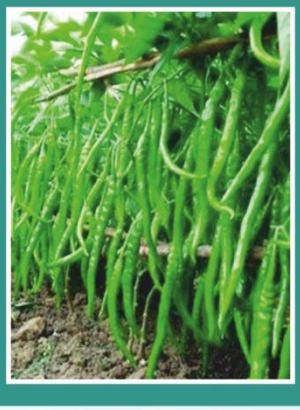
एक जिला एक उत्पाद

One District One Product

Karnataka, Kerala and Lakshadweep

A strategic document by KVKs



भाकृअनुप - कृषि प्रौद्योगिकी अनुप्रयोग अनुसंधान संस्थान

ICAR-Agricultural Technology Application Research Institute
Zone-XI, Hebbal, Bengaluru-560 024

एक जिला एक उत्पाद
One District One Product

Karnataka, Kerala and Lashadweep

A strategic document by KVKs

Compiled and edited by

B. T. Rayudu
D.Harshitha
Akshatha M.K
D. V. Kolekar
Thimmappa K
M. J. Chandre Gowda
D. V. Srinivasa Reddy
M. B. Hanji
L.G.Hiregoudar

ICAR-Agricultural Technology Application Research Institute
Zone-XI, Hebbal, Bengaluru

One District One Product-Karnataka, Kerala and Lakshadweep
A strategic document by KVKs

Compiled and edited by

B. T. Rayudu
D.Harshitha
Akshatha M.K
D. V. Kolekar
Thimmappa K
M. J. Chandre Gowda
D. V. Srinivasa Reddy
M. B. Hanji
L.G.Hiregoudar

Year of publication: 2022

Published by

Dr. V. Venkatasubramanian
Director
ICAR-Agricultural Technology Application Research Institute
MRS, H.A. Farm Post, Bhoopsandra Main Road, Hebbal, Bengaluru-560 024
Email: atari.bengaluru@icar.gov.in; Phone: 080-23510616/23410614

Printed at

Bhandage Graphic Prints
Gadag-582101

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, बेंगलुरु५६००२४
Fax: +91-80-23410615
Email: director.atariblr@icar.gov.in

Dr. V. Venkatasubramanian
डॉ।वी।वेंकटसुब्रमण्यन
Director
निदेशक

PREFACE

The 'One District, One Product' (ODOP) was launched by the Government of India, to help districts reach their full potential, foster economic and socio-cultural growth, and create employment opportunities, especially, in rural areas through value addition and processing these district specific agri-produces. It aims to do this by identifying, promoting and branding a product from one district. The One District One Product scheme aims to turn every district in India, into an export hub through promotion of the product in which the district specialises. The initiative plans to accomplish this by scaling manufacturing, supporting local businesses, finding potential foreign customers and so on, thus helping to achieve the vision of '**AtmaNirbhar Bharat'**.

This publication is the technology backstopping for KVKs in the states of Karnataka, Kerala and Lakshadweep for planning, implementing and promotion of ODOP. I am sure that the contents of this publication serve as technological support for theagri-entrepreneurs, SHGs, FPOs, CIGs etc. in order to establish and upscale the production related to district specific product.

It is my pleasure to congratulate the KVK team of Karnataka, Kerala and Lakshadweep in giving their best for compilation of this document. My congratulations also to Dr.B.T.Rayudu, Dr.DVS Reddy, Dr.M.J.Chandre Gowda, Dr.Thimmappa K, Principal Scientists; Dr.D.V.Kolekar, Scientist,Dr.M.B.Hanji, CTO (Computer), D.Harshitha, YP-II, and Akshatha M.K, SRF of ICAR-ATARI, Bengaluru and Dr.L.G.Hiregoudar, Head and Team KVK, Gadag for their supportive role in coordinating the compilation and editing this publication.

(V Venkatasubramanian)

Bengaluru
16 June 2022

Contents

Contributors

Sr No	Names
1	Dr.Mouneshwari R. Kammar, Senior Scientist & Head and team KVK, Bagalkote
2	Mrs. Rekha B Karabhari, Senior Scientist & Head and team KVK, Belagavi-I
3	Mrs. Sridevi B. Angadi, Senior Scientist & Head and team KVK, Belagavi-II
4	Dr Ramesh B K, Senior Scientist & Head and team KVK, Ballari
5	Dr.Sunilkumar N M, Senior Scientist & Head and team KVK, Bidar
6	Dr.ChandrakalaHanagi, Senior Scientist & Head and team KVK, Chamarajnagar
7	Dr. Krishnamurthy A.T. , Senior Scientist & Head and team KVK, Chikkamagaluru
8	Dr. Kumara, Senior Scientist & Head and team KVK, Chitradurga
9	Dr. T.J. Ramesha, Senior Scientist & Head and team KVK, Dakshina Kannada
10	Dr.Devaraja T.N. , Senior Scientist & Head and team KVK, Davanagere
11	Dr. S. A. Biradar, Senior Scientist & Head and team KVK, Dharwad
12	Dr.L.G.Hiregoudar, Senior Scientist & Head and team KVK, Gadag
13	Dr. Raju G Teggelli, Senior Scientist & Head and team KVK, Kalaburagi-I
14	Dr.SanjeevkumarBellad, Senior Scientist & Head and team KVK, Kalaburgi-II
15	Dr.Rajegowda, Senior Scientist & Head and team KVK, Hassan
16	Dr.Ashoka P, Senior Scientist & Head and team KVK, Haveri
17	Dr.Saju George, Senior Scientist & Head and team KVK, Kodagu
18	Dr. M Papireddy, Senior Scientist & Head and team KVK, Chikkaballapura
19	Sri. K. Thulasiram, Senior Scientist & Head and team KVK, Kolar
20	Dr. M.V. Ravi, Senior Scientist & Head and team KVK, Koppal
21	Dr.Naresh, Senior Scientist & Head and team KVK, Mandya
22	Smt. Divya H.V. , Senior Scientist & Head and team KVK, Mysuru
23	Dr.Pralhad, Senior Scientist & Head and team KVK, Raichur
24	Dr.B.C.Hanumanthaswamy, Senior Scientist & Head and team KVK, Shivamogga
25	Dr. Savita S. Manganavar, Senior Scientist & Head and team KVK, Ramanagara
26	Dr.Nataraju O.R. , Senior Scientist & Head and team KVK, Tumakuru-I
27	Dr.N.Loganandhan, Senior Scientist & Head and team KVK ,Tumakuru-II
28	Dr. B. Dhananjaya, Senior Scientist & Head and team KVK, Udupi
29	Dr.Manju M J, Senior Scientist & Head and team KVK, Uttara Kananda
30	Dr.Shubha.S, Senior Scientist & Head and team KVK, Vijayapur-I
31	Dr.R.B.Negalur, Senior Scientist & Head and team KVK, Vijayapura- II
32	Dr.Amaresh Y.S. , Senior Scientist & Head and team KVK, Yadgir
33	Dr. P. Muralidharan, Senior Scientist & Head and team KVK, Alappuzha
34	Dr. P. Ratha Krishnan, Senior Scientist & Head and team KVK, Kozhikode
35	Dr. Shinoj Subramannian, Senior Scientist & Head and team KVK,Ernakulam
36	Dr. R. Marimuthu, Senior Scientist & Head and team KVK, Idukki
37	Dr.Jayaraj P, Senior Scientist & Head and team KVK, Kannur
38	Dr.Manojkumar T.S. , Senior Scientist & Head and team KVK, Kasaragod
39	Dr.Bini Sam, Senior Scientist & Head and team KVK, Kollam

Sr No	Names
40	Dr.G.Jayalekshmi, Senior Scientist & Head and team KVK, Kottayam
41	Dr.IbraheemKutty .C, Senior Scientist & Head and team KVK, Malappuram
42	Dr.Sumiya K.V. , Senior Scientist & Head and team KVK, Palakkad
43	Dr. Christin P. Robert, Senior Scientist & Head and team KVK, Pathanamthitta
44	Dr.Suma Nair, Senior Scientist & Head and team KVK, Thrissur
45	Dr.Binu John Sam, Senior Scientist & Head and team KVK,Thiruvananthapuram
46	Dr Safia, Senior Scientist & Head and team KVK, Wayanad
47	Dr. P. N. Ananth, Senior Scientist & Head and team KVK, Lakashadweep

Prologue

The unorganized food processing sector in the country comprises nearly 25 lakh food processing enterprises which are unregistered and informal. With only 7% of investment in plant and machinery and 3% of outstanding credit, the unorganized enterprises contribute to 74% of employment (a third of which are women), 12% of output and 27% of the value addition in the food processing sector. Nearly 66% of these units are located in rural areas and about 80% of them are family-based enterprises. Most of these units fall under category of micro manufacturing units in terms of their investment in plant and machinery and turnover.

The unorganized food processing industry in India faces many challenges like lack of productivity and innovation, deficient quality food safety control systems, lack of branding and marketing skills, and low bank credit and capital deficiency. Hence, unorganized micro food processing units, need intensive hand holding support for skill training, entrepreneurship, technology, credit and marketing, across the value chain, necessitating active participation of the state government for better outreach. With this background, One District One Product (ODOP) scheme is designed and launched by Government of India to address these challenges with the aim to enhance the competitiveness of existing micro-enterprises of the food processing industry and to support FPOs and SHGs and Producers Cooperatives along their entire value chain through a package that includes handholding support for up gradation of skills and technology and better access to credit and support for branding and marketing.

The Scheme adopts ODOP approach to reap the benefit of scale in terms of procurement of inputs, availing common services and marketing of products. ODOP for the scheme will provide the framework for value chain development and alignment of support infrastructure. The States would identify the food product for a district, keeping in perspective the focus of the scheme on perishables. The ODOP product could be a perishable produce based product or cereal based product or a food product widely produced in a district and their allied sectors. In addition, certain other traditional and innovative products could be supported under the Scheme. For example, honey, minor forest products in tribal areas, traditional Indian herbal edible items like turmeric, amla, haldi, etc. Support for agricultural produce would be for their processing along with efforts to reduce wastage, proper assaying and storage and marketing. Support for innovative products including for waste to wealth would also be provided in the Scheme. With respect to support to existing individual micro units for capital investment, preference would be given to those producing ODOP products. However, existing units producing other products would also be supported. In case of capital investment by groups, predominately those involved in ODOP products would be supported. Department of Commerce is focusing on agriculture crops on a cluster approach for support for exports under the Agriculture Export Policy and Ministry of Agriculture is also focusing on cluster

approach for development of specific agri produce in districts having comparative advantage. A number of states have adopted similar cluster based development. The ODOP approach of the Scheme would lead to ease in providing common facilities and other support services.

In order to encourageagri-based home scale and small scale enterprises, KVKs under ICAR-ATARI, Bengaluru have prepared a frame work of action plan for their respective district product notified by the Government of India in the form of this publication entitled **'**One District One Product-Karnataka, Kerala and Lakshadweep: *A strategic document by KVKs*' which will be useful to promote district specific products on large scale among Agripreneures, FPOs, SHGs, CIGs etc., as well as serve as ready reference to researchers, extension personnel, administrators, policy makers and other stake holders.

DAVANAGERE – MILLET & ITS PRODUCTS

The area, production and productivity of millets in Davanagere district during 2019-20

Sl. No.	Crop	Area (ha)	Production (t)	Productivity (kg/ha)
1	Sorghum	8386	17579.6	2096.303
2	Finger millet	9040	21999	2433.518
3	Bajra	580	928	1600
4	Other millets	455	375	824.17

Technological backstopping

Crop	Variety	Days	Suitable period for sowing	Yield (Q/acre)
Foxtail Millet	S-118, K-122-1 Ps-4, SIA-326	100 80-85	June- August	6-8
Little Millet	CO-2, PRC-3 OLM-203	90-100 85-90	June-September	5
Kodo Millet	PSC-1, RSK-155 JNK-364, GPUK-3	100-110 100-120	June-July	7-8
Proso millet	GPU-21, TNAU-145 TNAU-151	70-75	June- August	6-7
Barnyad Millet	VL-29, VL-172	85-90	June-September	6-8
Browntop Millet	Local varieties	85-90	June-September	5-6

Scope of PHT

Different value added products are manufactured nowadays and are listed below;

Foxtail millet Hurakki Holige: Hurakki holige is one of the traditional cuisines of North Karnataka. It is prepared using foxtail millet. This culturally accepted traditional food is remunerative for rural entrepreneurs. (Source: UAS, Dharwad).

Foxtail Millet Besan Laddu: Besan Laddu is one of the popular laddus prepared with Bengal gram dhal flour. Substitution of foxtail millet flour enhances fiber and micro nutrient content of laddu. Foxtail millet flour blends very well with Bengal

gram flour in improving its nutritive value in ethnic products of Karnataka. Technology is simple and traditional and is proved to be remunerative for rural entrepreneurs. (Source: UAS, Dharwad)

Millet based Diabetic mix: Type II diabetes needs to be managed by slow digesting carbohydrates and fiber rich diet. Millets are rich sources of complex carbohydrates and dietary fiber. The mix has low glycemic index. This is a low glycemic index food and is suitable for diabetic and hyperlipedemic patients as staple food. It can be consumed in form of Upma or rice and it can be milled in to flour and consumed as mudde or masala roti. (Source: UAS, Dharwad)

		
Foxtail millet Hurakki Holige	**Foxtail Millet Besan Laddu**	**Millet based Diabetic mix**
		
Little millet nippattu	**Sports Food mix**	**Puffs from Pearl Millet**
		
Little millet papad	**Little Millet Chakli**	**Millet cookies**

Sports Food mix: Protein energy ratio of the diet is important for sports people. Formulation of acceptable, easy to consume, natural food based product with good shelf life having optimum combination of nutrients for the people in sports field is need of the hour. It is useful for sports people, children and elderly as a protein and energy supplement. (Source: UAS, Dharwad)

Little Millet Nippattu: Nippattu is a popular South Indian deep fried snack usually prepared from rice flour. Addition of little millet flour enhances nutritional value of nippattu. Processing and better nutritional quality of millets makes it suitable for large scale production of fried snacks. (Source: UAS, Dharwad)

Little Millet Chakli: Chakli a rice and black gram dhal product is one of the deep fried foods that has a large share of snack food industry and is valued for its crispiness. Addition of little millet flour enhances nutritional value of chakli. It replaces rice completely and provides better nutritional quality and suitable for large scale production. (Source: UAS, Dharwad)

Little Millet Papad: Papad is a popular food adjunct, prepared with varied cereals, pulses along with spices. Little millet can also be used for preparation of papads from gelatinized flour. Little millet flour blends well with spices and adds variety to diet. Exotic taste of fired papad is unique. (Source: UAS, Dharwad)

Puffs from Pearl Millet: Pearl Millet (bajra) puffs are product which is a resultant of explosive puffing or gun puffing where the bajra grain is expanded to maximum expansion consistent with the grain identity (similar shape of the grain). It is the RTE (ready to eat) snack . It can be roasted, masala coated and fried and consumed as evening snack. (Source: ICAR-IIMR, Hyderabad)

Instant Dosa Mix: Dosa is an indigenous traditional breakfast food in mostly southern Indian cuisine, which is a pancake made from rice semolina and ground pulses and typically served with a spiced vegetable filling or chutney. Substitution of millets(Sorghum/Foxtail millet/Littile millet/Finger millet) flour, blackgram dhal (2:1), salt; citric acid and sodium bicarbonate were used as main ingredients and mixed uniformly in a blender. The instant dosa mix has high amount of fibre and protein when compared to traditional dosa. It is Gluten Free and safe for Celiac Patients. The shelf life of dosa mix is 6 months. It can be can up as a remunerative activity by rural women.(Source: ICAR-IIMR, Hyderabad)

Instant Pongal Mix: Pongal is a delicious South Indian traditional breakfast recipe, generally prepared from rice and green gram. Incorporation of processed sorghum instead of rice promotes healthy digestion. It fights against Arthritis and Rheumatism. Its shelf life is one year. It can be can up as a remunerative activity by rural women/SHGs or entrepreneurs. (Source: ICAR-IIMR, Hyderabad).

Millet Instant Laddu Mix: Laddu is an Indian sweet made from a mixture of flour/semolina, powdered low calorie sugar, and shortening, which is shaped into a ball. Millet laddu mix is developed from roasted sorghum fine rawa, finger millet flour, pearl millet flour; adding to it powdered low calorie sugar, dry fruits and cardamom are added. The mix has to be mixed with ghee or milk to make round balls before serving.

Millets Cookies: Cookies are popular ready-to-eat product consumed by different age groups in a family. Cookie of 100% millets is prepared using pearl millet, finger millet and foxtail millet flour of superior quality with addition of sugar, milk solids, trans free-fat, salt and nature identical flavoring substances. Pure Millet biscuits are fiber rich and beneficial for all age groups. Low sugar and low fat compared to the market products. It is rich in magnesium, zinc, iron, dietary fiber and protein. (Source: ICAR-IIMR, Hyderabad)

Marketing opportunities

Less than 50 per cent of the population in India consumes millets. It was observed in one study that 49.6 percent of the population consume millets once or twice in a week and 34.9 per cent never consume millets.

