradigm shift in farmers' income was more evident in enterprises like bee keeping, mushroom and vermi-compost production. The income from these sectors increased from Rs.31563 to Rs.83999 (166.13%). Fisheries had the highest share of 50.00 per cent in the additional income generated during the period.

Table 23. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	12466	28960	132.31	10.31	8.54	7.55
Horticulture	9519	25017	162.81	7.87	7.37	7.10
Livestock	17755	42499	139.36	14.68	12.53	11.33
Fisheries	49606	158787	220.10	41.03	46.80	50.00
Farm and non-farm enterprises	31563	83999	166.13	26.10	24.76	24.01
Total	**120909**	**339262**	**180.59**	**100.00**	**100.00**	**100.00**

Among the farmers involved in the DFI efforts, majority of farmers belonged to smallholder category (44.64%) followed by marginal landholders (24.22%). Although the increase in income was highest for large farmers (204.33%), marginal landholders achieved remarkable increase in income up to 189.17 per cent.

Table 24. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1 ha)	764	24.22	63571	183828	189.17
Small (1-2 ha)	1408	44.64	110157	295263	168.04
Medium (2-4 ha)	709	22.48	140838	390720	177.43
Large (>4 ha)	273	8.66	285063	867538	204.33
Total	**3154**	**100.00**	**120909**	**339262**	**180.59**

The overall analysis indicated that marginal farmers were more dependent on cereal crops and small farmers were more inclined to cultivate horticultural crops. Whereas, large farmers have diversified their farming pattern to fisheries and livestocks. Non-crop sectors like fisheries, poultry, dairy, bee keeping etc., might have contributed to a great extent towards such enhancement of income.

WEST BENGAL

Implementing agency : 23 KVKs

Number of farm households covered : 2,531

1. Sector-specific Interventions

1.1 Field crops

- Introduction of stress and submergence tolerant varieties of rice (CR 1009, Swarna Sub 1, Bina 11, and Luna Swarna), integrated crop management practices, mechanical sowing/ transplanting and DSR.
- Popularization of improved jute variety namely JRO 204 and use of CRIJAF SONA for improving fiber quality during retting.
- Introduction of green gram and black gram varieties (PDM 84-139, Virat and WBU 109) with proper crop management practices.
- In oilseeds, varieties like Dharani and Devi of groundnut; CUMS 17 (Suprabha) in sesamum, Parvati, PM 28 of mustard, and KBSH 41 and LSFH 171 of sunflower were newly introduced.
- Large -scale popularization of farm tools and implements towards farm mechanization.

1.2 Horticultural crops

- Large-scale cultivation of vegetables like tomato, chilli, cauliflower and cabbage in off-season.
- Protected cultivation of high value vegetables like coloured cauliflower, cabbage, broccoli, celery, parsley and lettuce in low-cost structures.
- Cultivation of betelvine under shade net.
- Nutrient management and mulching in vegetables.
- Micro-irrigation for water management in vegetables.
- Proper management of orchards of mango, litchi, banana and pineapple in terms of canopy management and irrigation scheduling.
- Introduction of *kharif* onion varieties (Sukhsagar and Agri Found Red)
- Intercropping in the orchards with turmeric, yams and ginger.
- Nutrient, disease and pest management in fruit crops.
- New production technology of marigold, tuberose, gladiolus, gerbera, other loose and cut flowers.
- Nursery of ornamental plants.

1.3 Animal husbandry

- Introduction of balanced nutrition, fodder cultivation, vaccination schedule and clean milk production practices.
- Introduction of new Turkey Breed (White Broad Breasted).
- Introduction of Khaki Campbell duck.
- Introduction of improved breed of poultry (Vanaraja and Kaveri), and proper management practices.
- Location-specific mineral mixture.
- Introduction of semi-intensive poultry rearing practices.

1.4 Fisheries

- Introduction of proper stocking density in IMC production.
- Scientific pond eco-system for higher fish production.
- Improved fish seed production.
- Air breathing fishes and scampi production.
- Vannamei culture, king prawn and green crab.
- Introduction of ornamental fishery as commercial venture.
- Improved feeding and disease management practices.
- Introduction of production technology for Asian cat fish.

Training at KVK Burdwan, West Bengal

1.5 Farm and non-farm enterprises

- Seed production of rice, oilseeds and pulses.
- Production of vegetable seedlings and fruit crop saplings.
- Mushroom and spawn production.
- Bee keeping and azolla production.
- Vermi-compost production.
- Processing and value addition.

2. Impact on Household Income

Between 2016-17 and 2020-21, the household income increased by 211.46 per cent (Table 25). Income increase was the highest in fisheries (267.56%) followed by livestock (240.98%). In fact, farmers derived most of their additional income from farm/non-farm enterprises (32.70%) and fisheries (31.81%).

Table 25. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	9837	16735	70.12	18.65	10.19	6.18
Horticulture	6320	20472	223.92	11.98	12.46	12.69
Livestock	7692	26228	240.98	14.58	15.96	16.62
Fisheries	13262	48746	267.56	25.14	29.67	31.81
Farm and non-farm Enterprises	15641	52121	233.23	29.65	31.72	32.70
Total	**52752**	**164303**	**211.46**	**100.00**	**100.00**	**100.00**

Marginal holdings (76.37%) dominated the land class categories of the farmers involved in the survey (Table 26). Large farmers reported highest increase in income to the extent of 377.39 per cent followed by medium farmers (261.97%).

Table 26. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1 ha)	1933	76.37	41385	123927	199.45
Small (1-2 ha)	508	20.07	73808	216640	193.52
Medium (2-4 ha)	61	2.41	145575	526934	261.97
Large (>4 ha)	29	1.15	246331	1175960	377.39
Total	**2531**	**100.00**	**52752**	**164303**	**211.46**

It can be inferred that commercial cultivation of crops and vegetables, scientific livestock rearing, crop diversification towards high value crops and creation of large number of enterprises in the rural areas have contributed greatly towards the success to double the income of the farmers of West Bengal.

ANDAMAN AND NICOBAR ISLANDS

Implementing agency : 3 KVKs

Number of farm households covered : 57

1. Sector-specific Interventions

1.1 Field crops

- Introduction of rice variety CARI Dhan and integrated crop management practices.
- Introduction of green gram, black gram varieties (CO 08 and VBN Bg 8).
- Large -scale promotion of farm tools and implements.

1.2 Horticultural crops

- Promotion of vegetables like tomato, chilli and cucurbits.
- Nutrient management and mulching in vegetables.
- Micro-irrigation for water management in vegetables.
- Nutrient and disease-pest management in fruit crops.
- Improved package of practices for seed spices and trees spices.
- Improved cultivation practices of medicinal plants.
- Improved cultivation practices of plantation crops like coconut and arecanut followed by post-harvest management.

1.3 Animal husbandry

- Introduction of balanced nutrition, fodder cultivation and vaccination schedule.
- Introduction of Khaki Campbell duck.
- Introduction of improved breed of poultry (Vanaraja and RIR).
- Location-specific mineral mixture.
- Introduction of semi-intensive poultry rearing practices.

1.4 Fisheries

- Introduction of proper stocking density in IMC production.
- Scientific pond eco-system.
- Improved fish seed production.
- Prawn and crab culture.
- Introduction of ornamental fish as commercial venture.
- Improved feeding and disease management practices.

1.5 Farm and non-farm enterprises

- Seed production of rice.
- Production of vegetable seedlings and fruit crop saplings.
- Mushroom and spawn production.
- Bee keeping and azolla production.
- Vermi-compost production.
- Processing and value addition.

2. Impact on Household Income

The household income increased by 271.69 per cent (Table 27). Maximum increase was in farm and non-farm enterprises (568.90%) followed by fisheries (295.32%) and horticulture (214.44%). Fisheries contributed as the main source of additional income (34.25%) followed by farm and non-farm enterprises (26.81%).

Table 27. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	14420	42229	192.85	11.85	9.34	8.41
Horticulture	15418	48480	214.44	12.67	10.72	10.00
Livestock	37898	105720	178.96	31.16	23.38	20.52
Fisheries	38330	151525	295.32	31.51	33.51	34.25
Farm and non-farm enterprises	15576	104183	568.87	12.80	23.04	26.81
Total	**121642**	**452137**	**271.69**	**100.00**	**100.00**	**100.00**

Distribution of the farmers into different land class categories indicated that the small farmers constituted the majority (40.35%) followed by marginal landholders (36.84%) and the remaining were medium farmers (22.81%). However, the medium farmers reported maximum increase in income to the extent of 348.94 per cent as compared to 273.86 per cent by smallholders and 171.25 per cent among marginal farmers (Table 28) .

Table 28. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1 ha)	21	36.84	75497	204789	171.25
Small (1-2 ha)	23	40.35	147012	549612	273.86
Medium (2-4 ha)	13	22.81	151298	679237	348.94
Total	**57**	**100.00**	**121642**	**452137**	**271.69**

The major crops cultivated in the Islands were paddy, pulses like chickpea, green gram, vegetables like turnip, okra, cucumber, chilli, bitter gourd etc. Farmers also cultivated fruits like mango, pineapple, guava, and jackfruit. The efforts of three KVKs in introducing improved varieties, scientific package of practices, diversification of high value crops/vegetables and appropriate skill resulted into enhancement of average income per farmer.

ARUNACHAL PRADESH

Implementing agency : 14 KVKs

Number of farm households covered : 1,307

1. Sector-specific Interventions

1.1 Field crops

- Scientific cultivation of maize (HQPM 1), millet (Local), summer rice (Dehangi), sesame (AST 1), toria (TS 46), vegetable pea (Azad P 1), frenchbean (S 9), pigeonpea (Pusa 920), cabbage, okra, tokopatta and potato var. Kufri Jyoti.
- Popularization and cultivation of paddy variety CAU R 1 and maize Hybrid-4.
- Use of improved varieties and management practices in finger millet (VL Mandua 347).
- Integrated paddy cum fish culture and composite fish farming.

1.2 Horticultural crops

- Value addition in jackfruit, banana and ginger.
- Use of high yielding varieties, scientific cultivation and management practices in cabbage, cauliflower, beans and peas.
- Low cost protected cultivation of King Chilli.
- Cultivation of fruits like kiwi, apple and orange.
- IPM in vegetable crops.

1.3 Animal husbandry

- Introduction of dual-purpose improved breeds of poultry (Kamrupa), pig (Hampshire) and duck (Khaki Campbell).
- Popularization of amur common carp in pond polyculture system.
- Integrated farming system (duck-cum-fish culture).
- Popularization of improved breed of poultry in backyard farming.

