



ENHANCING FARMERS INCOME IN KERALA : IMPACT OF TECHNOLOGIES PROMOTED BY KVKs



ICAR-AGRICULTURAL TECHNOLOGY APPLICATION RESEARCH INSTITUTE
H.A.Farm Post, Bhoopasandra road, Hebbal, Bengaluru - 560024

Title: Enhancing Farmers Income in Kerala: Impact of Technologies Promoted by KVKs

Published by

Dr.V.Venkatasubramanian, Director, ICAR ATARI Bengaluru
March 2023, Bengaluru

Concept and Guidance

Dr.A.K. Singh, Former DDG (AE), ICAR, New Delhi

ISBN Number: 978-81-958900-0-2

Editors

Chandre Gowda M.J.
Srinivasa Reddy D.V.
Rayudu B.T.
Thimmappa K.
Kolekar D.V.
Mallikarjun B Hanji
Harshitha D.
Deeksha Raj N.

Citation: Chandre Gowda, M.J., Srinivasa Reddy, D.V., Rayudu, B.T., Thimmappa, K., Kolekar, D.V., Mallikarjun, B. Hanji, Harshitha, D. and Deeksha Raj, N. (2023). Enhancing Farmers Income in Kerala: Impact of Technologies Promoted by KVKs, ICAR- Agricultural Technology Application Research Institute (ATARI), Bengaluru, pp: 95.

Copyright ©: ICAR-Agricultural Technology Application Research Institute (ATARI), Bengaluru (2023).

Printed by

M/s Precision Fototype Service, No.13, Sathyanarayana Temple Street,
Gupta Layout, Halasuru, Bengaluru 560008, Karnataka.

शोभा करांदलाजे
SHOBHA KARANDLAJE



MESSAGE

राज्य मंत्री
कृषि एवं किसान कल्याण
भारत सरकार
Minister of State For
Agriculture & Farmers Welfare
Government of India
D.O. No.118/.....MOS(A&FW)/VIP/2021-22/

Agriculture directly or indirectly provides employment to more than half of our population. With just 2.4 per cent of the global geographical area, the nation has to sustain 17.7 per cent of the global population. Yet, it is a matter of great pride that India is among the fastest growing economies of the world. The Government of India, under the dynamic leadership of Prime of India Sh. Narendra D. Modi ji, has envisioned that the nation not only achieves the food and nutrition security for its huge population, but at the same time, ensures economic security for every farmer. The much needed vision to double farmers' income (DFI) by 2022 was based on the unwavering faith of the government in the capabilities of farming community across the length and breadth of the country.

The Indian Council of Agricultural Research (ICAR) has ably shouldered the responsibility of achieving the national agenda on DFI through its frontline extension network of Krishi Vigyan Kendras (KVK). The KVKs implemented multipronged and location specific strategies in each district to facilitate doubling farmers' income since 2016-17. The focus was on enhancing productivity of crops and livestock, reduction in cost of production through resource use efficiency, facilitating diversification towards high value crops and enterprises, processing/value addition of farm produce, collective and direct marketing of the produce and income generation from non-farm sector.

It is gratifying to note that the state level documentation of successful farmers are being published by ICAR Agricultural Technology Application Research Institute (ATARI) Bengaluru for Karnataka and Kerala. I congratulate ICAR, the Division of Agricultural Extension, and ATARI Bengaluru for guiding KVKs to come out with district level analysis of successful examples for encouraging other farmers to emulate and excel with the help of technological support.

I congratulate the authors from each KVK and the editorial team at ICAR ATARI Bengaluru for bringing out state-wise summary and district-specific synthesis of doubling farmers income initiatives in Karnataka and Kerala.

Shobha Karandlaje
(Shobha Karandlaje)

Delhi Office : Room No. 322, 'A' Wing, Krishi Bhawan, Dr. Rajendra Prasad Road, New Delhi-110 001
Tel. : +91-11-23383975/76 Fax : +91-11-23383971, E-mail : mos.shobha.agri@gmail.com
Residence : 101, Narmada Apartments, Dr. B. D. Marg, New Delhi-110 001



डॉ. ऊधम सिंह गौतम

उप महानिदेशक (कृषि विस्तार)

Dr. U.S. Gautam

Deputy Director General (Agril. Extn.)

भारतीय कृषि अनुसंधान परिषद

कृषि अनुसंधान भवन-1, पूसा, नई दिल्ली 110 012

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Krishi Anusandhan Bhawan-I, Pusa, New Delhi – 110012

Phone: 91-11-25843277 (O)

E-mail: ddg-extn.icar@gov.in ; us.gautam@icar.gov.in

FOREWORD

Ever since the first announcement made by Hon'ble Prime Minister of India in February 2016, the Doubling of Farmers' Income (DFI) has become a national buzzword. The entire nation has strongly believed in the vision of the Prime Minister and solidly supported the ambitious goal. The country is well-endowed with the natural resources although widely varying climatic parameters like rainfall, temperature and humidity did pose great bit of challenge to farming community. Fortunately, the Indian Council of Agricultural Research (ICAR) has always led the nation in its pursuit of development of agriculture driven through science and technology. The vast network of Krishi Vigyan Kendras has created a niche for itself as the most dynamic, vibrant and credible cutting-edge level farm science institution, thereby shaping the future of the farming community. The possibility of technology-driven doubling of farmers' income has been proved beyond doubt by the national-level compilation of 75000 farmers' success stories, which was released by the Hon'ble Prime Minister, as a part of the 75th year of Independence. It is extremely gratifying to note that ICAR-ATARI, Bengaluru is publishing the district-wise synthesis of composition and changes in farmers' income due to KVK interventions in the states of Karnataka and Kerala. I congratulate the entire team of ICAR-ATARI, Bengaluru, wholeheartedly, for coming up with state-wise documents for Karnataka and Kerala.

The Agricultural Extension Division of ICAR takes this opportunity to congratulate all the farmers and their family members for joining hands with the team of ICAR-ATARI, Bengaluru in this great achievement. My sincere appreciations to all the scientists of KVKs in Karnataka and Kerala for guiding and supporting farmers with all their might.

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

(Udham Singh Gautam)



ICAR-Agricultural Technology Application Research Institute, Zone XI

भा.कृ.अनु.प.- कृषितकनीकीअनुप्रयोगअनुसंधानसंस्थान, जोन XI

MRS, HA Farm Post, Hebbal, Bengaluru 560 024

एम. आर. एस, एच. ए. फार्मपोस्ट, हेब्बाल, बैंगलुरु ५६० ०२४

Fax: +91-80-23410615 Email: director.ataribl@icar.gov.in

Preface

Indian economy witnessed great progress since independence, in terms of infrastructural development, liberalization in other economic sectors, education and communication systems, and changes in demand patterns for food and other agricultural raw material. Such a development accelerated the pace in recent years, and it is necessary that associated changes must come into agricultural systems, to remain contextual and take advantage of developments in non-agricultural spheres. Hon'ble Prime Minister of India in sharing a renewed vision for the farmers of the country, has effectively set a new era for agriculture by initiating the ambitious target of Doubling Farmers Income (DFI). Hon'ble Prime Minister reiterated that productivity must be defined as a measure of gainful income (the outcome) and not only as a measure of production per unit of asset (the output).

To bring this vision into a reality, the Government of India took a policy decision in 2016-17 to achieve doubling farmers income by 2022. The approach to DFI broadly covered a) income enhancement; b) social security cover; c) access to institutional credit; d) risk cover; and e) access to knowledge. Therefore, it was important to take advantage of scientific knowledge and technology. In this context, the Indian Council of Agricultural Research (ICAR) led from the front by constituting state level coordination committees to work out state-specific DFI strategies, which analysed the agro-climatic zone based cropping/farming systems and identified the thrust areas, potential technologies and feasible approaches to achieve the national goal. To facilitate this under the over-arching leadership of the Agricultural Extension Division of ICAR, Krishi Vigyan Kendras (KVKs) took up the responsibility of planned frontline extension interventions. Besides ensuring profitability in the existing cropping patterns, the KVKs aimed at augmenting the farm household income through diversification into high value crops, intensifying livestock production and exploring agri-business opportunities in each district. The efforts could enable the contact farmers to get the benefits of the right technologies made available at the right time using the right approaches.

The district-level analysis of successful farmers in Kerala has thrown light on evidences into the technology-enabled doubling of farmers income. Each district has focused on distinctive approaches keeping the prevailing agro-climatic situations, socio-economic opportunities and market preferences. Horticulture has been the mainstay of farmers income, but the sector-wise analysis has clearly brought out the contribution of field crops, livestock, fisheries and supplementary enterprises to enhance farmers' income. The technology-driven income enhancement was evident across all land classes, including the landless category of rural households. The impact has been possible due to the sheer determination and dedication of all the scientific, technical and administrative staff working in all the KVKs of Kerala. The Director of Extension, Kerala Agricultural University and the officers in the Directorate of Extension are thanked for providing all the support to KVKs and consistent guidance for proper planning, implementing and documenting the impact on the selected farm households in each district. All the farmers and family members of the farm households involved in the documentation process deserve wholehearted appreciation for being part of the national mission to achieve doubling of income.

Editors

vii

List of Abbreviations

AESA	Agro Eco System Analysis
AEU	Agro Ecological Unit
APTIC	Agro Processing Training and Incubation Centre
ARYA	Attracting and Retaining Youth in Agriculture
BT	Bacillus thuringiensis
CMFRI	Central Marine Fisheries Research Institute
CPCRI	Central Plantation Crops Research Institute
DFI	Doubling Farmers Income
EDP	Entrepreneurship Development Programme
EPN	Entamo Pathogenic Nematode
FPO	Farmer Producer Organization
GAP	Good Agricultural Practices
GI	Geographical Indication
GIFT	Genetically Improved Farmed Tilapia
HYV	High Yielding Variety
ICAR	Indian Council of Agricultural Research
ICM	Integrated Crop Management
IFS	Integrated Farming System
IIHR	Indian Institute of Horticulture Research
IISR	Indian Institute of Spice Research
INM	Integrated Nutrient Management
IPDM	Integrated Pest and Disease Management
IPM	Integrated Pest Management
KAU	Kerala Agricultural University
KSCDC	Kerala State Cashew Development Corporation
KVK	Krishi Vigyan Kendra

NABARD	National Bank for Agriculture and Rural Development
NATP	National Agriculture Technology Project
NGO	Non Governmental Organizations
PGPR	Plant Growth Promoting Rhizobacteria
POPI	Producer Organization Promoting Institution
PPFM	Pink Pigmented Facultative Methylootrophs
SC ST	Scheduled Caste / Scheduled Tribe
SCC	State Coordination Committee
SHC	Soil Health Card
SHG	Self Help Group
SHM	State Horticulture Mission
Mobile SMS	Short Message Service
TC	Tissue Culture
UMMB	Urea Molasses Mineral Block

Contents

Introduction	1
Kerala State Summary.....	3
Kasaragod	11
Kannur	17
Wayanad	23
Kozhikode (Calicut)	29
Malappuram	35
Palakkad	41
Thrissur	47
Ernakulam	53
Idukki	59
Kottayam.....	65
Alappuzha	71
Pathanamthitta	77
Kollam.....	85
Thiruvananthapuram	91



Introduction

Indian Council of Agricultural Research (ICAR) has established a network of 731 Krishi Vigyan Kendras (KVKs), also known as Farm Science Centres, in rural districts of the country as on date. The KVK acts as a single-window agricultural knowledge, resource and capacity development centre in the district. The KVKs are functioning under the administrative and technical supervision/guidance of ICAR Institutes, Agricultural Universities, Development Departments, Non-Government Organizations and other Institutions. Each KVK has a multidisciplinary team of specialists, an agricultural farm to demonstrate the latest agricultural technologies, demonstration units, need-based laboratories for providing the diagnostic services and communication infrastructure for extending advisory services. Farm and laboratory-based production units enable KVKs to make available seeds, plants and other inputs to facilitate adoption of new technologies. The KVK serves as a perfect platform for the convergence of all development departments and agencies towards science-led agricultural development in a district.

In India, the early agricultural development strategies focused primarily on raising agricultural output for attaining food security. The announcement for doubling farmers' income (DFI) in five years 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 seven-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/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 comprised 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 vast 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 were promoted as per the needs and interests of the farming community.

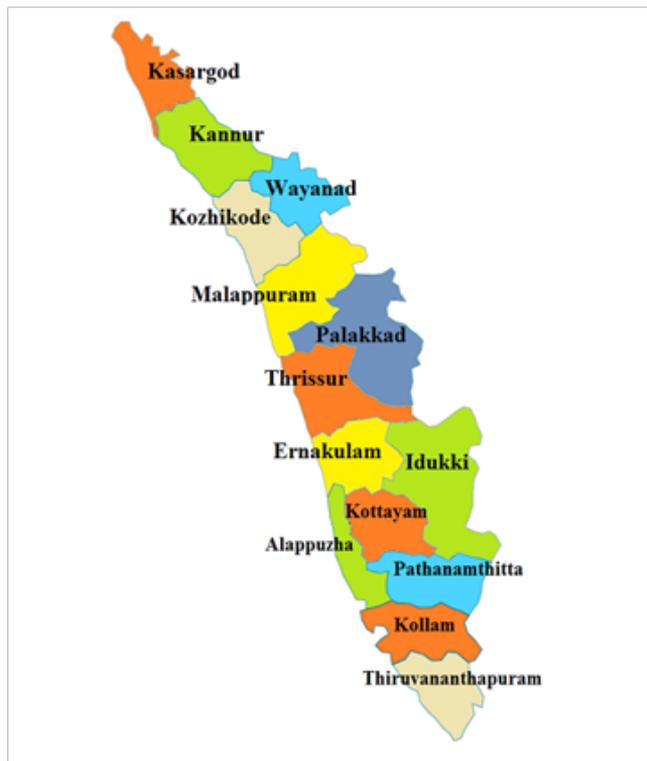
In each KVK, the specialists formulated and conducted series of need-based capacity development programs at regular intervals to bridge the knowledge and skill gaps of farming communities and other stakeholders. KVKs engaged with farmers, individually and collectively, at all stages of agricultural production 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.

A format was designed and shared with all the KVKs for creating database of successful farmers. Based on the individual farmer's data, the household income in 2020-21 has been compared with that of 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.

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 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. As part of the Platinum Jubilee celebrations of Independence, an attempt has been made to document successful farmers from 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.

Kerala State Summary



Kerala state has a total cropped area of 2627577 ha, out of which the net sown area was 2023073 ha, with a cropping intensity of 130 per cent. The state has 75.83 lakh holdings and most of the holdings belonged to marginal (96.33%) category. In the gross cropped area of 25.69 lakh hectares in 2020-21, food crops comprising paddy, pulses, tapioca, ragi, small millets, sweet potato and other tubers occupied 11.03 per cent. Paddy is the major cereal crop cultivated in 2.02 lakh ha area. The state is known for horticultural crops as coconut is cultivated in 7.69 lakh ha area occupying 29.9 per cent of the cultivated area. Kerala has a substantial share in the four plantation crops of rubber, tea, coffee and cardamom. These four crops together occupied 7.11 lakh ha, accounting for 27.7 per cent of the total cropped area in the state. Pepper (4.09%) and banana (3.78 %) are the other major horticultural crops occupying good share of the cultivated area. Cashew is cultivated in an area of 43090 ha. The state has been focusing on vegetable development programmes with the objective of attaining self-sufficiency in vegetable production. Livestock



and fisheries are the emerging sectors with focus on processing, value addition, farm and non-farm enterprises and agri-business development.

The Indian Council of Agricultural Research has established 14 Krishi Vigyan Kendras (KVKs) in the state to promote science and technology led agricultural development. Out of 14 KVKs, seven are with Kerala Agricultural University, four are with ICAR Institutes and three are with Non-Government

Organizations. As part of the national agenda of doubling farmers' income, the ICAR KVKs took up documentation of successful farmers who could enhance their income with the help and support of technological interventions by the KVKs. 1545 farmers spread across 14 districts of the state form the basis for this document. The number of farmers involved in each district is given below (Table 1).

Table 1: List of districts and no. of farmers covered

Sl.	District	Farmers (No.)
1	Alappuzha (Alleppey)	110
2	Ernakulam	110
3	Idukki	111
4	Kannur	111
5	Kasaragod	110
6	Kollam	111
7	Kottayam	110
8	Kozhikode (Calicut)	111
9	Malappuram	111
10	Palakkad	110
11	Pathanamthitta	110
12	Thiruvananthapuram	110
13	Thrissur	110
14	Wyanad	110
Total		1545

A brief summary of interventions and its impact in terms of household income under different components and the change in income for different land-class categories is given below.

1. Sector specific interventions by KVKs

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna and Shreyas), micronutrient management, promotion of soil amendments like dolomite and disease management, low-cost bio inputs like PGPR mix, and paddy husk ash.
- Integrated pest and disease management with *Trichocards*, *Trichoderma*, *Pseudomonas*, *Metarhizium*, Ayar and Sampoorna in vegetable crops.
- Summer fallow cultivation of greengram, blackgram, sesame, cowpea, summer vegetable, and horticulture-based integrated farming system.
- Promotion of secondary and micronutrient management (boron, magnesium, and zinc), dolomite and growing of dhaincha 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 and 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, and *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.

- Facilitation of nursery management, gardening and landscaping with regular agro advisory services.
- Technical backstopping for coconut oil extraction and supporting FPOs to take up paddy grain milling and coconut oil extraction as enterprises.

1.4 Farm and non-farm enterprises

- Capacity development and supporting for mushroom farming through 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, produce and marketing of dressed fish and safe to eat fish.

2. Shift in cropping and farming patterns due to KVKs interventions

Farmers shifted from crops-based farming to (i) crops + livestock which increased from 21.95 per cent to 25.58 per cent (ii) crops + enterprises increased from 4.68 per cent to 10 per cent and (iii) crops + livestock + enterprises increased from 1.82 per cent to 6.3 per cent as compared to benchmark year. KVKs could influence farmers to shift towards high value crops and activities as they supported them with technological and technical support as per the needs to individual farmers (Fig. 1).

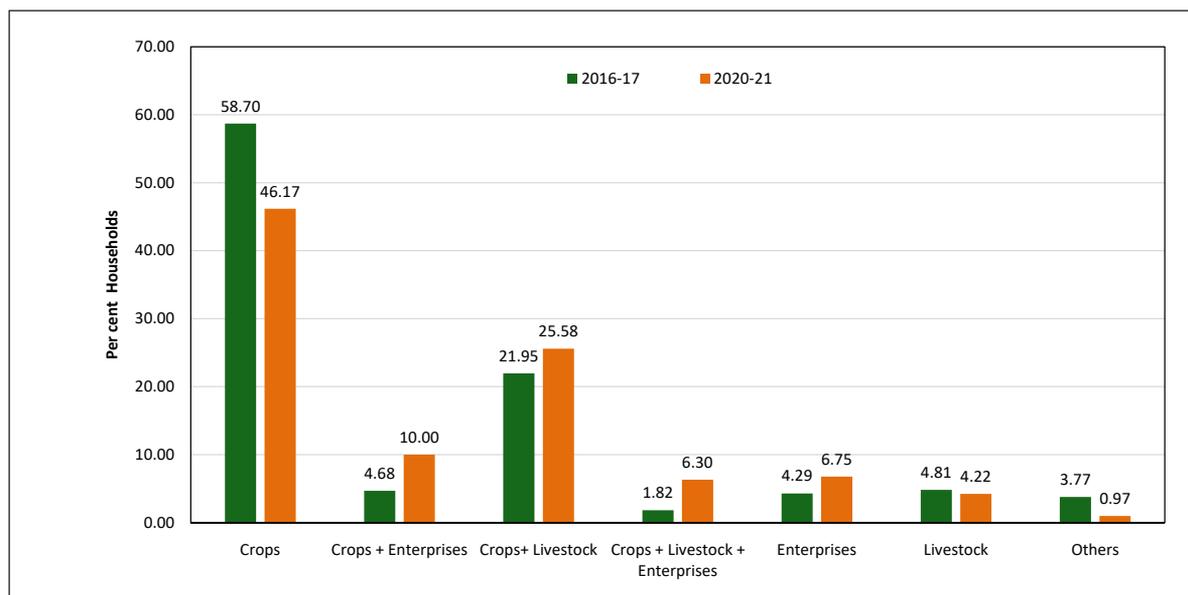


Fig. 1: Shift in crop and enterprises for increasing income

3. Impact of interventions on household income

The average income of farm households (before and after the interventions) has been more than doubled (2.65 times) between 2016-17 and 2020-21 (Table 2). The share of enterprises in household income experienced 5.3 times consolidating enterprise share in the household income increased to 11.32 per cent in 2020-21 from 5.65 per cent

in 2016-17. Fisheries income increased by 5.1 times, although its share in total income negligible. Horticulture, the dominant source of household income, experienced 2.4 times increase in income due to KVKs interventions. It is the major source of income before as well as after with a share of 68.66 per cent and 62.73 per cent respectively. Its share in total income has marginally declined, but is still the biggest contributor to additional income with 59.15 per cent.

Table 2: 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
Fisheries	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

4. Component wise contribution to income from horticulture

Further analysis of horticulture components indicated that, all the components recorded more than 100 per cent increase in income, highest being 326.03 per cent in the case of floriculture. High percentage of increase in income from floriculture could be attributed to the lower benchmark income levels but is a strong indicator that the floriculture sector has huge potential to enhance farmers' income in the state (Fig. 2).

Farmers from all land classes benefitted from the technical interventions (Table 3). In particular, income of the landless families increased 3.88 times, the highest for all classes, because of lower benchmark income

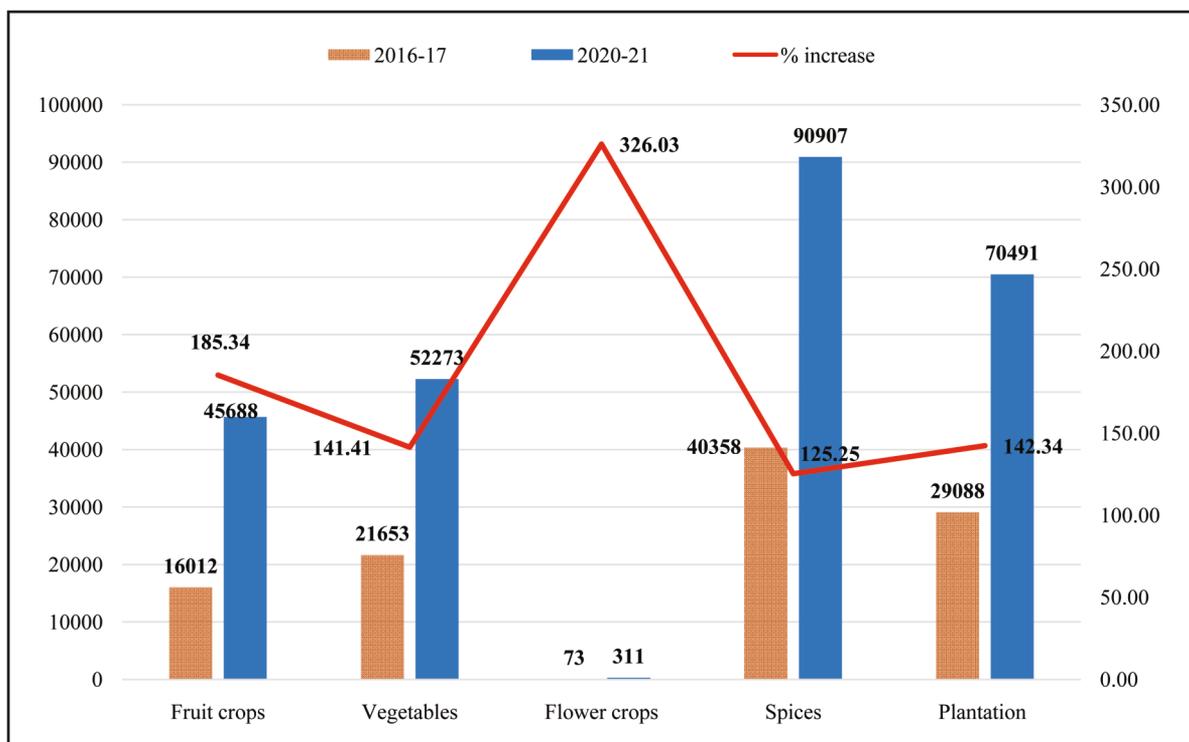


Fig. 2: Share and percentage increase of horticultural components in farmers income

levels. Income for marginal landholding households increased by 2.9 times and all other categories could increase farm household income by 2.5 times.

Table 3. Income level and change in household income by land class

Land class	Households (No.)	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



Enhancing Farmers Income in Kerala

District-wise Analysis



KASARAGOD

Manojkumar, Manikandan, Saritha Hegde,
Neelofar Illiaskutty and Jayashree

ICAR-Krishi Vigyan Kendra, Kasargod



About the district

The Kasargod district is located at the northern tip of Kerala, bounded by the western ghats in the east and Arabian sea in the west and twelve rivers flowing across its terrain. The district has a total



geographical area 199166 ha, with a total cropped area of 157859 ha. The net sown area is 186766 ha. In the gross cropped area 46339 ha (29%) cultivated crops are paddy, pulses, vegetables, fruits, tubers and spices. Paddy cultivated in 2291ha area, which is 1.45 per cent of the total cropped area. Coconut is cultivated in 65998 ha area occupying 42 per cent of the cultivated area. Arecanut is cultivated in 20764 ha (13%). Cocoa is grown as intercrop in coconut and arecanut gardens in an area of 281 ha. Cashew is cultivated in an area of 7240 ha. Black pepper is cultivated in 3088 ha area and rubber in 33920 ha. Livestock and fisheries are the emerging sectors with focus on processing, value addition, farm and non-farm enterprises and agri-business development.

About KVK Kasaragod

The KVK for the Kasaragod district was established on 1st January 1993 under the administrative control of ICAR- Central Plantation Research Institute. It is situated about five kilometers away from Kasaragod towards Mangalore. As part of the national agenda of doubling farmers' income, the KVKs took up documentation of successful farmers who could enhance their income with the help and support of technological interventions. A brief summary of interventions, the impact in terms of household income under different components and the change in income for different land-class categories is given below.