Saturday organic bazaar in our KVK campus

- Creating awareness among the school and college students about importance of millets and starting food courts near school and colleges.
- Promoting the cultivation of millets in Kodaganuru cluster and helping the farmers in selling the produce/ product developed from millets through Kodaganuru Taralabalu Amrit Farmers Producer Organization.
- We can promote millet recopies in Mid-day meal scheme.

Efforts made by KVK for the promotion of millets

Introduction of new high yielding varieties

Demonstration of ICM practices in millets

VIII. Methodology(Strategy and Activity plan):

- ✓ Establishment of processing unit for processing of different minor millet crops with special reference to resource poor farmers.
- ✓ Procurement of different suitable types of processing machines for millets that specially suit for present day farmers.
- ✓ Identification of region, crop and land specific equipments and machineries for processing.
- ✓ Feedback from the farmer is necessary for the promotion of large scale processing units in the district. This system will motivate rural youth to establish their own processing units for their profitable business.

Technological interventions proposed by KVK for ODOP

- ➢ Establishment of millet processing, value addition and training centre at Davanagere
- ➢ Training-cum-Demonstration to the Farmers/local entrepreneurs/ Rural youth and women will be conducted in the areas of crop cultivation, selection of quality machineries,
- ➢ Capacity building to improve knowledge and skills on value addition in minor millets through Hands-on-Training Programmes to rural youths and other beneficiary group.
- ➢ Popularization and commercialization of value added products,equipments/ machineries through pamphlets, video, mass media and workshops/seminar/Krishimela.
- ➢ To record and analyze the impact of value added and processed products in the district and also to popularise the importance of value addition in the minor millets

KALABURAGI 1 – PIGEONPEA

Area, Production, Productivity and Socio Economic Importance

Agriculture is the mainstay of Kalaburagi district and its economy is intricately interwoven with the development of agriculture. The climate and soil types of the district make it possible to grow all types of crops. The crop yields have been stagnating during the past two decades. Depletion of soil health, coupled with environmental degradation, has necessitated a new approach with emphasis on organic farming. Increasing cost of production has led to decreasing income for farmers. There is a need to empower farmers to face the competition of globalization. Food security, nutritional security and income security for farmers have to go hand in hand. Keeping in line with these issues, the Karnataka Agricultural Policy 2006 aims at achieving 4.5 per cent growth in agriculture. The policy is based on "Panchasutras" viz., protection and improvement of soil health, conservation of natural resources with special emphasis on water and micro irrigation, timely availability of credit and other inputs to the farmers, integration of post harvest processing with production process and reduction in the distance between lab and land through transfer of technology. The KVK, on the other hand, aims at working towards doubling farmers 'income in the next four years in line with its objectives based on **'Four Strategies'** viz., improving crop/ enterprise productivity, reducing production costs, crop/ enterprise diversification and value chain development including market linkages.

Area, Production and Productivity (Ref. Year 2016-17)

Crop	Area (ha)	Production (Metric tons)	Productivity (kg /ha) and tones per ha
Pigeonpea	397025	250736	776

Agro-climatic zones of the district and their characters

The Kalaburagi district comes under two agro climatic zones. North Eastern Transition Zone (Zone 3) comprising Aland and Chincholi taluks and Northern Eastern DryZone (Z0ne 2) comprising remaining five taluks viz., Jewargi, Kalaburagi, Chitapur, Sedam and Afzalpur.

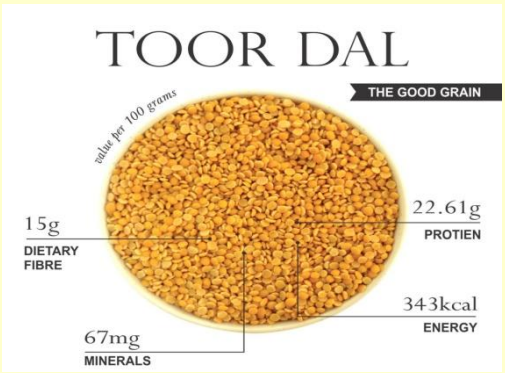
North Eastern Transition Zone: annual rainfall varies from 830-890 mm. About 63% of the rainfall is received du ring the Kharif season. The elevation ranges between 800-900 m in major areas. The soils are shallow to medium black, clay in major areas and lateritic in the remaining areas.

Details of technological backstopping available for the product

Secondary and

Specialty Agriculture in respect of the identified product

Secondary Agriculture –



Speciality Agriculture –

Production of Fortified Rice Analogues using Broken Rice and Dhal

Broken Rice flour

Nutrient mix

Composite flour

Broken Dhal flour

Cold Extruder

Fortified Rice Analogue

Fortified Rice Aanalogues (20 g) for mixing with raw rice (1 Kg)

VALUE ADDED PRODUCTS OF PIGEONPEA

- ✓ **Dhal (Split pulses)**
- ✓ **Ready-to Eat (RTE) *dhal***
- ✓ **Vegetable Pigeonpea**
- ✓ **Fortified dhal**
- ✓ **Dal Chawal and Dal Khichdi RTE**
- ✓ **Instant dhal**
- ✓ **Bisibelebath Mix RTE**

Canned Green Pigeonpeas

Frozen Green Pigeonpeas

BOILED PIGEONPEA SEEDPODS

Canned Green Pigeonpeas

Frozen Green Pigeonpeas

TUR DAL HUSK

- ✓ Rich in Nutrients, Protein & Fibre
- ✓ Ensure good health as well as growth and development of the animals

TUR DAL DRIED HUSK FOR CATTLE FEED

It would be an act of value addition if Tur dal husk are converted into their carbon form and utilize as adsorbent for heavy metals removal.

TUR BHUSA FOR GOAT FEED

TUR STALKS

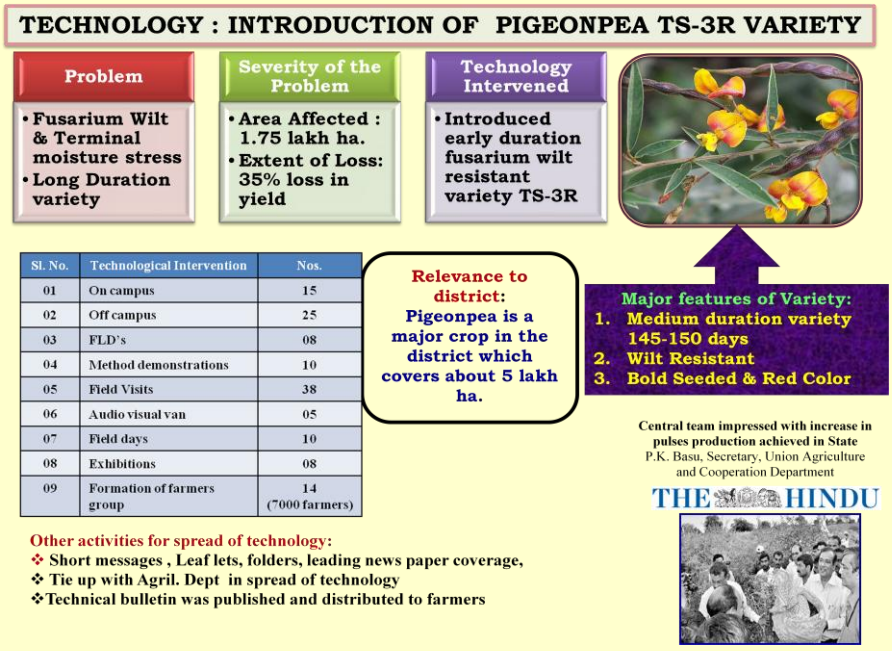
PEA STRAWS FOR CATTLES

IV. Marketing opportunities for the identified product of the district – both domestic and international.

V. Brief on the mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district including the impact created.

Sl. No.	Activity	Title of technology	Area (ha.)
1	FLD	ICM in Pigeonpea (TS-3R Variety)	3,00,000
		Demonstration of Pulse magic spray in Pigeonpea to reduce the flower drop and increase the yield	25,000
		Nipping Technology in Pigeonpea	50,000
		IPM in Pigeonpea	30,000

1. TECHNOLOGY : INTRODUCTION OF PIGEONPEA TS-3R VARIETY



2. Demonstration of Pulse magic spray in Pigeonpea to reduce the flower drop and increase the yield

PULSE MAGIC

Problem	Severity of the Problem	Technology Intervened
• Terminal Moisture Stress • Flower Drop • Low Yield	• Area Affected : 2.0 lakh ha. • Extent of Loss: 20% loss in yield	• Pulse magic spray

Sl. No.	Technological Intervention	Nos.
01	On campus	11
02	Off campus	73
03	FLD's	05
04	Method demonstrations	59
05	Field Visits	164
06	Short Films	50
07	Field days	10
08	Exhibitions	15

Major features of Product: A Unique combination of nutrients and growth regulators

Other activities for spread of technology:
- Short messages , Leaf lets, folders, leading news paper coverage
- Tie up with Agril. Dept in spread of technology
- Technical bulletin was published and distributed to farmers

IMPACT :
1. A Project was sanctioned by NFSM with a fund of Rs. 1.0 crore for production and popularization of the product
2. The Area spread to an extent of 25,000ha. Resulting 375 crores income to the farmers
3. 18-20% increase in Yield

Farmer's Feedback : No Necessary of Grading

3. Nipping Technology in Pigeonpea

NIPPING IN PIGEONPEA BY USING NIPPING MACHINE

Problem	Technology Intervened
• Manual Nipping is Laborious • Less branching	• Nipping at 50 – 55 days of sowing

Activities for spread of technology:
- FLDs, Trainings, Method Demonstrations, Exhibitions
- Short messages , Leaf lets, folders, leading news paper coverage
- Tie up with Agril. Dept in spread of technology
- Technical bulletin was published and distributed to farmers

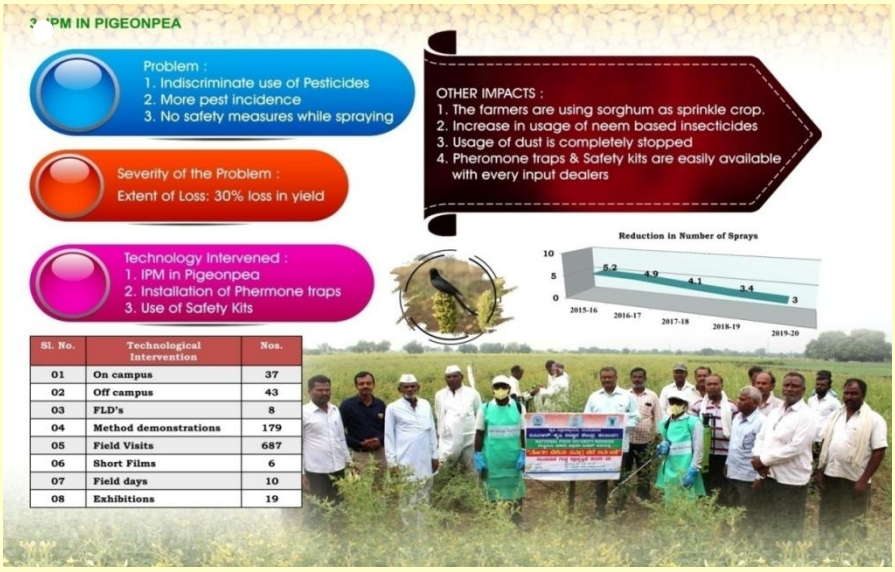
I Thank You for reducing the Drudgery of farmers and contributing the crores of rupees to the nation

Major features of Product: Very economic, Less Drudgery, can be operated by women, Time & Labor saving

IMPACT :
1. More than 20,000 nipping blades were sold which covered an area of 1 lakh acres
2. Increase in yield by 10%

Dr. Rajendra, IAS, Chairman, PPV-FRA, New Delhi

4. IPM in Pigeonpea



Timeline proposed interventions by the KVK in promoting ODOP

Interventions by the KVK in promoting Pigeonpea under ODOP (2021-22)

Sl. No.	Technology	Title of technology	No. of demos	Amount (Rs.)
1	FLD	ICM in Pigeonpea (NFSM)	25	50,000/-
		Demonstration of Pulse magic spray in Pigeonpea to reduce the flower drop and increase the yield	12	9,600/-
		Total	37	59,600/-

Sl. No.	Technological Intervention	Nos.
01	On campus	2
02	Off campus	3
03	Method demonstrations	2
04	Field Visits	5
05	Short Films (MMM)	2
06	Field days cum Exhibitions	1
07	Group discussions	1
08	KMAS	2
09	Publications	5
10	Success Stories	1

KALABURAGI 2 – PIGEONPEA

Area, Production, Productivity and Socio Economic Importance

The Kalaburagi district comes under two agro climatic zones. North Eastern Transition Zone (Zone 3) comprising Aland and Chincholi taluks and Northern Eastern DryZone (Zone 2) comprising remaining five taluks viz., Jewargi, Kalaburagi, Chitapur, Sedam and Afzalpur.

Place/ State	Area (ha)	Production (ton)	Productivity (kg/ha)
Kalaburagi	596689	569078	976
Karnataka (total)	1543308	945939	638

Technological backstopping

- Pigeonpea new varieties
- Intercropping of Pigeonpea with minor millet
- Mechanization in Pigeonpea
- Solar powered equipments for Pigeonpea
- Solar powered equipments for Pigeonpea
- Short duration Pigeonpea varieties to accommodate rabi crops
- Planting methods in Pigeonpea under rainfed kharif
- Solar powered high clearance bullock drawn boom sprayer for Pigeonpea
- Pulse magic
- ICM technologies

Scope of PHT

- Dhal making
- Fortified dhal by CFTRI
- Improved mini-Dhal mill

  Improved mini dhal mill is operated with 3 HP motors and it makes 100-150 kg dal/hr and its work efficiency is 70-74%

Marketing opportunities

The 'Gulbarga tur dal' renowned for its superior quality World over, received Geographical Indication (GI) tag from the government recently. It helps growers to get premium price as well as create export value. Gulbarga alone has some 300 dal mills, with capacities to process 10 to 15 tonnes per day.

Efforts made by KVK for the promotion of Pigeonpea

- Demonstration of improved varieties
- Intercrop of minor millet in Pigeonpea
- Mechanization in Pigeonpea

- Demonstration of Solar powered equipments for Pigeonpea
- Demonstration of Solar powered equipments for Pigeonpea
- Assessment of Short duration Pigeonpea varieties to accommodate rabi crops
- Assessment of planting methods in Pigeonpea under rainfed kharif
- Demonstration of solar powered high clearance bullock drawn boom sprayer for pigeonpea

Interventions by the KVK in promoting ODOP for the identified produce and product

- Demonstrations on improved varieties
- Capacity Development programmes

CHITRADURGA - GROUNDNUT

Chitradurga district is located in the Central Dry Zone of Karnataka and receives average rainfall of 450-500 mm. The major crops of the district are finger millet, maize, pigeonpea, groundnut, cotton, onion, coconut, banana, arecanut and millets. Chitradurga is one among lead district in Groundnut production in the state and is cultivated in 75074 ha as rainfed crop.

Place/ State	Area (ha)	Production (mt)	Productivity (kg/ha)
Chitradurga	75074	30623	429
Karnataka	541121	396697	772

Technological backstopping

- Introduction of seed drill
- Biofertilizers-
- Foliar of 0.1% borax at flower initiation
- INM, IPDM and ICM practices
- Use of micronutrients (4 kg $ZnSO_4$)
- RDF-10:20:10 kg NPK+ 3 t FYM/ acre + 200 kg gypsum/acre
- 19:19:19 fertilizer (10g/l) sprayed at 35 DAS

Scope on PHT

Some of the popular value added products are Groundnut chikki, milk, peanut butter, peanut cookies and roasted peanuts.

Peanut butter

Groundnut milk

Peanut cookies

Marketing opportunities

- Farmer – SHGs - Trader – Broker - Exporter
- Farmer - SHGs - Bakeries
- Farmer - SHGs - Trader Urban Retailer
- Farmer – SHGs - Broker – Trader – Broker - Export
- Farmer - SHGs – Malls
- Farmer - SHGs – Apartments

<table>
<tr><td> 
</td><td>  </td></tr>
<tr><td colspan="2">Assessment of Nano fertilizer (N & Zn) on growth and yield of groundnut</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Seed treatment with biofertilizer</td><td>Line sowing in Groundnut</td></tr>
</table>

Efforts made by KVK for the promotion of Groundnut

Particulars	Numbers
OFT	3
FLD	8
Farmers scientist interaction	15
Field day	05
Training	28
Method demonstrations	10
In collaboration with DOA	15 – trainings, 5 - field days, 15 - Krishi Abhiyan

Technological interventions proposed by KVK for ODOP

- FLD on ICM practices of groundnut
- Capacity building programmes on following topics
  - Training programmes on groundnut cultivation (Innovative technology for groundnut field preparation and cultivation practices)
  - Quality seed production of groundnut and its storage
  - Integrated nutrient management in groundnut
  - Soil and water conservation methods for groundnut cultivation in upland
  - Improved disease management practices in groundnut
  - Appropriate management practices for insect control in groundnut
  - Appropriate weed management practices in groundnut
  - Harvesting and post harvest management practices for groundnut and culinary preparation with value addition in groundnut for better economics return
- Literature on partially defatted peanut flour and value added products will be distributed

YADGIR – GROUNDNUT PRODUCTS

The cropping pattern in the district is mainly dominated by field crops viz., pigeonpea, paddy, cotton, groundnut, chickpea, sorghum and sugarcane are the major crops cultivated in the district. In addition to field crops, horticultural crops also have huge potential for expansion. The average rainfall in Yadgir district is 725 mm with 46 rainy days in a year. The temperature ranges between 26 in winter to 42 ^{0}C in summer. Groundnut is an important oilseed crop in India which occupies first position in terms of area and second position in terms of production. In Yadgir district groundnut is mainly cultivated in both kharif and rabi season.