1.4 Farm and non-farm activities

- Use of low-cost vermi-compost production technology.
- Scientific method of oyster mushroom production.
- Eri silkworm rearing.
- Value addition of pineapple into squash and guava into guava jelly.

- Training farmers on scientific approach of rearing farm animals and de-worming.
- Liming and fertilization of pond water and supply of fingerlings and feed.

2. Impact on Household Income

The household income before and after the interventions was compared (Table 29). The average income of farm households more than doubled (2.9 times) between 2016-17 and 2020-21. The increase in income from livestock was 3.5 times (243.73%) followed by fisheries, which increased by three times during this period. Livestock and fisheries also provided the greater share in additional income with a contribution of 36.55 per cent and 21.20 per cent, respectively.

Table 29. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	5400	12540	132.22	12.97	10.50	9.19
Horticulture	8720	23202	166.07	20.94	19.44	18.63
Livestock	11654	40059	243.73	27.99	33.56	36.55
Fisheries	8495	24970	193.93	20.40	20.92	21.20
Farm and non-farm enterprises	7363	18580	152.34	17.70	15.58	14.43
Total	**41632**	**119351**	**186.68**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. In Arunachal Pradesh, 1307 farmers were surveyed by 14 KVKs. Out of that, 43.53 per cent of them were marginal farmers, 29.10 per cent small farmers, 12.50 per cent medium farmers, and 7.60 per cent large farmers. Highest increase in income was reported by large farmers (274.95%) followed by medium farmers (207.85%) and small farmers (189.85%). The income of the landless families increased by 159.80 per cent and marginal farm households income increased by 133.20 per cent, respectively (Table 30).

Table 30. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	99	7.57	27366	71099	159.80
Marginal (<1.0 ha)	569	43.53	29826	69558	133.20
Small (1-2 ha)	380	29.07	45521	131944	189.85
Medium (2-4 ha)	163	12.47	56109	172735	207.85
Large (>4 ha)	96	7.35	86347	323759	274.95
Total	**1307**	**100.00**	**41632**	**119351**	**186.68**

Ovster Mushroom Cultivation - Arunachal Pradesh

Potato Cultivation Arunachal Pradesh (2)

ASSAM

Implementing agency : 25 KVKs

Number of farm households covered : 2,953

1. Sector-specific Interventions

1.1 Field crops

- Utilization of rice fallow with crops such as toria (var. TS 67 and Uttara), mustard (var. NRCHB 101), lentil (var. Moitre), lathyrus (var. Ratan) and field pea (var. Aman).
- INM in toria, lentil and IPM in rice.
- Promotion of sali rice (var. Gitesh, Ranjit sub 1 and TTB 404).
- Cultivation of black gram (var. PU 31) and short duration paddy varieties during post – flood.
- Introduction of honey bee in toria crop.
- Scientific nutrient management in tea.
- Integrated crop management in buckwheat (GC1), sesamum and toria.

1.2 Horticultural crops

- High value crops such as Assam lemon (local), banana (var. Malbhog) and broccoli (var. Green star).
- Promotion of strawberry (var. Charlie and Early dawn).
- Year-round production of cut flowers like summer marigold (Seracole), gerbera (Red Gem) and tuberose (Subhasini).
- Scientific cultivation of black pepper (var. Panniyur 1), potato (var. Kufri Jyoti) and apple ber.
- Popularization of high yielding turmeric var. Megha Turmeric 1.

1.3 Animal husbandry

- Introduction of dual purpose improved breeds of poultry (Kamrupa), duck (Indian runner), pig (Rani and HDK-75) and goat (Beetel cross breed).
- Popularization of amur common carp in pond poly culture system.
- Improved feeding and disease management practices.
- Integrated fish cum duck farming system.

1.4 Farm and non-farm enterprises

- Use of low-cost vermi-compost production technology.
- Low-cost oyster mushroom production.

- Scientific bee keeping *(Apis cerana)*.
- Production of vegetable seedlings and fruit crop saplings.
- Product diversification and value addition of woven fabric.
- Development of weaving unit.
- Establishment of *Jalkhund* for life saving irrigation.

2. Impact on Household Income

Table 31 gives an analogy between before and after intervention on household income. The income of the farm households more than doubled from the base year (2016-2017). As far as per cent sectorial contribution in the total income is concerned, the share of field crops and farm and non-farm enterprises sector increased over the base year, the share of horticultural crops and fisheries sectors reduced, and the share of livestock sector in the total income remained same in 2020-21 as compared to base year.

Table 31. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	8952	30466	240.33	15.61	17.76	18.84
Horticulture	12450	35850	187.95	21.70	20.90	20.49
Livestock	15680	46714	197.92	27.34	27.23	27.17
Fisheries	14580	39570	171.40	25.42	23.06	21.88
Farm and non-farm enterprises	5699	18970	232.87	9.94	11.06	11.62
Total	**57361**	**171570**	**199.11**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. In Assam 2,953 farmers were surveyed by 25 KVKs. Out of that, 43.69 per cent of them were marginal farmers, 33.42 per cent were small farmers, 16.97 per cent were medium farmers, and 5.11 per cent were large farmers. The households at the bottom of land distribution benefitted relatively more. The income of the landless families increased to 215.75 per cent and marginal and small farm households increased to 210.33 and 207.45 per cent, respectively. The medium and large farm households could increase their household income to 178.75 and 193.37 per cent, respectively (Table 32).

Table 32. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	24	0.81	127863	403722	215.75
Marginal (<1.0 ha)	1290	43.69	36533	113373	210.33
Small (1-2 ha)	987	33.42	54348	167098	207.45
Medium (2-4 ha)	501	16.97	89002	248088	178.75
Large (>4 ha)	151	5.11	138802	407210	193.37
Total	**2953**	**100.00**	**57361**	**171570**	**199.11**

Oyster Mushroom cultivation- Assam

Scientific Cultivation of Maize- Assam

SIKKIM

Implementing agency : 4 KVKs

Number of farm households covered : 474

1. Sector-specific Interventions

1.1 Field crops

- Organic cultivation of rice (Pusa Sugandha 6) and maize (Sikkim Shankul Makka 1).
- Utilization of rice - fallow with specific crops such as toria (Toria 36) and maize (HQPM 1).
- Introduction of rajma cultivation (Jwala and Varun).
- Seed production of high yielding varieties of toria (TS 38, TS 67).
- Integrated nutrient management and pest management in toria and rice.
- Introduction of honeybee in toria cultivation.

1.2 Horticultural crops

- Organic cultivation of garden pea (TSX 10), cabbage (Rare ball), cauliflower (Suhasini), radish (Chinese pink), broccoli (Everest) and potato (Kufri Jyoti).
- Utilization of rice fallow with garden pea (Avira 11).
- Red cherry pepper cultivation with plastic mulching.
- Organic cultivation of large cardamom using Pusa Hydrogel.
- Off-season cultivation of vegetable crops like cauliflower (Snowball), cabbage (Pusa Mukta) and broccoli (Everest).
- Sequential vegetable cultivation under low-cost tunnels.
- Value addition of vegetables and fruit crops.
- King chilli and tomato cultivation in low-cost polyhouse.
- Popularization of high yielding ginger varieties (Nadia and Bhaisey).

1.3 Animal husbandry

- Introduction of dual-purpose improved poultry breed Vanaraja.
- Low-cost pig farming (Rani, Large White and Black Yorkshire) with deep litter housing system.
- Introduction of newly developed dual-purpose poultry breed Kamrupa under backyard farming.
- Introduction of rabbit farming.

- Nutritional supplementation of fresh azolla @ 1.5 kg/cattle/day for milch cows.
- Vaccination of dairy animals and pigs.

1.4 Farm and non – farm enterprises

- Use of low-cost vermicompost production technology.
- Low- cost oyster mushroom production.
- Scientific bee keeping *(Apis cerana)*.
- Introduction of plug tray for raising nursery.
- Introduction of hermetic storage of urd using grain pro super grain bag (50 kg).
- Establishment of life saving irrigation Jalkhund.

2. Impact on Household Income

The income of farm households more than doubled between 2016-2017 and 2020-21. Income from fisheries increased six-fold and the increase in income from other components was 174.88% from enterprises, 163.65% from livestock, 123.32% from horticulture and 109.78% from field crops (Table 33).

Table 33. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	6664	13980	109.78	8.76	6.86	5.73
Horticulture	38348	85640	123.32	50.43	42.04	37.05
Livestock	12201	32168	163.65	16.05	15.79	15.64
Fisheries	14755	60668	311.17	19.36	29.79	35.97
Farm and non-farm enterprises	4092	11248	174.88	5.4	5.52	05.61
Total	**76060**	**203704**	**167.82**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions. In Sikkim 474 farmers were surveyed by 4 KVKs. Out of that, 67.30 per cent of them were marginal farmers, 23.84 per cent small farmers, 6.75 per cent medium farmers, and 1.90 per cent large farmers. The income of the landless families increased to 294.77 per cent followed by income of medium farmers (190.70%). Income of marginal and small farm households increased 178.11 and 146.30 per cent, respectively. Large farm households could increase their household income by141.98 per cent (Table 34).

Table 34. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	1	0.21	38250	151000	294.77
Marginal (<1.0 ha)	319	67.30	57242	159199	178.11
Small (1-2 ha)	113	23.84	105063	258781	146.30
Medium (2-4 ha)	32	6.75	137546	399850	190.70
Large (>4 ha)	9	1.90	164508	398078	141.98
Total	**474**	**100.00**	**76060**	**203704**	**167.82**

Potato Cultivation- Sikkim

Production of Red cherry pepper - Sikkim

MANIPUR

Implementing agency : 09 KVKs

Number of farm households covered : 1,076

1. Sector-specific Interventions

2.1 Field crops

- Popularization of paddy var. CAU-R1, mustard var NRCHP 101, and rapeseed var.-TS 36 and TS 39.
- Introduction of integrated crop management (ICM) practices, SRI, INM, IPM, and IWM in paddy cultivation.
- Popularization of zero tillage mustard and minimum tillage of oilseed and pulses in rice fallows.

1.2 Horticultural crops

- Cultivation of high value crops such as King chilli and strawberry.
- Cultivation of off-season crops under polyhouse.
- Integrated pest management (IPM) in banana.
- Nutrient management in vegetables cultivation.
- Crop diversification with improved varieties of frenchbean, radish, broccoli, carrot, onion and garlic.