1. Sector specific interventions by KVK Kasaragod

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna, Shreyas, Pratyasa, Karuna, Pournami) and promotion of soil amendments like dolomite
- Integrated pest and disease management with *Tricho cards* and *Trichoderma*, *Pseudomonas*,

- Summer fallow cultivation of greengram, blackgram, sesame and cowpea.

1.2 Horticultural crops

- Promotion of coconut based farming system including fodder grass, banana, pepper and tubers.
- Promotion of arecanut based farming system including banana, pepper and cocoa.
- Integrated pest management in coconut and arecanut.
- Integrated disease management in coconut and arecanut gardens.
- Integrated crop management in banana and use of Ayar as nutrient supplement.
- Introduction of bee keeping in coconut gardens for increasing yield.
- Promotion of banana special micronutrient mixture as a nutrition management in banana.
- Promotion of new tuber crop varieties - tapioca (Sree Jaya), amarphophallus (Gajendra) demonstration of mini set techniques in tuber crops.
- Demonstration on canopy management in cocoa.
- Promotion of bush pepper production
- Integrated disease management in pepper using bio agents.
- Introduction of Arka Mangala, Geethika, Jyothika varieties of yard long bean.
- Pest and disease management in vegetable crops.
- Integrated disease management in pepper.

1.3 Animal husbandry

- Awareness programmes and training programmes on goat rearing and poultry production

1.4 Fisheries

- Supply of fingerlings and training on fish culture.

1.5 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 on value added products from seasonal fruits and vegetables.

- Bee keeping as an enterprise for increasing farm income.

2. Impact on household income

The average income of farm households (before and after the interventions) is more than doubled (1.72 times) between 2016-17 and 2020-21 (Table 4). Horticulture is the dominant source of household income, with 73.12 per cent contribution to household income. The share of enterprises in household income experienced 399.30 per cent increase during this period consolidating enterprise share in the household income increased to 10.24 per cent in 2020-21 from 5.59 per cent in 2016-17. Livestock income increased by 118.72 per cent.

Table 4: 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	6083	17082	180.83	2.97	3.06	3.11
Horticulture	159466	417901	162.06	77.75	74.82	73.12
Livestock	28075	61404	118.72	13.69	10.99	9.43
Fisheries	13	4973	38153.85	0.01	0.89	1.40
Enterprises	11454	57192	399.30	5.59	10.24	12.94
Total	205091	558552	172.34	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

As indicated above, the horticulture sector was the major source of additional income as well as total increase in income. Further break-up of the horticulture sector into its subcomponents revealed that the plantation crops dominate the share in total income as well as contribution to additional income. The percentage increase in income was to the extent of 199.55 per cent. All the components could generate substantial increase in income as depicted in Fig. 3.

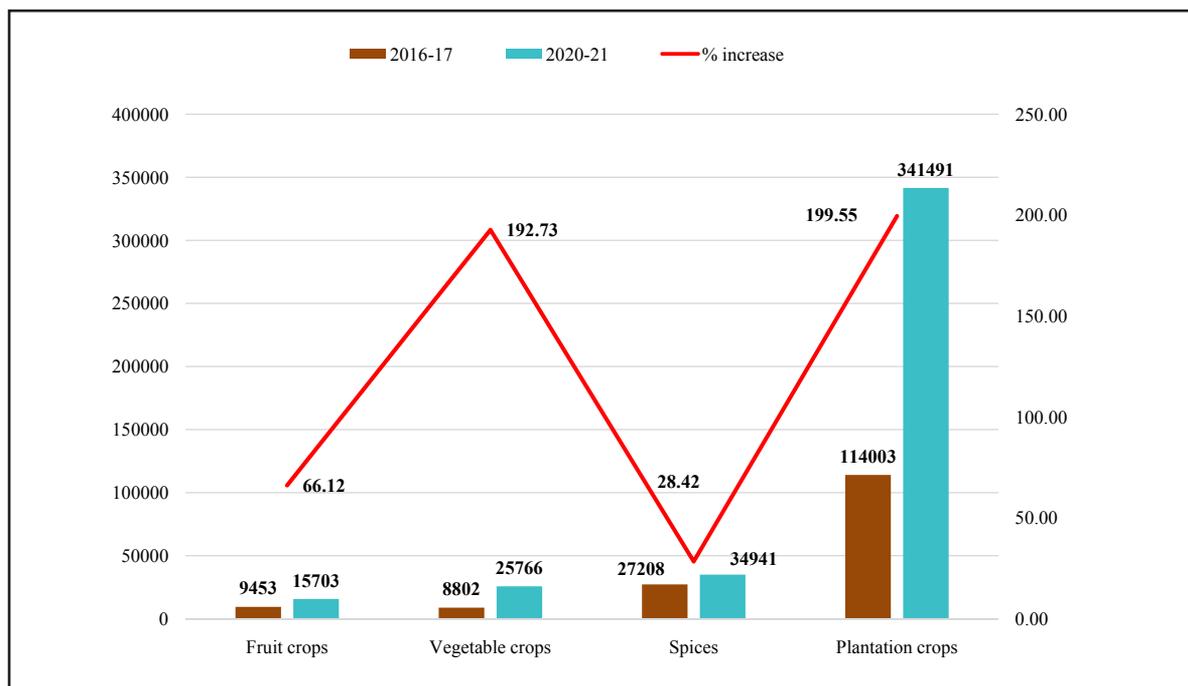


Fig. 3: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

Out of 110 respondents, the share of marginal framers is more (36%) followed by small (33%) and medium farmers 22 per cent (Fig. 4).

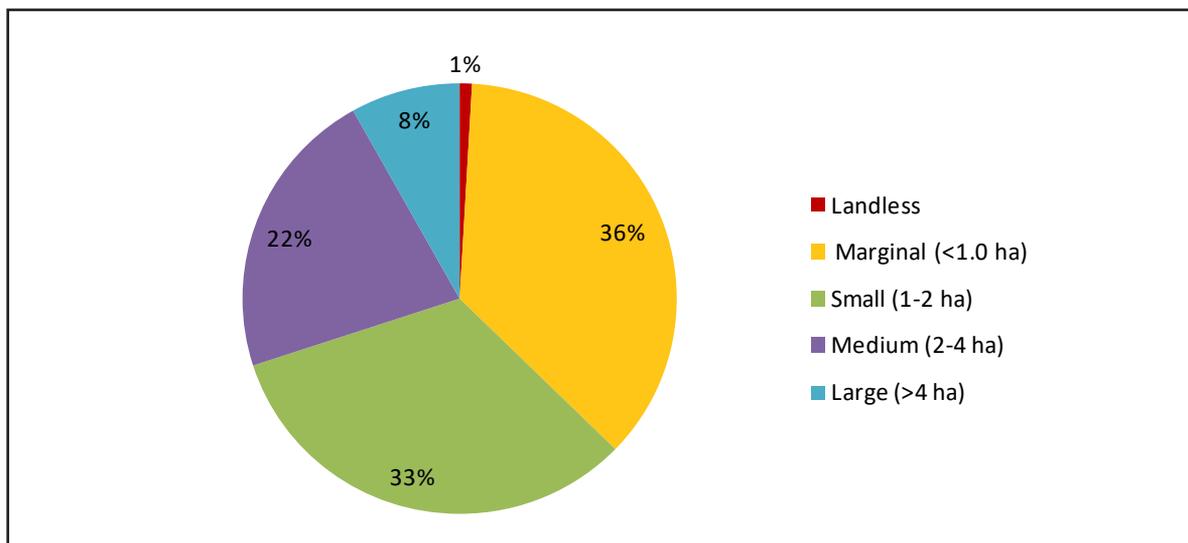


Fig. 4: Proportion of land categories among successful farmers in Kasargod district

Farmers from all land classes benefitted from the technical interventions (Table 5). In particular, income of the marginal families increased 242.72 per cent times, the highest for all classes, because of lower benchmark income levels. Income for small landholding households was increased by 167.07 per cent and other categories ranging from 113.36 per cent (landless) to 161.67 per cent (large farmers) could increase farm household income by 1.72 times.

Table 5: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Landless	1	83100	177300	113.36
Marginal (<1.0 ha)	40	80107	274548	242.72
Small (1-2 ha)	36	190467	508681	167.07
Medium (2-4 ha)	24	293092	745296	154.29
Large (>4 ha)	9	597944	1564650	161.67
Total	110	205091	558552	172.34



Kunjambu Nair, Periya



Radhakrishnan Pollakkada



Suresh Nayak, Kudlu



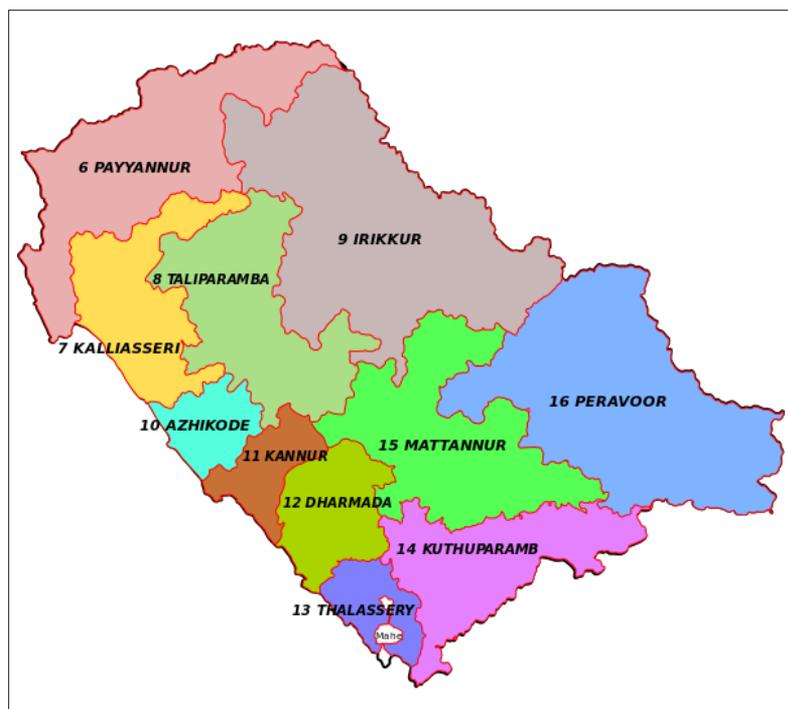
Krishnan Prakkodal, Bio plus, Madikkai



KANNUR

Jayaraj P., Parvathy A., Mannambeth Renisha Jayarajan,
Manju K. P., Anu V., Ambili John and Elizabeth Joseph

ICAR-Krishi Vigyan Kendra, Kannur



About the district

Kannur district has a total geographical area of 2966 square kilometers spread over five different agro ecological units viz. Northern coastal plains (AEU 2), Kaipad lands (AEU 7), Northern midland laterites (AEU 11), Northern foot hills (AEU 13) and Northern high hills (AEU 15). The district contributes 7.6 per cent of the area of the Kerala state. About 90 per cent of the total land holdings in the district are of less than one hectare size. A majority of the population of the district is dependent directly or indirectly on agriculture for their



livelihood. The main crops grown in the district are paddy, coconut, pepper, cashew, tapioca, arecanut and plantation crops like rubber. Paddy occupies the largest area among annual crops. The average yield of paddy is recorded as 2146 kg per hectare. Next to paddy, coconut is the most important crop in the district. Coconut is extensively grown throughout the district. An important cash crop grown in the district is cashew. Among spices, pepper occupies an important place. Pepper is mostly grown as an intercrop with coconut, arecanut and various fruit trees. In the hilly areas of the district, inter-cultivation is done with rubber and cashew.

About KVK Kannur

ICAR-Krishi Vigyan Kendra, Kannur was established in 2004 at Panniyur of Kannur district. KVK is primarily works for the assessment and refinement and frontline demonstrations of agricultural technologies to establish production potential of technologies in farmers' fields, capacity building of farmers and extension functionaries, and facilitating the spread of technologies tailored to the diverse environment of farmers. The model developed by KVK Kannur is now gaining momentum in all districts, in producing participatory production of seeds and planting materials of paddy, pulse crops, tuber crops, spices etc. KVK is conducting training and skill development programmes for youths under mushroom production, processing and value addition of fruits and vegetables, bee keeping landscaping and gardening etc. under ARYA (Attracting and Retaining Youth in Agriculture) programme and the placement record is encouraging. Training to rural youth in association with FPO is also yielding good results in processing value addition and nursery activities. KVK Kannur is functioning as Producer Organization Promoting Institution (POPI) with financial support from NABARD to the three FPOs in the district and also providing technology support for twenty FPOs in the district. Integrated crop management activities including input production, procurement, grading, processing, value addition

and marketing of agricultural commodities are being done with continuous hand holding support through developing business plan for each FPOs. Capacity building and skill development training programme through incubation centre at KVK is now being utilized by large number of fruits and vegetable farmers to make their surplus production to value added products with proper branding and marketing observing food safety standards. This facility is now being utilized by passion fruit, coconut, cashew, vegetable and mushroom growers in the district with nominal fee. KVK Kannur has established mushroom spawn production units under ARYA programme to supply quality spawn materials to the mushroom farmers of Kannur district. KVK Kannur has mass production of *Trichocake*, *Metarhizium*, *Beauveria bassiana* and *Lecanicillium lecanii*, *Trichoderma*, *Pseudomonas*, Neem-X, enriched vermi compost, enriched coir pith compost with *Trichoderma* and micronutrients. These bio agents are distributed to the farming community through various outlets of Department of Agriculture (Agro Service Centre, Eco shops, Bio input centre, Farmer Extension Organization).

As part of the national agenda of doubling farmer's income, the Krishi Vigyan Kendra, Kannur took up documentation of 111 successful farmers who could enhance their income with the help of technological interventions by the KVK. A brief summary of interventions, the impact in terms of household income under different components and the change in income for different land-class categories is given below.

1. Sector specific interventions by KVK Kannur

1.1 Field crops

Wet land ecosystem of the district is spread over all agro ecological units except high hills.

- Soil health management with ameliorants and demonstration of standard operating protocol emphasising the importance of nutrients at critical stages of the crop

- Besides introduction of high yielding varieties of paddy (Pournami, Lavanya, Akshaya) seed growers programme through participatory mode also initiated in identified farmer's field to ensure the availability of these high yielding varieties.
- Crop rotation with pulse crops like greengram (CO-8), blackgram (VBN-8), oilseeds such as sesame (Tilak, TMV-7), groundnut (Kadiri), tuber crops like amorphophallus (Gajendra), yam (Sree Neelima), tapioca (Sree Suvarna, D-48, D-39),
- Linking farmers with Mayyil Paddy FPO resulted in procurement and decentralised processing of agri. products.
- Technical support to paddy farmer producer organization for processing and value addition.

1.2 Horticultural crops

Horticultural crops are grown mainly in homesteads where banana and vegetables are grown on a commercial scale individually and in cluster mode. Major interventions include

- Integrated crop management in banana and vegetables.
- Promotion of AYAR as secondary and micro nutrient supplement in banana, coconut, arecanut and vegetables to address the deficiency of secondary and micronutrients.
- IPDM with promotion of entamo pathogenic nematodes (EPN), cadavers in banana and tricho cakes for bud rot management in coconut.
- Standard operating protocols for major horticultural crops
- Promotion of open precision farming in vegetables with dynamic fertigation schedule.
- Micro climate management with introduction of tubers and other crops to make Nutri smart homesteads
- Capacity building programmes in

processing and value addition of fruits and vegetables.

- Handholding of farmer producer organizations of coconut, vegetables, fruits and spices in the district for business for plan preparation and other technological support for input supply, procurement, grading, processing and value addition, branding and marketing as input providers.

1.3 Animal husbandry

- Introduction of high yielding bajra hybrid Napier variety KAU Susthira.
- Awareness and skill development programmes on livestock management and entrepreneurship development in animal husbandry.
- Capacity building programmes on Integrated Farming System (IFS).
- Awareness on management of zoonotic diseases.
- Promotion of hydroponics green fodder production and azolla production.
- Scientific management practices for livestock. Processing and value addition of milk and meat based products.

1.4 Fisheries

- Capacity building programme for processing and value addition of fish.
- Promotion of fisheries component in IFS.

1.5 Farm and non-farm enterprises

- Skill development programmes and support to mushroom spawn production, mushroom cultivation, marketing of fresh, processed and branded products of mushroom.
- Skill development and EDP programmes in nursery management and landscaping, vegetable and fruit processing and value addition.
- Training and capacity development programmes on bee keeping.



- Handholding for the establishment of enterprises by trained youths under ARYA.
- Providing technical support for revival of Aralam farm
- Sponsored skill training to identified youth under Kudumbshree under GREEN CARPET training.
- Skill training to prisoners of open prison cheemeny.
- Providing technical support to farm plan based activities of selected beneficiaries of

Taliparamba, Irikkur, Pravur and Edakkad blocks of Kannur.

2. Impact on household income

The Table 6 indicated that the average income of farm household (before and after the interventions) more than doubled (5.11 times) between 2016-17 and 2020-21. The share of enterprises in household income experienced a 38.59 times increase during this period. Percentage share in the additional income was more for horticulture (48.69%) followed by enterprises (31.74%) and livestock (13.33%).

Table 6: 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	7294	24159	231.22	10.63	6.90	5.99
Horticulture	47457	184627	289.04	69.16	52.70	48.69
Livestock	11479	49026	327.09	16.73	13.99	13.33
Fisheries	9	722	7922.22	0.01	0.21	0.25
Enterprises	2378	91780	3759.55	3.47	26.20	31.74
Total	68617	350313	410.54	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

As evident from the above, the major source of additional income as well as total increase in income was from horticulture sector. Sub-component wise analysis revealed that fruit crops dominated the share in total income. The percentage increase in income from fruit crops was found to be 441 per cent. Besides fruit crops, other horticultural components also generated substantial increase in income as depicted in Fig. 5.

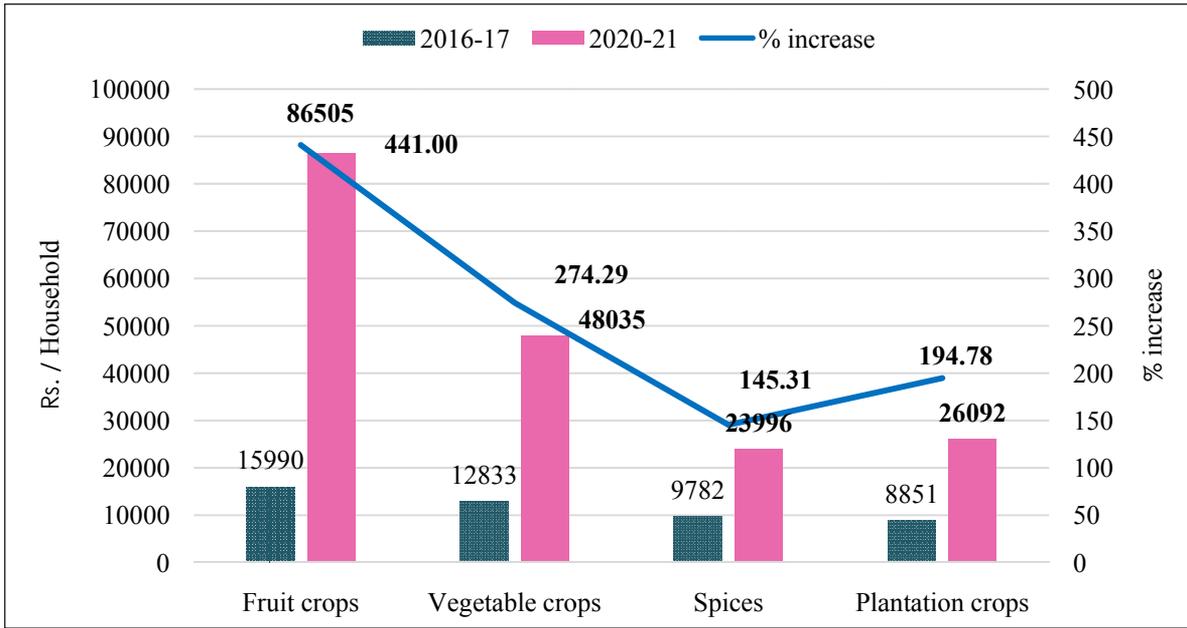


Fig. 5: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

The share of marginal farmers out of 111 respondents was about 64 per cent followed by small farmers who constituted 26 per cent (Fig. 6).

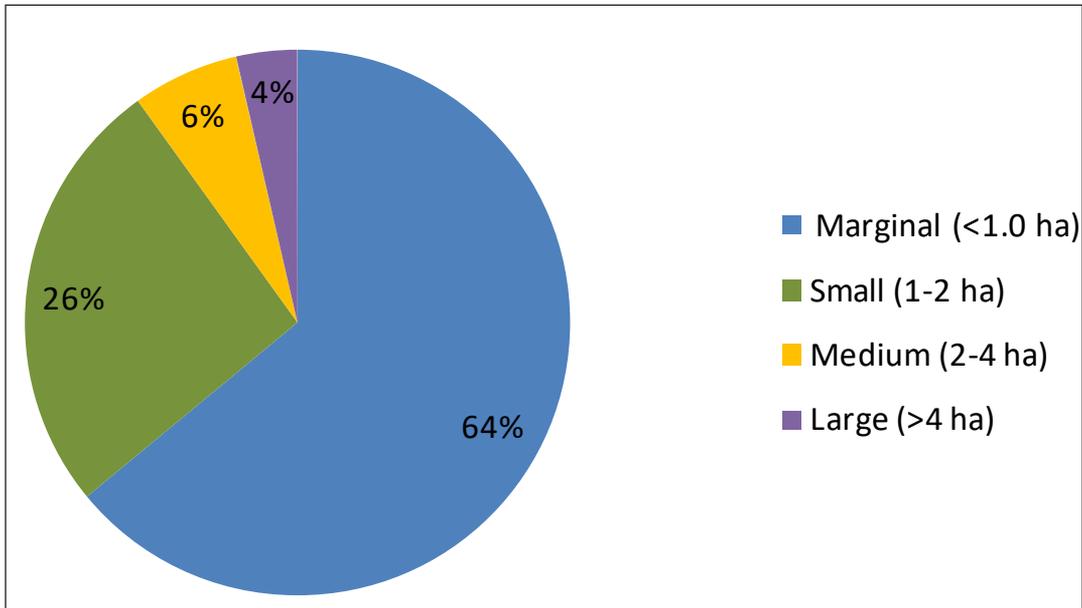


Fig. 6: Proportion of land categories among successful farmers in Kannur district

The impact of KVK intervention on farmers' income with respect to land classes is given in Table 7. Income for marginal landholding households was increased by 8.24 times as compared to the base year. Higher percentage change in household income was also observed for farmers belonging to medium landholding (312.09%).

Table 7: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	71	33875	278966	723.51
Small (1-2 ha)	29	107187	412221	284.58
Medium (2-4 ha)	7	137829	567971	312.09
Large (>4 ha)	4	284525	787000	176.60
Total	111	68617	350313	410.54



Field visit to papaya plantation



FLD on paddy



Vegetable cultivation

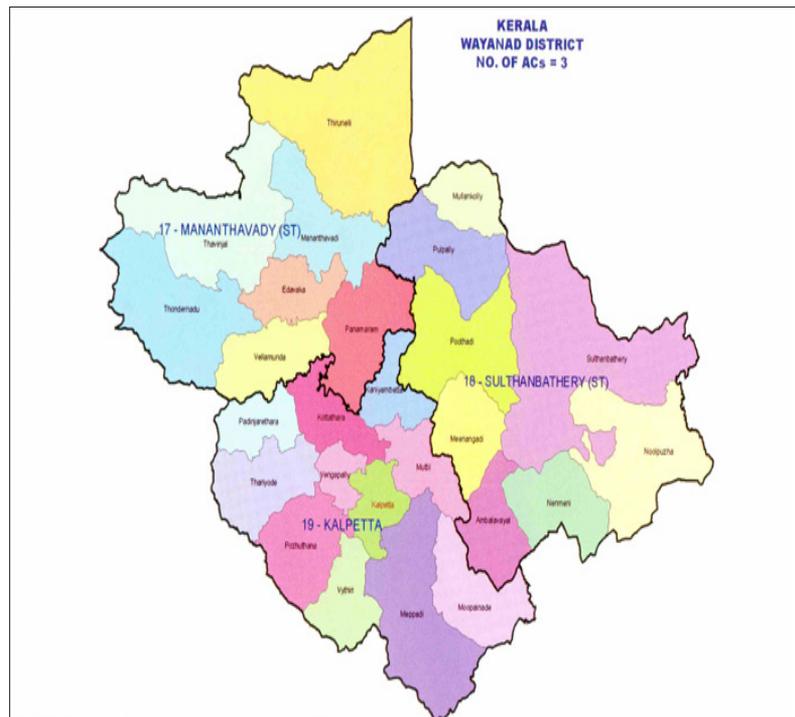


Open precision farming

WAYANAD

Safia N. E., Deepa Surendran,
Ashitha M. R. and Deepa Rani C. V.

ICAR-Krishi Vigyan Kendra, Wayanad



About the district

The green paradise of Kerala, Wayanad is nestled among the mountains of the Western Ghats. Wayanad consists of four development blocks Kalpetta, Sulthan Bathery, Mananthavady and Panamaram. The district headquarters is located at Kalpetta. Often called the spice garden of south, it is known for its cool highland climate, misty peaks and its virgin forests. Physico-ecographically, Wayanad is a high range area having an undulating terrain with altitudes ranging from 700-1200 m above MSL. Wayanad district has a total geographical area of 2129 sq. km. of which 37 per cent is covered by



forest. Coffee, pepper, paddy, cardamom, coconut, rubber, arecanut, tea, banana and vegetables are the major crops grown. The area under paddy has been on the decline due to farmer-animal conflict issues and cultivation of more remunerative cash crops. Coffee and pepper continue to be the major crop of the district. The concept of organic farming is gaining momentum in the district and dairy is the prominent allied activity.

About KVK Wayanad

The Krishi Vigyan Kendra operates in the district as an outreach arm of the National and State Agricultural Research System. The Krishi Vigyan Kendra, Wayanad at Ambalavayal started functioning under Kerala Agricultural University project, attached to the Regional Agricultural Research Station from October 1982. KVK demonstrates latest agricultural technologies in the high range zone for improvement of various crops in the district. The KVK helps to facilitate, validate and improve adoption of new technologies through on farm testing, front line demonstrations, trainings and other extension interventions.