Technology backstopping

- High yielding varieties such as DH-86, DH-256 and JPBD-4 for seed production and to create seed bank for further season
- Mulching with raised bed and sprinkler irrigation for higher water productivity and resource conservations
- Soil health card based nutrient management for increasing crop yield and reducing cost of fertilizer
- Integrated pest and disease management
- Farm mechanization through conservation seed drill, advance seed cum fertilizer drill and solar operated sprayer timely operation as well as to reduce the labour requirement
- Demonstration of groundnut digger cum elevator and stripper for labour management and to minimize post harvest losses.
- Installation of small scaled oil pressing machine for groundnut oil extraction

A view of cold press groundnut oil extraction unit with a capacity of 350 litres per day at Rulmaur, Yadgir district

Scope on PHT

Groundnut finds wide range of uses in the daily life of the people as well as in the various industries. Half of the groundnut production is crushed into oil for human consumption or industrial uses. Following extraction, the residual cake is processed largely for animal feed. Groundnut is also consumed directly and is used in processed food and snacks. Approximately one-third of world production is used in the confectionery products. Among the various by-products traded in the international market, peanut butter and roasted groundnuts are major and others are salted peanut, groundnut milk, mishi and groundnut chikki, etc.

Marketing opportunities

- There is an existing export market for rice, pigeonpea and cotton which can be exploited for groundnut and its products also
- Huge market demand for peanut butter and roasted groundnuts

Efforts made by KVK for the promotion of Groundnut

Following post harvest processing infrastructure facility for of groundnut are created at KVK

- Power operated groundnut grader
- Mini shelling units
- Mini oil mills
- Groundnut decorticator
- Power operated mini oil pressing unit

THRISSUR – RICE

Agricultural Profile - Area, Production and productivity

Thrissur, the cultural capital of Kerala is located in the central part of Kerala. The district is situated in a hillock, and surrounded by wetlands and is landlocked. Besides its cultural background, Thrissur is mainly an agricultural district where the main crops grown are paddy, coconut, pepper, banana, and vegetables.

The district has a total cropped area of 171398 ha. As per the latest statistics, the area under cultivation of paddy in the district is 21100 ha with a production of 57478 tonnes. The rice requirements in this state are estimated at 3.5 - 4.0 million ton/year. However, Kerala produces only one-fifth of this amount. The deficit in rice production is mounting each year, owing to the decline in the area under rice cultivation. The major rice producing area occurs in the Kole wetlands of the district. With a production of 69,114 tonnes, rice is the most produced crop in the district, followed by tapioca at 56,168 ha and rubber at 15,600 ha in 2017-18. The presence of the Peechi irrigation project with a commandarea of 17,256 ha is a supporting factor. The major rice-growing panchayaths include Pazhayanoor, Adat and Mundathikode. At block level, Anthikkad block accounts for a major share of rice production in the district with 11829.863 tonnes, which is over 19.72 percent of the district production. The local varieties are not commonly cultivated and high yielding varieties like Jyothi, Uma, and Manuratna are favoured by the farmers.

Details of technological backstopping available for the product

Out of the major rice based MSMEs sampled from the district around 90 percent belonged to the micro-enterprises and the 8.7 percent in the small category of enterprises and there was around one percent in the medium enterprises' category. Kudumbasree and SHGs are majoring in food processing enterprises functioning in the district. Even with the decreasing area, the productivity of rice in the district reduces the production gap over the years. This has helped a lot of enterprises to thrive in the district. In turn, the presence of various mills and rice-based enterprises may be cited as a reason for the focus on the crop in the district. Both basic and advanced trainings are organized in the production, management, processing and value addition of rice in the district by various agencies. These organizations have supported the paddy farmers of the district with technology developments that support their livelihood and research findings that help these farmers to augment the same. These organizations include Kerala State Seed Development authority of India, Krishi Vigyan Kendra, Thrissur, KAU Agri Business Incubator, and various research stations of Kerala Agricultural University, State Bio Control Lab etc.

The technologies and products

Kerala Agricultural University has been instrumental in promoting technical developments in rice cultivation by providing high yielding varieties, scientific management techniques, safe plant protection mechanisms, mechanisation packages, and processing and value addition for augmenting the income of farmers. The major products and technologies developed and standardized to empower rice processing by Kerala Agricultural University is briefed below.

1) Brown Rice production protocol
2) Broken rice
3) Puffed Rice
4) Flaked rice
5) Energy Bars/ Nutri bars
6) Ready to Cook pasta
7) Extruded RTE products
8) Health mixes
9) Novel breakfast mixes and Instant products
10) Small scale Parboiling cum milling units and Mini Rice mills
11) Rice bran incorporated food formulations
12) Functional and therapeutical food formulations

Apart from these, germplasm collection of thousands of speciality rice varieties is maintained at KAU as many of the traditional rice varieties possess immense nutritional and therapeutic potential. Traditional rice varieties like *njavara, rakthasali* etc. are used widely in therapeutic food formulations. Farmers and entrepreneurs are provided with information and trainings for nutraceutical formulations using rice as well as rice polishing.

Opportunities for Secondary and Specialty Agriculture in Rice Processing

The by-products of rice have a 2-fold contribution to food sustainability. Firstly, bioactive compounds and nutrients contained in by-products, such as rice bran and husk can be extracted, providing use in food products, as well as generate indirect income. In 2015, global rice bran oil (RBO) market size was estimated at over 1.2 million tons. By-products of rice milling have been utilised within animal production systems, particularly poultry. Broken rice is processed into flour and utilized for different food preparations. Rice flour is hypoallergenic and gluten-free, therefore, it is an alternative for producing gluten-free products. For baby food, puddings, and other food products; food companies prefer rice flour to other flours because of decreased risk for people with sensitivities.

It is estimated that the world's annual production of rice bran amounts to 76 million tonnes. Rice bran can potentially serve as a viable source of protein, fat, and fibre that could have positive impacts on human health. Rice bran is a rich source of E complex vitamins (tocopherols and tocotrienols) and B complex vitamins (niacin, thiamine, pantothenic acid, and pyridoxine), while being the only natural source of γ-oryzanol. Rice bran possesses several unique properties

that render its suitability for niche markets, such as food, nutraceutical, and pharmaceutical industries.

Marketing opportunities for Rice and Rice products

Concerning value-added products, rice processers are purchasing the raw material from the rice mills but not directly from the farmers. Rice after harvest is mainly procured by Supply co - the government agency, directly from farmers. Supply and demand for value-added rice products in the local markets was matching equally and the quantity demanded and supplied was 6364MT/year. The reason for equal demand and supply might be because of the highest area under the rice in the district. There is huge scope for exporting the rice value-added products out of the district, where the supply and demand gap is 300MT/year.

Some of the unique rice varieties of Kerala could also find buyers in other parts of the world. Wayanad Jeerakasala rice and Wayanad *Gandhakasala rice* are two such products. Njavara rice, which is cultivated in 12 districts of Kerala, could also find buyers in foreign markets. Organic rice, brown rice, germinated brown rice etc are also have high demand in the international market. Overseas markets need to be explored for rice and rice products.

Mandated activities undertaken by the KVK during the past 5 years on rice processing

KVK Thrissur has been involved in technology dissemination in various aspects of rice cultivation. Interventions have been made to introduce new and high yielding varieties in the district, which has played a role in increased productivity. Through the on farm trials and front line demonstrations, the KVK could establish the importance of adoption of the scientific crop management practices, proper fertiliser application, and safe use of plant protection agents, emphasise and popularise the IPDM techniques and introduce mechanisation for operations in rice cultivation. Various capacity building programmes in processing and value addition of rice have been conducted Preservation of the knowledge about rice based traditional foods was also done by means of capacity building programmes. The rice producers have been encouraged and supported by the KVK to mill their rice as brown rice and market it under their own brands. This has increased their income and enhanced their entrepreneurial abilities. Many women and young farmers are actively involved in branding and marketing their safe to eat rice in the district.







Interventions by KVK in promoting ODOP

Kerala Bureau of Industrial Promotion (K-Bip) is the state Nodal Agency and Kerala Agricultural University, Thrissur is the state level Technical Institution for the implementation of PMFME scheme in Kerala. Krishi Vigyan Kendra, Thrissur in association with KAU Agri Business Incubator is handling ODOP for Rice as the crop specified for the KVK operational district is rice.

Krishi Vigyan Kendra Thrissur has played a strategic role in technology assessment, dissemination, capacity development and production. KVK is involved in collecting background data regarding the identified crop and its enterprises related to it. KVK associated with Agri Business Incubator of Kerala Agricultural University in conducting the baseline survey to identify the area, production and productivity of the crop and the number of stake holders related to the processing of the crops. KVK SMS (Home Science) was selected as the master trainer and has undergone trainers' training for the master trainers successfully. District level trainers were identified and were trained under the master trainers. The district level trainings were handled by KVK faculty and all the materials required for trainings were prepared and uploaded. Contact sessions for DLTs were also conducted. Hands-on trainings for the identified stake holders were conducted at KVK.

A need assessment among the stake holders was conducted and feasible technologies were suggested. The interested entrepreneurs were introduced to various research and extension centres of KAU for transfer of technology and technical consultancy. Kerala Agricultural University has developed many technologies in food processing and is associated with several industries across the state. Capacity building programmes in rice processing and value addition, with emphasis on transfer of the latest technologies in the sector, are being planned and implemented at the KVK for farmers and entrepreneurs of the district.

ALAPPUZHA – RICE PRODUCTS

Major part of Kuttanad, the rice bowl of Kerala is situated in Alappuzha district. In addition, major part of the Onattukara region and a small portion of Pokkali region also are covered in this district. Both these regions are also known for rice cultivation. In Kuttanad, only a single crop (Late Rabi/early summer) is possible in most of the area, but in a smaller area an additional Kharif crop is possible. From a total area of 40393 ha, about 1.17 lakh tonnes of paddy is produced annually with an average productivity of 2909 kg/ha.

For technological backstopping, two research stations under KAU and the KVK is available. Good Agricultural Practices for cultivation, production, storing and processing of paddy are promoted by these organizations.

Opportunities for products like Red rice, Medicinal Rice, GABA rice, Rice based extruded products, Rice based traditional wafers and Rice based functional foods exist in the district.

Marketing opportunities: Majority of the paddy produced is procured by the state Govt. agency, Civil Supplies Corporation. Remaining quantity is procured by local mills and only a very less quantity is used for value addition.

KVK-Alappuzha has introduced a series of technologies for the promotion of paddy cultivation and value addition in the district through its interventions like OFTs, FLDs, EDPs, capacity building programmers etc. Some of them are

1) HYVs like Prathyasa, Sreyas, Manuratna, Swarnaprabha, Vaishakh etc.
2) Machineries like drum seeder, paddy transplanters, power weeder, Cono weeder, power sprayers, threshers, mini rice huller etc
3) Resource conserving and eco friendly technologies for climate resilience
4) Integrated pest and disease management practices
5) Site Specific Nutrient Management (SSNM) technologies
6) Upland paddy cultivation technologies like modified the drum seeder

KVK further proposes to have technology demonstrations and dissemination on latest technologies through capacity development, production and distribution of technological inputs, and frontline extension programmes for the identified produce and product during 2022-23 depending on the availability of funds and opportunities.

BELAGAVI 1 - SUGARCANE

Belagavi is hub of sugar production since long time. Sugarcane grown in the district is processed and converted into sugar by 25 sugar mills, highest ever in any district of Karnataka. This network of sugar mills throughout the district has been supported by extensive cultivation of sugarcane in all the taluks. Sugarcane based industry provides an excellent potential in promoting the integrated development of sugarcane industry and in transforming the rural economy as dynamic and buoyant industrialized economy. In India Sugar and Jaggery (Gur) is primarily produced from sugarcane. At present a total of 25 sugarcane crushing factories and more than 585 jaggery production units are functioning in the district.

Technological backstopping

Opportunities for Secondary and Specialty Agriculture

It provides employment to over a million people directly or indirectly besides contributing significantly to the national exchequer. The sugar juice is used for making white sugar, brown sugar (khandsari) and jaggery (Gur). The main by-products of sugarcane industry are bagasse and molasses. Bagasse is mainly used as fuel. It is also used for production of compressed fibre board paper, plastic and others. Molasses is used in distilleries for the manufacturing of ethyl alcohol, butyl alcohol, citric acid etc. Rum is the best potable spirit made from molasses. Molasses is also used as an additive to feeds for livestock. Press mud can be used as soil amendment in saline and alkali soils. Green tops of cane are good source of fodder for cattle.

Market opportunities:

The establishment of livelihood business incubation centre for jaggery unit is designed to address the self-employment issues in Belagavi district through entrepreneurship development among rural community. The aim is to build agri-preneurial skill of entrepreneurs through KVK, thus making them business oriented. The Processing unit enhances quality of jaggery manufacturing through improved post-harvest processes, technology, management and value addition. More business opportunities for rural entrepreneurs by strengthening their capacities and entrepreneurial skills. Land holding with facilitation for funding with a view to empowering them to set up own business enterprises Entrepreneurial opportunities for rural youth, employment generation, By-products will be used as manures and export opportunity for Organic Jaggery.

Activities taken by the KVK

KVK conducted many activities on sugarcane production and value addition programmes in farming community. Importance of varieties, modern production

technologies, integrated pest and diseases management, integrated crop management and more emphasis was given to value addition and market linkages.
Impact: Area spread from 1.98 lakh ha (2017-18) to 2.98 lakh ha (2021-22) covering more than 2.5 lakh farmers

Interventions proposed by the KVK

- Created awareness about efficient Jaggery production methods
- Provided technological support for entrepreneurs
- Made Certification through PGS India
- Organized trainings on Packaging and Branding
- Created awareness about market Linkages
- Attended programmes in association with KSDA, Belagavi,
- Created awareness about bi products and value addition of Jaggery products like Solid jaggery (Cube shape),Liquid jiggery, Granular or Powder Jaggery, Bottling of Sugarcane Juice, Nutrition Rich Jaggery,Value-added Jaggery Cubes and Bars, Jaggery chocolate: A novel confectionary product

Action photographs:

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Diagnosing the nutrient deficiency in Sugarcane production</td><td>Interaction with Farmers on Sugarcane pest management</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>A view of ICM practice in Sugarcane ICAR KVK Tukkanatti</td><td>Farmers meeting conducted at farmer field</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Field day organized by ICAR KVK Tukkanatti</td><td>Exposure visit to progressive farmers Jaggery production units</td></tr>
</table>

BELAGAVI 2 - JAGGERY

Agro- climatic Condition, Area, Production and Productivity

Agriculture is main sector of economy in the district, which is about 67% of geographical area, fit for cultivation and is responsible for providing livelihood to nearly 71% of population. The district comes under three agro climatic zones *viz.,* (a) Northern Dry Zone (Zone No. 3), (b) Northern Transitional Zone (Zone 8) and (c) Hilly Zone (Zone No. 9). Annual average rainfall is about 808 mm. Many parts of the district may not receive adequate rainfall. Gross cultivable area is about 9.90 lakh ha, out of total geographical area of 13.44 lakh ha. Major existing soil types are deep black, medium deep black, shallow black, red sandy, red loam and **lateritic.** *Kharif* occupies 67 % of crops followed by *Rabi* (31%) and very little in summer (2%). Crops are irrigated from different sources, which cover 30% of gross covered area. Further, agro-forestry covers mainly on the bunds of farms and animal husbandry plays a pivotal role in providing livelihood security to farmers which mainly includes - dairy, poultry, sheep/goat and inland fisheries.

Sugarcane is major commercial crop of the district covering an area of 2,62,383 ha with a production of 2,06,22,425 and productivity of 104 t/ha in Belagavi district. Due to its large area under sugarcane and establishment of 27 sugar factories in the district, the Belagavi district is rightly called as SUGAR BOWL of Karnataka.

The district is also known for jaggary production. Jaggary making plants are generally small in size. The machineries of the plant are usually fabricated by local people and faces the problem of producing quality jaggery. Table 2 represents the no. of jaggary units in Belagavi district and variety suitable for jaggery production.