1.3 Animal husbandry

- Popularization of improved breeds of poultry (Vanaraja and Gramapriya).
- Popularization of improved breeds of pig (Hampshire).
- Popularization of IFS- fish cum duck rearing.
- Scientific piggery production.

1.4 Farm and non-farm enterprises

- Mushroom production .
- Value added products of fruits and other crops.
- Bee keeping for honey production and its value addition.

2. Impact on Household Income

Household income before and after the interventions are given in Table 35. The average income of farm households more than doubled (2.6 times) between 2016-17 and 2020-21. The share of supplementary enterprises in household income, although small, the net income increased 5.5 times during this period. Livestock income increased by 2.8 times, consolidating its share in the household income to 46.93 per cent in 2020-21 from 43.53 per cent in 2016-17. Non-farm activities also experienced 45.86 per cent increase in income over base year income.

Table 35. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	15337	32394	111.21	26.73	21.49	18.27
Horticulture	14250	40156	181.80	24.84	26.64	27.74
Livestock	24971	70740	183.29	43.53	46.93	49.01
Supplementary enterprises	827	4570	452.60	1.44	3.03	4.01
Farming and non-farming enterprises	1982	2891	45.86	3.45	1.92	0.97
Total	**57367**	**150751**	**162.79**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefited from the technological interventions of KVKs (Table 36). However, marginal and small farmers benefited relatively more compared to large farmers. The income of the marginal farmers increased by 2.7 times, small and medium farm households by 2.6 times each and large farm households by 2.2 times.

Table 36. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1.0 ha)	705	65.52	41523	111441	168.38
Small (1-2 ha)	282	26.21	81646	213092	161.00
Medium (2-4 ha)	77	7.16	102862	263785	156.45
Large (>4 ha)	12	1.12	125725	270033	114.78
Total	**1076**	**100.00**	**57367**	**150752**	**162.79**

MEGHALAYA

Implementing agency : 07 KVKs

Number of farm households covered : 702

1. Sector-specific Interventions

1.1 Field crops

- Intensify cropping system in rice-fallows.
- Major crops – rice, maize, rapeseed and mustard farming system followed by livestock and horticultural crops.
- Adoption of multiple cropping system.
- Use of bio-pesticides in plant health management.
- Introduction of integrated pest and disease management.

1.2 Horticultural crops

- Cultivation of high value crops like arecanut, cashew, orange, dragon fruit and King chilli.
- Low-cost structures for horticultural crops.
- Low chilling peach cultivation.
- Use of bio-organic formulation GF1 for the management of ginger soft rot disease.
- Black pepper production.
- Turmeric production.

1.3 Animal husbandry

- Improved management practices in dairy, piggery, goatery, poultry and duckery.
- Deep litter piggery housing system.

1.4 Fisheries

- Integrated fish farming especially paddy cum fish farming.
- Introduction of genetically improved verities like Jayanti and Amur carps.
- Promotion of seed and feed production units.

1.5 Agricultural engineering

- Cooling storage structures.
- Construction of low-cost cold storage chamber like zero energy cool chamber for storage of fruits and vegetables.

- Introduction of various farm machinery such as paddy thresher, maize sheller, cono weeder and wheel hoe.
- Construction of *Jalkund* for water harvesting and conservation.

1.6 Farm and non-farm enterprises

- Supplementary enterprises like vermicomposting and mushroom production.
- Food processing and value addition of locally available fruits and vegetables like jackfruit, pineapple, starfruit etc.

2. Impact on Household Income

The average income of farm households (Table 37) more than doubled (2.8 times) between 2016-17 and 2020-21. Net income from supplementary enterprises increased by 539.97 per cent over the base year income. Livestock sector income increased by 243.51 per cent over the period, consolidating its share in the household net income to 36.91 per cent in 2020-21 from 29.54 per cent in 2016-17. Horticultural enterprises were the dominant source of household income and experienced 141.27 per cent increase in income over the period.

Table 37. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	6221	13806	121.93	15.12	12.21	10.54
Horticulture	21834	52678	141.27	53.08	46.58	42.86
Livestock	12153	41747	243.51	29.54	36.91	41.13
Supplementary enterprises	708	4531	539.97	1.72	4.01	5.31
Farming and non-farming enterprises	222	335	50.90	0.54	0.30	0.16
Total	**41138**	**113097**	**174.92**	**100.00**	**100.00**	**100.00**

All categories of farmers benefited from the technological interventions of KVKs. However, the large farmers benefited relatively more as compared to marginal, small and medium farmers (Table 38). The income of large farm households increased the most (2.9 times) followed by the marginal farmers' income (2.8 times) and small farmers income (2.7 times). Among all categories of farmers, income of medium farmers increased the least (2.6 times).

Table 38. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1.0 ha)	412	58.69	29998	84017	180.08
Small (1-2 ha)	259	36.89	55148	149863	171.75
Medium (2-4 ha)	28	3.99	66317	173423	161.51
Large (>4 ha)	3	0.43	126467	369410	192.10
Total	**702**	**100.00**	**41138**	**113097**	**173.92**

MIZORAM

Implementing agency : 08 KVKs

Number of farm households covered : 960

1. Sector-specific Interventions

1.1 Field crops

- Popularization of maize varieties, HQPM 5 and RCM 75.
- Awareness on *jhum* improvement through good agricultural practices.
- Introduction of wet rice cultivation and rice based mixed cropping system.
- Cultivation of rajma in maize based cropping system.
- Zero tillage cultivation of mustard and oilseeds.
- CFLD on oilseeds (toria, soybean, sesame, sunflower) and oil processing.
- Introduction of short duration and high yielding variety of paddy (Hakuchuk 2).
- Introduction of short duration maize RCM 76.

1.2 Horticultural crops

- Introduction of improved varieties of tomato, cabbage, watermelon and paddy.
- Nutrient management in dragon fruits, mandarin orange and lemon.
- IDM and IPM in maize, paddy, tomato and orange.
- Establishment of community nursery for rabi vegetables.
- Cultivation of organic banana (var. Dwarf Cavendish).
- Integrated management in mandarin and orange.
- Scientific management of Assam lemon and post-harvest processing.
- High density planting of banana.
- Off-season vegetable cultivation.
- Inter- cropping of ginger and soybean.
- Low-cost polyhouse for round the year production of off-season vegetable

1.3 Animal husbandry

- Introduction of improved pig breed – Large White Yorkshire.
- Prevention and control of ecto-parasitic infected skin diseases in pigs.
- Demonstration on poultry breed (Rainbow Rooster).
- Scientific management of dual-purpose birds, *i.e.*, Vanaraja and Rainbow Rooster.

- Creep feeding in piglets.
- Prophylaxis measures in poultry birds.
- Feed supplementation in piggery and poultry.

1.4 Farm and non-farm enterprises

- Amla processing.
- Nutri garden.
- Seed production.
- Value addition of pineapple, sesamum, ginger, milk and pickles production.
- Vermi-compost and mushroom production.
- Advisory services through phone and WhatsApp.
- Mobilization of self-help groups (SHGs) through value addition.

2. Impact on Household Income

Comparison of household income before and after the interventions and income from major crops and enterprises in 2016-17 and 2020-21 is given in Tables 39 and 40. The average income of farm households more than doubled (2.6 times) between 2016-17 and 2020-21 in Mizoram. The income from farm and non-farm enterprises increased by 11.84 times, followed by the income from supplementary enterprises (3.76 times). Horticulture, the dominant source of household income, experienced 160.65% increase in income and its share in total income increased from 52.75% (2016-17) to 53.38% (2020-21).

Table 39. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	12991	25817	98.73	18.93	14.60	11.86
Horticulture	36202	94361	160.65	52.75	53.38	53.78
Livestock	17623	48833	177.10	25.68	27.63	28.86
Supplementary enterprises	1703	6410	276.39	2.48	3.63	4.35
Farm and non-farm enterprises	114	1350	1084.21	0.17	0.76	1.14
Total	**68633**	**176771**	**157.56**	**100.00**	**100.00**	**100.00**

Farmers from all the categories of land classes benefited from interventions (Table 40). However, the households at the top of land distribution benefitted relatively more. The income of the large farm households increased 2.8 times followed by that of medium famers (2.7 times). Income for marginal families increased 2.6 times and small farm households by 2.5 times.

Table 40. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1.0 ha)	395	41.15	58262	150681	158.63
Small (1-2 ha)	467	48.65	74734	189543	153.62
Medium (2-4 ha)	90	9.38	79601	215191	170.34
Large (>4 ha)	8	0.83	101300	287174	183.49
Total	**960**	**100.00**	**68634**	**176771**	**157.56**

NAGALAND

Implementing agency : 11 KVKs

Number of farm households covered : 1,310

1. Sector-specific Interventions

1.1 Field crops

- Field crops like paddy (SARS 1), maize (HQPM 1), soybean (JS 335) and potato (Giriraj) were promoted.
- Farming systems are agriculture + horticulture + animal husbandry; agriculture + animal husbandry; horticulture + aquaculture + animal husbandry; agriculture + horticulture + silvi+pastoral and agriculture + silvi+pastoral.
- Enhancing maize production through improvement in soil microbes.
- Adoption of IPM measures in paddy.
- Demonstration of rice-toria cropping sequence.

1.2 Horticultural crops

- Introduction of improved varieties of tomato, cabbage, chilli, ginger and cucumber.
- Cultivation of high value crops like coffee, large cardamom, kiwi, zanthoxylum and lilium.
- Scientific cultivation of banana and papaya.
- Organic management in cabbage.
- Garden pea cultivation var. Arkel.

1.3 Animal husbandry

- Popularization of Rainbow Rooster.
- Rearing of buffalo and mithun.
- Practicing of dairy, piggery, goatery, poultry (Vanaraja) and duckery.
- Supply of upgraded germplasm of livestock and poultry.
- Backyard rearing of rabbit.
- Introduction of dual purpose poultry unit.

1.4 Farm and non-farm enterprises

- Production of mushroom.
- Production of vermicompost.
- Apiculture.

- Cultivation of broom grass.
- Rubber enterprise.
- Preparation of tapioca cake.
- Preparation of bamboo shoot pickle and chilli pickle.