The KVK conducts need based capacity-building programmes for practising farmers, extension functionaries, farmwomen and unemployed rural youth in agriculture and allied fields. Participatory approaches focusing technological empowerment in family farming, popularization of high yielding varieties, production of quality planting materials, integrated farming system, livestock and poultry management, farm mechanization, value addition, resource recycling, organic farming practices, soil health management and cyber extension are the major strategies resorted to unravel these problems. The centre provides total technological solutions for commercial production of spices, sub-tropical fruits, cool season vegetables, flower crops and spices. The KVK Wayanad has now initiated high-end technologies like use of drone technologies for helping farming community to overcome the

shortage and high cost of labour. KVK equally focuses on the development of tribal community with reference to their livelihood and nutritional security. It also provides feedback mechanisms to the research organization, thus acting as a bridge between technology generators and end users.

1. Sector specific interventions by KVK Wayanad

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna, KAU Akshaya, Supriya, Pournami) and promotion of IPDM.
- Promotion of Sampoorna KAU Multimix spray using UAV in paddy.
- Crop intensification in paddy fallows using promising pulse varieties such as cowpea (DC11, PGCP 6), blackgram (VBN8) and greengram (CO8).
- Introduction of nutrient rich varieties of tubers (Sree Neelima, Bhu Krishna).

1.2 Horticultural crops

- Promotion of secondary and micronutrient application in vegetables (Sampoorna) and banana (Ayar and Sampoorna).
- Promotion of intercropping in young coffee gardens.
- Management of nematode attack in pepper using biocontrol agents.
- Popularization of Soil test based nutrient management and IPDM in arecanut and ginger.
- Capacity building in bee keeping, vegetable cultivation and pest and disease management.

1.3 Animal husbandry

- Promotion of hydroponic fodder production and various fodder crops (fodder oats and fodder cowpea) to improve the nutrient composition of the ration in dairy cattle,

fodder preservation methods such as silage preparation.

- Introduction of breeds of poultry (Gramasree, BV380, Kadaknath).
- Popularization of Gramasree male cockerel and Malabari goat for meat purpose.
- Breeding management in goats with the application of progesterone sponges.
- Prophylactic management of mastitis and Biosecurity measures for disease prevention in farms.
- Facilitation in procurement of quality chicks and goats.

1.4 Fisheries

- Promotion of poultry-fish based integrated farming system

1.5 Farm and non-farm enterprises

- Capacity development in value addition of jackfruit, passion fruit, papaya, pepper, ginger, turmeric, coffee and coconut.
- Capacity development and support for mushroom farming, its value addition and spawn production.

2. Impact on household income

The average income of farm households has increased 2.19 times between 2016-17 and 2020-21 (Table 8). The share of enterprises in household income experienced a 4.88 times increase during the same period. Horticulture, the dominant source of household income, experienced 2.27 times increase in household income. The horticulture sector contributed 61.73 per cent to the additional income during the period.

Table 8: 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	13029	26391	102.55	15.51	14.33	13.34
Horticulture	48486	110324	127.54	57.72	59.90	61.73
Livestock	21714	44149	103.32	25.85	23.97	22.40
Fishery	136	227	66.91	0.16	0.12	0.09
Enterprises	631	3079	388.24	0.75	1.67	2.44
Total	83995	184169	119.26	100.00	100.00	100.00

3. Component-wise contribution to income from horticulture

All the components have recorded more than 100 per cent increase in income, highest being 200.86 per cent in the case of vegetable crops. High percentage of increase in income from vegetable crops could be attributed to the lower benchmark income levels and it is a strong indicator that the vegetable sector has huge potential to enhance farmer's income in the state as depicted in Fig. 7.

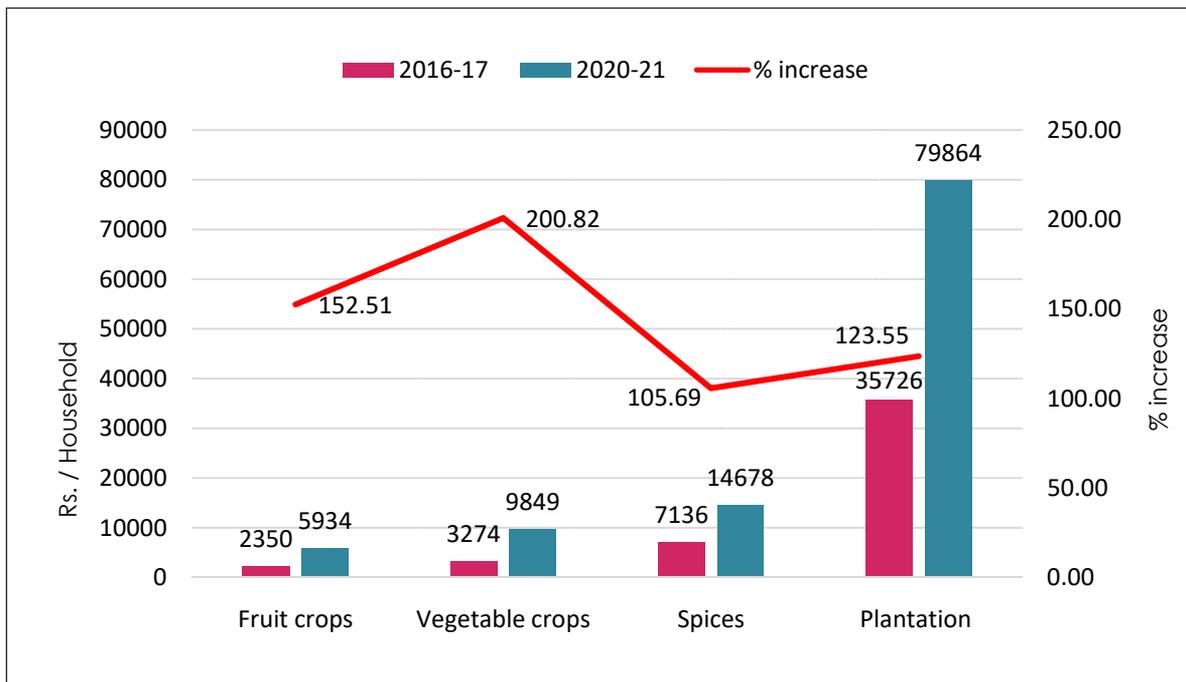


Fig. 7: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

More number of farmers belonged to marginal category of land holding (40.00%) followed by small land holding category (38.18%) as depicted in the Fig. 8 below

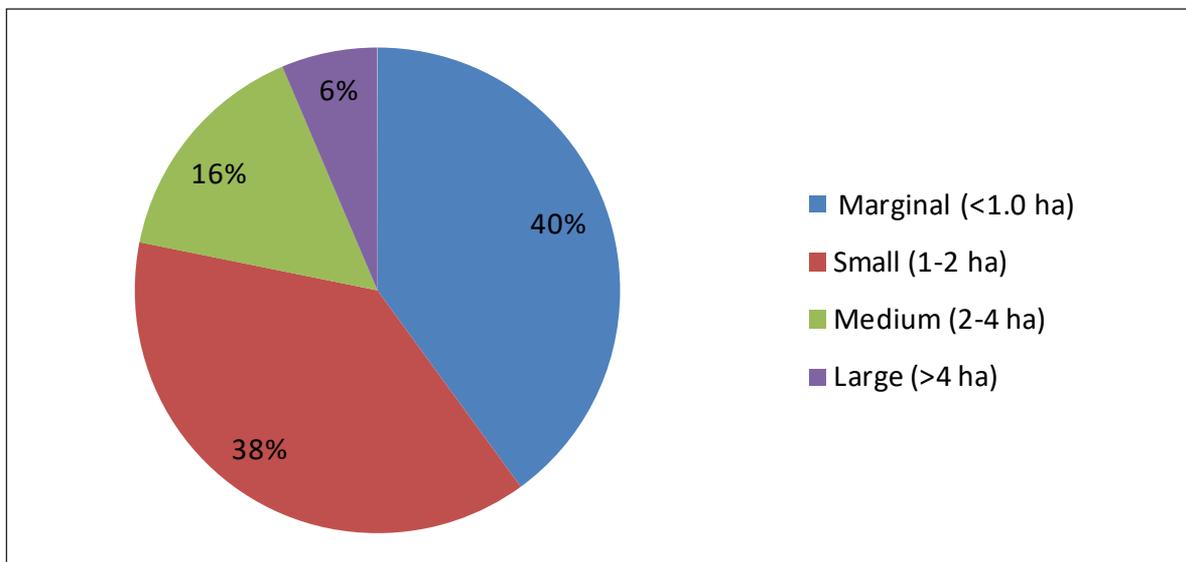


Fig. 8: Proportion of land categories among successful farmers in Wayanad district

Farmers from all land categories benefitted from the technical interventions (Table 9). In particular, income of the small farmers increased 2.26 times, the highest of all categories. Income of marginal landholders has increased by 2.18 times and other categories had increased farm household income by more than 100 per cent.

Table 9. Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	44	55759	121802	118.44
Small (1-2 ha)	42	79628	180393	126.55
Medium (2-4 ha)	17	135294	287394	112.42
Large (>4 ha)	7	163099	348157	113.46
Total	110	83995	184169	119.26



Farmer in coffee plantation



Farmwomen in nursery



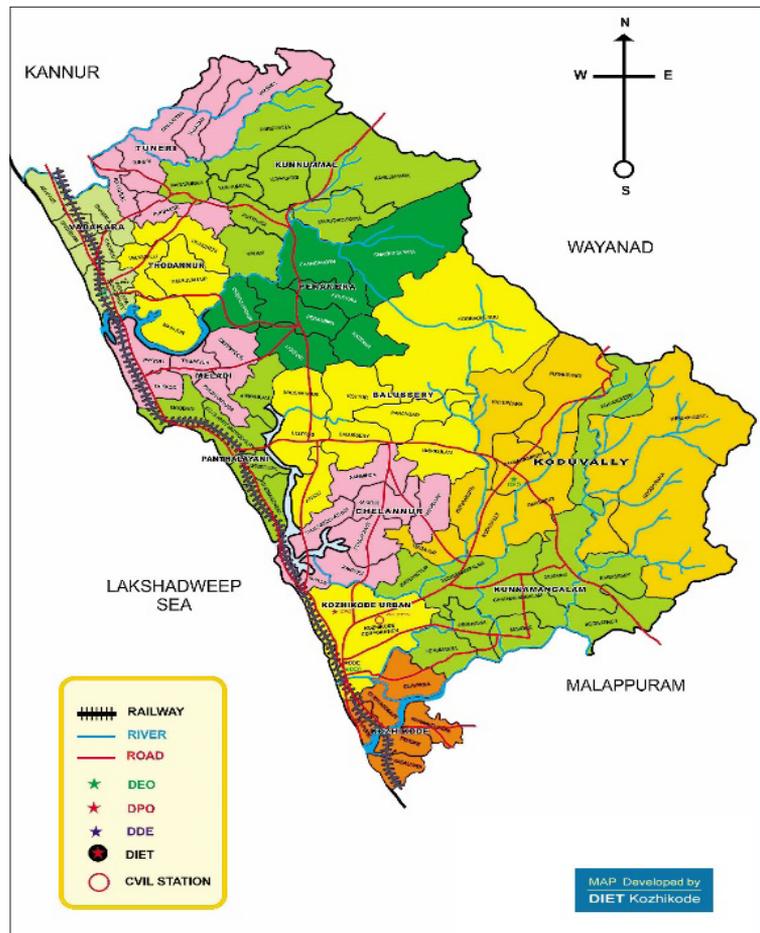
Farmer performing intercultural operations



KOZHIKODE (CALICUT)

Ratha Krishnan P., Manoj P. S., Prakash K. M.,
Pradeep B., Aiswarya K.K. and A. Deepthi

ICAR-Krishi Vigyan Kendra, Kozhikode



About the district

Kozhikode District was once a renowned commercial center. The district of Kozhikode is bordered by Kannur district to the



north, Wayanad to the east, and Malappuram to the south. To the west, lies the mighty Arabian Sea endowed with lush green country sides with diverse agricultural practices ranging from low-lying areas to hilly terrains. It consists of four taluks namely Kozhikode, Vadakara, Koyilandy and Thamarassery with 12 block panchayats namely, Balusseri, Chelannur, Koduvally, Kozhikode, Kunnamangalam, Kunnummal, Melady, Panthalayani, Perambra, Thodannur, Thuneri and Vadakara. About 62 per cent area is being net sown (144963 ha) and 41450 ha is under tree cover. In the total cropped area of 1.93 lakh hectares, paddy is being cultivated in 2405 ha, spices in 15234 ha, fruits in 27562 ha and tubers in 2000 ha. Kozhikode is possessing larger area under coconut with 1.14 lakh ha. In the hilly areas, tree spices and tropical fruits are cultivated more.

The district has a substantial share in the plantation crops like rubber, cocoa and cashew. Among the fruits, jack is available in 9151 ha, mango in 8656 ha, banana in 1737 ha, papaya in 1887 ha and other fruits in about 1100 ha. Practicing integrated farming is one of the successful models of Kozhikode district especially in rural areas. Kozhikode is also carrying major agriculture improvements through vegetable development programmes, apiculture and fruit production with the objective of attaining self-sufficiency in agriculture production giving thrust to safe to eat cultivation. Due to the availability of inland and seashore fishing activities, fisheries sector is carrying major support to marginal and small fishermen. Livestock including chicks made it as an emerging sector to improve the farm income and ensure the health. Likewise, the other emerging sectors are processing, value addition, farm and non-farm enterprises and agri-business development.

About KVK Kozhikode

Krishi Vigyan Kendra, Kozhikode was established in 1992 under the Indian Institute of Spices Research (ICAR-IISR) at Peruvannamuzhi, located 60 km

from the district headquarters. Skill development on bush pepper production, mushroom cultivation, apiculture and high-density fish farming are some of the flagship programmes. The Krishi Vigyan Kendra is producing quality planting materials/ seeds of spices (Pepper, ginger, turmeric and nutmeg), bio-control agents, layer chicks, ornamental fishes etc., and made it available to public. During 2011, received best KVK award of ICAR (Zonal Level). Many of the KVK supported farmers received district, state and national awards and recognitions.

1. Sector specific interventions by KVK Kozhikode

1.1 Field crops

- Popularizing the paddy cultivation with high yielding varieties like Uma and demonstration on farm mechanization.
- Promotion of soil test based INM, correcting soil acidity using lime for various crops and application of secondary and micronutrients to increase production and productivity.
- Promotion of organic manure production through popularisation of crop residue waste management by vermicomposting technology.
- Demonstration of different Integrated farming models among farmers with coconut, arecanut, tubers, spices medicinal plants, fodder crops livestock, apiary etc.
- Popularising moisture conservation practices like opening of basins for coconut, mulching, digging of moisture conservation pits etc., in holdings.
- Demonstrating crop rotation with HYVs of greengram like CO1, BGS 9 etc., in summer paddy follows.
- Promotion of organic production of vegetable crops.
- Popularization of integrated pest and

disease management methods of coconut, banana, vegetable crops, spice crops, paddy, and tuber crops, etc., through trainings and frontline demonstrations.

- Promotion of apiculture through trainings and supply of inputs through linkage with horticulture crops and marketing support to farmers.
- Popularization of mushroom cultivation through production and supply of quality spawn for promotion of mushroom cultivation by crop residue utilization.

1.2 Horticultural crops

- Promotion of new HYVs of cassava like Sree Pavithra and Sree Raksha, including customized fertilizer application for higher yield and additional income generation.
- Promotion of HYVs of vegetables like KAU Mithra, Arka Mangala, Geethika, Lola, Vellayani Jyothika, KAU Deepika, Anjitha, Surya, Haritha, Vengeri brinjal etc. and use of Sampoorna KAU Multimix in vegetable crops for improvement in yield and quality parameters.
- Promotion of bush pepper production through training and demonstrations, marketing assistance involving buy back of bush pepper plants. Popularization of potted bush pepper cultivation in urban areas and grafted pepper in disease prone areas.
- Popularizing TC plants of Nendran variety of banana and a shade tolerant banana variety Big Ebanga in coconut gardens. Integrated crop management in banana with the use of banana secondary and micro-nutrient formulations Ayar and banana special as nutrient supplement.
- Farmer participatory seed production of HYVs of ginger and turmeric.
- Self-employment generation through establishing commercial plant nurseries.

1.3 Animal husbandry

- 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, homemade ration, timely insemination and management of ecto-parasites.
- Prophylactic management for prevention and control of mastitis in dairy animals.
- Facilitation in production and management of quality chicks.
- Scientific goat rearing under semi-intensive and intensive management.

1.4 Fisheries

- Popularisation of back yard high density farming systems for edibles fishes such aquaponics, biofloc and RAS systems.
- Improvement of water quality and health of fishes by using water remediators (detrodigest), probiotics, diatom based culture systems , immune-stimulants etc.
- Popularisation of fresh and brackish water aquaculture including cage and pen culture systems.
- Introduction of improved varieties of fishes such as Genetically Improved Farmed Tilapia (GIFT), amur common carp and high value fishes like pearl spot, sea bass, milk fish etc.
- Introduction of backyard ornamental fish breeding and culture at farmers' field.
- Marketing support to farmers for ornamental fishes and aquatic plants from KVK sales counter and linking them to buyers.
- Introduction of aquarium plants culture.
- Development and popularisation of peruma ornamental fish feed which



improves colouration and health of fishes their by improving its quality and price

- Formation of farmers society FRANK (Fish Rearers Association North Kozhikode).

1.5 Farm and non- farm enterprises

- Capacity development and supporting for bush pepper production, mushroom spawn production and apiculture.
- Capacity building for value addition of coconut, jackfruit, spices, banana and handholding for enterprises establishment.
- Skill and entrepreneurship development through nursery management, gardening and landscaping with regular consultancy and on-site advisories.
- Supporting and developing farmer groups, FPOs societies and clubs.

- Women empowerment and entrepreneurship development through machenised coconut climbing, non-agri activities like garment making etc.

2. Impact on household income

The average income of farm households (before and after the interventions) more than doubled (2.83 times) between 2016-17 and 2020-21 (Table 10). The share of enterprises in household income experienced a 4.25 -times increase during this period. Fisheries income increased by 4.34 times, consolidating enterprise share in the household income increased to 40.35 per cent in 2020-21 from 26.92 per cent in 2016-17. Horticulture, the next dominant source of household income, experienced 2.26 times increase in its contribution to household income with 44.63 per cent share in additional income.

Table 10: 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	1002	2772	176.78	0.75	0.73	0.72
Horticulture	87125	196764	125.84	65.15	51.86	44.63
Livestock	7991	19794	147.70	5.98	5.22	4.80
Fisheries	1614	7009	334.26	1.21	1.85	2.20
Enterprises	35996	153077	325.26	26.92	40.35	47.65
Total	133728	379416	183.72	100.00	100.00	100.00

3. Component-wise contribution to income from horticulture

As reflected above, the horticulture sector had the highest share in total income during 2016-17 as well as 2020-21. Further analysis of horticulture sector implied that, the plantation crops took major share in additional income. The percentage increase was more in spices to the tune of 225.26 per cent. All the components could generate substantial increase in income as depicted in Fig. 9.

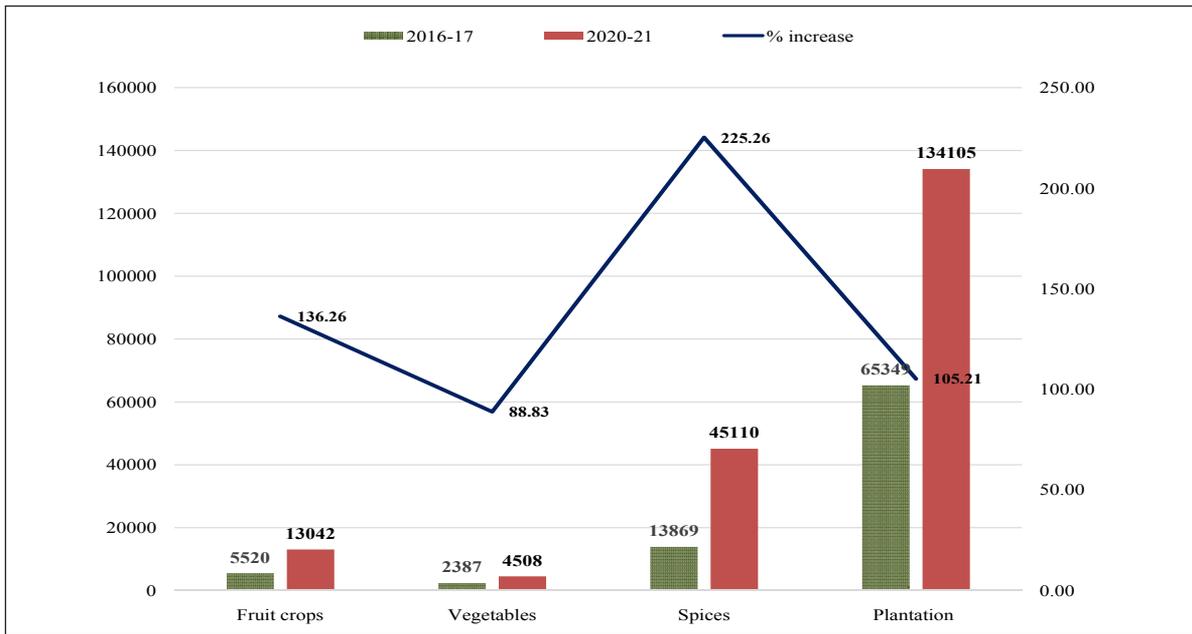


Fig. 9: Share and percentage increase of horticultural components in farmer's income

4. Representation of land categories in DFI success stories

Majority of farmers found to have marginal land holdings (73%) followed by small (19.00%), medium (7.00%) and large (1.00%) holdings in Kozhikode district (Fig. 10)

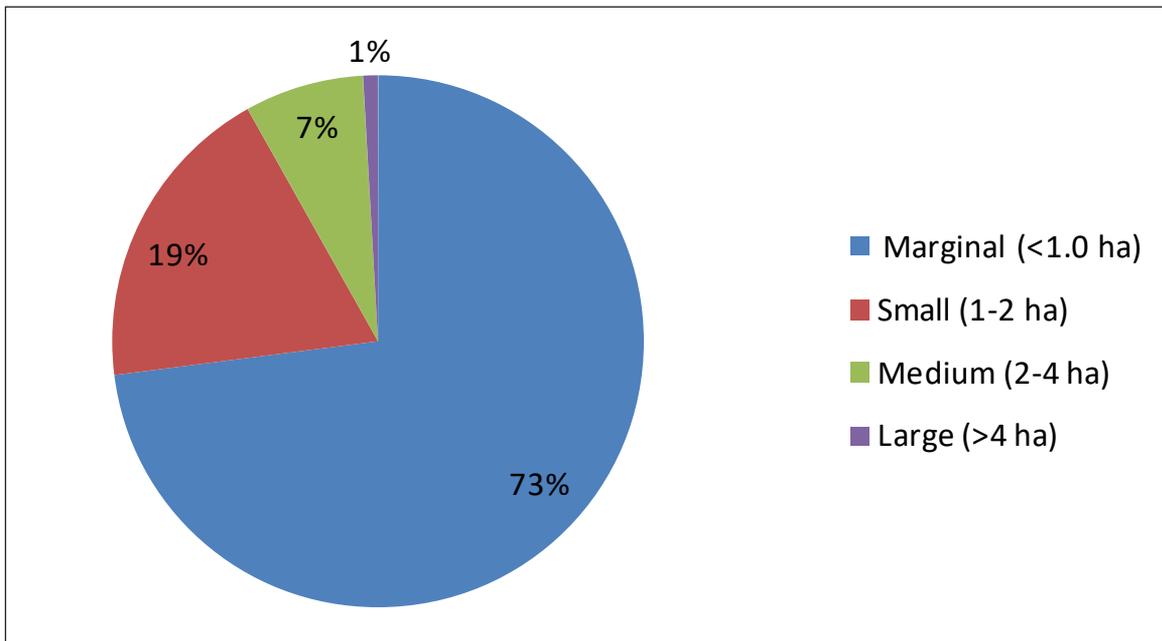


Fig. 10: Proportion of land categories among successful farmers in Kozhikode district

Farmers from all land classes benefitted from the technical interventions (Table 11). In particular, income of the marginal land holding families increased by 3.62 times, which is the highest for all classes, because of lower benchmark income levels. Income for small landholding households was increased by 2.48 times and all other categories could increase farm household income by more than 2.25 times.

Table 11: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	81	64556	233804	262.17
Small (1-2 ha)	21	308222	764037	147.88
Medium (2-4 ha)	8	288375	649662	125.28
Large (>4 ha)	1	835000	1935000	131.74
Total	111	133727	379416	183.72



Jojo and Bindu in their Randuplackal Nursery



Smt. Bindu Aju as master trainer of Mushroom cultivation



Farmwomen coconut climbing capacity building

MALAPPURAM

Ibraheem Kutty C., Abdul Jabbar P. K., Priya G. Nair,
Prasanth K., Lilia Baby, Najitha Ummer and Prasanthi K.

ICAR-Krishi Vigyan Kendra, Malappuram



About the district

Malappuram district of Kerala, with a total geographic area of 3,55,446 ha is predominantly an agricultural district with an estimated total cropped area of 2,41,924 ha. More than 89 per cent of the cropped area is under horticultural crops of which coconut (105,090 ha), vegetables (77,606 ha), banana (7,572 ha), plantain



(4431 ha), pepper (2718 ha), mango (8120 ha), cashew (1939 ha) and turmeric (312 ha) are important (Department of Economics and Statistics, 2018). The district falls under five agro ecological zones such as Northern laterites (44.71%), Northern high hills (33.91%), Northern foothills (10.28%), Northern coastal plain (5.89%) and kole lands (4.1%) and constituted predominantly of five major soil types.