Table 2: Jaggary Processing units and Variety suitable for jaggery production

No of Jaggery Units	:	400 No
Sugarcane organic certified growers	:	79.10 ha
Certified organic jaggery units	:	06 No
Varieties suitable for Jaggery production	:	Co-92005, C0-86032, CO-9004, SNK-07680, SNK-9227
Total sugar production of the district	:	19,05,175 t
Average recovery per cent	:	11.69

Sugarcane varieties play a major role in quality production of jaggery. Sucrose content and non-sugars present in sugarcane juice decides the quality and recovery of jaggery. It is imperative that the cane varieties for quality jaggery production should possess softness and low fibre, medium in diameter of stalk, and easily clarificable juice, high sucrose with low reducing sugars. The factors influencing quality of jaggery are as follows

1. Agro-climate
2. N.P. & K fertilization
3. Soil properties
4. Irrigation water
5. Sugarcane cultivation practices
6. Boiling of juice
7. Clarificants: vegetable clarificants and Chemical clarificants
8. Compositing of juice
9. Grading
10. Storage

Technological Backstopping

The list of National institutes working on jaggery production technology is below

1) Agriculture Research Station, Sankeshwar, UAS, Dharwad, Karnataka
2) University of Agricultural Sciences, Bengaluru, Karnataka
3) Sugarcane Breeding Institute, Coimbatore, Tamil Nadu
4) ICAR- Indian Institute of sugarcane Research, Lucknow, Uttar Pradesh
5) S. Nijalingappa Sugar Institute, Belagavi, Karnataka
6) Vasanthdada Sugar Institute, Pune, Maharashtra
7) Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
8) AICRP on Post Harvest Technology, Regional Sugarcane and Jaggery Research Station, Kolhapur, Maharashtra
9) Regional Agricultural Research Station, Anakalapalli, Andra Pradesh
10) G.B.Panth University of Agriculture and Technology, Pantnagar, Uttarakhand
11) Vishweshwarayya Canal Farm, Mandya, Karnataka

Secondary and Specialty Agriculture in respect of the identified products
Secondary Agriculture

Jaggery is a natural sweetener prepared by concentrating the sugarcane juice. Jaggery can be used as a base for number of sweet dishes because of its sweet fragrance and delicious flavour. It contains nutrients like protein, vitamins and minerals like iron and copper. It is also used as an energy food having therapeutic advantage. So, it can be used for blood purification, regular functioning of liver and keeping blood healthy. A good quality jaggery has golden yellow colour, hard texture, crystalline structure, sweeter taste and less moisture content. Jaggery can be in the form of solid, liquid and granuals. In recent days, consumers prefer organic jaggery which is free from chemical like sodium bicarbonate, sulphur dioxide, citric acid, alum, etc. Jaggery is known as 'medicinal sugar' which is used for pharmaceutical formulations. Jaggery improves digestion, helps in cleansing the liver, relieves constipation, boosts energy purifies the blood, anti-toxic and anti-carcinogenic properties, relives tension, treatment of bronchial or lung infections and pre-menstrual syndrome. Jaggery can be added with some different natural flavour like black pepper, ginger, lemon, cardamom etc. and nutrients like protein,

amino acids, peptides, vitamins and phytochemicals (flavonoids, polyphenols, phytosterols, etc.). Jaggery has been used for manufacture of ice cream, milk shake, sapota milk shakes and kulfi, jaggery chocolate etc. Due to number of advantages of jaggery is a better choice as compared to sugar. The organic jaggery is fetching more price as compared to the chemical jaggery

Process of jaggery production

On an average, from 10,000 g of sugar cane around 6500 g cane juice and 3500 g bagasse is obtained. Jaggery is manufactured in three forms i.e., liquid, solid and powder or granular form.

a) **Solid Jaggery:** The clarified, filtered cane juice is pumped into open pans which is heated using triple pan furnace and the bagasse is used as fuel. Herbal clarificant (deola extract @ 45 g/100 kg juice) is used for clarification of juice, to make light coloured jaggery by eliminating impurities in suspension, colloidal and colouring compounds by accumulation. The juice is then boiled in open pan with stirring and concentrated to form jaggery mass in desired shape and size.
b) **Liquid Jaggery:** The intermediate product which can be acquired during concentration of purified sugarcane juice in the course of jaggery making, and is semi-liquid syrup like product. Liquid jaggery is a majorly part of diet in most parts of West Bengal, Maharashtra and is achieving commercial values. The liquid jaggery is being employed as sweetener in foods and drinks in Maharashtra, Kerala, West Bengal, Gujarat, Andhra Pradesh and Tamil Nadu. The chemical and microbial quality of liquid jaggery mostly depends on to the physico-chemical quality of cane juice, striking temperature at which concentrating juice is collected and type of clarificants used. For a good quality liquid jaggery, the concentrated juice is removed from open boiling pan, when it reaches striking point at a temperature of 103- 106 °C, which further depend upon the variety and agro-climatic zone. To eliminate the risk of crystallization and to make liquid jaggery more eye-catching in colour, citric acid is added at a rate of 0.04% (400 mg/kg of liquid jaggery), however to enhance the storage life of liquid jaggery without deterioration in its any quality parameters, potassium metabisulphite at a rate of 0.1% (1 g/ kg of liquid jaggery), or benzoic acid at a rate of 0.5%, is added. Liquid jaggery is then hold undisturbed for 8-10 days at ambient conditions. Later after filtration, it is properly packaged in sterilized bottles. The chemical composition of typical liquid jaggery has about 30 to 36% moisture, 40 to 60% sucrose, 15 to 25% invert sugar, ~0.30% calcium, 8.5 to 10 mg/100g iron, ~ 5mg/100g phosphorus and ~0.10 mg/100g protein.
c) **Granular Jaggery:** The concentrated slurry (TS 58-60%) is worked with wooden scrapper, for formation of grains. The granular jaggery is then cooled and sieved. For a good quality of jiggery, less than 3 mm sized crystals are found to be better. Increasing pH of cane juice with lime solution, up to 6.0 to 6.2, and striking point temperature of 120°C produces

an excellent quality granular jaggery with high sucrose content of around 88.6% with low moisture content of around 1.65%, with good colour, friability and crystallinity. Jaggery in the granular form (about 3 mm), sun dried and reduced moisture content to about 2% or less, and packed in polyethylene polyester bags or polyethylene bottles, can be stored for longer time (more than two years) at ambient temperatures, even during monsoon period with little changes in its physicochemical quality.

d) **Value addition in jaggery:** Jaggery can be added with different natural flavouring components (black pepper, cardamom, ginger, lemon etc.), nutritive ingredient (amino acids, vitamins and phytochemicals), texture improving compounds (additives) and taste enhancers (additives like nuts, cereal, spices and pulses).
e) **Utilization of Jaggery in Dairy and Food Products:** Jaggery has been used for manufacture of ice cream, milk shake, sapota milk shakes and kulfi, jaggery chocolate, jaggery pedha, milk based fortified eggless pudding, coffee, kheers and weaning foods etc.
f) **Jaggery cubes/pellets for tea/coffee/milk:** Jaggery cubes or blocks can be used conveniently at home in our daily preferred food items. We can even use jaggery in a variety of homemade energy drinks and snacks that we want to prepare without sugar.
g) **Jaggery powder:** On an average 10 to 20 kg of jaggery is consumed per person in a year in developing countries like India; a consumer spends Rs. 500-1000 on jaggery annually which indicates a good market potential. Further, the better keeping quality and convenience of usage of properly processed and packaged jaggery powder can be of more value to a consumer
h) **Confectionary products-Jaggery Nutritious bar/energy bar, cookies from cereals & millets and chocolates:** These nutritious bars are easy to make with lots of crunchy nuts and sweetness imparted from jaggery. Delicious and crunchy Oats bars is easy and healthy snack for kids. Healthy no-bake Oat bars are packed with flavor and healthy ingredients, no cholesterol, no refined sugar at all. This energy bar is made of jaggery without addition of sugar. It is made with all healthy ingredients such as rolled oats and millets, varieties of nuts and seeds, dates and raisins.

Speciality Agriculture

a. Biochar

Biochar (BC) is the carbon-rich product obtained when biomass, such as wood, manure, or leaves, is heated in a closed container with little or no available air. In more technical terms, BC is produced by so-called thermal decomposition of organic material under limited supply of oxygen (O2) and at relatively low temperature. Addition of BC to agriculture soils has been projected as a means to improve soil fertility and mitigate climate change. It is indicated that amending BC into soil improves the structure and properties of soil, such as the water-holding

capacity, organic matter content, aeration condition, pH value, cationic exchange capacity (CEC). These properties are the important factors that influence the migration, transformation, and bioavailability of contaminants in soil.

b. Eco-friendly disposable food containers

Eco-friendly bowls are made completely from 100% sugarcane bagasse without any plastic or wax coating. They are certified bio-degradable and compostable and have a strong structural integrity to be able to hold their shape when being used with solid and liquid food. Due to the environmental and human health effects of non-degradable plastic packaging, many people are fighting to drastically reduce plastic production and increase recycling.

Marketing opportunities for the identified product of the district – Domestic and International

Jaggery manufacturing has been one of the most antediluvian practice and significant rural-based cottage industry. It has higher medicinal and nutritional values as compared to other sweeteners, easily available to the rural people and is highly recommendable by health experts. There are number of applications of jaggery in variety of foods and its use in households makes it a better choice as compared to sugar. Also, jaggery is associated with number of health benefits; which makes it a better choice than sugar. Hence, it is catching attention of customers and has demand in international market. The advantages of producing organic jaggery is as follows

- A large number of people are preferring organic jaggery over sugar for daily use due to its health advantages
- Organic jaggery has more shelf life than chemical jaggery
- Organic jaggery is fetching more price than the chemical jaggery
- Organic jaggery has got more demand in India and international market (Netherland, USA, Russia, European countries)
- Value addition to jaggery with flavours like ginger, ashwagandha, etc will enhance the immunity of the consumer
- There is a good opportunity for marketing of organic jaggery through malls, retail outletsand exhibitions
- Jaggery is used as an alternative to sugar in preparation of Ayurvedic medicine

There is good growing demand for jaggery than the traditional refined sugar as process of sugar manufacturing involves more chemical than jaggery. Besides this, the finished product of jaggery contains more nutrients than refined sugar because of its molasses content which is usually removed when making refined sugar. It is because of this fact that, there is a wider scope/opportunities for marketing of the jaggery with increased knowledge about ill effects of chemicals in the present lift style. In addition to this, there is much scope for value addition

with medicinal valued products like Ginger, Ashwagandha, Tulsi *etc.,* which not only provide healthy life but also add flavour to the jaggery. Bringing speciality to jaggery with above value addition, attract the consumers towards enhancing the jaggery usage. Hence, both secondary agriculture and speciality agriculture with respect to jaggery will create adeptness in marketing both at domestic and international markets. 184

Activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Sugarcane is the main commercial crop grown in the district. Farmers of the region are facing problem in gaining good productivity. The productivity is low due to various reasons like cultivation practices, inadequate nutrient management, occurrence of pest and diseases etc. In view of this, KVK identified two prominent problems in the cultivation of sugarcane *i.e*., burning of trash and incidence of white grub. Burning of trash leads to loss of nutrients and carbon emission causing environmental pollution. By burning of trash from one hectare of land accounts for loss of 28 kg of nitrogen, 10.4 kg of phosphorus and 52 kg of potash. These also miss the opportunity of better soil fertility management in sugarcane ecosystem. The other major problem in the district is incidence of white grub which spoil the rhizosphere of sugarcane plant and destroys the crop to the extent that the farmer have to cease the cultivation. To address these problems, KVK has taken up interventions like Frontline demonstrations, trainings, campaigns and supply of technology inputs to sugarcane growers in the KVK jurisdiction. Table 3 presents the technology interventions taken up by the KVK during last 5 years

Table 3: Technology interventions taken up by the KVK

Sl No	Intervention	2016-17	2017-18	2018-19	2019-20	2020-21	Total
1	Technology Assessment	-	-	01	-	02	03
2	Technology demonstration	02	01	01	02	02	08
3	Trainings	12	15	17	25	18	87
4	Extension activities	18	23	31	37	42	151
5	External project	-	-	-	01	-	01
6	Technological inputs *Metarhizium* *Azospirillum* PSB	209 Kg - -	177 Kg - -	2515 Kg 82 Kg 159 Kg	951 Kg & 627 l 172 Kg 126 Kg	2436 Kg & 309 l 59 Kg 355 Kg	6288 kg 936 l 768 kg 686 kg

Among these interventions, the most eye-catching interventions were on crop residue management in sugarcane and Integrated Management of white grub in sugarcane which created huge impact among the farming community. The details of the technology is mentioned below

		
Survey of whitegrub	**Demonstration of solar trap**	**Catch and kill method of whitegrub adults**

KVK interventions in promoting ODOP for the identified produce and product

The lists of technological interventions were selected based on the problems faced by the sugarcane growers in the district. Jaggery making plants are generally tiny in size and the machineries of the plants are fabricated by local artisans or engineering workshops.

Intervention	Title	Implementation time
OFT	Assessment of bio-cultures for in-situ trash management and Assessment of maize and sugarcane top silage as enriched green fodder	Summer- 2021-22
FLD	Management of white grub in sugarcane	*Rabi* - 2021-22
FLD	INM in sugarcane	Summer 2021-22
FLD	Demonstration of harvesting machine in sugarcane	*Rabi* /Summer 2021-22
EDP	Production of different flavoured organic jaggery	Summer 2021-22
Capacity building	• Management of whitegrub in sugarcane • INM in sugarcane • Trash management in sugarcane • Production technology of flavoured organic jaggery	2021-22
Frontline extension programmes	1) Campaign on a) Whitegrub management b) Sugarcane Trash management c) Soil Health Management 2) Formation of FPO - Production of organic jaggery	Ongoing
Production of technology inputs	Bio-fertilizers: *Azosprililum* and PSB Bio-pesticide: *Metarhizium* Sugarcane Seedling production of ruling varieties	Ongoing

 **Training on management of white grub in sugarcane**	 **Interacting with farmers on use of nano fertilizer**
 **Trash Management in Sugarcane**	 **Exposure visit to jaggery unit**

BAGALKOTE - JAGGERY

Area, production, productivity, socio economic importance

Karnataka is one among the major sugarcane and sugar producing states in the country as sugarcane is being cultivated in large areas since many years for production of jaggery, khandsari and white sugar. The jiggery is considered as healthier alternative to white sugar, provides livelihood to millions of agricultural families and their dependents, particularly in rural areas.

According to a recent study, growth rates in area, production, productivity of sugarcane in Bagalkot district were worked out with help of secondary data for the period of seventeen years from 2000 to 2016 and are presented in the Table 1. The results revealed that the area under sugarcane increased over the years at the rate of 4.26 percent whereas the production of sugarcane increased significantly over the years at the rate of 10.25 percent and productivity increased about 0.14 percent annually. The results explain that, the area under sugarcane had been increasing in the district, as it is a commercial crop of high income (Wali et al. 2019). According to recent statistics, the area under sugarcane (both planted and ratoon) accounts to a total of 109065 ha with a productivity ranging from 75 to 77 t/ha.

The Sugar Industry in Karnataka has more than 50 sugar factories distributed well across the state. The major benefits of Karnataka sugar industry are many as it has generated many facilities in the state such as communication, employment and transport. The sugar industry in Karnataka contributes around Rs.36 crore per year to the state exchequer as central excise duty.

It was mentioned that up to the year 2000 there were only 34 sugar crushing mills in Karnataka and from 2000 onwards 15 new mills have commissioned and other 14 are in the pipeline. It is also clear that no sugar mills exist before 1930 in Karnataka. The entire cane grown prior to 1930 was used for making jaggery. During last two decades , the scenario of sugarcane cultivation and processing in Karnataka has changed prominently as compared to the India as a whole. Some of the prize winning farmers in Bagalkot and Belgaum districts of Karnataka have harvested up to 360 tones/ha. The state has large potential to increase the productivity of cane as well as sugar recovery level.

Jaggery is a traditional unrefined non-centrifugal whole cane sugar consumed in Asia, Africa, Latin America, and the Caribbean. Bagalkot and Belgaum districts are the major sugarcane growing belts of Northern Karnataka known for jaggery production. Mahalingapur APMC is hub of the jaggery market.

The demand for jaggery was usually based on colour. Jaggery with light golden yellow colour and firm hardness fetches more price in comparison to other

varieties. The next preferred colours were saffron and golden yellow. Dark brown coloured jaggery has the least demand, which the report says in the main reason for chemical additives. On an average, price difference of Rs.100 to Rs.500 per quintal was found between different varieties of jaggery based on variation in colour and shape.

Need for establishment of jaggery industry in Karnataka:

Jaggery which is still dominating in the preparation of food items in the rural area, is of ancient origin. According to the estimates made, two third of the sweeteners required in the food habits of rural populace is met by jaggery because of the facts that it is not only a chief sources of sweetening in the food habits of rural mass but has considerable linkage in the rural economy. By 2020 the Indian population would be around 1360 million. Considering an average of 40 kg of sweeteners consumption per head per year, the country would produce 54 million tones of sweetener to meet the demand, of which over 40 per cent is met by jaggery alone. This industry requires very less capital investment for establishment and operation and does not require any sophisticated machinery. Further, it is estimated that crushing sugarcane for jaggery, fetches three times more profit than supplying to sugar mills. Over 55-60 per cent of the sugarcane produced in Karnataka is crushed for jaggery production. Apart from creating an employment opportunity to the rural people the jaggery industry provides highly nutritious product at lower cost to the rural poor. It is therefore, imperative to establish this industry in the state by introducing modern equipment and technology; (i) to strengthen the economic status of the rural community, (ii) to encourage decentralized production of jaggery with available locally made equipment and machinery, (iii) to encourage the farmer to harvest the cane with his convenient avoiding transportation cost of cane to the sugar mill and (iv) to create ready market in the neighborhood. Apart from this there will be flexibility in shifting jaggery production into value added sweeteners like, khandsari (brown sugar), rab (massecuite), liquid jaggery, powdered jaggery etc. which might be more beneficial to the jaggery producers.