3. Impact on Household Income

The crop- and enterprise- wise income in base year and 2020-21 is given in Table 41. The average income of farm households more than doubled (2.5 times) between 2016-17 and 2020-21. Livestock, the dominant source of household income, experienced 2.98 times increase in income and its share in the household income increased to 38.13 per cent in 2020-21 from 31.82 per cent in 2016-17. Livestock component contributed highest to the total additional income (42.37%), followed by horticulture (31.86%) and field crops (19.83%).

Table 41. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	14981	28592	90.86	32.47	24.91	19.83
Horticulture	14627	36496	149.51	31.70	31.79	31.86
Livestock	14682	43771	198.13	31.82	38.13	42.37
Supplementary enterprises	686	3997	482.43	1.49	3.48	4.82
Farm and non-farm enterprises	1162	1934	66.39	2.52	1.68	1.12
Total	**46138**	**114789**	**148.80**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technological interventions (Table 42). Income of large farmers increased the most (152.07%) followed by medium farmers (150.97%). The income of the small and marginal families also increased by 147.36% and 144.67%, respectively.

Table 42. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1.0 ha)	376	28.70	30392	74360	144.67
Small (1-2 ha)	468	35.73	49239	121797	147.36
Medium (2-4 ha)	301	22.98	54453	136662	150.97
Large (>4 ha)	165	12.60	58044	146313	152.07
Total	**1310**	**100.00**	**46137**	**114788**	**148.80**

TRIPURA

Implementing agency : 06 KVKs

Number of farm households covered : 566

1. Sector-specific Interventions

1.1 Field crops

- Major field crops include paddy (Aman, Aus and Boro), *jhum* and maize (Var- Navjyot)
- Cultivation of HYV variety of rice (Var- Gomati)
- Major oilseed and pulses include mustard, sesame, groundnut, lentil, green gram, rajmah and field pea.
- Major farming system- paddy followed by paddy and horticultural crops.
- Integrated farming system: Fishery-piggery/duckery/poultry-horticultural crops.
- Introduction of integrated fish-cum-pig farming and integrated fish-cum-duck farming.
- Utilization of rice fallow by cultivating oilseed and pulse crops.
- Adoption of SRI method in paddy.
- IPM in true potato seed production.

1.2 Horticultural crops

- Major horticultural crops include potato, true potato seed, pointed gourd, spine gourd, brinjal, chilli, ridge gourd, cucumber, carrot, cauliflower and cabbage.
- Cultivation of high value vegetable crops on pond embankment.
- Cultivation of bitter gourd using mulching technique.
- Cultivation of apple ber.
- Cultivation of brinjal (var Singnath).
- Cultivation of cauliflower (var Snowball).

1.3 Animal husbandry

- Dairy farming.
- Piggery, poultry (Vanaraja) and duckery.
- Crossbred goat rearing.

1.4 Farm and non-farm enterprises

- Seed production and distribution.
- Value addition of pineapple, sesamum, ginger, milk and pickles production.

- Vermi-compost and mushroom production.
- Apiculture.

2. Impact on Household Income

Comparison of household income before and after the interventions (Table 43) indicate that, the average income of farm households more than doubled (2.5 times) between 2016-17 and 2020-21, increasing the net income by 150 per cent during this period. Livestock and horticulture, being the dominant sources of household income, experienced an increase in income by 206.83 and 136.65 per cent, respectively. Livestock and horticulture also contributed the most to the additional income to the extent of 44.49% and 40.87%, respectively.

Table 43. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	13341	24533	83.89	21.95	16.14	12.27
Horticulture	27287	64575	136.65	44.89	42.48	40.87
Livestock	19628	60224	206.83	32.29	39.61	44.49
Supplementary enterprises	531	2696	407.72	0.87	1.77	2.37
Total	**60787**	**152028**	**150.10**	**100.00**	**100.00**	**100.00**

The income of the marginal, small and medium families increased around 2.5 times, and large farm households income increased by 2.16 times (Table 44).

Table 44. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Marginal (<1.0 ha)	397	70.14	46589	116167	149.34
Small (1-2 ha)	143	25.27	78730	199093	152.88
Medium (2-4 ha)	23	4.06	189744	471358	148.42
Large (>4 ha)	3	0.53	95367	205867	115.87
Total	**566**	**100.00**	**60787**	**152028**	**150.11**

GOA

Implementing agency : 01 KVK

Number of farm households covered : 111

1. Sector-specific Interventions

1.1 Field crops

- Introduction of high yielding and improved varieties of cowpea.
- SRI technique, scientific rice cultivation, IPM and INM in rice.
- Integrated farming system and soil test-based fertilizer application.
- Scientific training to farmers, demonstrations on improved practices, exhibition, farmer tour/ visit and kisan melas.

1.2 Horticultural crops

- Diversification with horticultural crops like vegetables, fruits, flowers, spices and condiments, medicinal and plantation crops, along with processing and value addition.
- Better management practices in arecanut, cashewnut, coconut, pineapple, watermelon, banana and mango.
- IPM for bud rot and rhinoceros beetle in coconut.
- Scientific orchard management, intercropping and multi-storey cropping.
- Introduction of banana and pineapple intercrop.
- Cashew stem and root borer management with IPM.
- Okra, broad bean, chilli, tomato, brinjal, cucumber, ridge gourd and sweet corn cultivation practices.
- Spice crops like black pepper, turmeric and nutmeg management practices.
- Flower crops like marigold production.
- Weed management, bio-intensive pest/disease management and quick wilt management.

1.3 Animal husbandry

- Introduction of breeds of backyard poultry.
- Rearing of cow and buffalo for milk production and fodder cultivation.
- Clean milk production, bypass fat feeding and silage making.

1.4 Farm and non-farm enterprises

- Horticultural nursery for seedlings of fruits, flower crops, plantation crops and vegetables crops.

- Vermi-compost production through locally available earthworms.
- Cashew and arecanut processing.
- Cashew fenny making, arecanut leaf plate making and coconut oil production.
- Kitchen gardening.
- Agro tourism has potential in Goa as many tourists visit in all seasons.

2. Impact on Household Income

The analysis of income of farm households before and after the interventions revealed that overall income was more than doubled (2.9 times) between 2016-17 and 2020-21 (Table 45). The enterprises income was zero during benchmark year and increased by Rs.13123 during 2020-21. Livestock income increased by 10.77 times, consolidating its share in the household income to 15.34 per cent in 2020-21 from 4.16 per cent in 2016-17. Horticulture, the dominant source of household income, experienced 2.5 times increase over benchmark year and contributed 57.33 per cent to the household additional income.

Table 45. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crop	34826	80570	131.35	24.41	19.33	16.69
Horticulture	101897	259030	154.21	71.43	62.15	57.33
Livestock	5935	63941	977.42	4.16	15.34	21.16
Farm and nonfarm enterprises	0	13213	0.00	0.00	3.17	4.82
Total	**142658**	**416754**	**192.13**	**100.00**	**100.00**	**100.00**

Farmers from all land classes got benefitted from the technical interventions. However, the households at the bottom of land distribution benefitted relatively more. The income of the landless families increased four times. The medium farm households could realize 3.6 times increase in income followed by marginal farmers (3 times). Increase in income of large and small farm households was by 2.8 times each (Table 46).

Table 46. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	1	0.90	27132	109350	303.02
Marginal (<1ha)	30	27.03	25486	78615	208.46
Small (1-2 ha)	18	16.22	62577	177592	183.79
Medium (2-4 ha)	20	18.02	60309	217481	260.6
Large (>4 ha)	42	37.83	302638	862991	185.15
Total	**111**	**100.00**	**142658**	**416754**	**192.13**




GUJARAT

Implementing agency : 30 KVKs

Number of farm households covered : 3,239

1. Sector-specific Interventions

1.1 Field crops

- Introduction of high yielding and improved varieties of paddy (Jaya, GAR 13, GNR 6, GNR 3, Kamod, Mahisagar, Gurjari), pearl millet (86M52), wheat (GW 451, GW 496), pigeonpea (Vaishali, AGT 2, GP 1, GT 104, BDN 2), chickpea (GJG 3, GG 5), greengram (GAM 5), cowpea (Pusa Phalguni), black gram (GU 1), mustard (NRCHB 101, GDM-4), groundnut (GG 34, GG 20, GJG-22), soybean (NRC 37), sesame (GT 2) and castor (GCH 7).
- Commercial crops like sugarcane (12073, 265, 13073), cotton, tobacco, jute, amaranthus and guar for seeds.
- Introduction of new varieties of fodder (COFS 29, guinea grass, hybrid napier).
- Intercropping in sugarcane, cotton, soybean, maize, pigeonpea and groundnut.
- Spray of 2% potassium nitrate at flowering and pod development stage in chickpea and ferrous sulphate (spray) in groundnut.
- KNO_3 and Novel OLN spar on cotton and use of thiourea 500 ppm on wheat.
- Seed treatment with *Azatobacter* (150 g), PSB (150 g), *Rhizobium* (25 g/kg), PSB (25 g/kg), and KMB (25 g/kg).
- Soil application of *Trichoderma viride* and *Mycorrhiza*.
- Pheromone traps for chickpea pod borer.
- Foliar application of micro nutrient mixtures like pulse wonder, use of pheromone traps, yellow stick traps, line sowing, utilization of residual moisture and mechanical harvesting.
- Stalk puller for uprooting crop stalks of pigeonpea, cotton and castor.
- Bio intensive management of cotton mealy bug through installation of bird perches @ 30-40/ha, hand collection of egg mass, larvae, neem-based pesticides, HNPV @ 250 LE/ha.
- Use of ICT tools for market, adoption of organic farming, crop rotation, optimum plant population, low-cost production technology, crop diversification, change in the cropping pattern and water management in summer instead of leaving fallow.
- Use of *jivamrut* through drip irrigation and neem oil spray.
- Selection of dual propose early maturing varieties.
- Selling of green pods of greengram, cowpea, pigeonpea and beans for maximum price.