About KVK Malappuram

Krishi Vigyan Kendra Malappuram under the mandate of ICAR and control of Kerala Agricultural University (KAU) is the institution in Malappuram district for dissemination of new and improved technologies and imparting grass root trainings to the farmers in all required agricultural disciplines. KVK Malappuram is situated at Tavanur inside the campus of KCAET (Kelappaji College of Agricultural Engineering and Technology) and was established during the year 2004, with the support of Indian Council of Agricultural Research (ICAR) for speedy transfer of technology to the farmer's fields. The KVK holds 20 hectares of land mainly consisting of vegetable cultivation fields and demonstration units. The KVK infrastructure include Main building, Trainees hostel, Staff quarters, Sales counter and various production / demonstration facilities such as seedling production unit, poly house/ green house, rain shelters, machinery yard, soil testing lab, agro processing unit, bio control production unit, multi mix production unit, mushroom spawn production unit, custom hiring machinery unit, farmer innovation museum and so on.

KVK Malappuram is offering on-campus and off-campus trainings in various aspects of horticulture including production technology of fruits, vegetables, flowers medicinal plants and spices, integrated pest management, organic farming, cut flower production, nursery management and plant propagation, value addition in fruits, vegetables and spices. The institute regularly conducts on-campus and off-campus training field days, frontline

demonstrations to introduce proven technologies in farmers' fields.

1. Sector specific interventions by KVK Malappuram

1.1 Field crops

- Paired row system in paddy.
- Popularisation of high yielding varieties of KAU.
- Granular Dolomite application for managing soil acidity in paddy.
- Sampoorna - micro nutrient mixture for foliar application.
- Integrated pest and disease management using bio control agents with *Tricho cards*, *Trichoderma*, *Pseudomonas*, and *Metarhizium*.
- Summer fallow cultivation of greengram, blackgram, sesame, cowpea, summer vegetable, and horticulture-based integrated farming system.
- Promotion of secondary and micronutrients (boron, magnesium and zinc), dolomite application and growing of daincha as a green manure crop for improving crop productivity.

1.2 Horticultural crops

- Banana macro-propagation, bunch covering and precision farming techniques, adoption of Sampoorna for secondary and micronutrient management.
- Micro nutrient management in black pepper.
- Introduction of High yielding varieties of tuber crops like Sree Raksha, Suvarna, Gajendra, Bhu-Sona etc.
- Popularisation of tapioca harvester.
- Popularisation of honeybee farming through trainings.
- IPDM-prophylactic management of

rhizome weevil, pseudostem weevil, leaf spot diseases in banana.

- Sucking pest control in vegetables using bio control agents.
- Popularisation of yard long bean KAU varieties (Manjari, Geethika, Deepika).
- Popularisation of bio fortified sweet potato variety Bhokrishna with ICM.
- Introduction of cassava mosaic disease resistant short duration tapioca variety Sree Suvarna with ICM.
- Cost reduction in drip irrigation of vegetables by adopting crop geometry.
- Scientific nutrient management in coconut.
- Introduced high yielding varieties of musk melon, water melon, tubers, spices and vegetables.

1.3 Animal husbandry

- Introduced improved Thalasseri breed of poultry.
- Infertility management in dairy animals.
- Introduction of alternate feeding strategies to reduce the cost of production and to enhance efficiency of feed utilisation.
- Management measures to minimise the impact of thermal stress on health and productivity of dairy animals.
- Management intervention on oestrus detection and breeding to minimise infertility in AI bred animals.

- Introduction of high yielding fodder crops like Guinea grass 'CO (GG) 3' in coconut planted homesteads reducing feed cost.

1.4 Farm and non- farm enterprises

- Capacity development and support 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.
- Facilitation of nursery management with regular agro advisory services.
- Skill trainings in micro irrigation technician, mechanised coconut climbing, agricultural extension service provider, nursery management, fruit and vegetable processing.
- Support and guidance for FPOs of GI crops of the district such as Edayur chilli and Tirur betelvine.

2. Impact on household income

There is a remarkable rise in the total income compared to base year 2016-17 by 3.34 times. Of all the components, fisheries recorded highest of 11 times increase in income during the study period. Livestock component recorded 323.44 per cent increase in income and its share in total income increased from 11.61 per cent to 14.68 per cent. Horticulture contributed to 51.13 per cent in the additional income (Table 12).

Table 12: 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	23195	79445	242.51	25.63	26.23	26.48
Horticulture	48151	156767	225.57	53.21	51.75	51.13
Livestock	10503	44474	323.44	11.61	14.68	15.99
Fisheries	90	991	1001.11	0.10	0.33	0.42
Enterprises	8559	21243	148.21	9.46	7.01	5.97
Total	90498	302921	234.73	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

Within horticulture, fruit crops component has the highest share in total income as well as percentage share in additional income. The percentage increase was also more in fruit crops to the extent of 325.91 percent as depicted in Fig. 11.

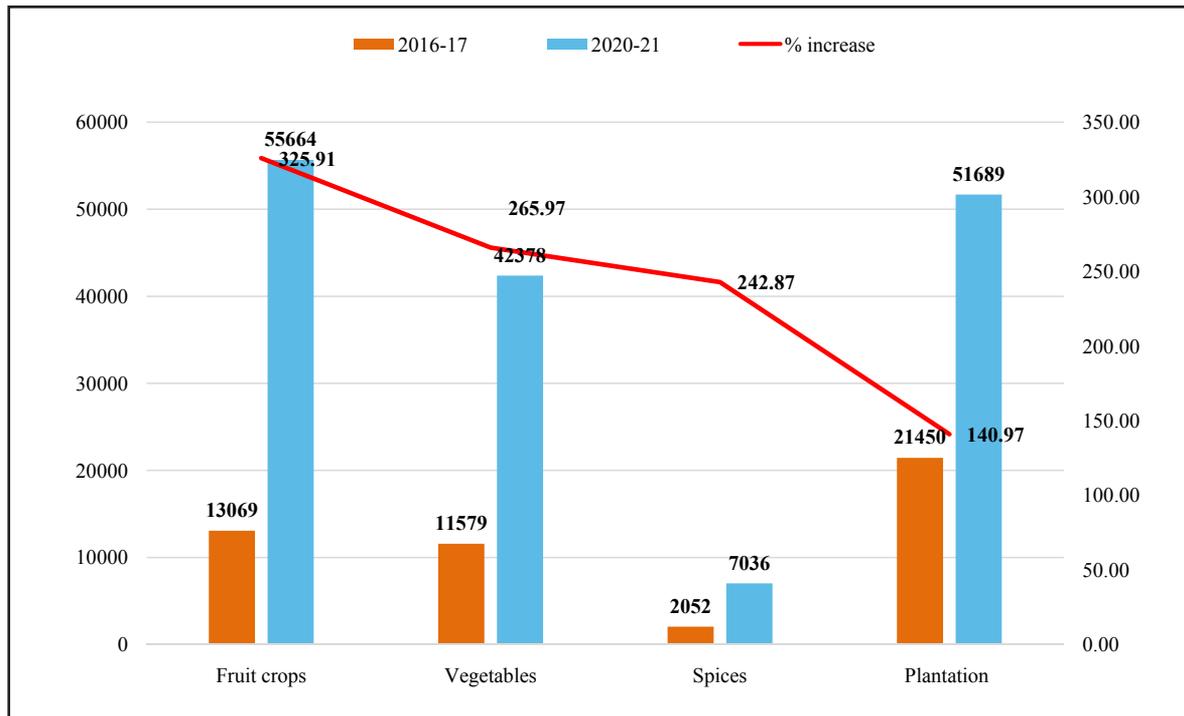


Fig. 11: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

With respect to landholding status of farmers, more than half of the respondents (52%) possessed marginal land holding followed by small holders 27 per cent (Fig.12).

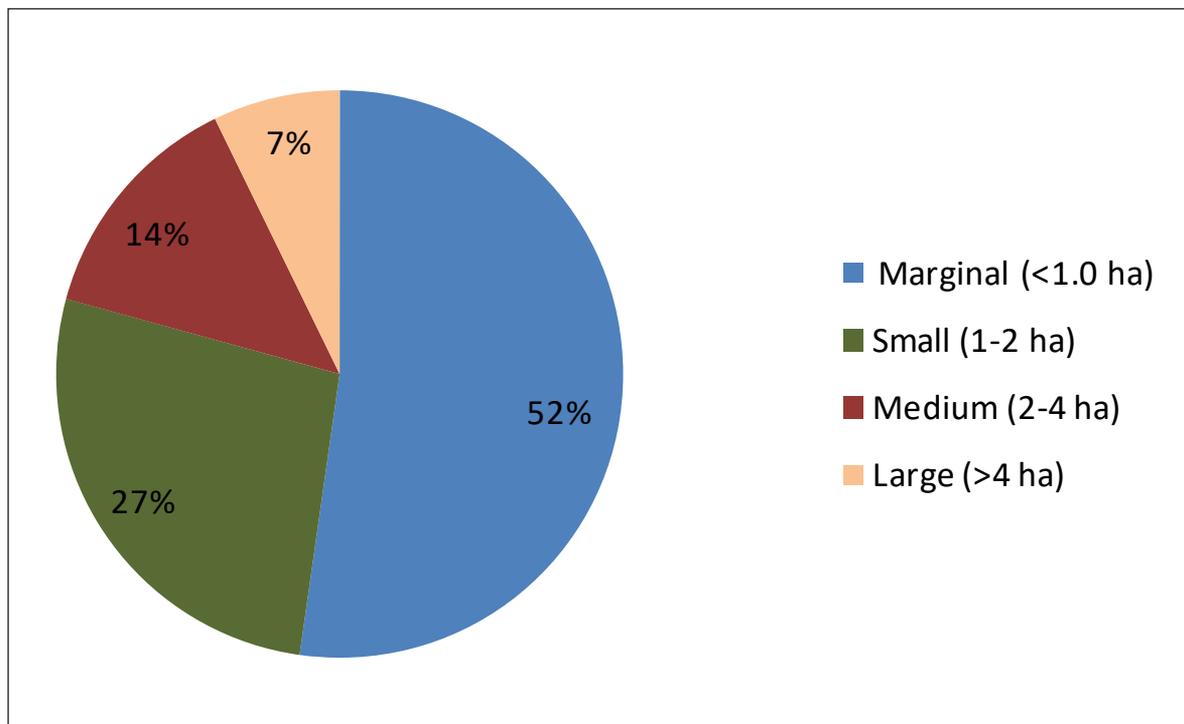


Fig. 12: Proportion of land categories among successful farmers in Malappuram district

Table 13: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	58	66691	204196	206.18
Small (1-2 ha)	30	93611	279014	198.06
Medium (2-4 ha)	15	100949	348689	245.41
Large (>4 ha)	8	231825	1022516	341.07
Total	111	90498	302921	234.73

Among the various land classes, large farmers' income has increased by 4.4 times during the period. Net income of all other landholders' categories increased more than 100 per cent over the benchmark year. Significant rise in income of largescale farmers can be attributed to number of enterprises, crop interventions and diversification undertaken in their fields due to availability of land in abundance.



FLD on paddy cultivation

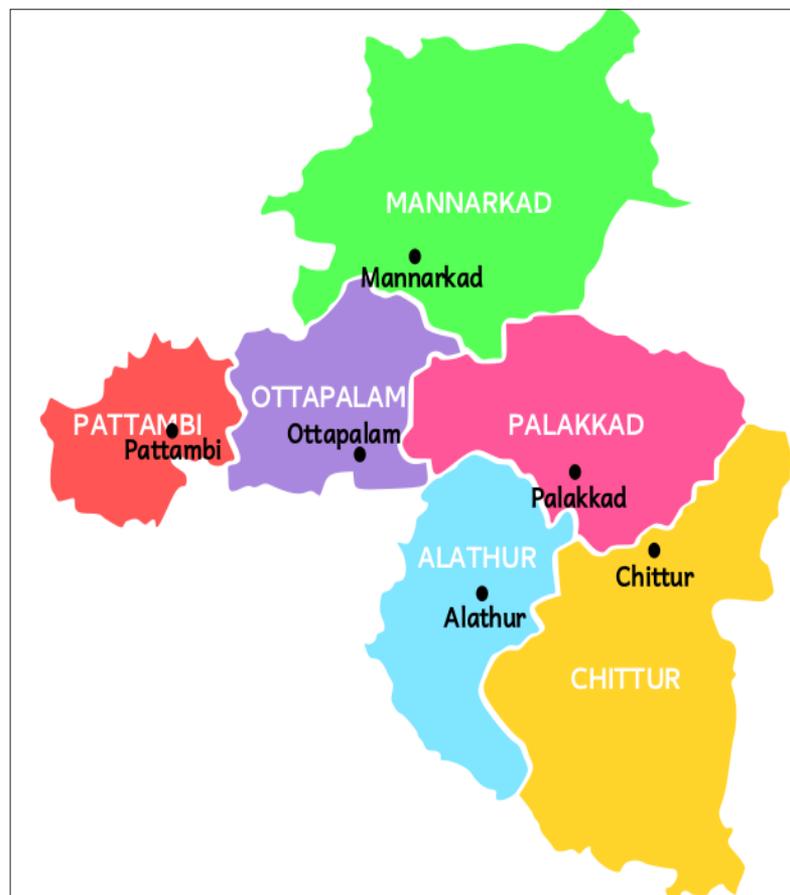


Amorphophallus field

PALAKKAD

Sumiya K.V., Gilsha Bai E. B., Resmi J.,
Sreelakshmi K., Darsana S., Smijisha A. S and Reshmi R.

ICAR-Krishi Vigyan Kendra, Palakkad



About the district

Palakkad, one of the interior districts of Kerala, is unique in many aspects. The district is bounded by Malappuram and Nilgiri districts on the north, Coimbatore district on the east, Thrissur district on



the south and Malappuram and Thrissur districts on the west. Topographically, the district can be divided into two regions, the low land comprising the midland and the highland formed by the hilly portion. The soil is laterite in the hill and mid regions. The cropping pattern of this area is food crops oriented. Since the district gets the benefit of south-west and northeast winds, rainfall is heavy in both the seasons and consequently Palakkad district has extensive paddy fields and is known as the granary of Kerala. The district is endowed with rich agricultural traditions and is a part of “rice bowl” of Kerala. Palakkad is the major producer of paddy in the state. Paddy is cultivated in a gross area of around 77000 ha in the district. Midland is thick in vegetation with coconut, arecanut, banana, vegetable and paddy cultivation. Apart from crops, livestock and poultry also form an integral part of farming. Mushroom, bee keeping, value addition and nursery are the major farming enterprises of the district.

About KVK Palakkad

KVK Palakkad is functioning since 1982 utilizing ICAR fund. A laboratory building and a training hall were established in 1985 utilizing the fund from ICAR. At present, soil-testing lab, plant diagnostic lab, home science lab and a biocontrol agent production are also operating in the building. An eco-park is being set up on the top floor of training hall for show casing various ecofriendly technologies. Various demonstration units established in KVK are given below. Three polyhouses, one rain shelter and two net houses were fabricated utilizing funds from ICAR, SHM and DoECC, which are utilized for production of vegetable seedlings, arecanut seedlings and seedlings of fruit crops. Bio-input production unit in KVK produces an average of 1 t biocontrol agents, 5 t enriched goat manure and 2500 numbers of other bio inputs annually and earns around 15 lakhs annually from the sale of inputs.

The vet park goatery, poultry and rabbit units are utilized including for egg and manure production. The seed storage structure unit is utilized for storage of pulses seeds produced as a part of participatory

seed production. Around 1.5 t pulse seed are produced annually. A mushroom spawn production unit was established in 2021. Oyster mushroom and milky mushroom spawns are produced here. The unit also serves as a model unit for imparting trainings on mushroom. A value addition cum processing unit is being operated in KVK. Various value added products are produced here. Coconut nursery at KVK was established in 2019, which is utilized for coconut seedling production.

1. Sector specific interventions by KVK Palakkad

1.1 Field crops

New high yielding paddy varieties like Akshaya, Supriya, Shreyas, Sampada and Pournami were introduced and demonstrated in various regions of Palakkad district. Enhancing productivity through scientific management with soil test based nutrient management, irrigation during critical phases, integrated pest and disease management especially bacterial blight and false smut management. Sampoorna a multi nutrient mixture by KAU rectified nutrient deficiency in paddy and is well received by farmers. New molecule herbicides are tested and the results were demonstrated, where broad spectrum weeds control was achieved. UAV technology was demonstrated in paddy field using drone. Borep, sound repellent and bio acoustic equipment demonstrated in paddy fields were effective in warding off wild boar attack by 60 per cent. Several farmer field schools were arranged on scientific cultivation of paddy.

Millets

KVK took a lead role in ensuring creation of demonstration units at Attapady tribal hamlets and imparting trainings to tribes on scientific knowhow of millets. High yielding short duration varieties of ragi, foxtail millet and little millet cultivations were demonstrated and a millet seed hub was established at Attapady. KVK also demonstrated the cultivation of little millet in paddy fallows.

Pulses

KVK intervened in revamping of paddy fields through popularization of pulse cultivation in summer fallows where cultivation was difficult due to water shortage. Application of bio-fertilizer and micronutrient spray “pulse wonder” was also demonstrated. Intercropping with horsegram in coconut gardens was another demonstration conducted by KVK.

1.2 Horticultural crops

KVK Palakkad is in the forefront for organizing on farm trails and front line demonstrations in various areas of horticulture with a view to improve farming technology.

Intensive approach for popularization of eco-friendly Technologies

Krishi Vigyan Kendra, Palakkad initiated a series of programmes for educating the farmers regarding the ill effects of non-judicious use of chemical pesticides and in order to empower and equip them with ecofriendly technologies for the management of pests and diseases. KVK Palakkad promoted the use of ‘ready to use’ technologies through mass production of neem based formulations to control sucking pests in vegetables, bio control agents like *Trichoderma*, *Trichoderma* enriched goat manure, *Trichoderma* coir pith cakes, pheromone traps etc.

Interventions to save Muthalamada mango farmers

Muthalamada and Kollengode forms the major mango growing tracts in Kerala. Demonstrations were conducted on IPM in mango, IHR mango-special and nano emulsion of Hexanal technologies for yield improvement and extending shelf life to Muthalamada farmers.

Disease and drought management in coconut

KVK Palakkad has documented on integrated package for the management of root (wilt) disease of coconut developed by ICAR-CPCRI. Demonstration on various drought management measures like drip irrigation, micro-watershed, husk mulching and intercropping, are adopted in coconut gardens.

Demonstrations of perennial nutri-garden with backyard poultry were conducted at Attappady

Enhancement of Banana Production

Correction of hidden hungers or deficiencies of micronutrients in banana for balanced nutrition were taken up to get higher yield on sustainable basis.

1.3 Animal husbandry

Ovulation synchronization protocol was demonstrated to treat infertility. Flumethrin was used as a pour-on preparation for control of biting flies and ticks. Floppy kid syndrome was effectively managed with antibiotics and other management tools. Dipping teats with povidone-iodine were practiced to prevent the occurrence of mastitis. Trained youths have started new poultry rearing units and their income was increased.

1.4 Fisheries

Fish farming in the polyethylene sheet ponds also provided an additional income to few farmers.

1.5 Farm and non-farm enterprises

- KVK conveyed the idea of group farming among farmers through capacity-building programmes. Group action ensured access to modern machinery for all. This reduced the cost of cultivation considerably and increased the B:C ratio.
- Capacity-building programmes named “Friends of coconut tree” motivated the farmers to use the climbers to harvest coconut and to start enterprises like copra-making units.
- Farmers of the district gained knowledge about the machines for post-harvest operations of vegetables and other crops from the demonstrations and capacity-building programmes conducted by KVK.
- Capacity building programmes and demonstrations inspired participants to start vermicomposting units.



- Capacity building programmes on beekeeping were conducted by KVK regularly. KVK has conducted demonstrations and capacity building programmes on biogas production and its uses as a renewable energy source.
- KVK has given capacity-building programmes for the production of bio-control agents like trichocard. Some farmers of the district started enterprises to produce trichocards.
- Value addition of fruits and vegetables programmes were conducted. Some have started enterprises related to the value addition of fruits and vegetables.
- KVK conducted a number of capacity building programmes on mushroom cultivation.
- Capacity building programmes on the production of virgin coconut oil were conducted by the KVK inspiring some farmers to start enterprises.
- Capacity building programmes conducted by the KVK on making bonsai plants and terrariums motivated some of the participants to start terrarium and bonsai-making units. It triggered their income.
- KVK conducted a number of capacity building programmes on the production of bio-inputs like *Trichoderma*-enriched goat manure. Several farmers of the district started enterprises for the production of bio-inputs, which is giving them additional income.

1 Impact on household income

The interventions by KVK Palakkad have helped to increase the income of farmers to a tune of 135 per cent. The major increase is contributed by various enterprises including mushroom, bee-keeping, organic input production, etc. Interventions on field crops increased the total income by 119 per cent. The interventions by the KVK on horticulture, livestock, and fisheries made an improvement by 154 per cent, 139 per cent, and 152 per cent respectively, on the farmers' income.

Table 14: 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	151910	332933	119.16	52.43	48.70	45.96
Horticulture	111870	284224	154.07	38.61	41.57	43.75
Livestock	13446	32105	138.78	4.64	4.70	4.74
Fisheries	3636	9173	152.28	1.25	1.34	1.41
Enterprises	8895	25233	183.67	3.07	3.69	4.15
Total	289757	683668	135.95	100.00	100.00	100.00

3. Component-wise contribution to income from field crops

As indicated above, the field crops were the major source of income in Palakkad district. There was a remarkable increase in percentage share in additional income from cereals. With respect to per centage increase fodder component recorded highest percentage to the tune of 272.19 per cent. All the components could generate considerable increase in income as depicted in Fig. 13.

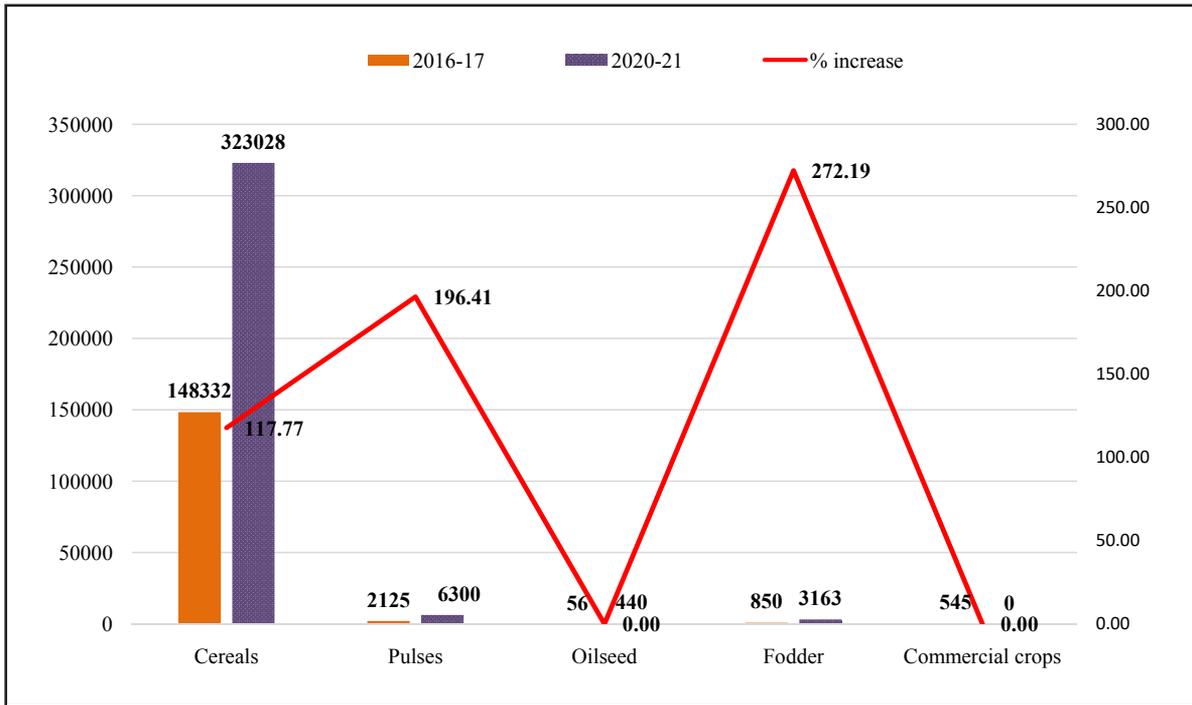


Fig. 13: Share and percentage increase of field crops components in farmers' income

2 Representation of land categories in DFI success stories

As per the figure given below, more number of farmers were found to have marginal land holding (32%) followed by large farmers (26%)

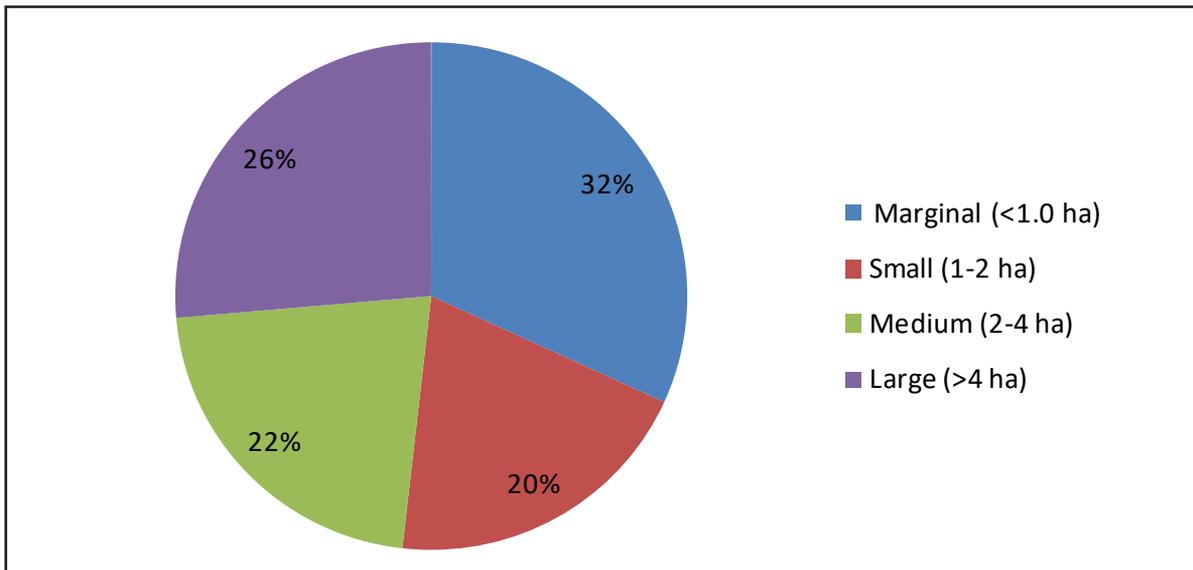


Fig. 14: Proportion of land categories among successful farmers in Palakkad district



Marginal farmers were more benefited from the interventions of the KVK, which increased their income, by 208 per cent. The interventions by the KVK benefited small, medium, and large farmers in the range of 158 per cent, 142 per cent, and 118 per cent respectively.