Technological backstopping

- CFTRI, Mysore
- IICPT, Tanjavore
- CIPHET, Punjab
- SBI Coimbatore, TN
- IISR, Lucknow, UP
- CIAE Bhopal
- University of Agricultural Sciences, Dharwad
- Jaggery park, Mudhol under the aegis of UAS Dharwad
- AICRP-Sugarcane , Sankeshwar
- S. Nijalingapa Sugar Institute Belagavi,
- College of B.Sc (Sugar Science and Technology)

Jaggery is known as a natural, high calorie traditional sweetener, which contains minerals, proteins, glucose and fructose that are naturally present in the sugarcane crop as a result of which it is considered to be healthier as compared to white sugar. The iron content in jaggery that is carried along its processing in iron vessels helps preventing anaemia. Trace amount of mineral salts i.e. 2.8g/100g present in jaggery as compared to that of sugar which contains only 300mg/kg, helps in strengthening the nervous system of the body and also helps take care of the blood vessels. To further add to the list, jaggery is said to be an excellent cleansing agent. Hence, people working in industries like wooden, textile, woollen industries are advised to incorporate jaggery in their daily life regime. This will prevent them from cough, cold & congestion and therefore helps them maintain the quality of life.

Jaggery being highly rich in important minerals (Calcium- 40-100 mg, Magnesium-70-90 mg, Potassium-1056 mg, Phosphorus-20-90 mg, Sodium-19-30 mg, Iron-10-13 mg, Manganese-0.2-0.5 mg, Zinc-0.2- 0.4 mg, Copper-0.1- 0.9 mg, and Chloride-5.3 mg per 100 g of jaggery), vitamins (viz., Vitamin A-3.8 mg, Vitamin B1-0.01 mg, Vitamin B2- 0.06 mg, Vitamin B5-0.01 mg, Vitamin B6-0.01 mg, Vitamin C-7.00 mg, Vitamin D2-6.50 mg, Vitamin E-111.30 mg, Vitamin PP-7.00 mg), and protein-280 mg per 100 g of jaggery, may prove to be beneficial source of food in order to mitigate problems of malnutrition and could also be used to provide instant care to the victims of natural calamities as a result of its various health benefits. Also micronutrients present in jaggery such as Zn, Ca, P may help providing people healthy life along with other benefits such as acting as a blood purifier and curing jaundice and other bile disorders.

Opportunities for Secondary and Specialty Agriculture

With the advent of modernization and introduction of new technologies while quality of sugar has improved to a greater extend in order to cater to the sector specific requirements of the market, there are many avenues to market the jaggery in the following forms

- Moulded jaggery blocks
- Organic jaggery
- Value added jaggery with dry fruits
- Liquid jaggery with dry fruits
- Powder jaggery
- Freeze dried sugarcane juice (SBI Coimbatore)
- Liquid jaggery process (SBI Coimbatore)
- Cane jam production (SBI, Coimbatore)
- Preservation of sugarcane juice/bottling of sugarcane juice
- jaggery spiced with ginger, elachi and such other desirable spices
- Inclusion of nutritive substances like puffed rice, gram, various kinds of nuts, popped grain amaranth, etc., in Jaggery

Marketing opportunities

Jaggery has the largest market through the following channels

- The largest market constitutes the rural, small town and large city population. The main jaggery producing countries are India, Columbia, Pakistan, China, Brazil, Bangladesh, Myanmar and Philippines. Colombia has the largest yearly per capita consumption of jaggery with around 10 Kg for 2009, followed by Myanmar with around 7 Kg/year/capita. Indias yearly per capita consumption is less than 4.0 Kg/year/capita. The consumption of jaggery in the other listed countries lies in the range of 2-4 Kg/year/capita.
- The second largest market for jaggery is its application for the production of alcoholic beverages and in other fermentation industries, both in the producing countries and also for export markets. One of the greatest examples is rum worldwide, Shochu in Japan and Cachaza in Brazil.
- The third market is the household consumption by middle and high income consumers, both in jaggery producing countries and export markets. This market is growing, mainly because of organic jaggery in export markets (International Sugar Organization 2013).
- Finally, a small, still incipient, market of jaggery is its use as a food industry. Main industries using jaggery as an ingredient are the beverage, confectionery, bakeries and sausage industries.

Jaggery Parks/Units available in Bagalkot District

Name	Place	Contact No	Remarks (Organic/ Inorganic)
Organic Jaggery Technology Park, Mudhol	ARS, Mudhol (UASD)	7829891560	Organic
Laxman Billur	Nagaral, Tq-Mudhol	9481879074	Organic
Mr. Janwad	Mugalkhod, Tq-Mudhol		Organic
Paramanand Madarakhandi	Mugalkhod , Tq-Mudhol	8884021714	Both
Gangappa Dodamani	Chimmad, Tq- Rabakavi	9449039238	Both
Shravan Kolhar	Algur, Tq- Jamkhandi	9008150004	Both
Mahalingappa Itnal	Sanganatti, Tq-Rabakavi	8310716071	Organic
Dundappa Sunagar	Mugalkhod, Tq- Mudhol		Both
Ningappa Sunagar	Mugalkhod, Tq- Mudhol		Both
Ganachari Somalingayya	Shirol, Tq-Mudhol		Organic
Bellad	Chimmad Tq- Rabakavi		Both
Prakash Paramagond	Algur, Tq- Jamkhandi	8904288108	Both
Raghu Shinde	Algur, Tq- Jamkhandi	9986025244	Both
Bhimu Phalake	Algur, Tq- Jamkhandi	8618125325	Both
Chidanand Sutar	Navalagi, Tq- Rabakavi	9620293882 9448309559	Both
Mallappa Mirji	Budni, Tq-Jamkhandi	8147140501	Chemical
Mudakappa Yadahalli	Belagali, Tq-Mudhol	990469788	Chemical

Name	Place	Contact No	Remarks (Organic/ Inorganic)
Paramanand Betageri	Belagali Tq-Mudhol		Chemical
Shankarappa Sunagar	Mugalkhod, Tq-Mudhol		Chemical
Ashok Mudalagi	Budni, Tq- Jamkhandi		Chemical
Mallappa Sunagar	Mugalkhod, Tq- Mudhol		Chemical
Basu Avari	Chimmad,Tq-Rabakavi	9945949721	Chemical
Hanamant Nesur	Chimmad, Tq- Rabakavi	9449789264	Chemical
Prakash Vandal	Chimmad, Tq- Rabakavi	9164600782	Chemical
Mudakappa Dodamani	Chimmad, Tq-Rabakavi	8073351443	Chemical
Basu Hallur	Hosur, Tq-Rabakavi	9945284586	Both

Activities undertaken by the KVK during the past 5 years

Details	Total.	2016-17	2017-18	2018-19	2019-20	2020-21
Farm trials (no)	04	-	-	1	2	1
Front Line Demonstrations(no)	14	1	1	8	3	1
On Farm Testing(no)	09	1	2	-	3	3
Metarrhizium production(kg)	2995	388	508	777	821	501

Details of the interventions

I. Farm trials implemented by KVK Bagalkote during last five years

Sl. No.	Title	Year
1	Field evaluation of mycorrhizal consortium in the management of parasitic weed in sugarcane	Kharif 2018
2	Field evaluation of Gluconacetobacter strains in Sugarcane	Kharif 2019
3	Evaluation of Halosulfuron Methyl 75 % WG against Cyperus rotundus in Sugarcane	Kharif 2019
4	Evaluation of Mesortione 40% SC against weed complex in sugarcane	Kharif 2020

II. Front Line Demonstrations implemented by KVK Bagalkote during last five years

Sl. No.	Title	Year	Place
1	ICM in non-arrowing Sugarcane variety, SNK-07680	2016-17	Bagalkote
2	ICM in non-arrowing Sugarcane variety, SNK-07680	2017-18	Bilgi
3	Demonstration of in situ vermiculturing in Sugarcane trash decomposition (K.R)	2018-19	Bagalkot and Bilagi
4	Management of Sugarcane Root Aphid (K.R)	2018-19	Bagalkot
5	Management rootgrub in sugarcane (K.R)	2018-19	Bagalkot
6	Demonstration of micronutrient application in early crop growth stage of Sugarcane	2018-19	Bagalkot

Sl. No.	Title	Year	Place
7	Demonstration of In situ green manuring in Sugarcane	2018-19	Bagalkot and Bilagi
8	Demonstration of mechanized harvesting of sugarcane	2018-19	Mudhol, Hunagund
9	Preservation of green fodder by silage making	2018-19	Bagalkote, Bilgi
10	Entrepreneurship development on value addition to jaggery	2018-19	Mudhol
11	Demonstration of Insitu Green manuring in sugar cane	2019-20	Bilgi
12	Demonstration of Mechanical harvesting of Sugarcane	2019-20	Badami
13	Management of rootgrub in Sugarcane	2019-20	Hunagund, Bagalkote
14	In situ green manuring in Sugarcane	2020-21	Katarki


Demonstration on root grub management in sugarcane

III. On Farm Testing implemented by KVK Bagalkote during last five years

Title	Year	Place
Assessment of effect of in situ vermiculturing in Sugarcane trash decomposition (K/R	2016-17	Bagalkot, Hunagund
Assessing the importance of insitu vermiculturing in sugarcane trash decomposition	2017-18	Ingalagi, Benakatti, Mirji
Assessment of alternate cropping system for sugarcane	2017-18	Bidari
Assessment of different compost culture in sugarcane trash decomposition (R/S)	2019-20	Bagalkote
Assessment of bio pesticide for Root grub management in Sugar cane	2019-20	Bagalkote
Assessment of performance of pulse as intercrop in sugarcane	2019-20	Hunagund
Assessment of different compost cultures for decomposition of sugarcane trash	2020-21	Bagalkote
Assessment of bio-pesticides for root grub (Holotrichia spp.) management in sugarcane	2020-21	Bagalkote
Assessment of coriander varieties as intercrop in sugarcane	2020-21	Bagalkote

Bioagents produced for the management of Root grub - Metarrhizium(Bioagents)

Year	Quantity Produced (kg)
2016-17	388
2017-18	508
2018-19	777
2019-20	821
2020-21	501
	2995 kgs

Metarrhizium Production at KVK Bagalkot

Interventions proposed by the KVK in promoting ODOP

I. On Farm testings (2)

Sl. No.	Title	No. of trials	Scientist
1	Assessment of different compost culture in sugarcane trash decomposition.	5	Ag. Entomology
2	Assessment of coriander varieties as intercrop in sugarcane	5	Horticulture

II. Front Line Demonstrations (4)

Sl. No.	Title	No. of demo	Scientist	New/ Cont
1	Demonstration of Sugarcane variety SnK-9293	05	Agronomy	N
2	Demonstration of silage making from sugarcane top shoots	10	Animal science	N
3	Management of Root grub (Holotrichia spp) in Sugarcane using VL light traps	10	Ag. Entomology	N

Proposal for EDP on Speciality agriculture in sugarcane

1) EDP on mushroom production using sugarcane trash as substrate
2) EDP on speciality agriculture in jaggery

Metarrhizium production 2021-22 - 5 q

Jaggery processing unit at AEEC Mudhol

MANDYA - JAGGERY

Area, production, productivity and socio economic importance

Sugarcane is one of the important commercial crop cultivated in the command areas of Karnataka state. In the State it is cultivated in an area of 4.25 lakh hectares with annual production of 357.3 lakh tonnes of sugarcane with a productivity of 84 tonnes / hectare (Ministry of Agriculture, 2014-15). Karnataka ranks 3rd in the country with respect to area of Sugarcane cultivation.

Sugarcane is one of the major commercial crop grown in Mandya district. Jaggery is one of the most ancient and important rural based cottage industry in the district. The majority of sugarcane growers are manufacturing jaggery with minimum capital investment which creates employement to the unemployed rural people. The jaggery manufacturers are small and marginal farmers relying on quick returns from jaggery. It is therefore essential to safeguard the sugarcane growers to earn more profit from jaggery manufacturing unit

Crop	Sugarcane
Area (ha.)	34083
Sugarcane Production	4.12 lakh tons
Sugarcane Productivity	130 tons/ ha
Jaggery Processing units (Nos.) (Aalemane)	539
Production capacity	3.0 tons per day per unit
Man power required	10 Mandays (For 3.0 tons production)

Table 1: Utilization of Sugarcane for Different Purposes

Year	Sugar cane production ('000' tons)	Sugarcane utilized for production of ('000' tons)			% of Sugarcane utilized for production of		
		White sugar	Seed, feed, chewing etc.	Jaggery & khandsari	White sugar	Seed, feed, chewing etc.	Jaggery & khandsari
1970 to 1980	1,30,096	45,713	16,675	77,708	35.29	11.90	55.81
1980 to 1990	1,85,659	78,527,	22,005	85,125	41.85	11.85	46.31
1990 to 2000	2,65,452	1,37,557	30,408	97,487	51.57	11.59	37.07
2000 to 2010	2,91,370	1,85,706	34,313	70,589	62.92	11.79	25.29

Nutritional and Medicinal Value of Jaggery

The acceptable taste and nutritive value of Jaggery has made it popular since ancient times. Jaggery is also called "*Non Centrifugal Sugar*" or Artisan Sugar. White sugar contains only sucrose (99.70%). Jaggery has sucrose (51.00%), protein (0.25%), glucose (21.20%) and minerals (3.40%) in addition to trace amount of fats (0.02 to 0.03%), calcium (0.39%), vitamin A, vitamin B, Phosphate (0.025%) and provides 383 K cal/100g.

Dietary sucrose (sugar) is a mixed blessing which makes food more attractive and appetizing, but excessive consumption often leads to *various* kinds of pathological conditions like., dental caries, coronary thrombosis, ischemic heart disease, diabetes, hyperacidity, depression, obesity etc., Some studies have also shown that high sugar intake leads to increased cancer risk.

Jaggery is an alternative sweetener to sugarcane and *eco*-friendly too. In Ayurveda**,** Jaggery is considered to be the best of all the preparations made from sugarcane. It serves as a cardiac tonic & it has a cooling and diuretic effect**.**

Details of technological backstopping available for the product

There are many national institutes working on jiggery production technologyfor the benefit of the farming community. The list of National institute working of jaggery production technology is enlisted below;

a) Agriculture Research Station, Sankeshwar, UAS, Dharwad, Karnataka
b) University of Agricultral Sciences, Bengaluru, Karnataka
c) Sugarcane Breeding Institute, Coimbatore, Tamil Nadu
d) ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh
e) S.Nijalingappa Sugar Institute, Belagavi, Karnataka
f) Vasanthdada Sugar Institute, Pune, Maharashtra
g) Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
h) AICRP on Post Harvest Technology, Regional Sugarcane and Jaggery Research Station, Kolhapur, Maharashtra
i) Regional Agricultural Research Station, Anakalaplli, Andra Pradesh
j) G.B.Panth University of Agriculture and Technology, Pantnagar, Uttarkhand
k) Vishweshwarayya Canal Farm, Mandya, Karnataka

Technology backstopping

a. Harvesting cane for Jaggery preparation

- Harvesting at peak maturity (Highest sucrose content)
- For good setting of jaggery the juice purity should be more than 85%
- The top few internodes, which contain more of non- sugars than sugars should be de- topped.

b. Crushing of cane for extraction of juice

- Extraction of juice should be done immediately after harvest (within 24 hrs) to
  prevent inversion of sucrose into glucose and fructose and formation of other
  harmful substances.
- The crusher should be capable of giving at least 65 to 70 per cent juice extraction,
  otherwise there will be loss of sugar in the bagasse.

The juice should be collected in a clean vessel after straining through a fine sieve or multistage filters made of stainless steel with 3mm, 0.5mm and micron size holes respectively.

c. Clarification and boiling of juice

- To avoid solidification and development of dark colour of jaggery adjust pH around 6.4-6.6 then boil the juice
- On vigorous boiling, the non- sugars float on the surface of the boiling juice as scum which is removed as and when formed periodically
- When the clear starts boiling , any one of the available organic clarificants given below may be used to futher calrification

Name of the calrificant	Botanical name	Part to be used	Method of use	Qty to be used in grams for 100 kg of juice
Deola	*Hibiscus ficulneus*	Stem and root of green plant	Pound with water and use the mucilaginous extract	40-45
Bhendi	*Hibiscus esculentus*	Stem and root of green plant	Pound with water and use the mucilaginous extract	45-50
Phalsa	*Grewia asiatica*	Bark of the tree	Pound with water and use the mucilaginous extract	50-55
Semal	*Bombax malabaricun*	Bark of the tree	Pound with water and use the mucilaginous extract	55-60
Sukhlai	*Kydin calycina*	Dry bark of the tree	Soak in water, use the mucilaginous extract	45-60
Castor	*Ricinus communis*	Seed	soak in water, remove the seed coat and use milky extract	70-75

D) Concentration and crystallization of syrup

- After clarification and removal of the scum completely, the juice is boiled vigorously till most of the water is evaporated and juice gets concentrated as syrup.
- The temperature starts raising steadily and at 106 to 108^{o} C, coconut oil is added to the syrup at the rate of 0.2 ml per litre of juice so as to prevent charring of syrup, to promote development of sugar crystallization and good colour.
- When the temperature of the syrup raises to 115 to 118^{0} C (strike temperature), the syrup is ready for transferring to the moulds.
- (Moulds which give shapes like ball is most preferable as it gives least surface area for absorption of moisture during storage. The Jaggery can be made into powder form also by rubbing the cooling magma by a wooden scrapper against the wall of the pan containing the transferred mass)

E) Grading

- The physical properties viz., colour, hardness and texture are important as these affect marketing of jaggery.
- The chemical properties like taste, flavour, sucrose content, reducing sugars, moisture, water insoluble matter, sulphated ash SO2 , etc. based on which different jaggery grading takes place.