1.2 Horticultural crops

- Diversification with horticultural crops like vegetables, fruits, spices, flowers, spices and condiments, medicinal and plantation crops along with their value addition and processing.
- Introduction of new varieties/hybrids of chilli (G 4, Arka Meghana), tomato (Arka Rakshak), brinjal (Green Gota), cabbage (Golden Acre), cauliflower (CFL 1522, Snow Heart), potato (Kufri Badshah, Loker), drumstick (PKM 1), onion (N 53, Pilipatti), pointed gourd (Kalkatti, GNPG 1), cluster bean (Pusa Navbahar) and okra (GAO 5).
- Weed management and bio-intensive pest/disease management.
- Flowers like gerbera, rose (Kashmiri), marigold (AG), orchid (*Dendrobium*) are cultivated across Gujarat state.
- Promotion of cumin (GC 4), garlic (G 282), ajwain (Guj 2), coriander (Guj 2, GC 2, GC 3), turmeric, funnel (GF 2, GF 12) and sandalwood.
- Growing of cucumber, capsicum, tomato, chilli and gourds in protected structure like greenhouse.
- Nursery raising of various crops like cauliflower, cabbage, brinjal, tomato, and chilli.
- Initiation of planting of exotic vegetables like lettuce, zucchini, broccoli, yellow and red capsicum and European cucumber.
- Introduction of new hybrids and varieties of papaya (Madhu bindu, Red Lady), banana (Grand Naine), mango (Kesar), guava (Taiwan pink, L 49), grapes (Super Sonaka), watermelon (Sugar queen), muskmelon (G. glory), pomegranate (Bhagva), dragon fruit (Red, Pink and white Flesh) and date palm (Barhee).
- Tissue culture raised plants of banana, little gourd, turmeric and ginger that are virus free.
- Foliar application of nutrients (ZnSO4 @0.3%), pesticides and insecticide (Dichlorvos 76 EC) in fruit crops with tractor operated sprayer.
- Application of organic fertilizer reduces the cost and increases the production of vegetables (novel organic liquid nutrient plus 1%, compost, ash).
- Spraying of banana pseudo stem sap @ 1 %, three sprays at flowering at 15 days interval on chilli.
- Azoxistrobin 23 SC, 0.23 % 10 ml/ 10 litre water to control insect infestation of fruit crops.
- Cultivation of leafy vegetables like spinach, fenugreek, bathua, colocasia, in kitchen garden to save additional cost on buying of vegetables.
- Intercropping of chilli in groundnut, chilli in cowpea and leafy vegetables in fruit orchards.
- Mulching in watermelon (paddy straw, plastic mulch- 30 micron silver black color)
- Green garlic grading and packaging.
- Use of okra plucker for drudgery reduction.

1.3 Animal husbandry

- Balanced nutrition, fodder cafeteria, area-specific mineral mixture, bypass protein (22%), bypass fat @ 50 g /day for 60 days (oral route probiotic powder @ 15 g/day for 60 days (oral route) clean milk production practices and trace element bolus with Clomiphen tablets.
- Loose housing system and scientific cattle shed.
- Triclabendazole tablets to reduce the mortality rate.
- Introduction of breeds of backyard poultry and feed supplementation with azolla.
- Cost-efficient nutrition management with locally prepared feed formulations like silage, urea treated paddy and sugarcane trash.
- Semi-intensive and intensive sheep and goat farming, micronutrient supplementation deworming practices and scientific dairy management.
- Processing and value addition in milk, ghee making from Gir cow milk, panner, khoa, peda and other milk products.
- Maize fodder (African tall), lucerne (Anand Lucern 2), rajka bajri (Local), green fodder sorghum (CoFS 29), gola grass, bullet grass and oat (Kent).
- Cow (HF, Gir, Dangi, Sahiwal, Kankrej, Jersey), buffalo (Surti, Mehsani, Banni, Jafarabadi), backyard poultry (Ankleshwari, Kadaknath, broiler) and goat (Sirohi).
- Fish culture in village pond and in cage culture (catla, rohu, grass carp and common carp).

1.4 Farm and non-farm enterprises

- Horticultural nursery for seedlings of sugarcane, paddy, fruits (mango, cashew, coconut, kokum), flowers (rose, marigold, gerbera), plantation crops and vegetables crops (brinjal, chilli, tomato, cauliflower).
- Silkworm (Muga) rearing and mulberry (V 1 variety) cultivation.
- Bee keeping for honey production and its value addition.
- Millet processing and value addition by making biscuits and laddoos.
- Value addition to ginger and turmeric, aonla, palmarosa oil, moringa and guava leaf powder, pickle, juice and flower jewellery making.
- Custom hiring of farm machinery like rotator and tractor, seed drill, ground-digger-cum shaker, hydraulic thresher, and cotton shredder.
- Oyster mushroom production in bags and shield.
- Farm labour activities by family members.

2. Impact on Household Income

The average income of farm households (Table 47) has more than doubled (2.5 times) between 2016-17 and 2020-21. The share of enterprises in household income, although small, the net enterprise income experienced 4.72 times increase during this period. Livestock income increased

by 2.4 times, consolidating its share in the household income to 19.7 per cent in 2020-21 from 21.2 per cent in 2016-17. Fisheries income increased by 2.84 times as compared to base year. Horticulture, the dominant source of household income, experienced 212.30 per cent increase over base year and contributed 55.89 per cent to additional household income followed by field crops (22.72%) and livestock (18.78%).

Table 47. Level and change in household income

Crops and enterprises	Net income (Rs/ household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crop	60698	120410	98.40	36.20	28.00	22.72
Horticulture	69208	216115	212.30	41.20	50.20	55.89
Livestock	35552	84919	138.90	21.20	19.70	18.78
Fisheries	1086	3094	184.80	0.60	0.70	0.76
Farm and nonfarm enterprises	1308	6183	372.60	0.80	1.40	1.85
Total	**167852**	**430721**	**156.60**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions (Table 48). However, the households at the top of land distribution benefitted relatively more. Income of the large farm households increased 2.87 times followed by the income of the landless families which increased 2.64 times. Income of small farm households increased by 2.42 times whereas the medium and marginal farm households could realize 2.38 and 2.30 times increase in income, respectively.

Table 48. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	46	1.42	224052	593069	164.70
Marginal (<1.0 ha)	782	24.14	64951	149693	130.47
Small (1-2 ha)	1235	38.13	109118	264146	142.07
Medium (2-4 ha)	786	24.27	192927	459180	138.01
Large (>4 ha)	390	12.04	503005	1445200	187.31
Total	**3239**	**100.00**	**167852**	**430721**	**156.61**

MAHARASHTRA

Implementing agency : 47 KVKs

Number of farm households covered : 5,154

1. Sector-specific Interventions

1.1 Field crops

- Introduction high yielding and improved varieties of paddy (PKV Tilak, Karjat 6, Sahyadri 1, PKV Kisan) integrated crop management (ICM) practices and direct seeding of rice (DSR).
- Introduction of new varieties of pearl millet (Ajit, Shradhha, Pineer 501), wheat (Phule Samadhan, MACS 6222), greengram (BM 2003-2, BM 4), mustard (Pusa Bold), turmeric (Boriavi) and sesame (PKV-NT11, JLT 408).
- Integrated pest management (IPM) of fall armyworm in maize, pink bollworm in cotton, pod borer in pigeonpea and semilooper in soybean.
- Nutrient management in commercial crop and biological control.
- Micronutrient and pest management in cotton.
- Intercropping in sugarcane, cotton, maize, pigeonpea and groundnut.

1.2 Horticultural crops

- Diversification with horticultural crops like vegetables, fruits, flowers, spices and condiments, medicinal and plantation crops along with processing and value addition.
- Introduction of new varieties of mango (Alphonso and Keshar) and cashewnut (Vengurla 7).
- Introduction of new varieties/hybrids of chilli (Sitara gold), tomato (Abhinav), brinjal (Pusa puple brown , Ajay, Panna), garlic (Phule Neelima), potato (Kufri Jyoti and Kufri Chandmukhi), weed management and bio-intensive pest/disease management.
- Growing of cucumber, capsicum, tomato, chilli and gourds in protected structures like greenhouse and polyhouse.
- Nursery raising in crops like cauliflower, cabbage, brinjal, tomato and chilli.
- Introduction of new hybrids and varieties of papaya, banana, organic watermelon, muskmelon, pomegranate (Bhagva, Super Bhagva), dragon fruit and custard apple (Balanagari).
- Tissue culture raised plants of banana, little gourd, turmeric and ginger.
- Nutrient management in field crops and horticulture.
- Pest and disease management and nutrient supplementation in mango.
- Introduction of new varieties of onion and tomato.

- Ginger rhizome rot management.
- Leafy vegetables in nutri-gardens.

1.3 Animal husbandry

- Balanced nutrition, fodder cafeteria, area-specific mineral mixture and clean milk production practices.
- Introduction of breeds of backyard poultry and feed supplementation with azolla.
- Cost-efficient nutrition management with locally prepared feed formulations.
- Semi-intensive and intensive sheep and goat farming and micronutrient supplementation and deworming practices, scientific dairy management.
- Value addition in milk, ghee making from Gir cow milk, panner, khoa, peda, and other milk products.
- Scientific dairy farming along with mineral mixture supplementation in cows (Gir and HF) and buffalo (Jafarabadi, Murrah).
- Promotion of fodder maize, lucerne and green fodder sorghum var CoFs 29.
- Fish culture with crab in village pond and in cage.

1.4 Farm and non-farm enterprises

- Seed production of cereals, pulses, oilseeds and fodder crops.
- Horticultural nursery for seedlings of fruits, plantation and vegetable crops.
- Bee keeping for honey production and its value addition.
- Millet, dal processing and value addition.
- Value addition to ginger, chilli, turmeric, aonla, palmarosa and moringa.
- Custom hiring of farm machineries like rotavator and tractor.
- Mushroom production in bags.

2. Impact on Household Income

The average income of farm households more than doubled (2.9 times) between 2016-17 and 2020-21 (Table 49). The share of enterprises in household income, although small, the net enterprise income experienced a 5.4-times increase during this period. Livestock income increased by 3.3 times, consolidating its share in the household income to 11.87 per cent in 2020-21 from10.53 per cent in 2016-17. Horticulture, the dominant source of household income, contributed 2.8 times more to household income.

Table 49. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crop	51088	104851	105.24	29.82	20.76	16.11
Horticulture	81006	227205	180.48	47.28	44.99	43.81
Livestock	18040	59929	232.19	10.53	11.87	12.55
Fisheries	532	2105	295.61	0.31	0.42	0.47
Farm and non-farm enterprises	20665	110933	436.81	12.06	21.97	27.05
Total	**171332**	**505023**	**194.76**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions (Table 50). However, the households at the top of land distribution benefitted relatively more. The large farm households could realize 3.3 times increase in their household income. Marginal farmers realized 2.8 times higher income due to technological interventions. The income of the landless families, small and medium farm households increased by 2.7 times each.