Table 15: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	35	85830	264164	207.78
Small (1-2 ha)	22	157033	405561	158.26
Medium (2-4 ha)	24	264789	641404	142.23
Large (>4 ha)	29	657226	1435917	118.48
Total	110	289757	683667	135.95



Farmers field school



Abdul Azeez in okra field



FLD in field of Ummer Thachanattukara

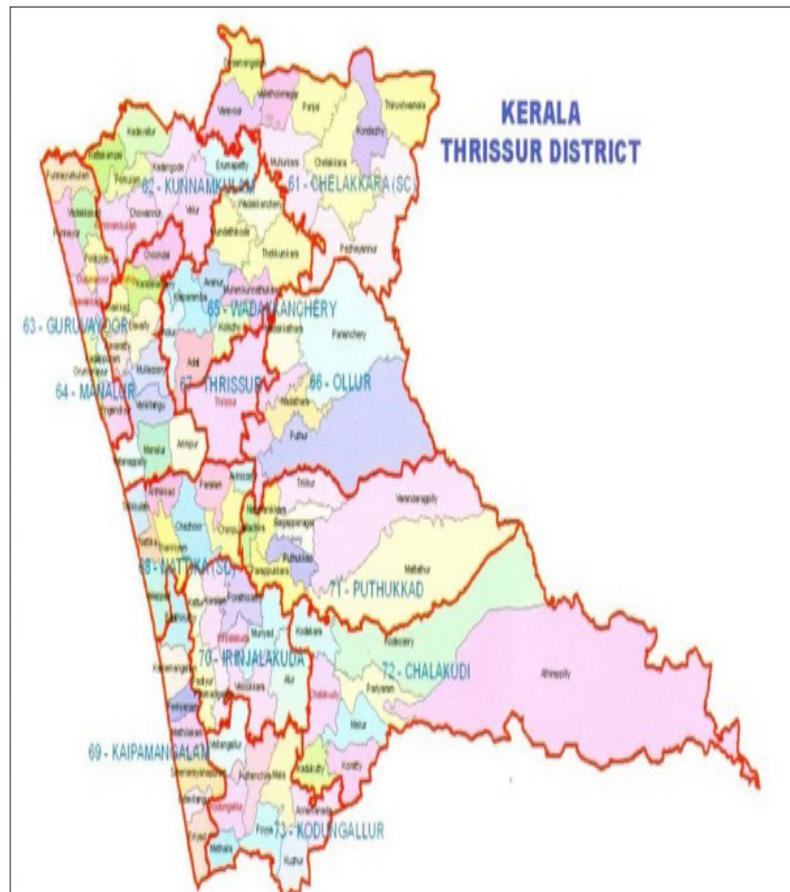


Field visit to paddy field of Vasudevan

THRISSUR

Suma Nair, Deepa James, Preethi Unnithan,
Aneena E. R., Anoop Krishnan, and Aparna Radhakrishnan

ICAR-Krishi Vigyan Kendra, Thrissur



About the district

Thrissur is one of the agriculturally vibrant districts where the major crops grown are paddy, coconut, banana, vegetables, arecanut, nutmeg, pepper, and tapioca. Thrissur District has a significant place in



the agricultural map of Kerala due to the presence of Kerala Agricultural University, traditional kole lands of paddy cultivation, and numerous nurseries. The district has a total cropped area of 1,73,300 ha, and the net area sown is 1,29,300 ha. The kole lands of Thrissur, one of the designated Ramsar sites, contribute a major share in the paddy production of the district. The topography of the district presents a clear distinction as high land, midland, and lowland. More than half of the income is generated from agriculture and allied activities. About 55 per cent of population have full-time employment in agricultural sector. The district is famous for the Chengalikodan Nendran, a banana variety, originated and was cultivated in Thalappilly taluk of Thrissur district that gained global recognition through the registry's geographical indication registration.

About KVK Thrissur

Krishi Vigyan Kendra, Thrissur, established in 2004 under Kerala Agricultural University, with the financial support of the Indian Council of Agricultural Research (ICAR), has mandates of on-farm trials, front line demonstrations, training, production and supply of quality seeds, and planting materials to farmers. KVK Thrissur has subject matter experts in agronomy, plant protection, horticulture, agricultural engineering, agricultural extension, and home science. As the district's technology hub for agriculture and allied subjects, KVK conducts training and guides visitors in the technology demonstration plots spread on 20ha of its farm on all working days and handholds about 1000 farmers per month. The demonstration units on poultry, goat rearing, mushroom, seed/planting material, and processing unit of KVK also serve as agri-enterprise models. The present training hall can house a maximum of 50 farmers that caters to the skill development needs of the farmers, including minorities, SC/ST, and women farmers of the district. The animal husbandry unit of KVK Thrissur produces goat kids, BV 380 chicks, and the mushroom unit produces *Pleurotus*

mushroom spawns for the farmers. The micro-secondary fertilizer production unit produces Sampoorna micronutrient mix on vegetables, paddy, and banana, and Ayar micro-secondary nutrient mix for the banana crop. The processing unit of KVK Thrissur produces processed products and maintains an array of machinery for processing and value addition of agricultural produce.

1. Sector specific interventions

1.1 Field crops

- Rejuvenation of paddy farming through the introduction of high-yielding varieties of paddy (Manuratna, Supriya, Pournami), seed production, micronutrient management, and promotion of soil amendments like dolomite and disease management, low-cost bio inputs like PGPR mix, and paddy husk ash.
- Pre-emergent weed management in rice, cultivation of forage crops.
- Integrated pest, disease, and nutrient management with *Tricho cards*, *Trichoderma*, *Pseudomonas*, and Sampoorna in paddy.
- Eco-friendly management of pests and diseases of field crops.
- Summer fallow cultivation of greengram, blackgram, sesame, cowpea, summer vegetable, finger millet, and horticulture-based integrated farming system.
- Promotion of secondary and micronutrient management (boron, magnesium, zinc), application of dolomite and growing of dhiancha as a green manure crop for improving crop productivity.
- KVK provides technical advisories and linkages.
- Facilitated better market prices for processed rice.

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, propping technology in bananas, and use of Ayar as a nutrient supplement.
- Promotion of IISR variety Thevam, quality planting material, balanced nutrition, and biological disease management in black pepper.
- IPDM and INM in ginger, turmeric, and tractor-operated harvesters.
- Introduction of beekeeping to increase the capsule setting in small cardamom.
- Eco-friendly management of pests and diseases of horticulture crops.
- Promotion of vegetable grafts.
- Promotion of new tuber crop varieties - tapioca (Sree Pavithra), amorphophallus (Gajendra), and introduction of the semi-manual harvester.
- Promotion of nutmeg shellers.
- Promotion of bush pepper production, marketing assistance involving buyback of bush pepper plants, and bio-intensive management of diseases.
- Soil test-based nutrient management, *in-situ* organic manuring, and *Trichoderma* enriched manure application.
- Introduction of Arka Mangala variety of yard long bean.
- Value addition of primary fruits and vegetables, promotion of various nutrient mixes.

1.3 Animal husbandry

- Introducing new poultry breeds (Gramasri, Thalasseri), use of low-cost cage system,

feed supplementation, and capacity building on broiler farming.

- Introduction of scientific farming of Malabari female goat along with nutrient management.
- Expansion of dairy units with the support of fodder production, timely insemination, management of ecto parasites and micronutrient supplementation.
- Prophylactic management for prevention and control of mastitis in dairy animals.
- Hydroponics green fodder production, azolla production and supplementation.
- Facilitation in marketing, dietary supplements 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.
- Facilitation of nursery management, gardening and landscaping with regular agro advisory services.
- Technical backstopping for vegetable production.

2. Impact on household income

About 129 per cent increase in income could be noticed among DFI farmers who cultivated field crops. The significant component contributing to increased revenue is the introduction of high-yielding varieties like Manuratna, Supriya, Pournami, Akshaya, etc. Other factors include weed management, integrated as well as ecofriendly pest and disease management using the application



of *Pseudomonas*, and *Trichoderma*, installation of Tricho cards, and integrated nutrient management using KAU Sampoorna. KVK also provided technical advisories on these topics and market linkages.

Among the farmers who sustained their livelihood with livestock, 120 per cent increase in income could be observed. The primary factor for the rise in revenue was the introduction of new poultry breeds (Gramasri, Thalassery), the use of low-cost cage systems, feed supplementation, and capacity building on broiler farming. In addition, the introduction of scientific farming of Malabari female goat and nutrient management, expansion of dairy units with the support of fodder production, management of ecto parasites and micronutrient supplementation could also enhance their income. They could also prophylactically manage mastitis in dairy animals.

Many DFI farmers who involved in the cultivation of horticultural crops like coconut, banana, and vegetables could obtain 110 per cent increase in their income. In coconut, the integrated management of pests and diseases was the major contributing factor for this increase, whereas in bananas, integrated crop management, propping technology, and the use of Ayar as a nutrient supplement were the critical factors for the increased effect. Using vegetable grafts and the integrated management of pests and diseases in the vegetable crops could help the farmers grow their income. KVK and farmers field schools organized numerous training classes that were also conducted in the farmers' fields. As most DFI farmers are involved in cultivating horticultural crops, it could bring about a 65.78 per cent share in additional income.

Table 16: 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	16811	38513	129.10	8.78	9.42	9.98
Horticulture	130531	273502	109.53	68.21	66.92	65.78
Livestock	38995	85642	119.62	20.38	20.95	21.46
Fishery	0	455	100.00	0.00	0.11	0.21
Enterprises	5024	10608	111.16	2.63	2.60	2.57
Total	191361	408720	113.59	100.00	100.00	100.00

3. Component-wise contribution to income from horticulture

As shown in Table 16, the horticulture sector was the major source of additional income. With respect to further analysis of horticulture components into its sub-components, plantation crops contributed more to additional income. Highest percentage increase in income was observed in fruit crops (Fig. 15).

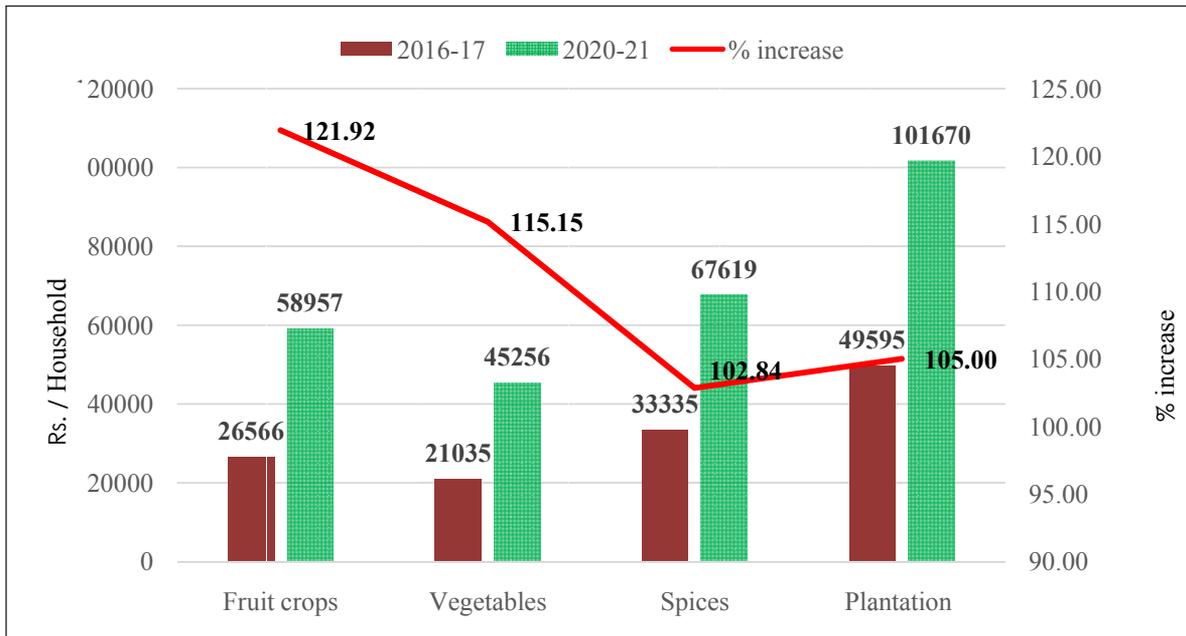


Fig. 15: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

Majority of the respondents from Thrissur district were marginal farmers (64%) followed by small farmers (24%) as per the figure given below (Fig. 16.)

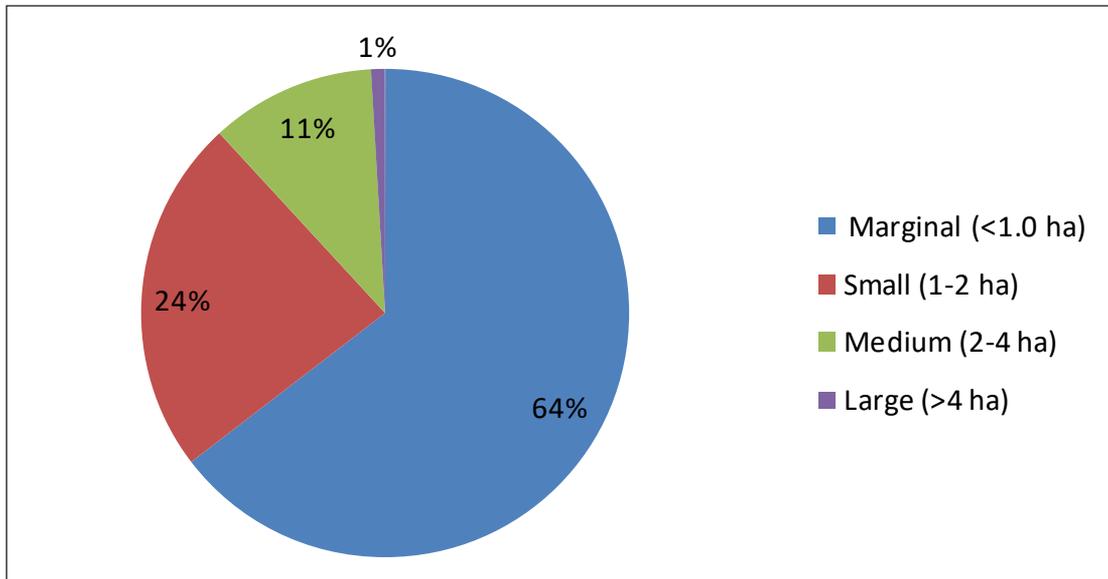


Fig. 16: Proportion of land categories among successful farmers in Thrissur district

The net income per household of marginal farmers increased from Rs. 1 lakh to Rs. 2.5 lakh and it could bring about 119 per cent increase in income of marginal farmers. Most of these farmers involved in the cultivation of horticultural crops.

The farmers belonging to small land group showed 114 per cent increase in their income and these farmers mostly involved in the cultivation of both field crops and horticultural crops, which contributed to the income enhancement. The DFI farmers belonging to large group showed 112 per cent increase in household income who involved in livestock too in addition to the cultivation of both field as well as horticultural crops. Many DFI farmers who engaged in various enterprises like mushroom cultivation, value addition, nursery management etc. could gain 111 per cent increase in income and 3 per cent share in additional income was noticed.

Table 17: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	71	112896	247682	119.39
Small (1-2 ha)	26	220295	471995	114.26
Medium (2-4 ha)	12	577226	1191335	106.39
Large (>4 ha)	1	379600	805808	112.28
Total	111	191361	408720	113.59



Farmer observing for nutrition deficiency in paddy crop



Scientists visiting vegetable crop demonstration plot

ERNAKULAM

Shinoj Subramannian, Sreeletha P., Pushparaj Anjelo F,
Shoji Joy Edison, Smitta Sivadasan and Vikas P. A

ICAR-Krishi Vigyan Kendra, Ernakulam



About the district

Ernakulam District is situated in the central part of Kerala on the coast of the Arabian Sea. Ernakulam bordering the district of Thrissur in the north, Idukki in the east, Alappuzha, and Kottayam in the south, and Lakshadweep sea in the west is an amalgam of a hoary heritage and global growth of industry and commerce. It is the third most populous district in Kerala, after Malappuram and Thiruvananthapuram. The district has a total geographical area of



3,068 km with highlands, midlands, and coastal regions. There are seven taluks in the district. River Periyar, the second-longest river in the state, runs across the district. The district benefits from both the Muvattupuzha river and Periyar valley irrigation projects. The soil is predominantly laterite and alluvial with the presence of China clay and graphite, enriched with mineral deposits in some pockets.

About KVK Ernakulam

ICAR- Krishi Vigyan Kendra, Ernakulam functioning under ICAR- Central Marine Fisheries Research Institute (CMFRI), aims at the overall development of the district in agriculture and allied sectors. The KVK has linkages with all the line departments in the district and contacts with most of the Agricultural Universities and all the ICAR Institutes in the country. These linkages update the recent technologies in the agricultural and allied sectors. Highly qualified professionals working with Kendra in each field of agriculture facilitate the modification of these technologies suited to local requirements by adopting various scientific methodologies. The impact of our technology dissemination activities is visible in the technology adoption rate by farmers. KVK has developed intense bondage with farmers through several activities and a series of practical measures to keep farming on the right track. Ensuring local production of safe food by promoting farming in every homestead is the central focus of this KVK. The satellite production centers of KVK, established in a public-private partnership with farmers, produce quality planting materials, seeds, and other agro-inputs for supplying through sales counter while acting as a source of livelihood for the partner farmers. KVK also worked on various programs for developing entrepreneurship among women and youth in the field of Agriculture and allied sectors.

1. Sector specific interventions by KVK

1.1 Field crops

- Introduction of high-yielding varieties of paddy (Manuratna, Shreyas), micronutrient management.
- Introduction of composted sugarcane press mud to replace the soil in planting media.
- Integrated pest and disease management with *Tricho cards*, *Trichoderma*, *Pseudomonas*, *Metarhizium*, Ayar, and Sampoorna in vegetable crops.
- Summer fallow cultivation of greengram BGS9, blackgram VBN8, summer vegetable, and horticulture-based integrated farming system.
- Promotion of secondary and micronutrient management (boron, magnesium, zinc), dolomite, and growing Daincha as a green manure crop to improve crop productivity.
- Demonstrated usage of bio pesticides to produce safe to eat banana.
- Demonstrated mechanized paddy farming, farm processing, branding and marketing of the paddy.
- Demonstrated application of soil test based primary and secondary nutrients along with application of dolomite as the liming material and demonstrated branding and marketing of the paddy.

1.2 Horticultural crops

- Open Precision farming of vegetables like snap melon and watermelon in summer paddy fallows, maximizing profit from the unit area.
- Promotion of nutri-garden activities in rural homesteads among economically weaker sections.
- 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.

- Promotion of scientific vegetable seedling production in rain shelters and greenhouses.
- Integrated crop management in vegetables.
- Promotion of bacterial wilt-resistant tomato varieties like Arka Rakshak, Arka Abhed, and Arka Samrat developed at IHR, Bengaluru.
- Management of primary, secondary and micronutrients in bananas.
- Promotion of new tuber crop varieties tapioca (Sree Pavithra, Sree Raksha), amorphophallus (Sree Padma), and its mini sett production program.
- Promotion of bush pepper production, use of IISR-Biomix BP and Trichoderma bio cap for better rooting and disease resistance in bush pepper.
- Soil test-based nutrient management, *in-situ* organic manuring, and *Trichoderma* enriched manure application.
- Introduction of KAU Deepika, Arka Mangala variety of yard-long bean and ridge gourd varieties like KRH1.
- Branding and marketing activities of Vazhakkulam pineapple.

1.3 Animal husbandry

- Introduction of rural type coloured broilers, Kadaknath parent stock rearing, improved quail for meat, better management of crops and birds through technical advice and small-scale eggger nursery unit for desi poultry.
- Design awareness and specifications required for Fabrication of poultry cages, hydroponic units, etc.
- Introduction of improved poultry varieties and breeds like BV-380, improved Thalasseri and promotion of Kuttanadan duck rearing in homesteads.
- Reducing feed cost using TMR and

complete ration along with technical assistance in feeding and management for balanced feeding and better production in dairy cows.

- Awareness on management and feeding, proper vaccination and branding & marketing support for desi poultry chicks and eggs.
- Introduction of improved breed-Mannuthy white pigs, use of Vitamin mix for pigs to balance the feed to reduce mortality and increase weight gain in piglets.
- Value addition of eggs with sardine fish oil supplementation in poultry feed to get Omega fatty acid enriched eggs.
- Promotion of hydroponic fodder production along with technical assistance in feeding and management and marketing of milk through KVK outlet.
- Promoting breeding and rearing of pure Malabari goats.

1.4 Fisheries

- The accelerated seed production of Pearlsport (Karimeen) in brackish water pond systems demonstrated. Provided technical backstopping to establish the units, brand the seeds, and marketing support through the KVKs farm store.
- Cage culture of high-value fish in floating cages in public brackish water resources demonstrated. Provided technical backstopping to establish the units, routine maintenance, and marketing support through the farm gate markets.
- Scientific farming of Mullet (*Mugil cephalus*) in brackish water ponds demonstrated. Provided technical backstopping to establish the units, routine maintenance, and marketing support through the farm gate markets.
- Demonstrated the scientific breeding of freshwater ornamental fishes in freshwater

ponds. Provided technical backstopping, routine maintenance, and marketing support to establish the units.

- KVK demonstrated the utilization of abandoned granite quarry ponds using cage fish culture in the district's eastern parts.

- Demonstrated organic manure production from fish market waste, branding and marketing
- Demonstrated value added product preparation from fish and shrimp, branding and marketing
- Demonstrated Mushroom production, branding and marketing.

1.5 Farm and non- farm enterprises

- Assistance for more opportunities for repair of tractors and other farm machinery through KVK.
- Training on use of different farm machinery and more opportunities for farm machinery work.
- Demonstrated minimal processing cut vegetables unit establishment, branding and marketing

2. Impact on household income

The average income of farm households (before and after the interventions) more than doubled (257.34%) between 2016-17 and 2020-21 (Table 18). Fisheries, the dominant source of household income, experienced 458.13 per cent increase in income and its contribution to additional income is 27.62 per cent, next to farm and non-farm enterprises which share in additional income was 40.46 per cent contribution to household income.

Table 18: 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	3456	7997	131.39	5.72	3.70	2.92
Horticulture	21999	50552	129.79	36.39	23.40	18.35
Livestock	8187	24766	202.50	13.54	11.46	10.65
Fisheries	9382	52364	458.13	15.52	24.24	27.62
Enterprises	17427	80378	361.23	28.83	37.20	40.46
Total	60451	216056	257.34	100.00	100.00	100.00

3. Representation of land categories in DFI success stories

The share of landless farmers (59%) was more followed by marginal holding (39%) out of 110 farmers included in the survey (Fig. 17).

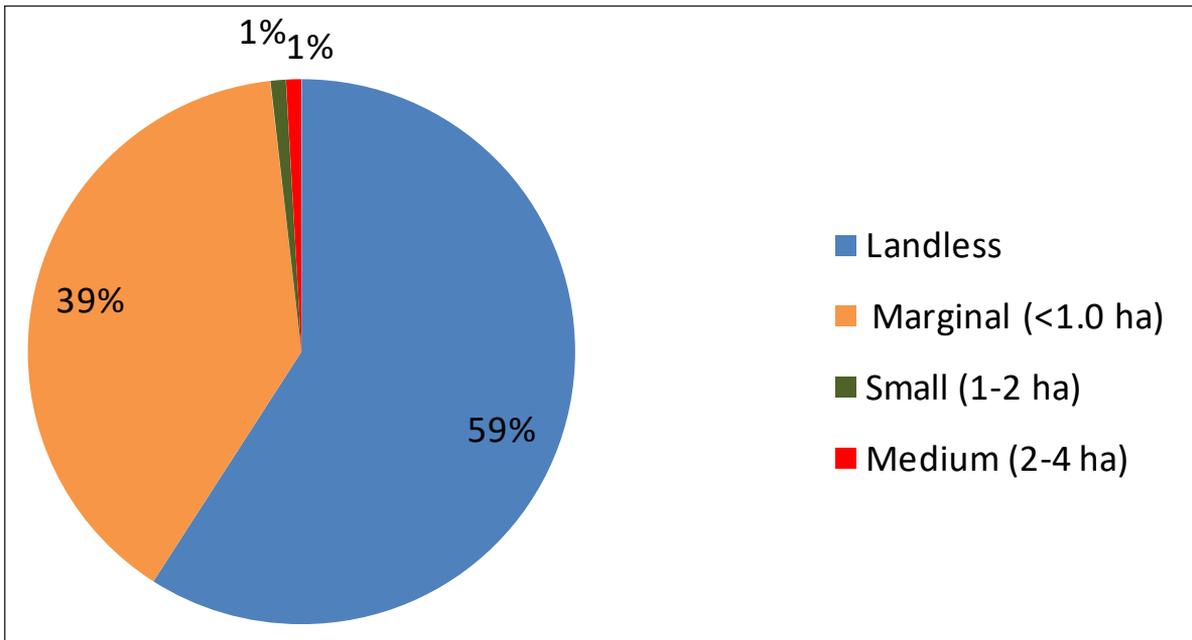


Fig. 17: Proportion of land categories among successful farmers in Ernakulam district

2. Impact on income level and change in household income by land class

Landless farmers and marginal farmers (<1 ha) are more when compared to other farming categories. This is typical characteristic of Ernakulam district. The percentage change in house hold income ranged from 103 to 301 per cent. Highest increase in income was noted in marginal (301%) followed by landless (255 %) and small farmers (220%).