F) Preservation of jaggery:

- The keeping quality of jaggery largely depends on the atmospheric humidity and temperature.
- Jaggery is mostly spoiled during the monsoon period because of presence of higher humidity in the atmosphere.
- The major problem associated with jaggery storage is the presence of invert sugars and mineral salts which having hygroscopic nature.
- The hygroscopicity arises from non-sucrose constituents like glucose, fructose and protein, etc. For good keeping quality, moisture content of jaggery should not exceed 6% and be kept at a relative humidity of 43-61%.
- In the coastal region of the country, where atmospheric humidity is very high as well as the higher monsoon rainfall, it is very difficult to store jaggery.

G) Value addition of jaggery

Addition of an aonla :

- Value-added jaggery may fetch better market prices and will have great export potential. Addition of aonla (*Emblica officinalis*) in jaggery has been

done to improve its taste, nutritional value and ultimately to make value added product.

- The process for making jaggery with aonla as a natural source of vitamin C includes processing of aonla in suitable form, quantity to be added and the suitable stage for addition in jaggery.
- Value addition to solid jaggery by inclusion of nutritive substances through puffed rice, gram, sesame and various kinds of nuts

Opportunities for Secondary and Specialty Agriculture in respect of the identified products

Secondary Agriculture

Jaggery is a natural sweetener prepared by concentrating the sugarcane juice. Jaggery can be used as a base for number of sweet dishes because of its sweet fragrance and delicious flavour. It contains nutrients like protein, vitamins and minerals like iron and copper. It is also used as an energy food having therapeutic advantage. So, it can be used for blood purification, regular functioning of liver and keeping blood healthy. A good quality jaggery has golden yellow colour, hard texture, crystalline structure, sweeter taste and less moisture content. Jaggery can be in the form of solid, liquid and granules. In recent days, consumers are preferring organic jaggery which is free from chemical like sodium bicarbonate, sulphur dioxide, citric acid, alum, etc. Jaggery is known as 'medicinal sugar' which is used for pharmaceutical formulations. Jaggery improves digestion, helps in cleansing the liver, relieves constipation, boosts energy purifies the blood, anti-toxic and anti-carcinogenic properties, relives tension, treatment of bronchial or lung infections and pre-menstrual syndrome. Jaggery can be added with some different natural flavour like black pepper, ginger, lemon, cardamom etc. and nutrients like protein, amino acids, peptides, vitamins and phytochemicals (flavonoids, polyphenols, phytosterols, etc.). Jaggery has been used for manufacture of ice cream, milk shake, sapota milk shakes and kulfi, jaggery chocolate etc. Due to number of advantages of jaggery is a better choice as compared to sugar. The organic jaggery is fetching more price as compared to the chemical jaggery

Process of jaggery production

On an average, from 10,000 g of sugar cane around 6500 g cane juice and 3500 g bagasse is obtained. Jaggery is manufactured in three forms i.e., liquid, solid and powder or granular form.

a) Solid Jaggery: The clarified, filtered cane juice is pumped into open pans which is heated using triple pan furnace and the bagasse is used as fuel. Herbal clarificant (deola extract @ 45 g/100 kg juice) is used for clarification of juice, to make light coloured jaggery by eliminating impurities in suspension, colloidal and colouring compounds by

accumulation. The juice is then boiled in open pan with stirring and concentrated to form jaggery mass in desired shape and size.

b) Liquid Jaggery: The intermediate product which can be acquired during concentration of purified sugarcane juice in the course of jaggery making, and is semi-liquid syrup like product. Liquid jaggery is a majorly part of diet in most parts of West Bengal, Maharashtra and is achieving commercial values. The liquid jaggery is being employed as sweetener in foods and drinks in Maharashtra, Kerala, West Bengal, Gujarat, Andhra Pradesh and Tamil Nadu. The chemical and microbial quality of liquid jaggery mostly depends on to the physico-chemical quality of cane juice, striking temperature at which concentrating juice is collected and type of clarificants used. For a good quality liquid jaggery, the concentrated juice is removed from open boiling pan, when it reaches striking point at a temperature of 103- 106 °C, which further depend upon the variety and agro-climatic zone. To eliminate the risk of crystallization and to make liquid jaggery more eye-catching in colour, citric acid is added at a rate of 0.04% (400 mg/kg of liquid jaggery), however to enhance the storage life of liquid jaggery without deterioration in its any quality parameters, potassium metabisulphite at a rate of 0.1% (1 g/ kg of liquid jaggery), or benzoic acid at a rate of 0.5%, is added. Liquid jaggery is then hold undisturbed for 8-10 days at ambient conditions. Later after filtration, it is properly packaged in sterilized bottles. The chemical composition of typical liquid jaggery has about 30 to 36% moisture, 40 to 60% sucrose, 15 to 25% invert sugar, ~0.30% calcium, 8.5 to 10 mg/100g iron, ~ 5mg/100g phosphorus and ~0.10 mg/100g protein.

c) Granular Jaggery: The concentrated slurry (TS 58-60%) is worked with wooden scrapper, for formation of grains. The granular jaggery is then cooled and sieved. For a good quality of jiggery, less than 3 mm sized crystals are found to be better. Increasing pH of cane juice with lime solution, up to 6.0 to 6.2, and striking point temperature of 120°C produces an excellent quality granular jaggery with high sucrose content of around 88.6% with low moisture content of around 1.65%, with good colour, friability and crystallinity. Jaggery in the granular form (about 3 mm), sun dried and reduced moisture content to about 2% or less, and packed in polyethylene polyester bags or polyethylene bottles, can be stored for longer time (more than two years) at ambient temperatures, even during monsoon period with little changes in its physicochemical quality.

d) Value addition in jaggery: Jaggery can be added with different natural flavouring components (black pepper, cardamom, ginger, lemon etc.), nutritive ingredient (protein, amino acids, vitamins and phytochemicals), texture improving compounds (additives) and taste enhancers (additives like nuts, cereal, spices and pulses).

e) Utilization of Jaggery in Dairy and Food Products: Jaggery has been used for manufacture of ice cream, milk shake, sapota milk shakes and kulfi, jaggery chocolate, jaggery pedha, milk based fortified eggless pudding, coffee, kheers and weaning foods etc.
f) Jaggery cubes/pellets for tea/coffee/milk: Jaggery cubes or blocks can be used conveniently at home in our daily preferred food items. We can even use jaggery in a variety of homemade energy drinks and snacks that we want to prepare without sugar.
g) Jaggery powder: On an average 10 to 20 kg of jaggery is consumed per person in a year in developing countries like India; a consumer spends Rs. 500-1000 on jaggery annually which indicates a good market potential. Further, the better keeping quality and convenience of usage of properly processed and packaged jaggery powder can be of more value to a consumer
h) Confectionary products-Jaggery Nutritious bar/energy bar, cookies from cereals & millets and chocolates: These nutritious bars are easy to make with lots of crunchy nuts and sweetness imparted from jaggery. Delicious and crunchy Oats bars is easy and healthy snack for kids. Healthy no-bake Oat bars are packed with flavor and healthy ingredients, no cholesterol, no refined sugar at all. This energy bar is made of jaggery without addition of sugar. It is made with all healthy ingredients such as rolled oats and millets, varieties of nuts and seeds, dates and raisins.

Speciality Agriculture

a. Biochar

Biochar (BC) is the carbon-rich product obtained when biomass, such as wood, manure, or leaves, is heated in a closed container with little or no available air. In more technical terms, BC is produced by so-called thermal decomposition of organic material under limited supply of oxygen (O2) and at relatively low temperature. Addition of BC to agriculture soils has been projected as a means to improve soil fertility and mitigate climate change. It is indicated that amending BC into soil improves the structure and properties of soil, such as the water-holding capacity, organic matter content, aeration condition, pH value, cationic exchange capacity (CEC). These properties are the important factors that influence the migration, transformation, and bioavailability of contaminants in soil.

b. Eco-friendly disposable food containers

Eco-friendly bowls are made completely from 100% sugarcane bagasse without any plastic or wax coating. They are certified bio-degradable and compostable and have a strong structural integrity to be able to hold their shape when being used with solid and liquid food. Due to the environmental and human health effects of nondegradable plastic packaging, many people are fighting to drastically reduce plastic production and increase recycling.

Marketing opportunities for the identified product of the district – Both domestic and international

Jaggery manufacturing has been one of the most antediluvian practice and significant rural-based cottage industry. It has higher medicinal and nutritional values as compared to other sweeteners, easily available to the rural people and is highly recommendable by health experts. There are number of applications of jaggery in variety of foods and its use in households makes it a better choice as compared to sugar. Also, jaggery is associated with number of health benefits; which makes it a better choice than sugar. Hence, it is catching attention of customers and has demand in international market. The advantages of producing organic jaggery is as follows

- A large number of people are preferring organic jaggery over sugar for daily use due to its health advantages
- Organic jaggery has more shelf life than chemical jaggery
- Organic jaggery is fetching more price than the chemical jaggery
- Organic jaggery has got more demand in India and international market (Netherland, USA, Russia, European countries)
- Value addition to jaggery with flavours like ginger, ashwagandha, etc will enhance the immunity of the consumer
- There is a good opportunity for marketing of organic jaggery through malls, retail outletsand exhibitions
- Jaggery is used as an alternative to sugar in preparation of Ayurvedic medicine

There is good growing demand for jaggery than the traditional refined sugar as process of sugar manufacturing involves more chemical than jaggery. Besides this, the finished product of jaggery contains more nutrients than refined sugar because of its molasses content which is usually removed when making refined sugar. It is because of this fact that, there is a wider scope/opportunities for marketing of the jaggery with increased knowledge about ill effects of chemicals in the present lift style. In addition to this, there is much scope for value addition with medicinal valued products like Ginger, Ashwagandha, Tulsi *etc.,* which not only provide healthy life but also add flavour to the jaggery. Bringing speciality to jaggery with above value addition, attract the consumers towards enhancing the jaggery usage. Hence, both secondary agriculture and speciality agriculture with respect to jaggery will create adeptness in marketing both at domestic and international markets.

Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Sugarcane is the main commercial crop grown in the district. Farmers of the region are facing problem in gaining good productivity. The productivity is low due to various reasons like cultivation practices, inadequate nutrient management, occurrence of pest and diseases etc. In view of this, KVK identified some

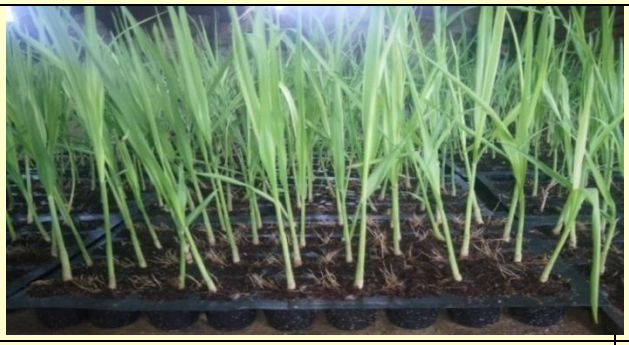
prominent problems in the cultivation of sugarcane *i.e*., Low quality sugarcane seedlings, high cost of cultivation, low yield, early shoot borer and burning of trash. Burning of trash leads to loss of nutrients and carbon emission causing environmental pollution. By burning of trash from one hectare of land accounts for loss of 28 kg of nitrogen, 10.4 kg of phosphorus and 52 kg of potash. These also miss the opportunity of better soil fertility management in sugarcane ecosystem. The other major problem in the district is incidence of white grub which spoil the rhizosphere of sugarcane plant and destroys the crop to the extent that the farmer have to cease the cultivation. To address these problems, KVK has taken up interventions like Frontline demonstrations, trainings, campaigns and supply of technology inputs to sugarcane growers in the KVK jurisdiction. Table 4 presents the technology interventions taken up by the KVK during last 5 years.

Technology interventions taken up by the KVK

Activity	Technology intervention	Achievement
On Farm Testing	Assessment of methods of raising quality sugarcane seedlings	Germination was 80-83% and the cane required for planting was saved
Frontline demonstrations	Popularization of sugarcane variety Co – 99463 (Vishal)	The yield increased upto 10-15% and variety sustained well even under water stress condition
	Integrated management of sugarcane early shoot borer	The management practices helped in increase in yield upto 15% and the quality of cane improved as pest damage was controlled
	Integrated Sugarcane Trash Management	Adoption of integrated sugarcane thrash management improved bud germination and cane yield upto 20.80% , with Net return – 20 to 25%compared to trash burning and improper ratoon management. This technology has spread to an extent of 30,100 ha area.
Farm Trials	Introduction of variety CoVC-16061, CoVC-16062 and CoVC-18061	The varieties introduced yielded more with better sugar yield

Demonstration on sugarcane trash management

Variety introduction



Raising of sugarcane seedling in protrays

Sugarcane single eye bud chip

DHARWAD - MANGO

Area, production, productivity and socio economic importance

- Mango is known as the "peach of the tropics", as it is sweet, refreshing and aromatics.
- India is the world's largest producer (18.77 million tons) by a wide margin, with more than 40% of global production
- Karnataka stands 2nd position w.r.t to area and 3rd position w,r,t production
- Dharwad district : 8,446 ha area with the production of 77,450 t (9.17 t/ha)

Technological backstopping

- Karnataka State Mango Development and Marketing Corporation Ltd.
- ICAR-Krishi Vigyan Kendra, Dharwad
- College of Food technology, UAS, Dharwad
- College of Agriculture, Dharwad
- Central Food Technological Research Institute (CFTRI), Mysore
- Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana, Punjab
- Indian Institute of Food Processing Technology, Thanjavur, Tamil Nadu
- Dept. of Agriculture food processing and engineering, UAS, Raichur
- Indian Institute of Horticulture Research, Bengaluru
- University of Horticultural Sciences, Bagalkot

Opportunities for Secondary and Specialty Agriculture

Due to awareness about health and range of products in mango, the demand is increasing day by day

Food products	Cosmetic products
• Mango pickle • Amchoor powder • Mango chutney • Mango pulp • Canned mango slices • Mango bar • Mango juice • Mango squash • Mango leather • Mango jam • Dehydrated mango	• Moisturizer • Lip balm • Gel • Face scrub • Soap




Marketing opportunities

- Direct sale
- Local market/ weekly outlets
- HOPCOMS
- Retail market
- Online marketing
- Kisan Bandi
- FPOs outlets



Activities undertaken by the KVK during the past 5 years for promotion of mango

Particulars	2016-17	2017-18	2018-19	2019-20	2020-21	2016-2021
FLD	-	-	1 (5)	1 (10)	1 (10)	**3 (25)**
Trainings	-	1 (14)	2 (34)	-	7 (170)	**10 (218)**
Planting material	2640	1007	519	217	916	**5299**
Production of mango special	-	-	-	1 t	2 t	**3 t**





Timeline proposed interventions by the KVK in promoting ODOP

Sl. No.	Technology	Title of technology	No. of demos	Scientist involved
1	OFT	Assessment of different legumes as intercrops in mango orchards	3	Soil Science
2	FLD	Integrated crop management in mango	10	Horticulture
3	FLD	Slow release pheromone traps for management fruit fly in mango	10	Plant Protection
4	FLD	Demonstration of mango ripening chamber	2	Home Science
5	FLD	Popularization of Horti-Poultry model	5	Animal Science
6	EDP	EDP on mango processing	1 SHG	Home Science
7	FFS	FFS on Mango	01	Horticulture
8	Production of Planting material	Alphanso, Kesar, Mallika varieties	500 Nos.	Horticulture
9	Production of Nutrients	Mango Special	2.0 t	Soil Science/ Horticulture

HAVERI - MANGO

India ranks first in world in mango production. The major mango producing states are Uttar Pradesh (23.06%), Andhra Pradesh (16.07%), Karnataka (9.29%), Bihar (7.52%), Gujarat (6.31%) and Tamil Nadu (5.88%). The UK is the country's biggest customer. Popular varieties of mangoes grown in the district include Badami, Mallika, Totapuri, Sindhoora, Raspuri, Malgoa.