Table 50. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	54	1.05	98591	269926	173.78
Marginal (<1 ha)	1011	19.62	67240	188544	180.41
Small (1-2 ha)	2320	45.01	116743	316556	171.16
Medium (2-4 ha)	1261	24.47	189174	522575	176.24
Large (> 4 ha)	508	9.86	591241	1977005	234.38
Total	**5154**	**100.00**	**171332**	**505023**	**194.76**

CHHATTISGARH

Implementing agency : 28 KVKs

Number of farm households covered : 2,502

1. Sector-specific Interventions

1.1 Field crops

- Provided quality seeds of improved varieties for rice (IGKV R 1, Indira Rajeshwari, Dubraj, Devbhog, Swarna, MTU 1010 and Maheshwari), pigeonpea (CG Arhar 1, Rajeev Lochan and TJT 501) and chickpea (RVG 204 and RVG 202).
- Integrated nutrient management in rice, chickpea, maize and pigeonpea.
- Weed management in rice and black gram.
- Integrated crop management in rice, maize, kodo and kutki.
- Integrated disease and pest management in black gram, chickpea, rice, rapeseed, mustard, groundnut and soybean.
- Rice-fallow land utilization using pulses and oilseeds.
- Ridge and furrow bed sowing method in kharif pulses.
- Improved rice variety with green manuring using modified system of rice intensification.
- Utilization of harvested rainwater for irrigation.
- Use of seed-cum-fertilizer drill for line sowing of crops.

1.2 Horticultural crops

- Integrated nutrient management in tomato, brinjal, papaya and guava.
- Integrated pest management in brinjal, cucurbits and okra.
- Use of plastic mulches along with drip irrigation in vegetables.

1.3 Animal husbandry and fisheries

- Oral calcium and phosphorus supplementation in cattle.
- By-pass fat supplementation in cattle.
- Dissemination of elite germplasm of backyard poultry (Kadaknath).
- Cultivation and feeding of azolla and hybrid napier as green fodder.
- Introduction of goat breeds Beetel, Barbari and Jamunapari (dual-purpose).
- Awareness and training on clean milk production.
- Vaccination/deworming practices for health management.
- Composite fish culture.

1.4 Farm and non-farm enterprises

- Mushroom cultivation and processing.
- Introduction of bamboo and eucalyptus plant.
- Vermi-compost unit.
- Marketing arrangements and formation of FPOs.
- Processing and value addition of NTFPs along with surplus fruits and vegetables.
- Nursery management for quality seedling production.
- Establishment of micro-enterprises like processing drumstick leaves powder, aromatic rice and mahua seed decorticator.

2. Impact on Household Income

The comparison of household income before and after the interventions (Table 51) revealed that the income increased three times between 2016-17 and 2020-21. The highest increase in net income was observed in allied sectors, like livestock, fisheries, and enterprises. Horticultural crops registered significant increase in share of total income from 16.59% (2016-17) to 26.88% (2020-21). Field crops, the most dominant source of household income with 49.01 per cent contribution to additional income, experienced 130.00 per cent increase in income over base year.

Table 51: Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	66235	152319	130.00	75.43	57.82	49.01
Horticulture	14563	70823	386.30	16.59	26.88	32.03
Livestock	3814	20410	435.10	4.34	7.75	9.45
Fisheries	1518	9347	515.80	1.73	3.55	4.46
Farm and non-Farm enterprises	1676	10539	528.80	1.91	4.00	5.05
Total	**87806**	**263438**	**200.02**	**100.00**	**100.00**	**100.00**

Small farmers accounted for half of the respondent farmers followed by medium farmers (21.30%) and marginal farmers (18.90%). Farmers from all land size classes benefited from the technological interventions (Table 52). However, the landless and marginal farmers benefited relatively more with 276.91 per cent and 223.20 per cent increase in income over base year, respectively.

Table 52: Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016	2020-21	
Landless	16	0.64	31698	119475	276.91
Marginal (< 1 ha)	473	18.90	32233	104177	223.20
Small (1 to 2 ha)	1244	49.72	61728	183452	197.19
Medium (2 to 4 ha)	533	21.30	108229	334810	209.35
Large (>4 ha)	236	9.43	294333	852829	189.75
Total	**2502**	**100.00**	**87806**	**263438**	**200.02**

On the basis of above discussion, it could be concluded that KVK's efforts in convergence with other line departments and agencies resulted in doubling farmers' income, which ultimately lead to prosperity among farming community.

MADHYA PRADESH

Implementing agency : 53 KVKs

Number of farm households covered : 5,378

1. Sector-specific Interventions

1.1 Field crops

- Provided quality seeds of improved varieties for soybean (JS 20 34), rice (MTU 1010, CR Dhan 310, JR 81), wheat (G 322, HI 1544, Pusa Tejas (HI 8759), HD 2932, JW 3211, JW 3336, JW3269 and JW 3020), pigeonpea (TJT 501 and Rajeshwari) and chickpea (JG 12, JG 14, JG 36 and RVG 202, RVG 203).
- Integrated crop management in soybean, wheat, maize, rice and black gram.
- Integrated nutrient management in rice, wheat, soybean, chickpea, maize, and pigeonpea.
- Weed management in soybean, wheat, rice, blackgram and groundnut.
- Integrated pest management in soybean, maize, chickpea, rice and mustard.
- Summer green gram cultivation.
- Ridge and furrow bed sowing method in all crops in *kharif* and *rabi* season.
- Proper utilization of harvested rainwater as lifesaving irrigation.
- Technological support in cash crops like sugarcane and cotton.
- Zero-tillage sowing of wheat.
- Use of Happy seeders in wheat and chickpea.
- Minor millet cultivation and processing.

1.2 Horticultural crops

- Integrated crop management in banana, papaya, guava and orange.
- Integrated nutrient management in onion, potato and cauliflower.
- Cultivation of kharif and rabi onion and garlic.
- Cultivation of ginger, turmeric and seed spices like coriander fenugreek and nigella.
- Integrated pest management in chilli, okra and cucurbits.
- Use of plastic mulches along with drip irrigation for tomato, chilli and watermelon.
- Protected cultivation of high value flower and vegetable crops.
- Medicinal and aromatic crops like kalmegh, aswagandha, isabgol and tulasi.

1.3 Animal husbandry and fisheries

- Round the year fodder production.
- Oral calcium and phosphorus supplementation.
- Cultivation and feeding of azolla and hybrid napier as green fodder.
- By-pass fat supplementation.
- Cultivation and feeding of hydroponic maize fodder.
- Promotion of backyard poultry using elite breed like Kadaknath and Narmada Nidhi.
- Introduction of dual-purpose breeds of goat *viz*., Jamunapari along with Barbari and Beetel.
- Mineral mixture preparation.
- Clean milk production.
- Vaccination/deworming practices.
- Composite fish culture.

1.4 Farm and non-farm enterprises

- Nursery management for seedling production.
- Vermi-compost production.
- Mushroom cultivation and processing as powder and pickles.
- Bee keeping.
- Processing and value addition of the surplus fruits and vegetables.
- Establishment of micro-enterprises like agro-processing units, milk products, aonla products, ber products and bael products.
- Promotion of bamboo, eucalyptus and mulberry.
- facilitating and supporting formation of FPOs.
- Promoting mechanization through custom hiring centres.

2. Impact on Household Income

The average income of farm households (Table 53) more than doubled (2.64 times) between 2016-17 to 2020-21. The highest increase in net income was observed in farm and non-farm enterprises. The shares of fisheries enterprises in household income, although small, the net fisheries income increased substantially. Livestock income increased by 3.1 times. Field crops, the dominant source of household income experienced 2.1 times increase in income, while net income from horticultural crops increased by 4.2 times.

Table 53. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	146641	308963	110.7	71.79	57.30	48.46
Horticulture	40607	170620	320.2	19.88	31.64	38.82
Livestock	15240	47141	209.3	7.46	8.74	9.52
Fisheries	480	3827	698.0	0.23	0.71	1.00
Farm and non-Farm enterprises	1295	8644	567.4	0.63	1.60	2.19
Total	**204263**	**539194**	**163.97**	**100.00**	**100.00**	**100.00**

Farmers from all land size classes benefited from the technical interventions as evident from Table 54. Increase in household income across landholding classes declined as the landholding increased. Landless category reaped highest dividends with increase in income of 324.44 per cent compared to 152. 84 per cent increase in income for large farmers.

Table 54. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	46	0.86	121865	517239	324.44
Marginal (<1 ha)	800	14.88	70222	199851	184.60
Small (1 to 2 ha)	2011	37.39	111872	306548	174.02
Medium (2 to 4 ha)	1489	27.69	201075	540097	168.60
Large (>4 ha)	1032	19.19	496478	1255271	152.84
Total	**5378**	**100.00**	**204263**	**539194**	**163.97**

ANDHRA PRADESH

Implementing agency : 21 KVKs

Number of farm households covered : 2,005

1. Sector-specific Interventions

1.1 Field crops

- Introduction of improved varieties of paddy *viz*., MTU 1172, integrated crop management (ICM) practices, direct seeding of rice (DSR) and mechanical sowing.
- Practicing thinning and early sowing in pigeonpea, high density planting in cotton and single bud seedling in sugarcane.
- Introduction of new varieties of finger millet (PPR 2700), sorghum (NTJ 5), pearl millet (ABV 04) and foxtail millet (SIA 3222).
- Integrated pest management (IPM) of fall armyworm in maize.
- Introduction of new pigeonpea varieties *viz*., TRG 59, ICPL 20325 and LRG 52
- Varietal demonstration of new groundnut varieties TCGS 1043, TCGS 1157 and K 9.
- Introduction of new varieties of blackgram (GBG 1, GBG 12, LBG 787, TBG 104) and safflower (PBNS 12).
- Introduction of fodder varieties like super napier.

1.2 Horticultural crops

- Introduction of new varieties/hybrids of chilli (Aka Kyati, Arka Harita, CO(CH) 1, LCA 616 and LCH 111), weed management and bio-intensive pest/disease management.
- Demonstration of onion var Arka Kalyan, Red 3, Bheema Kiran, Arka Bheem and Bhima Shubra.
- Introduction of new hybrids of tomato (Arka Samrat, Arka Abhed) and integrated pest and disease management practices.
- Introduction of marigold varieties, Arka Bangara 2 and Big ball yellow. Tuberose varieties Arka Shringar and Arka Prajwal were also introduced.
- Introduction of new turmeric varieties like Pragathi, Rajendra Sonali, Rajendra Sonia, Roma and ACC 48.
- Introduction of tapioca variety Sree Raksha 1.