Table 19: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Landless	65	44238	157103	255.13
Marginal (<1.0 ha)	43	46027	184894	301.71
Small (1-2 ha)	1	120000	244000	103.33
Medium (2-4 ha)	1	1675000	5360000	220.00
Total	110	60451	216056	257.41



Shri Ullas with trainees at his newly established Pearlsport seed production unit with the technical support of KVK



Demonstration of TMR feeding in dairy cattle for better production and health



DFI farmer during snap melon harvest

IDUKKI

Jayababu S., Manju Jincy Varghese, Sudhakar S.,
Ashibha A., Preethu K. Paul, Rachel Skariakutty and Maruimuttu R.

ICAR-Krishi Vigyan Kendra, Idukki



About the district

Idukki district is one of the 14 districts in Kerala. Idukki district contains two municipal towns Kattappana and Thodupuzha. Idukki has a large area of dense forest cover and shola forests. It is



highly vulnerable to floods and drought and is considered a climate change hotspot in Kerala. Researchers attribute the increasing frequency in landslides in Idukki to climate change and deforestation. Numerous spices crops and cash crops are cultivated throughout the district, making it **The Spice Garden of Kerala**. Idukki has a total geographical area of 4.36 lakh hectares, which is the second-largest district in the region in terms of area. According to the agricultural land use pattern of Idukki, net sown area covers 2.29 Lakh hectares with a gross cropped area of 2.89 lakh hectares. Among the total net sown area spices covers 0.82 lakh hectares and vegetables covers 0.0051 lakh hectares.

About KVK Idukki

A well-equipped soil-testing laboratory is functioning in the KVK since 2005. Soil health card is provided to the farmers with detailed information on acidity, organic content, and deficiency of major and minor nutrients. The KVK produces and distributes different bio-agents such as *Trichoderma viride*, *Trichoderma harziana*, and *Pseudomonas fluorescence*, to the farmers. There is also a production unit of Entamo Pathogenic Nematode (EPN) which is highly beneficial in controlling root grub of small cardamom. Different varieties of cardamom, specialised germplasm of pepper, fruit trees, medicinal plants, ornamental plants, coffee and other spice crops are maintained scientifically in this farm. The KVK is actively involved in the production and distribution of mushroom spawn. Organically produced vegetable seedlings are made available to the farmers through the sales outlet of the KVK at nominal rates. Seedlings of cool season vegetables are also available in portraits. Rural crafts unit of this KVK has displayed exemplary skills in utilizing and converting agricultural waste into products of immense importance. Ornamental hand crafted products and bouquet are made from coconut spathe, cardamom twigs, palm leaf, coconut flowers, dried twigs, leaves, and grass and

coconut shells. A brief summary of interventions, the impact in terms of household income under different components and the change in income for different land-class categories is given below.

1. Sector specific interventions by KVK Idukki

1.1 Field crops

- High yielding varieties of paddy-Manuratna, Hraswa and Shreyas; Integrated nutrient management.
- Reduction of iron toxicity by fine silica application, Nano-Urea application to ensure the cost saving.
- Promotion of soil amendments like lime application.
- Reduction in soil acidity measures.
- Utilization of paddy husk for establishing Oyster mushroom production units.
- Integrated pest and disease management with *Trichoderma* and *Pseudomonas*.

1.2 Horticultural crops

- IIHR vegetable special as a micro-nutrient management in vegetables.
- New tuber crop varieties in Tapioca Sree Pavithra.
- Soil test based nutrient management, *in-situ* organic manuring, and *Trichoderma* enriched manure application.
- KAU - Manjeri and Arka Mangala varieties of yard long bean.
- AESA based IPM practices and ICM practices in strawberry.
- Pest management mainly snails and slugs in strawberry using IPM practices.
- High quality planting materials of strawberry.
- Promotion of ICM, GAP, good quality seedlings in cool season vegetables like cabbage, carrot, cauliflower, beans and beetroot.

- Integrated micronutrient management in passion fruit using solubor and Ayar to reduce the micronutrient disorders.

1.3 Spice crops

- Foot rot resistant - IISR variety Thevam, quality planting material, balanced nutrition, and biological disease management in black pepper.
- IPDM in small cardamom using Entamo Pathogenic Nematode (EPN) and bio-intensive pest and disease management.
- Drought management practices using PPFM application in black pepper and small cardamom fields.
- Bio intensive pest and disease management practices in small cardamom and black pepper.
- Apiculture in small cardamom field to increase the pollination.
- Integrated pest and disease management with *Trichoderma* and *Pseudomonas*.
- Promotion of GAP, INM and ICM practices in spice crops.
- Flower inducing hormones for triggering the flower induction in spice crops.
- AESA based IPM practices in black pepper.
- IIHR Arka Microbial Consortium application for enhance growth and nutrient uptake in small cardamom.
- Botanical pesticides in spices to reduce the pest incidence.
- Promotion of IISR Cardamom special and IISR Pepper special in small cardamom and black pepper.

1.4 Animal husbandry

- Expansion of scientifically managed dairy units with the support of fodder production, timely insemination, timely vaccination, management of ecto-parasites and micro nutrient supplementation.

- Prophylactic management for prevention and control of mastitis in dairy animals.
- Promotion feed supplements in goats.
- Scientific farming of Chitralada and Tilapia in farm ponds.
- Integrated duck-cum-fish culture by the farmers.
- Timely vaccination for the control of Ranikhet disease in Poultry.
- Nutrient supplements for higher egg production and capacity building on broiler farming.
- Azolla production and supplementation.

1.5 Farm and non- farm enterprises

- Capacity development and supporting for mushroom farming through spawn production, marketing of fresh as well as processed products.
- Promotion of entrepreneurship through meliponiculture, dry flower making, bouquets, candle making among SHG members.
- Facilitation of nursery management with regular agro advisory services.

2. Impact on household income

The average income of farm households (before and after the interventions) more than doubled (2.35 times) between 2016-17 and 2020-21 (Table 20). Horticulture, the dominant source of household income, experienced 134.24 per cent increase in income. Its contribution to household income was substantial with a share of 86.37 per cent in the additional income. Farmers have started practicing fisheries and other enterprises due to KVK interventions. Income from livestock contributed nearly nine per cent to the additional income.

Table 20: 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	1344	2152	60.12	0.37	0.25	0.16
Horticulture	320277	750208	134.24	87.38	86.80	86.37
Livestock	44892	89117	98.51	12.25	10.31	8.88
Fishery	0	148	100.00	0.00	0.02	0.03
Enterprises	0	22648	100.00	0.00	2.62	4.55
Total	366513	864273	135.81	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

Data from the table 20 the horticulture sector was the major source of additional income as well as share in total income. Sub-component wise analysis of horticulture sector implied that, spice crops found to have highest percentage increase in income to the extent of 134.46 per cent. All the components of horticulture sector could generate noticeable increase in income as depicted in Fig. 18.

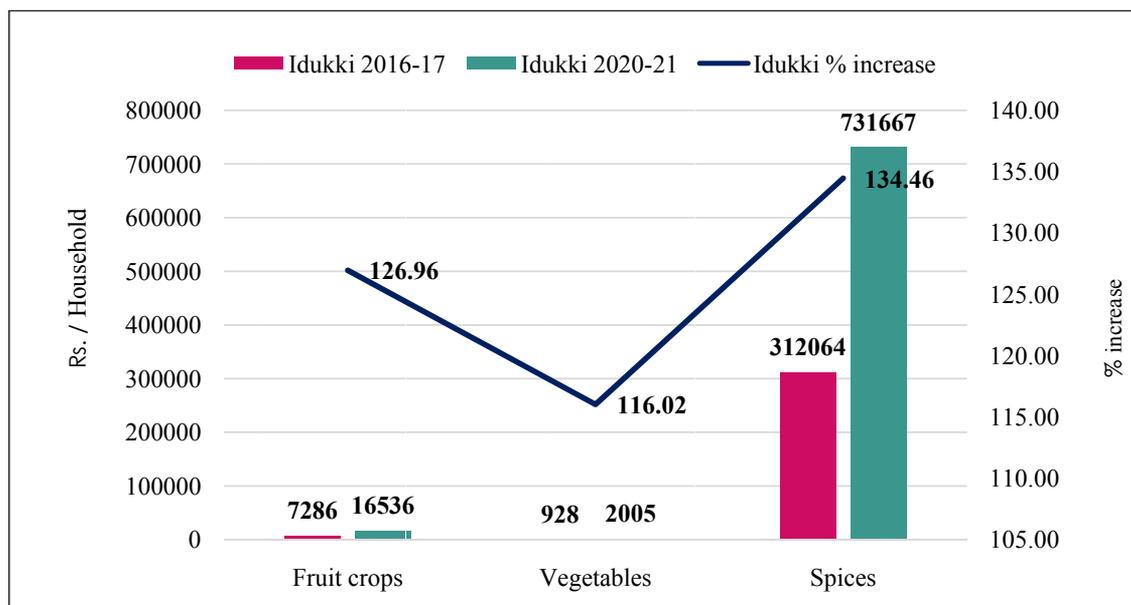


Fig. 18: Share and percentage increase of horticultural components in farmers' income

3. Representation of land categories in DFI success stories

Out of 111 DFI farmers as indicated in Fig. 19. More than half of DFI farmers (63%) from Idukki district were marginal farmers followed by small farmers (23%) the graph below.

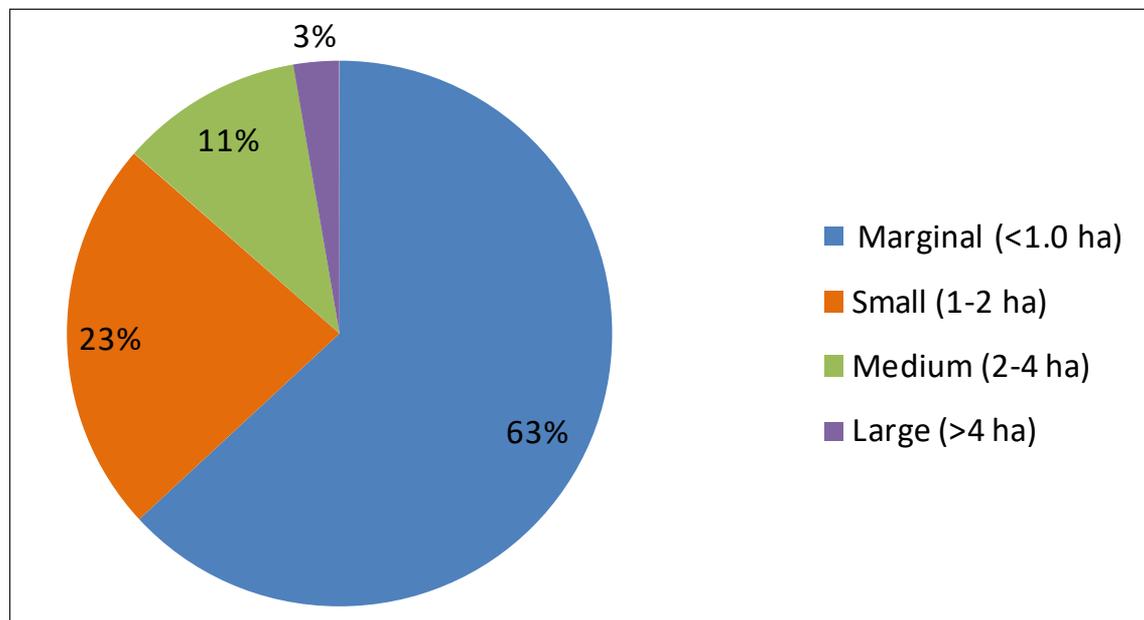


Fig. 19: Proportion of land categories among successful farmers in Idukki district

Farmers from all land classes were benefitted from the technical interventions (Table 21). In particular, income of the medium farmers increased 2.46 times, the highest for all classes, because of lower benchmark income levels. Income for marginal landholding households was increased by 2.35 times small farmers could increase farm household income by 133.12 per cent whereas large farmers had an increase of 108.75 per cent.

Table 21: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	70	246125	578433	135.02
Small (1-2 ha)	26	469999	1095654	133.12
Medium (2-4 ha)	12	781026	1922487	146.15
Large (>4 ha)	3	620666.7	1295667	108.75
Total	111	366514	864272	135.81



Small cardamom field with technology intervention



Pepper field of a DFI farmer



Pepper field with technological intervention of IISR pepper special



fields of *Kuttanad* on the west. Kottayam is a land of unique characteristics. The district is naturally divided into high land, mid land and low land, the bulk being constituted by the midland regions. Paddy, rubber, coconut, banana, tubers and spices are the major crops in the district. Coconut is the ODOP crop of the district covering an area of 1221 ha. Panoramic backwater stretches, lush paddy fields, highlands, hills and hillocks, extensive rubber plantations are the specialty of this district. The district comprises of three agro ecological units (AEUs) AEU 4- *Kuttanad*, AEU 9- south central laterites, AEU 12- southern and central foothills. *Kuttanad* is a special agro ecological unit delineated to represent the waterlogged lands, lying below, at or just above sea level. Hydromorphic soils often underlain by potential acid sulphate sediments and unique hydrological conditions characterize the unit. Seawater ingress in to *Kuttanad* is controlled through bunds and barrages to facilitate paddy cultivation. Coconut is grown in uplands, bunds, and paddy in lowlands.

The district is famous for homestead based integrated farming system with fishes and livestock along with field crops and horticulture crops. Fish integrated paddy farming is a traditional practice in *Kuttanadan Padashekharams*. Nutrient recycling, reduction in cost of cultivation and additional income are the unique features of this integrated farming system. Pearls spot, the state fish is native to *Kuttanad* backwaters and, Vembanad ecosystem has rich biodiversity of indigenous fishes. *Kuttanad* duck (Chara/Chempalli) and buffalo rearing is the common practice in this ecosystem. Apiculture and mushroom cultivation are the major income generating activities along with small-scale value addition units in rural households. KVK is providing technical support for agro eco-tourism ventures and farmer producer organizations.

About KVK Kottayam

Krishi Vigyan Kendra, Kottayam was established at Kumarakom in the year 2004 under the

administrative control of Kerala Agricultural University. KVK possesses demonstration units on Integrated Farming System for below sea level farming situations, horticultural nursery, production units for bio fungicide, mushroom, spawn, and micronutrient mixtures, aquaculture unit, bio-flock, fish manure unit, compost unit and livestock units. As a part of national agenda on doubling farmers' income, KVK Kottayam took up documentation of successful farmers who could enhance their income with the technological interventions of KVK. A brief summary on interventions, their impact on net household income for different land class categories through various components is given below.

1. Sector specific interventions by KVK

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna, Shreyas), micronutrient management, promotion of soil amendments like dolomite and pest and disease management.
- Integrated pest and disease management with *Tricho cards*, *Trichoderma*, *Pseudomonas*, and use of micro nutrient "Sampoorna- KAU multi mix" in paddy.
- Summer fallow cultivation of greengram, blackgram, cowpea and paddy based integrated farming system.
- Introduction of high yielding varieties of tuber crops such as white yam (DRF 1047), taro (Mukthakeshi) and mosaic resistant cassava variety Sreereksha.
- Weed management in paddy by using manual conoweeder and brush cutter attached paddy wheeler in drum seeded and transplanted paddy.
- Introduction of drone technology in paddy for spraying micronutrient Sampoorna and pseudomonas.

- Eco-friendly management of paddy bug using botanicals and bio agent.
- Collar rot management of elephant foot yam using *Trichoderma* seed treatment and soil application.
- Integrated pest and disease management in ginger using recommended pest and disease management strategies
- Disease management in paddy using bio-agents.

1.2 Horticultural crops

- Integrated crop management in banana by the adoption of biocontrol of psuedostem weevil and use of secondary and micronutrient mixtures from KAU.
- Promoted the cultivation of high yielding and disease resistant vegetable varieties from IIHR brinjal (Arka Arshida), okra (Arka Nikhitha), amaranthus (Arka Arunima) and cowpea (Arka Mangala).
- Introduced bio fortified sweet potato variety Bhu Krishna.
- Promoted cultivation of improved high yielding varieties of pepper IISR Thevam, Panniyur 5 and Kumbukkal (farmer selection).
- Promoted use of nutrient mixtures like Arka vegetable special and Arka banana special.
- Introduced macro propagation technique in banana to ensure the planting material availability of rare varieties.
- Integrated pest and disease management in cowpea and bitter gourd using bio-intensive pest and disease management strategies.
- Pseudostem weevil management of banana using entamopathogenic nematodes (EPN).
- Integration of meliponiculture (stingless bees) in cucurbit cultivation for enhancing

productivity as well as a source of additional income.

- Low cost eco-friendly management of sigatoka disease in banana.
- Management of fruit and shoot borer attack in brinjal var. Ponny through organic means.

1.3 Fisheries

- Popularised farming of GIFT tilapia in silpaulin lined ponds.
- Demonstrated the technology of GIFT tilapia farming in biofloc systems.
- Demonstration of polyculture of sea bass with tilapia in brackish water ponds.
- Popularisation of high yielding variety of amur carp in natural ponds.
- Assessed the impact of Nitrifying bacteria consortium in aquaculture ponds in nullifying the detrimental effects of ammonia.
- Assessment of plankton booster for increasing the crop yield in Vannamei shrimp farming.
- Capacity development programme on value addition of fish and fish based products.

1.4 Farm and non- farm enterprises

- Capacity development and support for mushroom farming.
- Fodder cultivation for profitable dairy farming.
- Apiculture as additional income generating enterprise for farmers.
- Agro-eco tourism and farmer producer organisations.

2. Impact on household income

The average income of farm households (before and after the interventions) has more than doubled

(2.55 times) between 2016-17 and 2020-21 (Table 22). The share of enterprises in household income experienced 702.63 per cent increase during this period. Fisheries income increased 455.91 per cent consolidating its share in the household income increased to 5.00 per cent in 2020-21 from 2.27 per cent in 2016-17. Livestock, the dominant source of household income, experienced 65.27 per cent increase in income and its contribution to household additional income was 47.99 per cent. Horticulture was the next major source of income with a share of 34.57 per cent in additional income.

Table 22: 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	9774	21157	116.46	7.51	6.44	5.74
Horticulture	58461	126971	117.19	44.93	38.68	34.57
Livestock	57546	152651	165.27	44.23	46.50	47.99
Fisheries	2955	16427	455.91	2.27	5.00	6.80
Enterprises	1382	11091	702.63	1.06	3.38	4.90
Total	130117	328297	152.31	100.00	100.00	100.00

3. Component wise contribution to income from Livestock

As evident from the Table 22, the livestock sector was the major source of additional income as well as major contributor to total income. Further break-up of the livestock sector into its subcomponents revealed that the dairy sector dominate the share in total income as well as major contribution to additional income. Highest percentage increase in income was observed in poultry (242.89%). All the sub-components of livestock could generate substantial increase in income as depicted in Fig. 20.

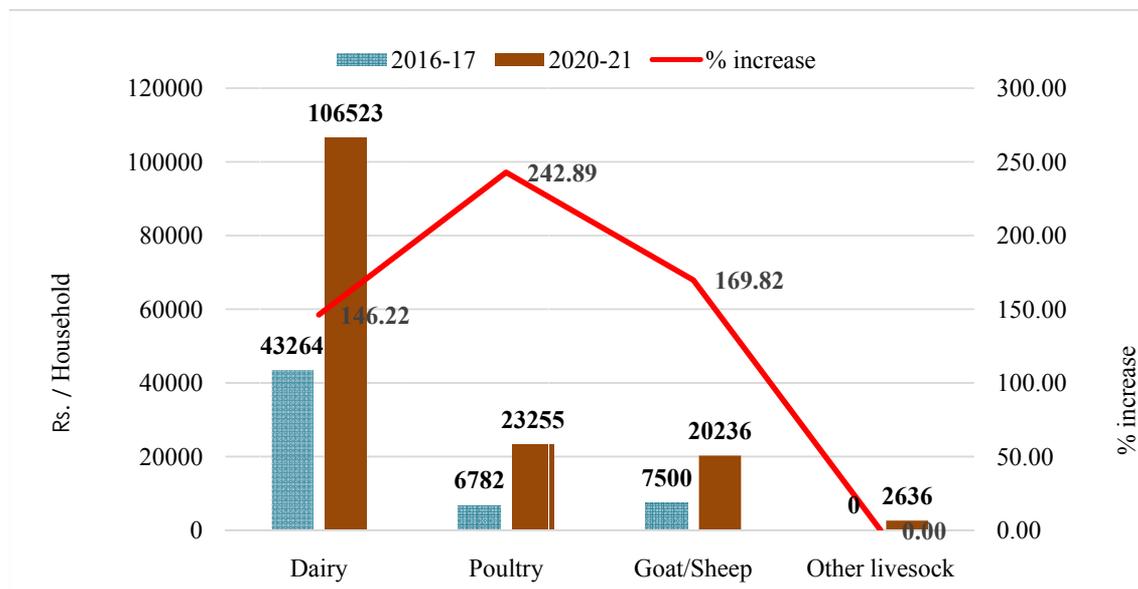


Fig. 20: Share and percentage increase of livestock components in farmers' income

4. Representation of land categories in DFI success stories

A perusal of figure 21 indicated that, greater proportion of farmers surveyed were marginal farmers (81%) followed by smallholding (16%) out of 111 farmers in Kottayam district.

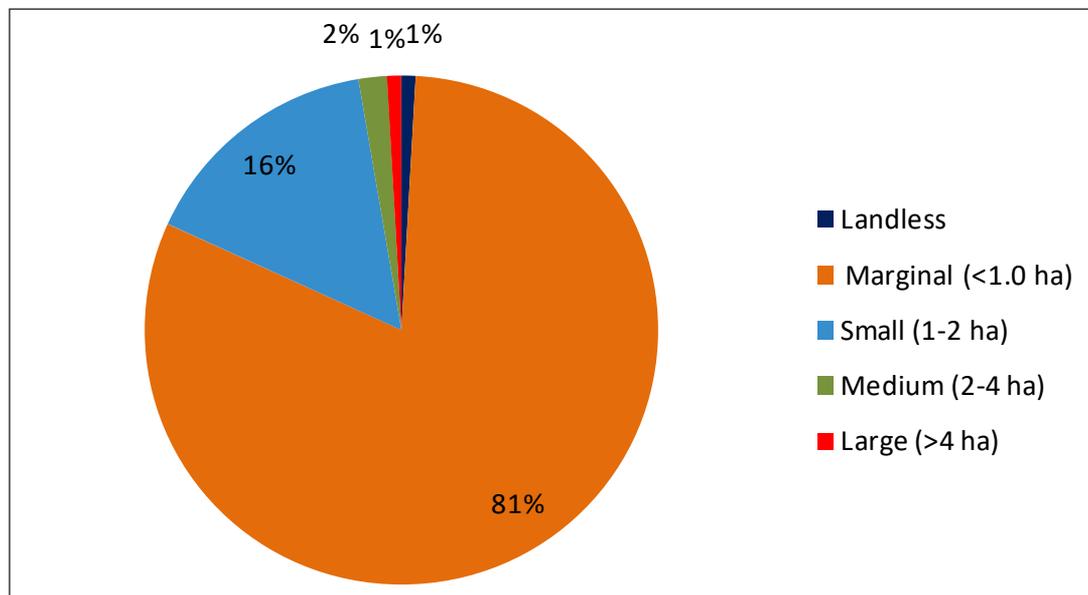


Fig. 21: Proportion of land categories among successful farmers in Kottayam district

Farmers from all land classes benefitted from the technical interventions (Table 23). In particular, income of the large farmer families increased 2.84 times, the highest for all classes. Income for marginal landholding households increased by 2.6 times and medium landholding households could increase farm household income by 2.38 times.

Table 23: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	93	118219	308285	160.77
Small (1-2 ha)	14	196467.5	424844	116.24
Medium (2-4 ha)	2	133000	317565	138.77
Large (>4 ha)	1	302000	859200	184.50
Total	110	130117	328297	152.31



Mushroom production



Field visit to ginger farm

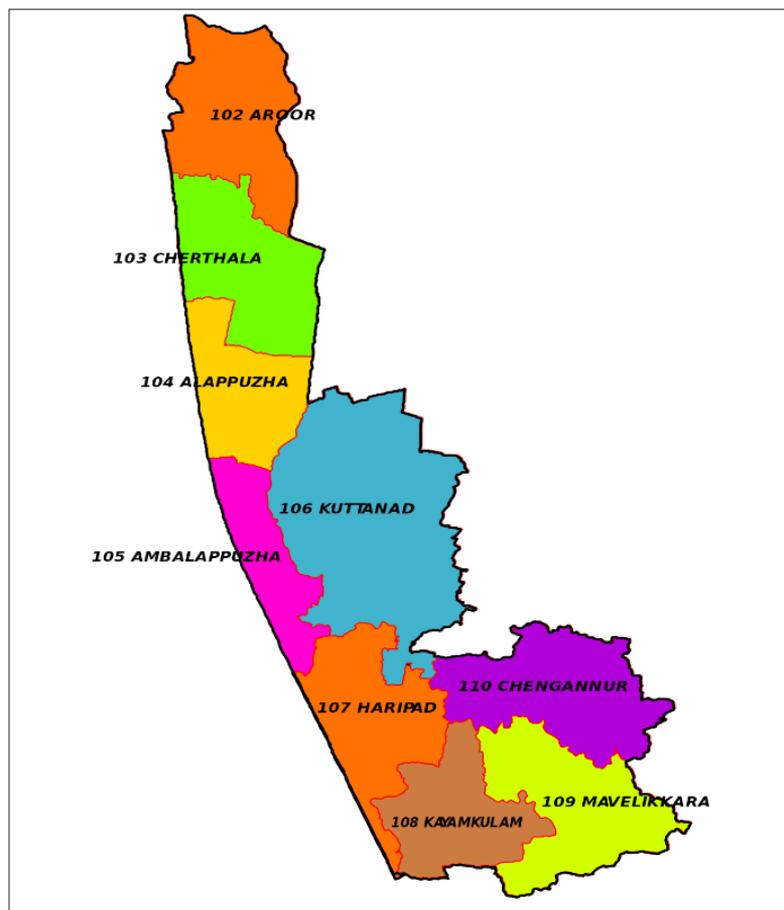


Farmer with harvested cucurbits

ALAPPUZHA

Muralidharan P., Sajnanath K., Ravi S., Rajeev M. S.,
Jissy George , Sivakumar T., Lekha G. and Ansary K. M.