Technology backstopping

Technologies developed at ICAR-IIHR, Bengaluru and ICAR- CTSH, Lucknow are listed below;

- Medium density planting in mango (Semi-intensive system)
- Rejuvenation of old and unproductive mango orchards
- Management of irregular bearing in mango
- Micro nutrient deficiency management in mango
- Water management
- Integrated pest and disease management
- Integrated management of post-harvest diseases
- Regulation of Fruit Drop

Scope of PHT

Most often mango is eaten in its raw unprocessed form in both urban and rural areas. Mango pulp is perfectly suited for conversion into juices, nectars, drinks, jams, fruit cheese or to be had by itself or with cream as a superb dessert. It can also be used in puddings, bakery fillings, fruit meals for children, flavours for food industry and also to make the most delicious ice cream and yoghurt. While the raw fruits are utilized for products like chutney, pickle, amchoor (mango powder), green mango beverage, Mango flakes, mango squares, green powder etc. other less known value added products from mango peel are jelly, vinegar, edible fibre, citric acid, cellulase and pectinase. Further mango kernel contains high amount of fat and starch. The oil extracted from kernel is of good quality and could be used in cosmetic and soap industries. The kernel flour (starch) after mixing with wheat or maize flour is used for making chapaties.

Marketing opportunities

- It is common in Haveri district that majority of mango producers leases out their orchard as per contract to the pre harvest contractors.
- Most of the time mango producers sell their produce to consumers and sometimes to retailers because of the market fluctuation and lack of marketing infrastructures.
- The district is well connected with national highway and train facilities.

- Existing of FPOs
- The direct marketing/selling activity where directly to customers through exclusive farmer's owned retail outlet, home delivery and online marketing approaches

Efforts made by KVK for the promotion of Mango

A number of field and extension activities were taken up by KVK Haveri for increasing the production and productivity of Mango namely FLDs (3), OFT (2), field visits (37), disgonstic visits (20), training (8) and method demonstrations (7).

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Mango workshop in KVK Haveri</td><td>Method demonstrations on plant protection measures in Mango at Farmer field</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Visit to OFT Mango orchard</td><td>Maximization of yield through Bee-Keeping</td></tr>
</table>

Technological interventions proposed by KVK for ODOP

Year	On farm testing	Frontline demo.	Capacity development programmes	Training programmes	Method demo.	Field visits	Planting material production
2021-22	01	01	04	08	04	18	1000 No.

MYSURU -BANANA

Area, production and productivity :

Mysuru district can be divided into two agro-climatic zones, Southern dry zone comprising of 4 taluks namely, Nanjangud, T.Narasipur, Mysore and K.R.Nagar and southern transition zone consisting of H.D.Kote, Hunsur, & Periyapatna. Soil is red sandy loam in most of the areas of the district. The annual rainfall ranges from 670 mm to 888.6mm in dry zones and from 611.7mm to 1053.9mm in the transition zone. The average annual rainfall is 782mm. The temperature ranges from 11^0 C to 38^0 C. Thus the climate of Mysore district is temperate with moderate variations in temperature in different seasons.

	Area (ha)	Production (M. tons)	Productivity(M.ton/ha)
Robusta (Pacchabale)	2583.30	79779.24	30.88
Others	10198.77	163160.73	16.00
Total	12782.07	242940	19.01

In Mysuru district, 60,803 hectares is under horticultural crops of which banana cultivation covered nearly 12,782 hectares, as per the Department of Horticulture. The production in 2018-19 was 2,42,940 tonnes and the yield was pegged at 19.01 tonnes per hectare.

The Nanjangud banana, natively called as Nanjangud rasabalehannu, is a variety of banana grown in and around Mysuru district and Chamarajangara district of Karnataka. It is famous for its unique taste and aroma. It was found that the black clay alluvial saline soil found in and around Nanjangud drastically changed the taste and aroma, giving it a particular geographical identity, so it is now registered under geographical indicators under Government of India.

Technologies from CFTRI, Mysuru

- Fruit dehydration
- Technology protocol for export of Banana variety dwarf Cavendish by ship
- Crunchy Banana cereal bar
- Improved Banana fruit Bar
- Process for the preparation of raw Banana powder
- Banana juice
- Liquid fruit (clarified fruit juice)
- Preparation of beverage blends from Banana pseudo stem juice

Technologies from TNAU, Tamilnadu

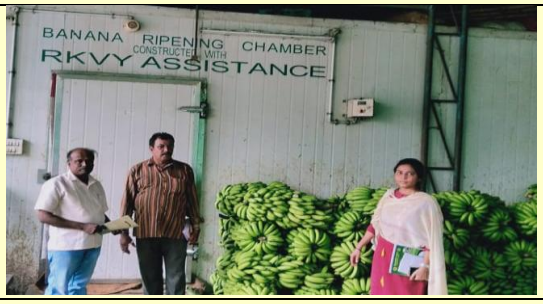
Value added products from Banana

Banana slice, Banana powder, Banana chips, Banana beverages, Banana jam, Banana jelly, Banana squash, Banana wine, Banana stem candy, Banana puree, Banana figs, Banana flower pickle, Banana soup mix from flower and flour, Banana baby food and health drink using banana flour.

Opportunities for Secondary and Specialty Agriculture in the identified products

- Ripening of Banana
- Banana chips
- Banana figs
- Banana powder and its products
- Banana fibre and its products
- Banana psuedostem and its products
- Banana leaves value additions
- Banana mixed fruit jam
- Banana RTS beverages

		
Banana chips	**Banana figs**	**Banana flower pickle**
		
Banana RTS beverages	**Banana fibre bags and decorative items**	**Banana fibre mats**

	
Banana ripening chamber at HOPCOMS, Mysuru	**Traditional method of Banana ripening**

Marketing opportunities for the identified product of the district – Domestic and International.

Banana and Banana value added products will be marketed in domestic way (domestic market) through Farmers Producer Organization, through entrepreneur, through tie-up with industries and Agricultural Product Market Cooperation (APMC).

International – Plan to grow Banana to meet the International market specification. Study the conditions to export the Banana. Major export markets of Indian Banana are UAE, Saudi Arabia, Iran, Kuwait, Bahrain and Qatar.


Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district including the impact created

- Management of Sigatoka leaf spot in Banana
- Intercropping with Integrated Nutrient Management in Banana
- Integrated Pest and Disease management in Banana
- Value addition in Banana and pseudo stem: Conducted training and demonstrations on value addition of banana and pseudo stem.




Timeline proposed interventions by the KVK in promoting ODOP

The proposed strategies and activities planned for setting up of incubation centre and promotion of entrepreneurship through Livelihood Business Incubation Centre is detailed below

1) Setting up of Incubation Centre

The built-up area required for establishment of different infrastructures under incubation centre is as follows

Sl. No.	Description Covered	Space Proposed (Sq. ft)
1	Dedicated Incubation Space	3000
2	Conference Room	1000
3	Meeting Room(s)	1000
4	Office Space	1600
	TOTAL	**6600**

2) Promoting agripreneurship through Livelihood Business Incubation (LBI) Centres

- **Selection of Incubate/beneficiaries***:* A preliminary workshop involving Officers of District Skill Development Department, District Industries Centre and Project Director of National Rural Livelihood Mission and Lead Bank Manager shall be convened to formulate the criteria for selection of potential youths in the age group of 25-30 years. Based on the outcome of the workshop, rural youths shall be selected as incubates for the programme.
- **Assessment of entrepreneurial needs :** Need assessment workshop will be conducted involving various stakeholders in the field of primary and secondary processing of Banana i.e. Scientists of Horticulture college, Mysuru, Scientists from CFTRI Mysuru, Scientists from IIHR, Bengaluru, Private Firms, Exporters and Progressive Banana growers etc. The workshop will focus on entrepreneurial qualities that can be build to promote Banana based products. Workshop will also focus on various value added products that can be promoted and the technology required for promotion. Workshop would supplement the mentoring process for generating innovative ideas as well as entrepreneurship needs. Based on the outcome of workshop, content for training programme will be designed.
- **Capacity Building:** Before launching the project, comprehensive need analysis of the selected entrepreneurs shall be carried out and accordingly capacity building programme shall be designed in each of the identified products. Apart from entrepreneurial capabilities, the beneficiary will also be trained on the essential agri-business skills as per the requirement of selected enterprise. Need based demonstration cum hands on experience on production process of each product line and technology will also be arranged. The selected candidates will be trained in the respective incubation technologies for the specified duration. Apart from hands on training, the candidates will also be exposed to other schemes of State and Central Government Departments for extending financial assistance to set up Banana

based micro-enterprises. Capacity building will also be done for feasible and viable project report preparation for the identified products.

- **Incubation and Mentoring:** After successful incubation training by ICAR JSS KVK, the entrepreneurs will set up their processing units in Banana based products, thus creating new employment opportunities. Mentoring and handholding with regards to value chain development, improving their financial and market access shall be done. Thus converting their ideas into business plans will be done. They will be guided for establishing enterprise/ firm by following activities:

a) The hands on training in selected product shall facilitate the transformation of unemployed youth in to budding entrepreneurs within a period ranging from 1 to 12 months.
b) Trouble shooting in setting up of an enterprise unit including pollution free process, costing and pricing, marketing and working capital management will be addressed.
c) KVK will guide entrepreneurs in testing and quality specifications.
d) KVK will facilitate the entrepreneurs in getting FSSAI license.
e) The business plans that emerged from the previous phase will be shared.
f) Bank and scheme linkages, procurement of equipments and raw materials including installation and commissioning, market support etc. will be facilitated by KVK.
g) The entrepreneurs will be mentored in setting up their business and will be guided over the first few years of operations.

Extension programmes for the identified produce and product.

- Training on Integrated Crop Management in Banana
- Training and demonstration on Banana ripening technology
- Training and demonstration on Banana value added products
- Training and demonstration on Banana fibre extraction and its products
- Organize group meetings, exposure visits and workshops

PALAKKAD - BANANA

Area, Production, Productivity and Socio Economic Importance

Being one of the interior districts of the State, Palakkad is unique in many respects. The continuity of majestic Western Ghats, which stretches over 1000 km, is broken at Palakkad, known as Palakkad gap with a width of 40 km. The climate of the district is greatly influenced by this gap as it enables the north east winds to blow spreading its wings right up to the coast throughout the breadth of the Ghat. The district has a tropical climate, with an oppressive hot season and fairly assured seasonal rainfall. 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. Midland is thick with Coconut, Arecanut, Cashew, Pepper, Rubber, Banana and Paddy cultivation. The eastern region of the district has high mountains, extensive ravines and dense forests. In the Southern part, there are number of orange estates. To the west of this region are the plains broken here and there by some isolated hills and drained mainly by Bharathapuzha and its tributaries

Palakkad is the land of the palmyras and the paddy fields. Food crops constitute the lion's share of agriculture in Palakkad district. Apart from rice, groundnut, black gram, coconut, cotton, ragi, pepper, banana, cashew, sugarcane and pea are also grown abundantly in the district. Palakkad is rightfully called the granary of Kerala and boasts of having over 64% of its geographical area under cultivation.

Banana (Musa spp.), identified as a "tropical treasure" is the most remunerative fruit crop which plays a pivotal role in the income security of farmers. Moreover, Bananas and plantains are deeply linked with the traditional culture of Kerala and the state is known for having one of the largest biodiversity of Musa spp. The crop is adaptable to diverse environmental condition, could be cultivated throughout the year and suited for homesteads as well as an inter-crop. Considering the yield potential and local preferences, farmers select and cultivate definite types, which perform better in that region.

Crop	Area (ha)	Production (Tonnes)
Banana	11997.22	429060
Plantain	7658.46	383102

Source-Department of Economic and Statistics, Kerala (2018-19)

Popular Banana varieties in the district

- Local Varieties : Manjeri, Puliyampatti, Mettupalayam
- HYV : Attunendran, Nedunendran, Swarnamukhi

Socio-economic importance

Nendran banana, an all-time favourite of Malayalis, is widely used both at home and in shops to make the lip-smacking banana fry called 'Pazhampori' in central and northern Kerala and 'ethakka appam' in the southern districts. Moreover, there is a special preference for Nendran banana over other cultivars for commercial cultivation due to consumer choice, multipurpose nature, better keeping quality and connection with Onam and vishu festival. Banana is an essential item in preparing the Vishukkani. Normally, the price of banana shoots up during Vishu and Onam season. But the coronavirus outbreak affected the bananas also and the price nosedived to very low rates.

Banana cultivation is subject to vagaries of nature such as flood, drought and lightning. Assured income from banana helps to boost the economic condition of banana growers individually. In the face of uncertainty and risk faced by the farming community, various schemes have evolved over time to protect farmers against risks, such as guaranteed prices, subsidized credit, and crop insurance. It has been seen that about 32 per cent and 36 per cent of the cost incurred are contributed by hired labour charges in Nendran banana planted in February-March (Kumbha Vazha) and October-November (Ona vazha) respectively. The net income obtained by cultivating Ona vazha was found to be higher. The B: C ratio was relatively higher at 3.32 in Palakkad compared to neighbouring districts owing to the lower costs incurred. Moreover, in Palakkad district, irrigation and bunch weight were found to influence total yield positively. Hence the proposed strategy aims to avail maximum profit to the farmers from the onam market through marketing of raw banana as well as value addition. In order to sustain and scale up the intensive banana cultivation programme and value chain units in the district, more new FPOs would be brought up into banana cultivation as well as more support to individual micro-units shall be done.

Details of technological backstopping available for the product

Banana is a very popular fruit due to its low price and high nutritive value. It is consumed in fresh or cooked form both as ripe and raw fruit. It is a rich source of carbohydrate and is rich in vitamins particularly vitamin B. It is also a good source of potassium, phosphorus, calcium and magnesium. The fruit is easy to digest, free from fat and cholesterol. Banana powder is used as the first baby food. It helps in reducing risk of heart diseases when used regularly and is recommended for patients suffering from high blood pressure, arthritis, ulcer, gastroenteritis and kidney disorders.

Processed products, such as chips, banana puree, jam, jelly, juice, wine and halwa can be made from the fruit. The tender stem, which bears the inflorescence is extracted by removing the leaf sheaths of the harvested pseudostem and used as vegetable. Plantains or cooking bananas are rich in starch and have a chemical composition similar to that of potato.

Banana fibre is eco friendly like jute fibre. The technology of banana fibre extraction has been developed in South India where in a good number of banana fibre extraction units have been running very successfully. Some firms are exporting the banana fibre products. Banana fibre is used to make items like bags, pots and wall hangers. Moreover, rope and good quality paper can be prepared from banana waste. Banana leaves are used as healthy and hygienic eating plates.

Secondary and Specialty Agriculture in respect to the identified product

Secondary Agriculture- Banana commodities through processing and value addition

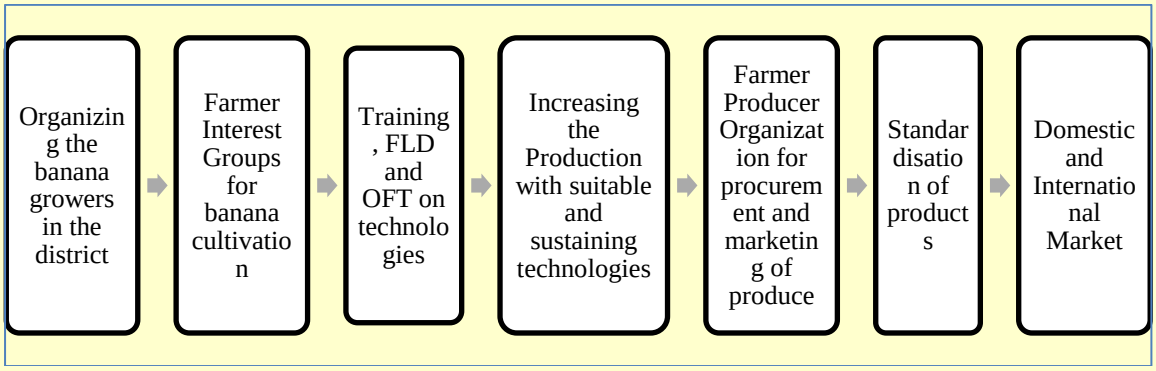
Various products could be derived from every part in banana plant, including the flower, central stem, pseudo stem and banana itself, be it raw or ripe. Banana fig, banana sauce, flower pickle, stem pickle, fibre products from pseudo stem sheaths, and beverages are the various products of which fig and pickles had good export potential. Switching to value-added products would also increase productivity since wastage would be reduced drastically.

Sl. No	Product	Technology used	Source
1.	Pulp, Juice and Concentrate	Pulping and juicing	Acharya N G Ranga Agricultural University
2.	Jam	Pulping	
3.	Toffee	Candy form	
4.	Dried slices/figs	Drying	
5.	Chips	Deep frying in oil	
6.	Flour/Powder	Drying	
7.	Wine	Fermentation	
8.	Fruit bar	Drying	
9.	Canned banana	Canning	
10.	Banana puree	Grinding	
11.	Beverages	Juicing	
12.	Slices	Cutting & drying	
13.	Cheese from peel	Pulping	
14.	Pectin from peel	Pulping	
15.	Vinegar	Pulping, fermentation	
16.	Banana fibre	Extraction	
17.	Banana stem candy	Candy form	
18.	Banana stem pickle	Pickling	KAU
13.	Banana stem squash	Juice Extraction	

Marketing plan for banana

Mostly farmer cultivate and sell the banana locally. Mostly the practices are done individually. Though group farming is practiced through Kudumbasree, VFPCK, Horticorp, NGOs etc, collective efforts in marketing is not well established in the district. Farmers are not involved in post harvest handling or grading of products. Though farmers have the knowhow of value added products, processing enterprises are minimum in number.