1.3 Animal husbandry

- Introduction of improved breeds of fish and production management technologies.
- Feeding balanced nutrients and mineral mixture to buffalos.
- Kadaknath and local breed Swarnadhara were introduced to poultry farmers.

1.4 Farm and non-farm enterprises

- Seed production of cereals, pulses and oilseeds.
- Horticultural nursery for seedlings of fruits, plantation crops and vegetables.
- Silkworm rearing and mulberry cultivation.
- Bee keeping for honey production.
- Millet processing and value addition.

2. Impact on Household Income

The highest enhancement in net annual income of the households (Table 55) was in farm and non-farm enterprises (473.47%) such as entrepreneurship, value addition and women empowerment activities. Increase in income by livestock rearing was 218.97% followed by 155.29% in horticulture involving growing of flower and plantation crops. The increase in income was the least in field crops (105.22%).

Table 55. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	32095	65866	105.22	45.89	37.46	31.89
Horticulture	25338	64687	155.29	36.23	36.79	37.16
Livestock	10379	33106	218.97	14.84	18.83	21.46
Farm and non-farm enterprises	2122	12166	473.47	3.03	6.92	9.49
Total	**69934**	**175825**	**151.42**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions of KVKs (Table 56). The per cent change in household income was highest in landless class (342.97%) followed by marginal farmers (180.87%) and large farmers (148.40%) as compared to small (139.76%) and medium (127.19%) farmers.

Table 56. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	163	8.13	17811	78896	342.97
Marginal (<1 ha)	600	29.93	53396	149972	180.87
Small (1-2 ha)	696	34.71	80851	193845	139.76
Medium (2-4 ha)	372	18.55	88160	200294	127.19
Large (>4 ha)	174	8.68	93152	231387	148.40
Total	**2005**	**100.00**	**69934**	**175826**	**151.42**

PUDUCHERRY

Implementing agency : 2 KVKs

Number of farm households covered : 220

1. Sector-specific interventions

1.1 Field crops

- Introduction of improved varieties of paddy (BPT 5204, ADT 37, White Ponni, CO 52, VRI 8) and integrated crop management (ICM) practices.
- Introduction of improved sesame varieties like TMV-7 with integrated crop management (ICM) practices.

1.2 Horticultural crops

- Introduction of new varieties/hybrids of chilli, okra (CoBH 4) and ridge gourd varieties and integrated pest and disease management practices in banana.

1.3 Animal husbandry

- Introduction of fertility enhancing technologies like prosync nano fibre progesterone, progesterone impregnated intra-vaginal sponge, controlled internal drug release and PGF2α.
- Introduction of improved breeds of fish and production management technologies.
- Feeding balanced nutrients and mineral mixture to buffalos

1.4 Farm and non-farm enterprises

- Millet processing and value addition.
- Introduction of improved mushroom cultivation practices.

2. Impact of Household Income

The highest enhancement in annual net income of the households (Table 57) was in farm and non-farm enterprises (374.26%) like entrepreneurship, value addition and women empowerment activities followed by horticultural crops (321.98% with growing flower and plantation crops), livestock rearing (279.62%) and field crops (149.37%).

Table 57. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	44548	111088	149.37	46.18	34.20	29.13
Horticulture	25572	107907	321.98	26.51	33.22	36.05
Livestock	20155	76511	279.62	20.89	23.55	24.68
Farm and non-farm enterprises	6189	29350	374.26	6.42	9.03	10.14
Total	**96463**	**324856**	**236.77**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions of KVKs (Table 58). The per cent change in household income was highest in large farmers (405.26%) followed by small (253.89%) and medium (219.20%) farmers. In comparison, the increase in income among marginal farmers (208.57%) and landless class (173.37%) was less.

Table 58. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	17	7.73	142197	388720	173.37
Marginal (<1ha)	93	42.27	56054	172965	208.57
Small (1-2 ha)	77	35.00	99289	351377	253.89
Medium (2-4 ha)	27	12.27	165732	529018	219.20
Large (>4 ha)	6	2.73	245250	1239150	405.26
Total	**220**	**100.00**	**96463**	**324856**	**236.77**

TAMIL NADU

Implementing agency : 29 KVKs

Number of farm households covered : 3,276

1. Sector-specific Interventions

1.1 Field crops

- Introduction of improved varieties of paddy *viz.*, TKM 13, TRY 3 (salt tolerant variety, integrated crop management (ICM) practices, direct seeding of rice (DSR), and mechanical sowing.
- Integrated crop management technologies like drum seeding and drip fertigation in rice.
- Introduction of new varieties of finger millet (ML365, ATL 1 and CO 15) and sorghum (CO 30, K 12).
- Integrated pest management (IPM) of fall armyworm in maize.
- Nematode management in tomato using IPM techniques.
- Varietal demonstration of new groundnut varieties TCGS 1043, TCGS 1157 and GJG 32.
- Introduction of new varieties of green gram (DGG 1 and COGg 8).
- Introduction of fodder varieties like super napier.

1.2 Horticultural crops

- Introduction of new varieties/hybrids of chilli (Aka Kyati, Arka Harita, COCH 1, LCA 616 and LCH 111), weed management and bio-intensive pest/disease management
- Introduction of ridge gourd varieties: Arka Vikram and COH 1.
- Demonstration of onion var. Arka Kalyan, Red 3, Bheema Kiran, Arka Bheem and Bhima Shubra.
- Introduction of new hybrids of tomato (Arka Samrat, Arka Abhed and COTH 3) and integrated pest and disease management practices.

1.3 Animal husbandry

- Introduction of fertility enhancing technologies like prosync nano fibre progesterone, progesterone impregnated intra-vaginal sponge, controlled internal drug release and PGF2α.
- Introduction of improved breeds of fish and production management technologies.
- Feeding balanced nutrients and mineral mixture to buffalos.
- Kadaknath breeds were introduced to poultry farmers.

1.4 Farm and non-farm enterprises

- Seed production of cereals, pulses and oilseeds.
- Horticultural nursery for seedlings of fruit, plantation and vegetable crops.
- Silkworm rearing and mulberry cultivation.
- Bee keeping for honey production.
- Millet processing and value addition.

2. Impact on Household Income

The enhancement in annual net income of the households was highest in livestock (267.08%) by rearing cow, goat and poultry farming followed by other farm and non-farm enterprises (264.80%) like vermicompost, value addition and mushroom production (Table 59). The annual net income enhancement in horticulture crops like fruits, flowers, vegetables, chillies and turmeric was 137.93 per cent and105.98 per cent in field crops.

Table 59. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	31506	64896	105.98	36.97	29.40	24.64
Horticulture	31904	75909	137.93	37.43	34.38	32.47
Livestock	15889	58325	267.08	18.64	26.42	31.31
Farm and non-farm enterprises	5931	21636	264.80	6.96	9.80	11.59
Total	**85230**	**220765**	**159.02**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions of KVKs (Table 60). The per cent change in household income was highest in landless class (170.59%) followed by large (166.99%) and marginal (162.86%) farmers. Comparatively, lesser increase in income was noticed among small farmers (159.22%) and medium farmers (147.73%).

Table 60. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	210	6.41	36092	97660	170.59
Marginal (<1 ha)	1240	37.85	64877	170533	162.86
Small (1-2 ha)	1171	35.74	95870	248515	159.22
Medium (2-4 ha)	515	15.72	105548	261474	147.73
Large (>4 ha)	140	4.27	175468	468481	166.99
Total	**3276**	**100.00**	**85230**	**220765**	**159.02**

TELANGANA

Implementing agency : 14 KVKs

Number of farm households covered : 1,474

1. Sector-specific intervention

1.1 Field crops

- Integrated crop management technologies like paired row planting in maize, drip fertigation with mulching in okra and closer spacing in cotton were introduced.
- Integrated nutrient management technologies like soil-test based fertilizer application in rice and maize.
- Integrated pest management (IPM) of fall armyworm in maize.
- Varietal demonstration of new groundnut varieties ICGV 3043, TCGS 1043.

1.2 Horticultural crops

- Introduction of new varieties/hybrids of chilli (Aka Kyati, Arka Harita, CO (CH) 1, LCA 616 and LCH 111), weed management and bio-intensive pest/disease management.
- Introduction of cowpea variety Arka Garima.
- Demonstration of onion var. Arka Kalyan, Arka Shwetha and Bheema Kiran.
- Introduction of new hybrid of tomato (Arka Abhed) and integrated pest and disease management practices.
- Introduction of marigold variety Ashta Ganda, US-5056 and Maxima yellow.
- Introduction of a new turmeric variety Rajendra Sonali.

1.3 Animal husbandry

- Introduction of fertility enhancing technologies like prosync nano fibre progesterone, progesterone impregnated intra-vaginal sponge, controlled internal drug release and PGF2α.
- Feeding balanced nutrients and mineral mixture to buffalos.
- Kadaknath and local breeds like Swarnadhara were introduced to poultry farmers.

1.4 Farm and non-farm enterprises

- Seed production of cereals, pulses and oilseeds.
- Horticultural nursery for seedlings of fruit, plantation and vegetable crops.
- Bee keeping for honey production.
- Millet processing and value addition.

2. Impact on Household Income

Farmers' income more than doubled (164.33%) due to KVK interventions (Table 61). Field crops (Rs.115105) contributed highest to the net income during 2020-21 followed by horticulture crops (Rs.103,871), livestock (Rs.49,676) and farm and non-farm enterprises (Rs.9,347). The enhancement in net annual income of the households was highest in other farm and non-farm enterprises (420.65%) like vermi-compost, tailoring and food processing activities. Livestock income increased by 375.27% through rearing cow, goat and poultry, followed by horticultural crops (293.44%) like fruits, ginger, flowers crops, chilli, turmeric, growing vegetable crops and establishing nutri-garden.

Table 61. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	66521	115105	73.04	63.25	41.40	28.11
Horticulture	26401	103871	293.44	25.10	37.36	44.82
Livestock	10452	49676	375.27	9.94	17.87	22.69
Farm and non-farm enterprises	1795	9347	420.65	1.71	3.36	4.37
Total	**105170**	**278000**	**164.33**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions of KVKs (Table 62). The per cent increase in household income was highest in marginal farmers (181.98%) followed by medium (171.37%) and small (167.46%) compared to landless class (161.79%) and large farmers (140.76%).