ICAR-Krishi Vigyan Kendra, Alappuzha



About the district

District of Alappuzha, formed in 1957, consists of six taluks spread over 12 development blocks, 72 panchayaths, and six municipalities. A typical coastal district of Kerala, it has been a famous



tourist destination with many religious, historical and cultural land marks. It is the smallest district of Kerala with a total land area of 1414 sq.km but has the highest population density of 1501 persons/sq. km as per 2011 census. Out of the total area of 86423 ha under cultivation, 40300 ha is under irrigation. The major farming system is the coconut-based homesteads with integration of animal husbandry including backyard poultry/duck rearing. The other major crops are paddy, tapioca, banana, vegetables and spices. Of the gross cropped area of 110118 ha, paddy-paddy-legume/sesamum/vegetables/fallow, rice-fish integrated systems and homestead gardens form the major cropping systems.

About KVK Alappuzha

ICAR-Krishi Vigyan Kendra-Alappuzha hosted by ICAR-Central Plantation Crops Research Institute (CPCRI), Kasaragod and located in the Regional Station at Kayangulam has achieved the status of the leading frontline extension system in the district during the last two decades. Started in June 2000 under the National Agricultural Technology Project (NATP) of ICAR, it was remanded to regular KVK status from April 2004. There has been a steady improvement in the infrastructural facilities available with the KVK. These include crop health lab, soil water and plant testing lab, sales counter, on campus demonstration units, farmers' library and reading room, and farmer facilitation centre cum rural mart.

Agro-Processing Training cum Incubation Centre (APTIC) with a built up area of 100 sq. m was established in 2020 with funding from the Govt. of Kerala. Besides, a counter for the sale of inputs such as seeds, planting materials, bio-agents, layer chicks, micronutrient formulations, pheromone traps, mushroom spawn and publications is set up in the KVK for the convenience of farmers and public, thus effectively functioning as a resource centre of the district. Technology demonstration cum input production with different demonstration

units such as nursery, seed production, mushroom spawn, bio-products, tissue culture plants, and value added products. A lab with state of art facilities for analyzing soil, water and plant has been established in the KVK. Farmers of the district could avail this very important facility without payment under the National Soil Health Card scheme. The water testing facility is being utilized by the fish farmers especially backyard pond fisheries and fresh water fish farmers.

1. Sector specific interventions by KVK Alappuzha

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna, Shreyas, Pournami), promotion of drum seeder for sowing, soil amendments (eg. dolomite), weedy paddy management, site specific-integrated nutrient-disease-pest management along with bio-agents.
- Promotion of summer fallow cultivation of sesame, greengram, blackgram, cowpea, summer vegetables.
- Promotion of dolomite application and secondary and micronutrient management for managing soil acidity and improving crop productivity of all crops.

1.2 Horticultural crops

- Promotion of coconut based integrated farming system, intercropping of fodder and spices in coconut gardens, integrated management of red palm/ rhinoceros beetle and soil test based nutrient management in coconut.
- Integrated nutrient-pest-disease management with *Trichoderma*, *Pseudomonas*, *Metarhizium*, Ayar and Sampoorna in banana and vegetable crops.
- Introduction of quality planting materials of HYVs (IISR Prathibha, IISR Pragati and IISR

Varada), balanced nutrition, and biological disease management in turmeric and ginger.

- Introduction of tuber crop varieties - tapioca (Sree Pavithra & Sree Jaya) and amorphophallus (Gajendra).
- Soil test based nutrient management, *in-situ* organic manuring, Trichoderma enriched manure application in all crops.

1.3 Animal husbandry

- Productivity enhancement of dairy units with the support of fodder production, timely insemination, management of ecto-parasites and mastitis, nutrient supplementation.
- Introduction of new breeds of poultry (Gramasree, Kadaknath), climate resilient poultry cages with raised platform for flood prone area, feed supplementation.
- Scientific goat rearing under semi-intensive and intensive management, use of shelter with raised platform for flood prone area, feed supplementation.
- Introduction of new breeds of duck (Vigova).
- Hydroponics green fodder production, azolla production and supplementation.

1.4 Fisheries

- Introduction of new breeds of fish (Varaal).
- Promotion of cage culture in fish farming.
- Integrated duck fish farming.

1.5 Farm and non-farm enterprises

- Capacity development and hand holding for mushroom farming and spawn production.
- Processing and value addition of all farm produces, capacity building, hand holding, technology backstopping and incubation facilities.
- Promotion of scientific apiculture.
- Technical backstopping and promotion of FPOs.

2. Impact on household income

The average income of farm households (before and after the interventions) has increased more than double (3.39 times) between 2016-17 and 2020-21 (Table 24). The share of livestock in household income experienced about 12 per cent increase during this period. Fisheries income increased by 12.7 times, other enterprise share in the household income increased to 18.47 per cent in 2020-21 as compared to 13.8 per cent in base year of 2016-17. Horticulture, livestock and enterprises altogether contributed more than 80 per cent of the total household income.

Table 24: 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	10216	27489	169.08	18.44	14.63	13.03
Horticulture	29416	69994	137.95	53.09	37.24	30.62
Livestock	7490	47577	535.21	13.52	25.31	30.25
Fisheries	643	8170	1170.61	1.16	4.35	5.68
Enterprises	7645	34719	354.14	13.80	18.47	20.43
Total	55410	187949	239.20	100.00	100.00	100.00

3. Component-wise contribution to income from horticulture

As indicated in the table, the horticulture sector was the major source of additional income. Horticulture sector was further analysed into its subcomponents contribution to farmers income, where in highest percentage share in additional income was recorded from vegetable crops. Substantial percentage increase in income was found in spices to the extent of 666.60 per cent (Fig. 22).

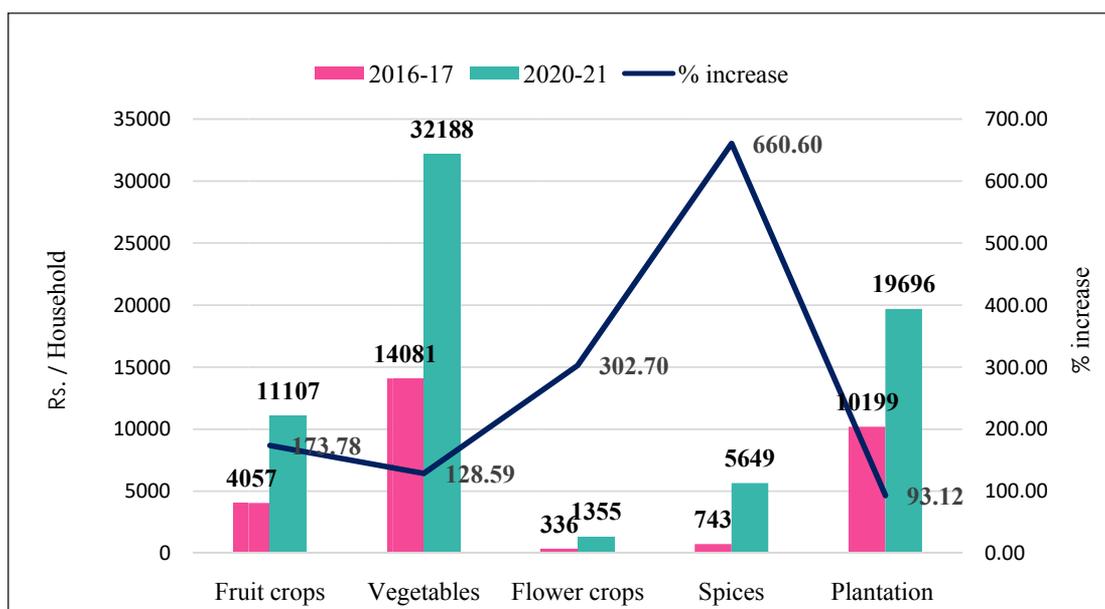


Fig. 22: Share and percentage increase of horticultural components in farmers' income

3. Representation of land categories in DFI success stories

The great majority of respondents found to have marginal land holding (86%) followed by smallholding (9%) as depicted in Fig. 23.

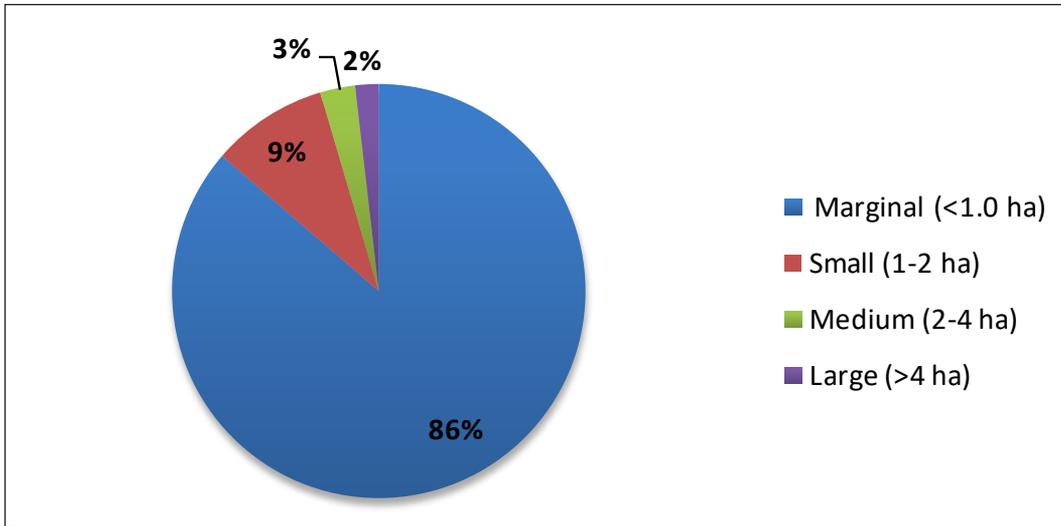


Fig. 23: Proportion of land categories among successful farmers in Alappuzha district

Farmers from marginal to large land classes benefitted more from the technical interventions (Table 25). In particular, income of the marginal landholders, the biggest among all classes, increased by 3.42 times. Income for large landholding households was increased by 7.28 times. The small and medium categories could increase farm household income by 3.24 and 2.58 times, respectively.

Table 25: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	95	47911	163867	242.02
Small (1-2 ha)	10	68357	221804	224.48
Medium (2-4 ha)	3	239584	620071	158.81
Large (>4 ha)	2	70600	514400	628.61
Total	110	55410	187949	239.20



View of homestead farming



Stanly Baby with incubator



Purushothaman Thampi with duck and fish farming

PATHANAMTHITTA

Robert C.P., Vind Mathew, Shana Hashan, Alex John, Rincy K. Abraham,
Sency Mathew, Sindhu Sadanandan, Ambily Varughese, Binu John and Gayathri S.

ICAR-Krishi Vigyan Kendra, Pathanamthitta



About the district

Pathanamthitta is the youngest district in the southern part of Kerala, formed on 1st November 1982. The district is known for pilgrim tourism and for its reserve forest and wild life. The land locked district comprises of four municipalities, eight block panchayaths and



53 grama panchayaths. The main crops raised in the district are paddy, tapioca, rubber, sugarcane, coconut, black pepper, banana and vegetables. Soil types of the district mainly consist of laterite and its variations. Special soil types such as riverbank alluvium and peaty soil are also seen in some parts of the district. The mean annual rainfall is 3134 mm and agro ecological situations are South Central laterite (AEU-9), Southern and Central Foot Hills (AEU-12), Southern High Hills (AEU-14) and Kuttanad (AEU-4).

About KVK Pathanamthitta

Krishi Vigyan Kendra for Pathanamthitta district KVK functions as 'Knowledge and Resource Centre for the district to support the farming community in solving the localized issues related to agriculture and allied fields. KVK gives more thrust on climate smart agriculture, good agriculture practices in crop production, good manufacturing practices in value addition and processing and developing viable agricultural based enterprises and business models in livestock, dairy, poultry, fisheries, etc. KVK is located at Vallikkala, in the 8th ward of Ezhumattoor Panchayat of Thelliyoor village under Koipuram block. KVK has a model farm, which is developed on an Integrated Farming System (IFS) approach with a number of demonstration units. KVK has a total area of 27.26 ha of land.

1. Sector specific interventions by KVK

1.1 Field crops

- LIGAPS (Low Input Good Agricultural Production System) in paddy, where in a combination of good, cost-effective technologies for paddy are applied like use of paddy trans planter, Site Specific Nutrient Management (SSNM), Integrated weed management, Use of Leaf Colour Chart (LCC), Bio intensive pest management strategy using trichocards etc.
- Stale seed bed technology and weed wiper for weedy rice problem.

- Potential fodder varieties of Hybrid Napier such as CO3, CO4 and CO5 and leguminous fodder like fodder cowpea and desmanthus.
- Sampoorna micronutrient as foliar spray along with recommended fertilizers using drone.
- Varieties of paddy like Pournami, Manuratna, Pratyasa and Shreyas.
- Fertilizer broadcaster and drum seeder.
- Fallow land paddy cultivation.
- Advisory on micronutrient management, promotion of application of soil amendments, disease management and low-cost bio inputs like PGPR mix.
- Integrated pest and disease management with *Trichocards*, *Trichoderma*, *Pseudomonas*, and *Metarhizium*.
- Secondary and micronutrient management (boron, magnesium, zinc), dolomite, dhiancha as a green manure crop for improving crop productivity.

1.2 Horticultural crops

- LIGAPS (Low Input Good Agricultural Production System) in banana, where in a basket of good, cost effective technologies for banana are applied together like High density planting, application of banana special (banana magic) and SOP and use of collar ring with string support.
- Potential varieties of ginger such as IISR Varada, IISR Mahima and IISR Rejatha.
- Use of IISR GRB 35 capsule for soft rot control in ginger
- Modified single sprout multiplication technique for faster spread of improved varieties in ginger
- Suitable cabbage for cool season (NS 160 & NS 183) and rainy season (Green Challenger & Green Voyager) and Cauliflower NS 60N and Basanth

- Open precision farming in bitter gourd and cowpea.
- Introduced mini-sett technologies for elephant foot yam, diascorea and tapioca
- Bio-intensive pest management practices with the use of bio agents such as *Trichoderma*, *Pseudomonas*, Pheromone traps and Bio-pesticides such as Nanma and Shreya.
- Introduction of HYV of pepper released from KAU-Panniyur 1-8, Vijay and IISR - Srekara, Subhakara, Panchami, Pournami, Malabar Excel, IISR Girimunda, IISR Thevam, IISR Shakti and popularized bush pepper cultivation
- Drip fertigation and mulching practices in vegetable cultivation
- HYV and hybrid seeds in cabbage, cauliflower and tomato
- Diversification of crops through introduction of exotic fruits.
- Timely advisory on crop management and pest control in horticultural crops
- GAP concept in fruit cultivation and vegetables
- Integration of vegetable production with vermi composting and dairy farming
- Organic cultivation practices and organic pest control measures of vegetable production.
- High-tech vegetable cultivation in polyhouses
- Use of water soluble fertilizer in fertigation method
- Training on canopy and nutrient management in fruit crops
- Micronutrient management using vegetable magic (Arka vegetable-special) and banana magic (Arka banana-special).

- FFS in coconut adopting IPM and INM practice.
- Mechanical dehydration of *Garcinia cambogia*.

1.3 Animal husbandry

- Improved varieties of poultry such as Grama Priya, Grama Lakshmi Cauvery and BV 380.
- High-tech poultry rearing cages for peri urban area and land less farmers.
- Use of total mixed ration in dairy for increased milk production.
- Use of pinless peepers in aggressive layers for reducing injurious pecking.
- Use of pellet feed for Poultry for reducing feed wastage.
- Black soldier fly larvae as alternative poultry feed for reducing cost of production.
- Introduced 'GOFAMS'- basket of technologies which will help in augmenting milk production, calf starters/milk replacers, legume fodders and total mixed ration. Hybrid Napier-CO4, replacement of green fodder with corn silage, improved variety of fodders, urea treatment of hay, probiotics-yeast, by pass protein, UMMB, by pass fat, cowmin forte etc.
- Small size portable incubation and brooding units for birds.
- Slated floor technique for poultry and goat.
- Conservation of indigenous varieties of poultry.
- Broiler goat rearing technology.
- Improved varieties of rabbit rearing.
- Disinfection of poultry and other livestock units for reducing disease incidence.
- Poultry based integrated farming system.
- Skill development on cage making technology.



- Deworming technique for poultry and livestock.
- Pour-on technology for reducing ectoparasites in dairy.

1.4 Fisheries

- Fisheries based Integrated farming system approach.
- Aquaponics for continuous availability of safe fish and vegetable production in urban and semi urban areas.
- FFS on Fresh water cage fish farming for reducing loss of fish during flood.
- Farming of improved variety like amur carp Hungarian strain in fresh water.

1.5 Farm and non-farm enterprises

- Different composting methods like vermicomposting, coir pith composting, use of composting inoculum among farming community SHG groups and peri-urban community.
- Zero energy cool chamber storage structure for fresh agricultural produce of rural farm families.
- Ancillary income generation activities namely mushroom cultivation, apiculture etc.
- Launched Farmer Facilitation Centre- an outreach technology facilitation cum marketing Centre for farming community as innovative marketing approach.
- Branding, labeling and licensing procedures among stakeholders by creation of models.
- Capacity development through vocational training and support for mushroom spawn production, apiculture, plant propagation and nursery management aspects etc.

- Capacity building and entrepreneurship development through incubation on value addition and related enterprise establishment activities.
- Diagnostic visits to farmer field, facilitation and advisory services on agriculture and allied activities through social media platforms, Agri. clinics etc., SMS service, mobile app etc.
- Skill training in agro machinery operations and coconut climbing.
- Empowerment of special children through training programmes in agriculture and allied activities.
- Established custom hiring center for farmer support.
- Training programme on scientific cultivation on coconut, banana, ginger, turmeric, paddy, black pepper, vegetable, poultry farming, goat farming, other livestock management, fish farming etc.

2. Impact on household income

The net income of farm households (before and after the interventions) is more than doubled (3.56 times) between 2016-17 and 2020-21 (Table 26). Income from field crops increased 6.09 times and is found to be the highest during this period. The income from horticultural crops increased by 2.57 times that of the base year. Livestock and fisheries sector experienced 3.89 and 3.2 times increase in income respectively. In case of enterprises, the net income increased 5.7 times and the percentage share in total income increased to 30.48 in 2020-21 from 18.9 in 2016-17. Percentage share in total income in each sector has increased but significant change is observed only in field crops and enterprises in its contribution to household income.

Table 26: 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	3067	18698	509.58	3.04	5.21	6.05
Horticulture	55602	143387	157.88	55.14	39.93	33.99
Livestock	19490	75969	289.79	19.33	21.15	21.87
Fisheries	3615	11609	221.13	3.59	3.23	3.09
Enterprises	19057	109471	474.45	18.90	30.48	35.00
Total	100830	359134	256.18	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

Findings presented in table 26 revealed that, the horticulture sector was the second major source of additional income next to income from enterprises. Further break-up of the horticulture sector into its subcomponents revealed that the fruit crops dominate the share in total income as well as contribution to additional income. The highest percentage increase was recorded in flower crops 322.56 per cent (Fig. 24).

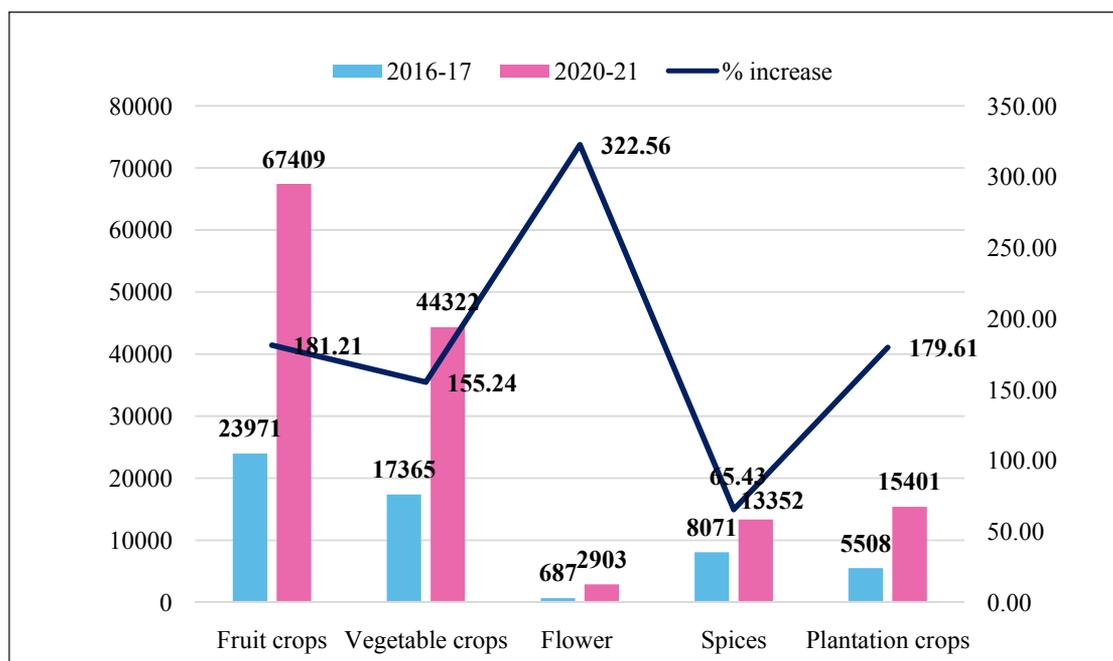


Fig. 24: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

Out of 110 farmers from Pathanamthitta district, major portion of farmers were marginal farmers (76%) followed by small famers (16%) as per the Fig. 25.

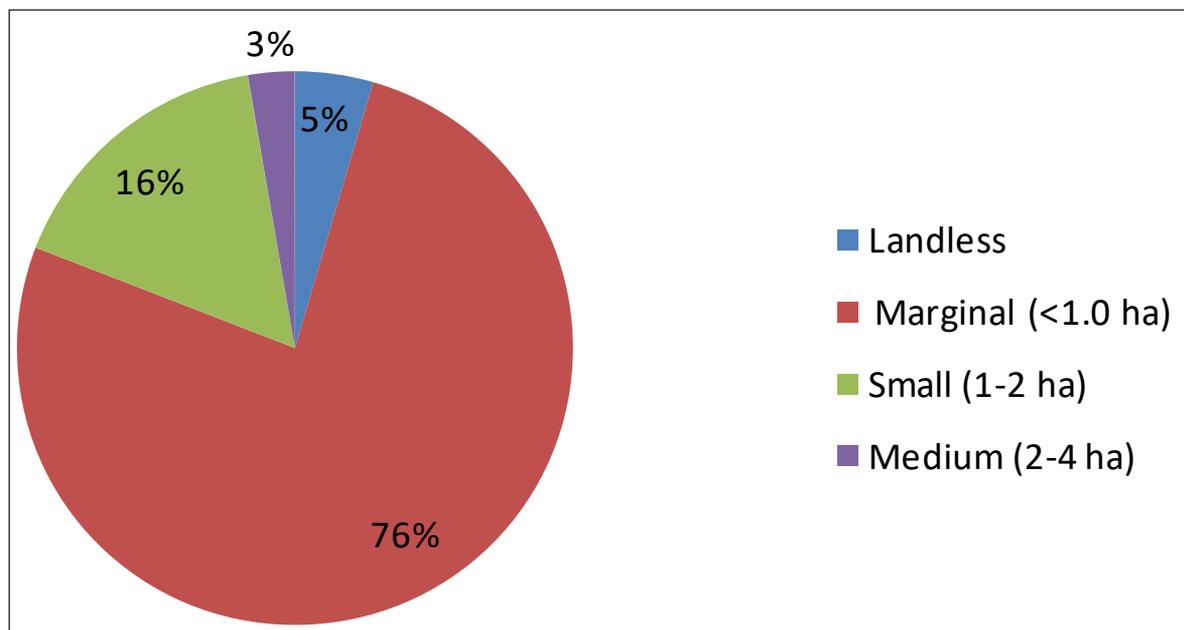


Fig. 25: Proportion of land categories among successful farmers in Pathanamthitta district

Table 27: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Landless	5	0	218600	100.00
Marginal (<1.0 ha)	84	85071	330193	288.14
Small (1-2 ha)	18	186772	500083	167.75
Medium (2-4 ha)	3	194474	557995	186.93
Total	110	100830	359134	256.18

Around 76 per cent of the total surveyed households have land size less than one ha and included under the category marginal. The net income of the marginal farmers increased 3.88 times during this period and is found to be the highest. Small and medium farmers also exhibit a significant change in their net income.



Mr. Ajay Mohan in his poultry farm



Practicing mulching technique in vegetable production by K.K Gopalan



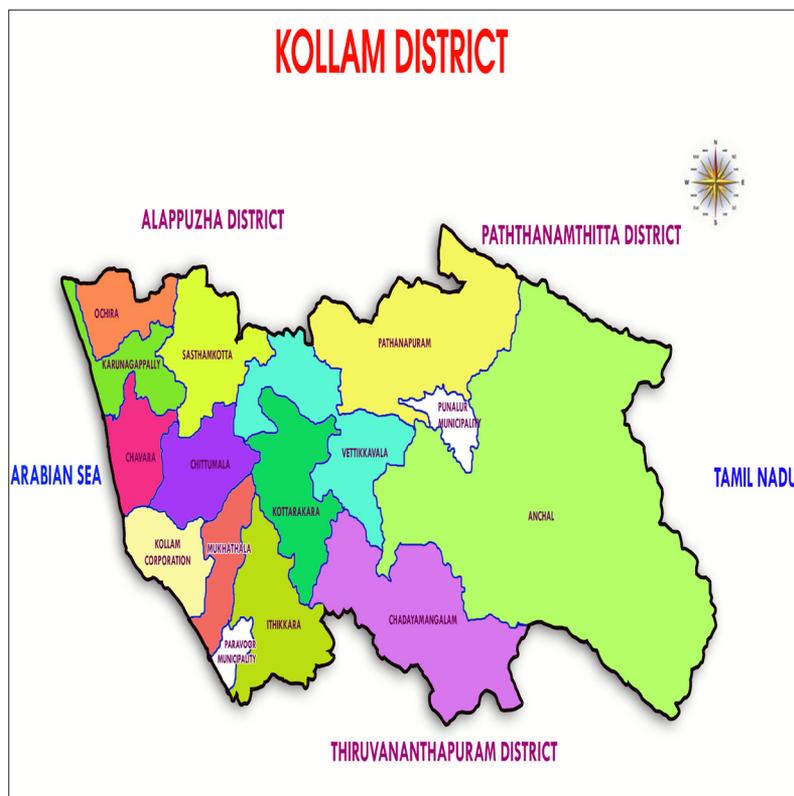
Mr. K. Prakash in his tuber crop field



KOLLAM

Bini Sam, Bindu Podikunju, Poornima Yadav P. I., Lekha M.,
Shamsiya A. H., Parvathy S., Saroj Kumar V., Ghee S. Sudha and Joy S. J.