Table 62. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	116	7.87	30093	78780	161.79
Marginal (<1 ha)	347	23.54	34639	97674	181.98
Small (1-2 ha)	588	39.89	103126	275823	167.46
Medium (2-4 ha)	298	20.22	160796	436345	171.37
Large (>4 ha)	125	8.48	247633	596201	140.76
Total	**1474**	**100.00**	**105170**	**278000**	**164.33**

KARNATAKA

Implementing agency : 33 KVKs

Number of farm households covered : 3,648

1. Sector-specific Interventions

1.1 Field crops

- Introduction of improved varieties of paddy *viz*., Gangavathi Sona, RNR 15048, MAS 26, KHP 13, KKP 5, direct seeding of rice (DSR), mechanical sowing and integrated crop management (ICM) practices.
- Introduction of new varieties of finger-millet (ML 365, KMR 340, 630, MR 6), sorghum (SPV 2217) and foxtail millet (DHFt 109-3).
- Integrated pest management (IPM) of fall armyworm in maize.
- Introduction of new pigeonpea varieties viz., BRG 3, 4, 5, GRG 811, TS3R, BSMR 736 and its intercropping in maize.
- Introduction of sugarcane variety VCF 517, adoption of nutrient management practices and biological control of root grub.
- Promotion of new groundnut varieties GPBD 4, G 2-52, DH 256, ICGV 03043, K 6, KDG 128 and cultivation of groundnut in rice fallows.
- Introduction of new varieties of chickpea (JAKI 9218, BGD 111-1), green gram (DGGV 2, BGS 9), black gram (LBG 791), horse gram (PHG 9, CRIDA 18), safflower (PBNS 12), sunflower (KBSH 53, RFSH 1887) and soybean (DSb 21).
- Promotion of micronutrient and pest management in cotton.
- Promotion of intercropping in sugarcane, cotton, maize, pigeonpea and groundnut.
- Adoption of dryland production technologies such as compartment bunding, seed hardening/ treatment with $CaCl_2$ and farm pond supported protective irrigation.
- Improved pulses production technologies such as use of pulse magic and nipping.

1.2 Horticultural crops

- Introduction of new varieties/hybrids of chilli (Arka Kyathi, Arka Haritha), weed management and bio-intensive pest/disease management.
- Introduction of new hybrids of tomato (Arka Rakshak, Arka Abhed) and integrated pest and disease management practices.
- Promotion of new varieties of frenchbean (Arka Arjun, Sharat, Suvidha).
- Nutrient management in coconut to reduce nut dropping.

- Banana disease management and foliar nutrition.
- Nutrient and disease management in arecanut, arecanut husk decomposition.
- Mango pest and disease management and use of mango special as micro-nutrient supplement.
- Introduction of new onion varieties (Bhima Super, Bhima Shakti) and management of pests and diseases.
- Ginger rhizome rot management.
- Introduction of new turmeric variety Pratibha and its processing at farm level for value addition.
- Promotion of new varieties of ridge gourd (Arka Prasan), okra (Arka Nikitha) and tuberose (Arka Prajwal).

1.3 Animal husbandry

- Promotion of balanced nutrition, area-specific mineral mixture and clean milk production practices in dairy animals.
- Promotion of fodder varieties DHN 6, CoFS 29, 30, 31 Co 3,4,5 and fodder seed production units.
- Introduction of breeds of backyard poultry (Swarnadhara), low-cost incubation and hatchery unit and feed supplementation with azolla.
- Cost-efficient nutrition management with locally-prepared feed formulations.
- Semi-intensive and intensive sheep and goat farming, micronutrient supplementation and deworming practices.

1.4 Farm and non-farm enterprises

- Seed production of cereals, pulses, oilseeds and fodder crops.
- Horticultural nursery for seedlings of fruit, plantation and vegetable crops.
- Mulberry cultivation and silkworm rearing for cocoon production.
- Bee-keeping for honey production and its value addition.
- Millet processing and value addition.
- Value addition to fig, direct and digital marketing strategies.
- Custom hiring of farm machinery and coconut climbing.

2. Impact on Household Income

The average income of farm households, before and after the interventions, more than doubled (2.47 times) between 2016-17 and 2020-21 (Table 63). The share of enterprises in household income, although small, experienced 4.3 times increase during this period. Income from fisheries increased four-fold and from livestock 3.1 times. Livestock sector consolidated its share in the household income to 11.26 per cent in 2020-21 from 8.98 per cent in 2016-17. Horticulture

component experienced 2.5 times increase in income over benchmark year. It proved to be the dominant source of household income with contribution of 58.06 per cent to the additional income.

Table 63. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	78925	153727	94.78	30.65	24.17	19.76
Horticulture	144549	364361	152.07	56.13	57.28	58.06
Livestock	23133	71654	209.75	8.98	11.26	12.82
Fisheries	1921	7687	300.16	0.75	1.21	1.52
Farm and non-farm enterprises	8985	38670	330.38	3.49	6.08	7.84
Total	**257513**	**636099**	**147.02**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions (Table 64). However, the households at the bottom of land distribution benefitted relatively more. The income of the landless families increased 3.5 times (251.2%). Marginal and small farm households were benefited by 2.6- and 2.5- times increased income, respectively. The medium and large farm households could realize 2.4 times increase in their household income.

Table 64. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2020-21	
Landless	20	0.55	78702	276401	251.20
Marginal (<1.0 ha)	790	21.66	109268	286108	161.84
Small (1-2 ha)	1479	40.54	175155	441184	151.88
Medium (2-4 ha)	865	23.71	296934	721890	143.11
Large (>4 ha)	494	13.54	679367	1643701	141.95
Total	**3648**	**100.00**	**257513**	**636099**	**147.02**

KERALA

Implementing agency : 14 KVKs

Number of farm households covered : 1,545

1. Sector-specific Interventions

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna, Shreyas), micronutrient management, promotion of soil amendments like dolomite, disease management, low-cost bio inputs like PGPR mix, and use of rice husk ash.
- Integrated pest disease management with *Tricho cards, Trichoderma*, *Pseudomonas, Metarhizium,* Ayar and Sampoorna in vegetable crops.
- Summer fallow cultivation of green gram, black gram, sesame, cowpea, summer vegetable and horticulture-based integrated farming system.
- Promotion of secondary and micronutrient management (boron, magnesium, zinc), dolomite application and growing of dhiancha as a green manure crop for improving crop productivity.

1.2 Horticultural crops

- Promotion of coconut based intercropping of vegetables, fodder and spices, integrated management of red palm/ rhinoceros beetle and soil test based nutrient management in coconut.
- Integrated crop management in banana and use of Ayar as nutrient supplement.
- Promotion of IISR variety Thevam, quality planting material, balanced nutrition and biological disease management in black pepper.
- IPDM and INM in small cardamom using entamo pathogenic nematode (EPN) and bio-intensive pest disease management.
- Introduction of bee keeping to increase the capsule setting in small cardamom.
- Skill development in rubber tapping techniques in collaboration with Rubber Board.
- Promotion of Arka vegetable special as a nutrition management in vegetables.
- Promotion of new tuber crop varieties - tapioca (Sree Pavithra), amarphophallus (Gajendra) and introduction of semi–manual harvester.
- Introduction of cocoa and meliponiculture.
- Promotion of bush pepper production, marketing assistance involving buy back of bush pepper plants, and bio-intensive management of diseases.

- Soil test based nutrient management, *in-situ* organic manuring, *Trichoderma* enriched manure application.
- Introduction of Arka Mangala variety of yard long bean.

1.3 Animal Husbandry

- Introduction of scientific farming of mullet and pearlspot in ponds, cage culturing, ornamental fish farming and scientific pond management practices.
- Introduction of new breeds of poultry (Gramasri, Kadaknath), use of low cost cage system, feed supplementation and capacity building on broiler farming.
- Expansion of dairy units with the support of fodder production, timely insemination, management of ecto-parasites and micro nutrient supplementation.
- Prophylactic management for prevention and control of mastitis in dairy animals.
- Hydroponics green fodder production, azolla production and supplementation.
- Facilitation in marketing and procurement of quality chicks.
- Scientific goat rearing under semi-intensive and intensive management.

1.4 Farm and non- farm enterprises

- Capacity development and supporting for mushroom farming, spawn production, marketing of fresh, processed and branded products.
- Capacity building for value addition of coconut, jackfruit and handholding for enterprises establishment.
- Promotion of entrepreneurship through dry fish unit, production and selling of dressed fish and safe to eat fish.
- Facilitation of nursery management, gardening and landscaping with regular agro advisory services.
- Technical backstopping for coconut oil extraction and supporting FPOs to take up rice grain milling and coconut oil extraction as enterprises.

2. Impact on Household Income

The average income of farm households more than doubled (2.65 times) between 2016-17 and 2020-21 (Table 65). The share of enterprises in household income experienced 5.3-times increase during this period, consolidating enterprise share in the household income increased to 11.32 per cent in 2020-21 from 5.65 per cent in 2016-17. Horticulture, the dominant source of household income, experienced 2.4 times increase in household income.

Table 65. Level and change in household income

Crops and enterprises	Net income (Rs/household at current prices)		% increase in income	% share in total income		% share in additional income
	2016-17	2020-21		2016-17	2020-21	
Field crops	18383	44569	142.45	11.78	10.77	10.16
Horticulture	107184	259671	142.27	68.66	62.73	59.15
Livestock	20160	54743	171.54	12.91	13.22	13.41
Fishery	1574	8077	413.15	1.01	1.95	2.52
Enterprises	8818	46876	431.59	5.65	11.32	14.76
Total	**156118**	**413936**	**165.14**	**100.00**	**100.00**	**100.00**

Farmers from all land classes benefitted from the technical interventions (Table 66). In particular, income of the landless families increased 3.88 times, the highest for all classes, because of lower benchmark income levels. Income for marginal landholding households was increased by 2.9 times and small holdings could increase farm household income by 2.5 times.

Table 66. Income level and change in household income by land class

Land class	No. of households	% share in total household	Net income (Rs/household)		% change in household income
			2016-17	2021-22	
Landless	71	4.60	41670	161719	288.09
Marginal (<1.0 ha)	951	61.55	98246	285220	190.31
Small (1-2 ha)	320	20.71	204967	510741	149.18
Medium (2-4 ha)	136	8.80	332104	816113	145.74
Large (>4 ha)	67	4.34	508308	1229496	141.88
Total	**1545**	**100.00**	**156118**	**413936**	**165.14**

DOUBLING FARMERS INCOME
State wise Synthesis

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Data Collection: Experts of 731 KVKs

Notes

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