ICAR-Krishi Vigyan Kendra, Kollam



About the district

Kollam district, earlier known as Quilon, is located in the south west coast of Kerala. The district is bordered by Alappuzha district on the north, Pathanamthitta district on the north east, Thirunelveli district of Tamil Nadu on the east, Thiruvananthapuram district on the south and



Arabian Sea on the west. The district covers an area of 2,492 km², which is about 6.48 per cent of the total geographical area of the State. The soils in the district can be classified as sandy loams, laterite and forest soil. The predominant soil type found in majority of the area is laterite while sandy loam is seen in the coastal belt and forest soil is found in the eastern forest belt. The district experiences a tropical humid climate with an oppressive summer and plentiful seasonal rainfall. The hot season lasting from March to May is followed by the southwest monsoon from June to September.

Kollam is the Headquarters of the Kerala State Cashew Development Corporation (KSCDC), which is the largest processor of cashew nut in the world. Kollam district ranks third in livestock wealth. The district is drained by three west flowing rivers, viz Achenkovil, Kallada and Ithikara, originating in the eastern hilly region. These rivers together with their tributaries exhibit dendritic pattern of drainage. Kollam is one of the major industrial and commercial centres of Kerala. It is the centre of the state's cashew and coir industry. It is also an important hub for the State's marine products industry, with the port of Neendakara being the centre for trawlers and ice plants.

The district has a large area under forest. The forest divisions are at Thenmala and Punalur. Kollam district is classified into five agro-ecological Units based on their location and climate. AEU 14 i.e., Southern High Hills occupies 31 per cent of the geographical area of Kollam district. While the AEU 3 Onattukara sandy plain occupies only 10.11 per cent. Nearly 26 percentage of the total area is represented by AEU 12 i.e., Southern and central foothills and 19 percentage by the AEU 9 i.e., South central laterites.

About KVK Kollam

Several location specific technologies were tested by KVK, Kollam on paddy, vegetables, banana, coconut, pepper and mushroom. The technologies

assessed over the period included management practices, INM, integration of ecofriendly techniques such as traps with the conventional practices and varietal trials. The proven technologies were then demonstrated for large-scale adoption. KVK has an umbrella of activities for production of vegetable seedlings, bio inputs, botanicals, chicks and goat. Mini rice and pulse processing units facilitate the farmers to process their farm produce, which ensure a better market price. The Kendra is acting as a single window system for organic inputs as well as biocontrol agents and also serves as a model training centre for organic farming. The major bio inputs like *Metarhizium anisopliae*, *Beauveria bassiana*, *Laecanicillium lecani*, *Paecilomyces lilacinus*, *Pseudomonas fluorescense* and *Trichoderma* are available individually as well as in biokits/IPM kits and ICM kits at nominal rates. In addition to this, Pheromone trap (cue lure traps and methyl eugenol traps) and botanicals like neem soap, neem garlic soap, *pongamia* soap, nanma and shreya for benefit of farmers for safe food production. Egg nursery of KVK aims for attaining sustainability of egg production in Kollam district by promoting backyard rearing of poultry under homesteads.

A multi diagnostic plant health clinic is functioning at KVK, Kollam that facilitates plant sample analysis for identification of pest and disease problem utilizing the stereo ad compound microscopes. Soil testing facility enables distribution of Soil Health Card (SHC), which gives the health status and fertilizer recommendations and soil amendment. Krishi Vigyan Kendra, Kollam has a collection of machinery for different farming practices, which is currently being used for training purposes as well as being leased out to farmers to meet their mechanization demands. Spawn production is taken up at KVK Kollam with aim to provide continuous supply of quality spawns to mushroom farmers in the District. Spawn provided mainly of Oyster mushroom which is the main mushroom cultivated in the District. Year round production of

vegetable seedlings depending on the seasonal demand is being done at the Kendra. In addition to this, tubers, bush pepper, pepper cuttings and nutmegs saplings are being produced and sold from KVK outlet at reasonable price.

1. Sector specific interventions by KVK

1.1 Field crops

- Introduction of high yielding varieties of paddy (Manuratna, Shreyas), micronutrient management, promotion of soil amendments like dolomite and disease management, low-cost bio inputs like PGPR mix.
- Integrated pest and disease management with *Tricho cards*, *Trichoderma*, *Pseudomonas*, *Metarhizium*, herbicides for weed management such as *Echinochloa*, weed management options in wet seeded paddy and integrated management practices for weedy paddy.
- Summer fallow cultivation of greengram, blackgram, sesame, cowpea, summer vegetable, and horticulture-based integrated farming system.
- Promotion of secondary and micronutrient management through Sampoorana Paddy (boron, magnesium, zinc), silicon nutrition using silicate solubilizing bio-fertilizers in iron toxic laterite soils and dolomite and growing of dhiancha as a green manure crop for improving crop productivity.
- Promoting organic practices against moisture stress in second crop season.
- Mechanization in paddy fields.

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 and Sampoorana Banana and vegetables as nutrient supplement, use of non-conventional soil ameliorants in managing soil acidity in banana, nano organic NPK formulation in okra

- Integrated management of soil pest in banana, fruit and shoot borer in brinjal, BT against amaranthus leaf folder, EPN against banana weevils, integrated management practices against downy mildew in bitter gourd, soil test based nutrient management for pest and tolerance in bitter gourd, use of cashew nut shell liquid based botanicals for pest management of cowpea, fusarium wilt management in cowpea.
- Promotion of borep against wild boars.
- Introduction of high yielding varieties of tapioca (Sree Pavithra, Sree Swarna).
- Integrated nutrient package for tania, customized fertilizer formulation for Elephant foot yam in coconut gardens.
- Use of *Trichoderma* against collar rot of elephant foot yam.
- Soil test based nutrient management, *in-situ* organic manuring, and *Trichoderma* enriched manure application.
- Introduction of Arka Mangala, Deepika, variety of yard long bean, KAU Vaika in amaranthus, KAU Suruchi in cluster bean, onion variety Agri found dark red, grafted solanaceous vegetables, chilli variety Arka Lohit, coriander variety Co (Cr)-4, okra hybrid Manjima.
- Promotion of fertigation schedule in poly house cultivated vegetable cowpea, open precision farming, rain shelter cultivation and automated irrigation system for terrace cultivation of vegetables, bio priming methods.
- Microbial inoculants and Pusa gel in vegetable cowpea against moisture stress



- Value addition in vegetables, banana and locally available fruits for maximization of income.
- Introduction of African marigold varieties for Kollam District.
- Application of endophytic fungus *Piriformospora indica* for improving growth and yield of black pepper.

1.3 Animal husbandry

- Introduction of new breeds of poultry (Gramapriya, Kalinga brown, Japanese Quail, Broiler Duck Vigova), 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.
- Azolla production as a feed supplementation.
- Facilitation in marketing and procurement of quality chicks.
- Scientific goat rearing under semi-intensive and intensive management.

1.4 Fisheries

- Introduction of scientific farming of Amur carp, GIFT and pearl spot in ponds and scientific pond management practices.

1.5 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.
- Facilitation of nursery management, gardening and landscaping with regular agro advisory services.

2. Impact on household income

The average income of farm households (before and after the interventions) has been more than doubled (2.25 times) between 2016-17 and 2020-21 (Table 28). Horticulture, the dominant source of household income, experienced 2.24 times increase in its contribution to household income while for field crops it was 2.38 times.

Table 28: 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	7696	18609	141.81	2.53	2.72	2.87
Horticulture	296583	665750	124.47	97.47	97.28	97.13
Total	304279	684359	124.91	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

Results depicted in Table 40 reflected that, vegetable crops (42.43 %) was the major contributor to percentage share in additional income followed by spices (41.43%). Further, highest percentage increase in income was found in plantation crops (155.34%). All the components of horticulture sector could generate considerable increase in income as depicted in Fig. 26.

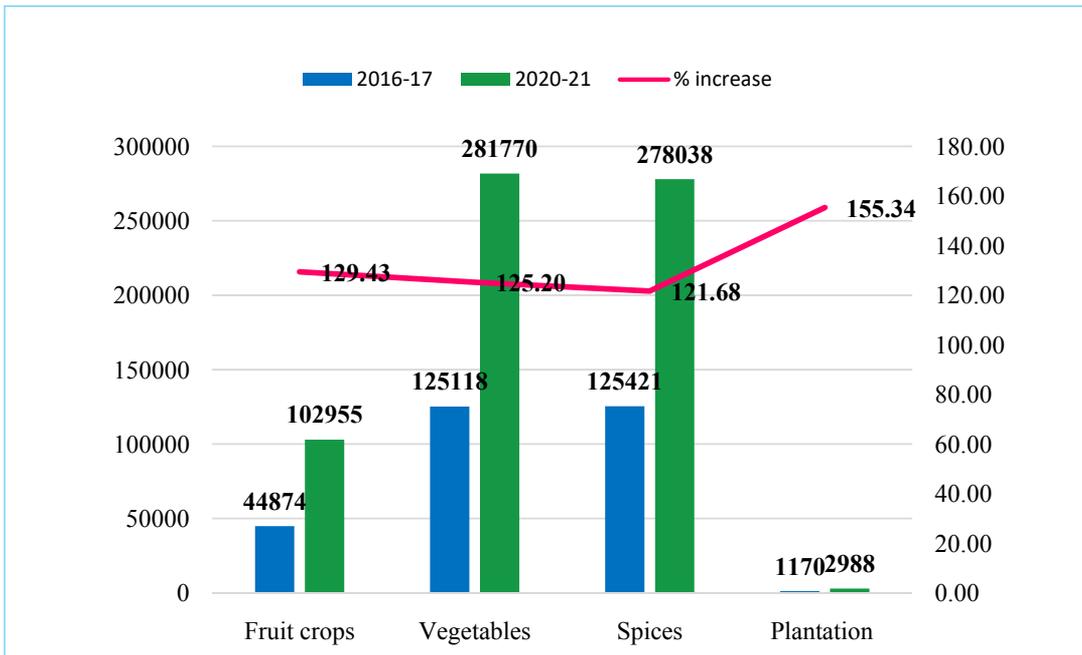


Fig. 26: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

Majority of farmers included in the survey possessed marginal type of land holding (68%) followed by small holding to the extent of 27 per cent with respect to land holding categorization (Fig. 27).

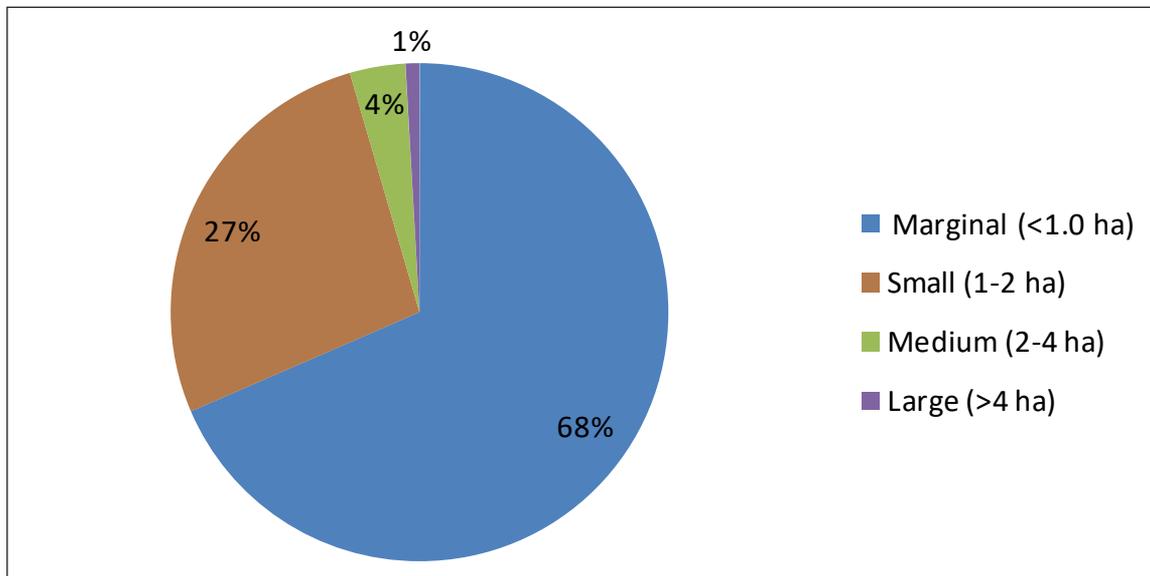


Fig 27 : Proportion of land categories among successful farmers in Kollam district

Farmers from all categories of land classes were benefitted from the technical interventions (Table 29). In particular, income of the marginal families increased 2.26 times, the highest for all classes. Income for small landholding households was increased by 2.25 times and other categories could increase farm household income in the range of 2.14 times to 2.12 times

Table 29: Income level and change in household income by land class

Land class	Households (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	76	214886	486506	126.40
Small (1-2 ha)	30	417681	940416	125.15
Medium (2-4 ha)	4	847196	1876310	121.47
Large (>4 ha)	1	1524357	3271660	114.63
Total	111	304279	684359	124.91



Cultivation of banana



Cultivation of amorphophallus



Cultivation of ginger and turmeric

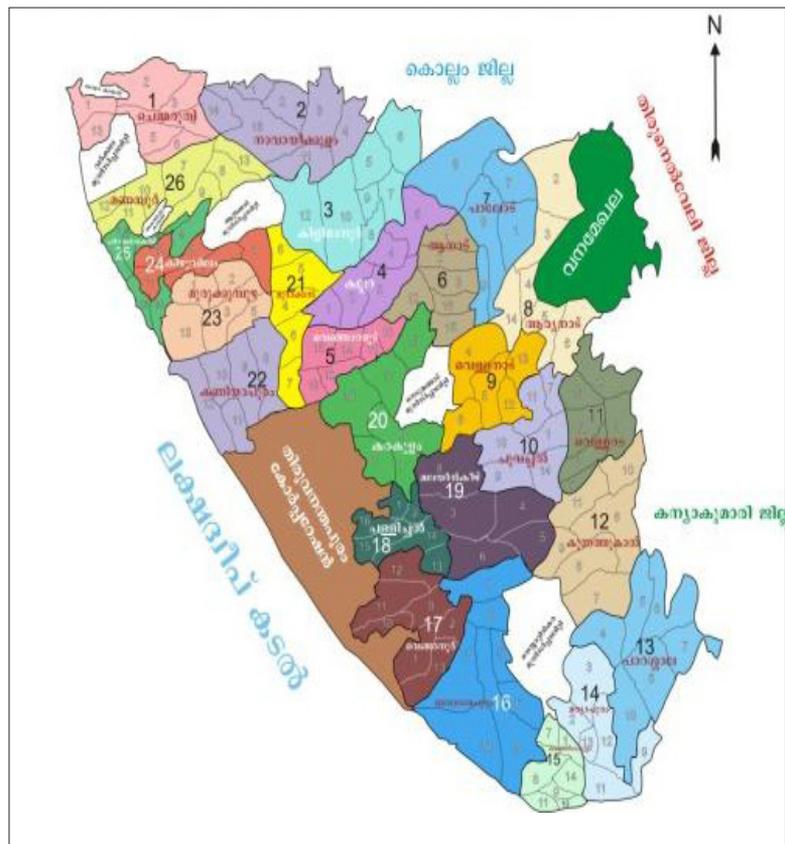


Cultivation of cowpea

THIRUVANANTHAPURAM

Binu John Sam, Chaithra G., Manju Thomas, Jyothi Rachel Varghese,
Bindu R., Mathews and Devika I.

ICAR-Krishi Vigyan Kendra, Thiruvananthapuram



About the district

Thiruvananthapuram district lies in the southern part of Kerala having six taluks namely Thiruvananthapuram, Neyattinkkara, Nedumangadu, Varkala, Chirayinkeezhu and Kattakada. The district stretches along the shores of the Arabian sea for a distance of 75



km. The total geographical area of the district is 2.187 lakh ha. Agriculture is the primary occupation of the people of district. The district is having one major irrigation project (Neyyar Irrigation project) covers an area of 116.65 sq.km and three rivers viz., Neyyar, Karamana and Vamanapuram. Among the total population, more than 50 per cent of the workforce of the district is engaged in service sector and 15 per cent are fully engaged with Agriculture for their livelihood.

About KVK Thiruvananthapuram

ICAR-Krishi Vigyan Kendra for Thiruvananthapuram district was established in 1980 at Vellanad panchayath. KVK has played a lead role in generating a road map for transforming Thiruvananthapuram district of Kerala into a developed agrarian economy. The efforts done to fulfill the mandate of KVK through an integrated approach have made a distinct positive impact on socio-economic life of rural people. On an average 7000 stakeholders comprising practicing farmers, rural women, rural youth and extension functionaries are being trained every year with the prime goal of economic and social empowerment. The institute has a strong manpower in each discipline viz. horticulture, agronomy, animal science, home science, agricultural engineering and plant protection to impart need based trainings on identified advanced technologies and problem based interventions on identified problems in crop production. Right from its inception, KVK has been catering to the multifaceted requirements of the farming community of Thiruvananthapuram district. In recognition to the contributions made KVK for the well-being of the farming community, the KVK has been bestowed with the National Award for Best KVK during the biennium 1998 to 2000.

1. Sector specific interventions by KVK

1.1 Field crops

- High yielding improved varieties, integrated nutrient management, bio intensive pest and disease management, nano nitrogen

and mechanization in paddy cultivation.

- High yielding tuber crop varieties such as Gajendra variety of amorphophallus, cassava mosaic virus tolerant variety Sree Pavithra, greater yam variety Sree Neelima.
- Management of wild boar, bio intensive management of root rot, semi – manual harvester in cassava.
- High yielding varieties greengram and blackgram.

1.2 Horticultural crops

- High yielding disease resistant crop varieties.
- Bio intensive pest and disease management.
- Management of secondary and micro nutrient deficiencies.
- Pump injection type fertigation unit for green house.
- Integrated Crop Management.
- Management of soil acidity and banana bunch covering device for quality banana production.

1.3 Animal husbandry

- Egg specific lines of quails in low cost cages.
- Low cost forced draft incubator for poultry.
- Dung cleaning pump for use in dairy farms.
- Optimizing conception rate in cows.
- Prophylactic management of hoof rot in cattle.
- Infertility management in cattle exhibiting anoestrus.
- Management of pod dermatitis in cattle.
- Probiotics supplementation for lactating dairy cattle.
- Integrated parasite control on dairy farms.

1.4 Farm and non-farm enterprises

- Value addition of farm produce.
- Entrepreneurship development programmes.

2. Impact on household income

The average income of farm households (before and after the interventions) more than doubled (2.73 times) between 2016-17 and 2020-21

(Table 30). The share of enterprises in household income experienced 7.6 times increase during this period. Livestock income increased by 3.2 times, consolidating enterprise share in the household income increased to 14.28 per cent in 2020-21 from 12.26 per cent in 2016-17. Horticulture, the dominant source of household income, experienced 2.4 times increase in its contribution to household income.

Table 30: 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	2947	7444	152.57	2.85	2.63	2.51
Horticulture	82750	198465	139.84	80.07	70.22	64.54
Livestock	12668	40370	218.68	12.26	14.28	15.45
Fisheries	0	1091	100.00	0.00	0.39	0.61
Enterprises	4980	35253	607.86	4.82	12.47	16.89
Total	103346	282624	173.47	100.00	100.00	100.00

3. Component wise contribution to income from horticulture

Data from the Table 30, the major source of additional income as well as total increase in income was from horticulture sector. Horticultural subcomponent-wise analysis revealed that percentage share in additional income was more in vegetable crops. Whereas, the highest percentage increase was recorded in spices to the extent of 397.07 per cent. All the components could generate more than 100 per cent increase in income as depicted in Fig. 28.

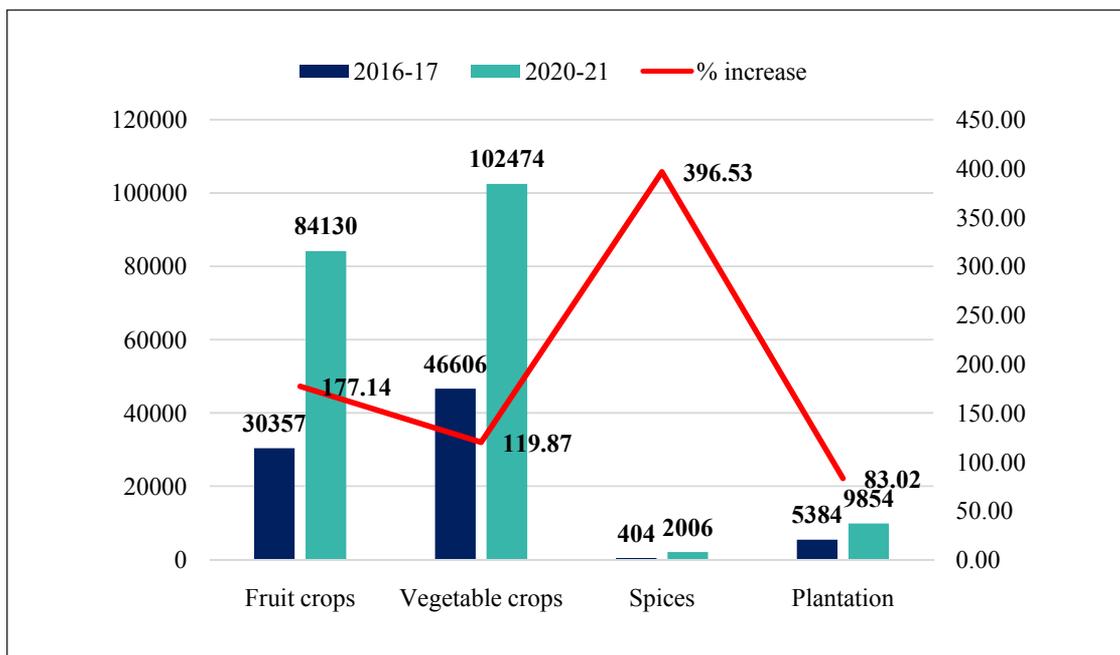


Fig. 28: Share and percentage increase of horticultural components in farmers' income

4. Representation of land categories in DFI success stories

The share of marginal farmers out of 110 respondents was about 82 per cent followed by small farmers who constituted 13 per cent (Fig. 29.).

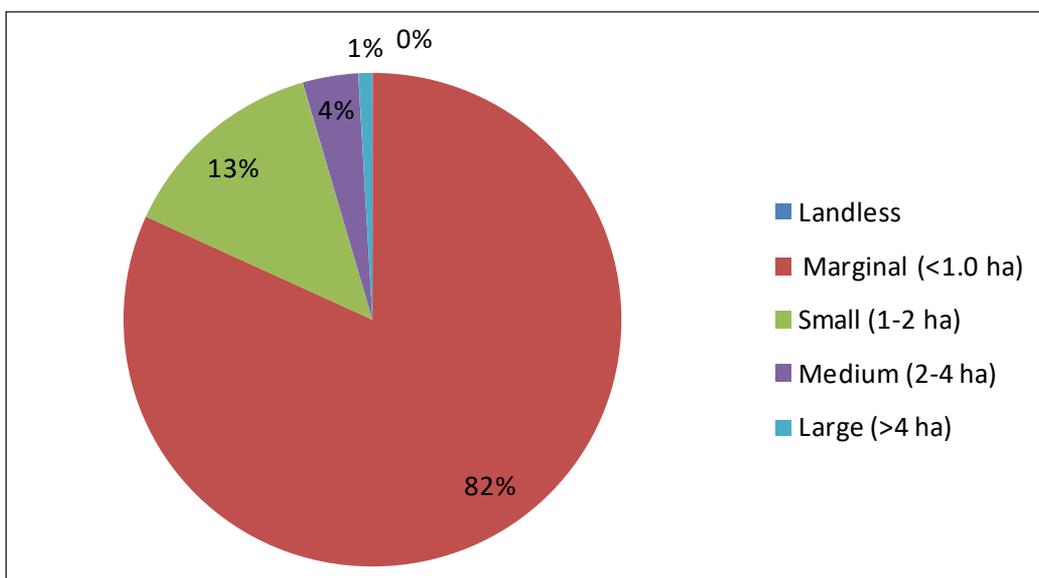


Fig. 29: Proportion of land categories among successful farmers in Thiruvananthapuram district

Farmers from all land classes benefitted from the technical interventions (Table 31). In particular, income of the marginal families increased 2.86 times, the highest for all classes, because of lower benchmark income levels. Income for small landholding households was increased by 2.73 times and all other categories could increase farm household income by 2.5 times.

Table 31: Income level and change in household income by land class

Land class	Household (No.)	Net income (Rs/household)		Change in household income (%)
		2016-17	2021-22	
Marginal (<1.0 ha)	90	78012	223269	186.20
Small (1-2 ha)	15	143335	391561	173.18
Medium (2-4 ha)	4	439994	1005235	128.47
Large (>4 ha)	1	437000	1100100	151.74
Total	110	103346	282624	173.47



Training on bee-keeping



Scientist visiting bee-keeping unit



Farmer practicing mushroom production