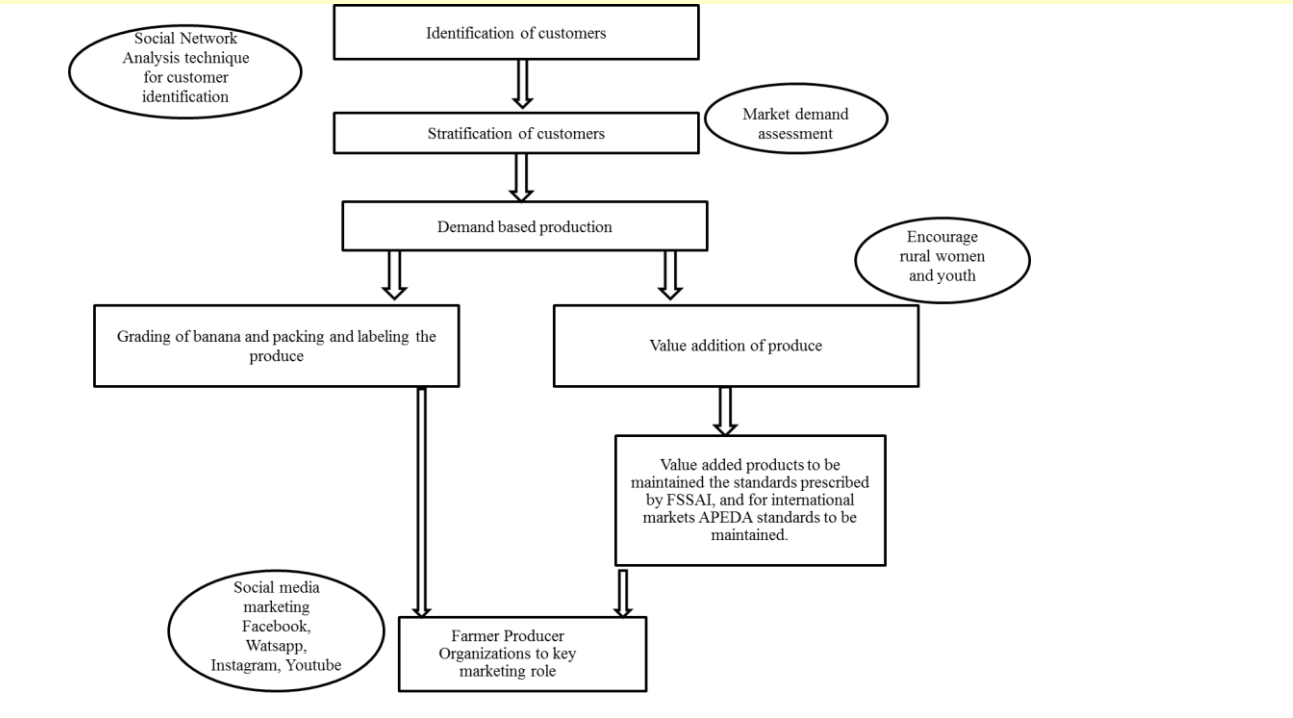
Based on the concept of ODOP, a production and marketing plan for the banana could motivate the farmers in the district.



Key Market Trends

1) Increasing Health Consciousness: Bananas are considered a rich source of vitamin B6, vitamin C, manganese, potassium, dietary fibers, and protein. Bananas contribute to the proper functioning of metabolism, nervous system and aids in the digestion process.
2) Wide variety of products: Bananas are also used in a wide variety of food products, such as breakfast cereals, ice cream, and other desserts apart from raw consumption.
3) Leaves, trunks and inflorescence can be utilized as such for different ceremonies and functions
4) Wide varieties are available and cultivated in the district
5) Organic banana boost sales in market

Marketing strategies for banana marketing



Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

One on farm trial and three frontline demonstrations were conducted by KVK Palakkad in banana during the last five years.

l) An OFT on Management of Pseudostem weevil in banana by EPN, mud swabbing, Beauveria and Nanma was conducted by KVK Palakkad. As the result of the treatment, zero infestation was found in EPN and Nanma application. About 10 percent infestation was found in application of Beauveria. These technologies were also popularised through training programmes.

m) An FLD on application of Sampoorna KAU multi mix Foliar formulation in banana was conducted by KVK Palakkad. It was applied as 10 g/l at 4 months and 6 months of planting.

17 FLDs were conducted at various locations of Palakkad district. The average yield of demo obtained was around 326 q/ha. Percentage increase in yield was 29.3. BCR was 7.04 when compared to 5.3 in the check.

Feedback

Use of sampoorna micronutrient in banana is highly effective in correcting nutritional disorders. There is improved yield. Pest and disease was also less compared to check.

Sampoorna application in banana

n) Demonstration of Dwarf Karpooravally was conducted by KVK Palakkad during 2019-20.

The dwarf karpooravally is shorter in stature with stouter pseudostem. So there is no need of propping and hence less labour requirements. It is a very good intercrop in coconut gardens.

o) An FLD on Precision farming and bunch covering equipment for High density planted banana is being conducted during 2020-21.

p) Paired row planting in banana as well as value added products of banana are proposed to be conducted in 2021-22 as part of special emphasis to ODOP. Trainings as well as awareness programmes on scientific cultivation of banana, integrated pest and disease management of banana, value addition in banana etc will be conducted to women and rural youth through Facebook live and on-campus programmes.

KVK interventions in promoting ODOP for the identified produce and product

Krishi Vigyan Kendra took a lead role in ensuring creation of ODOP units in Palakkad District and imparted trainings along with training manuals especially scientific knowhow of cultivation as well as value addition of banana. Such facility will boost confidence level and help them to start such units in their leadership. KVK Palakkad is also responsible for organizing need based training programmes for the project implementation functionaries of different line departments as well as the farming community. This can be achieved through linkages with other technical and management institutions in the state to support desired training input. The awareness programme will create a new positive thinking and action towards the proper crop management measures as well as value addition. Hence, it will increase the agricultural production and as well as income generation opportunities. The basic outcomes of the strategic proposal is capacity building of the community in terms of enhancing the management and technical skills of farm households in relation to production and postharvest handling of high-value crops like banana, sustainable natural resource management, family health and nutrition, and leadership and organizational skills, in addition to social capital development. KVK Palakkad can pave a way to increase the field level adoption of this technology and ensures positive impact on livelihood enhancement and nutritional security. In addition, this developmental proposal ensures welfare of women and children finally making sustainable livelihood.

Timeline of proposed interventions by the KVK in promoting ODOP

a) Productivity Enhancement

The set of technologies available to boost productivity of banana is still at the outreach of farmers of Palakkad. Hence the potential yield possible from banana could not be realized yet. Hence *in situ* production of inputs, their optimal use and technological interventions are envisaged. The climate of Palakkad is suitable for profitable cultivation of banana. However, farmers of Palakkad are not properly conscious or educated about the commercial potentials of this crop.

b) Capacity building programmes

Even though numbers of technologies are available in production and protection aspects of banana, farmers are still practicing the traditional method. So there is a need for skill based training on production, value addition and marketing concern. Capacity building programmes are planned to start with identification of banana growers in the district. Brainstorming, field visits and focused group discussion to identify the farmer's problem in banana farming will be conducted, and based on this training programmes would be planned effectively. Trainings will be concentrated on successful technologies for

productivity enhancement, value added banana products and innovative marketing strategies for doubling the farmers income.

A Project plan to conduct district workshop on on innovative trends in value addition and marketing of banana has been proposed under State Horticulture Mission programme.

c) Procurement and marketing

Managing the small holdings as a viable production system is a challenge to the farmers, and planners. In this juncture, boosting the morale of small holding farmers through transfer of scientific technologies for market driven production programme is inevitable. This approach envisages developing a system for procurement of marketable surplus in small holdings and marketing them profitable either in raw or processed form.

d) Value Chain Development and Market Linkages

Establishment of viable system of agro-produce procurement centers in rural areas for sale of marketable surplus of small holdings in a profitable manner.

e) Production of value added products

Banana when ripened is a soft and delicate fruit with a post-harvest shelf life of 5- 10 days. This makes it prone to injury during transport. Further, release of ethylene during bulk storage makes the fruit ripen faster and the fruits generally rot before reaching its destination. Hence, it has always being considered a 'problem fruit' with respect to transportation. These reasons contribute to a local market glut, resultant price crash and subsequent disinterest among the farming community to cultivate it on a large scale. It is hence important to overcome this problem by generating an increased demand for this fruit crop. Exploring possibilities of converting banana into a cash crop by developing value added products of commercial interest is one way of solving this problem.

f) Formation of FPOs

Farmers' producer organization (FPO) can be formed with an aim of to ensure better income for the producers through an organization of their own. Small producers do not have the volume individually (both inputs and produce) to get the benefit of economies of scale. Besides, in agricultural marketing, there is a long chain of intermediaries who very often work non-transparently leading to the situation where the producer receives only a small part of the value that the ultimate consumer pays. Through aggregation, the primary producers can avail the benefit of economies of scale. They will also have better bargaining power vis-à-vis the bulk buyers of produce and bulk suppliers of inputs

g) Setting up of a common facility center for food processing

Setting up own food business or developing an existing enterprise is expensive and complex. The food processing incubation units are designed to support the successful development of entrepreneurial self-help groups and farming community through an array of processing support resources and services. It provides all kinds of facilities and training for banana processing at an affordable rate. Processing centers of banana will be set up in common facility center mode under the management of Farmer Producer Company.

Time frame of work- 2 Years

Sl. No.	Objectives	Time frame
1	Productivity Enhancement	June 2021-March 2022
2	Capacity building programmes	Sept 2021- Feb 2022
3	Procurement and marketing	Jan 2022-March 2022
4	Value Chain Development and Market Linkages	March 2022- June 2022
5	Production of value added products	Jan 2022- Sept 2022
6	Formation of FPOs	Jan 2022- Nov 2022
7	Setting up of a common facility center for food processing	Sept 2022-June 2023

KOPPAL - GUAVA

Guava is one of the leading fruit crop of koppal district and is a promising crop for small and marginal farmers. The important varieties of Guava mainly cultivated in the district are Lucknow-49, Alahabad Safeda, Tiwan pink and white. The typically tropical and subtropical climate, favours the production of good quality fruits. Besides guava, Koppal is known for its high-quality mango, custard apple, cashew, Turkey fig, rice, *kavali hannu*, pomegranate, grapes, papaya, vegetables and medicinal and aromatic plants.

Place/ State	Area (Ha)	Production (ton)	Productivity (tons/ha)
Koppala	696	12478	17.92
Karnataka (total)	6430	124067	19.30

Technological backstopping

- High density and ultra high density system of planting
- Improved varieties Arka Poorna, Arka Kiran, Arka Mridula and Arka Rashmi
- Guava cidar
- Guava wilt management by *Aspergillus niger*
- Rejuvenation of old and unproductive guava orchard
- Guava fruit bar
- Guava squash
- Guava RTS
- Guava leather
- Carbonated Beverages

Scope on PHT

Guava is very popular as a fresh fruit because of its excellent taste, high vitamin content and 100% edibility. This fruit is equally important for the processing industry. Several advanced technologies have been developed in guava for value addition and there is immense scope for diversified value-added products of guava. Some of the value added products are;

- Natural jelly: Due to presence of rich amount of pectin, a high-quality natural jelly is obtained from guava
- Processed guava pulp is an excellent raw material for preparation of various other guava products.
- Guava juice, blended RTS beverages, Guava wine, Guava powder, jam, toffee, Cheese, ice cream topping, nectar are some important products of guava.

Marketing opportunities

Koppal guavas are much sought-after in the food processing industry for its natural sweetness and high pulp content. The government is planning to set up a guava fruit processing cluster in Koppal as part of its One District One Product (ODOP) initiative. These guavas will now be exported to Qatar, Germany, Singapore, Oman, Maldives, Canada, UK, Spain and others.

Efforts made by KVK for the promotion of Guava

- ✓ Technical support through GAP and GMP practices given by the KVK scientist during the field visit
- ✓ Technical support to control fruit flies and nematode
- ✓ Participation as resource person during the training and workshop organised by the Department of Horticulture
- ✓ Encouraging the interested farmers thorough department activities

	
Demonstration of Nematode management practices at muddalagundi village	**Plantting and early care of grafted guava seedling during initial period at kakkaragola village**
	
Nutrient management and management of fruit flies kanakagiri village	**Management practices for fruit flies at tavaragera village**

Promotion of Guava products and encouraging to establishment of Small processing unit under MSME programme by Horticulture department

Technological interventions proposed by KVK for ODOP

- ✓ Front Line Demonstration:
  - Demonstration of wilt complex management in Guava
  - Integrated crop management in Guava
  - Introduction of pink colour guava variety Arka Kiran
- ✓ Information dissemination through hand-outs, Television and radio programmes
- ✓ Skill Training Programme on guava Processing and value addition
- ✓ Exposure visit of interested farmers to institute like, IIHR, CFTRI, CIPHET
- ✓ Encouraging farmers to establish processing unit under MSME through Horticulture department

SHIVAMOGGA – PINEAPPLE

In Shivamogga horticultural crops are grown in an area of 121281.00 ha which is about 43.03% of the net cultivable area of the district. Pineapple is mainly cultivated in Sagara and Sorab taluk of the district and during the year 2018-19 pineapple was cultivated in 1475 ha with a production of 87536 t. Heart rot disease incidence, volatile market prices, post harvest losses and less information about value addition are the main constrains for pineapple cultivation in the district.

Place/ State	Area (Ha)	Production (ton)	Productivity (tons/ha)
Shivamogga	1475	87536	59.35
Karnataka (total)	2334	141710	60.72

Technological backstopping

Following production and processing technologies are available for adoption by the farmers of the district

Sl. No.	Name of the technology	Source of the technology
1	**Intercropping in Coconut garden** Planting of pineapple in flat bed with spacing 2 X 1 ft at a distance of 2.5 m from coconut plant	Kerala Agricultural University
2	**Heart rot management in pineapple** • Soil application of *Trichoderma* enriched Neem cake @ 20 gm/hill + Sucker treatment with Metalaxyl MZ @ 0.3% • Drenching with Metalaxyl MZ when disease noticed	UAS, Dharwad
3	Pineapple ready to serve beverage, Jam ,Pickle, Candy, Chips, Pulp extraction and squash	Pineapple Research Station, Vazhakulam
4	**Osmo-dehydrated Pineapple slices** • Steam blanching the pineapple slices for 3-5 minutes • Transfer the slices in Sucrose solution of 70°Brix (1:3 Ratio) for overnight • Dry in a solar cabinet air dryer to a moisture content of 11% for 9 hours. • Store the dried slices in air tight container for 2 to 3 days for sweating to equilibrate the moisture levels in the slices • Immediately pack the slices in Standby pouches (Aluminum and Polypropylene) and label • Store in cool and dry place.	Tamil Nadu Agricultural University

Scope of post harvest technology

- Most of the pineapple growing farmers are large farmers
- Existing of FPOs
- Technical as well as financial support from the FPOs namely Malnad Horticulture Farmers Producer Company Limited and Samara.

Field view of Pineapple

Marketing linkage for Pineapple growers by KVK, Shivamogga

Pineapple as a intercrop in younger arecanut garden at Sagar taluk

Visit to FLD Heart rot infected pineapple plot

Organization of field day by KVK Shivamogga

Marketing opportunities

- Farmers regularly sell their pineapple fruits for Rs.12 / kg to the traders of Shivamogga and neighboring districts. They also sell through middle-men to other states (Maharashtra, Uttar Pradesh and Tamil Nadu).
- Domestic market may be developed for pineapple ready to serve beverage, jam, pickle, candy, chips, pulp extraction and squash at Malls, whole sale dealers, Bazaars, Retail shops, Bakery units, exclusively pineapple oriented shops at taluk levels.
- Linkage with SHGs and FPOs for marketing of products though ICT viz., whatsapp, Face book and on other social media

- Pineapple products (Labeling and branding) patent has to be taken so as to establish international market link through tie up with some MNC.

Efforts made by KVK for the promotion of Pineapple

- FLD on Management of heart rot disease in pineapple
- Crop demonstration on Production technology through FPOs
- To facilitate exposure visits on improved technologies
- With the help of Horticulture department, KVK Shivamogga linked the growers to Horticultural Producers' Cooperative Marketing and Processing Society (HOPCOMS)

Technological interventions proposed by KVK for ODOP

- FLDs on ICM in Pineapple, demonstration on preparation of pineapple jam and pineapple candy
- Training programmes on improved production technology of pineapple and value addition of pineapple
- Method demonstration on osmo-dehydrated pineapple slices

ERNAKULAM – PINEAPPLE

Area, production and productivity

Pineapple is identified as the major product of Ernakulam under ODOP programme. Pineapple cultivation is very extensive in Ernakulam, Idukki, Kottayam and Pathanamthitta and fast spreading to all other districts of Kerala. The area, production and productivity of Pineapple in Ernakulam and Kerala as a whole is presented below:

Place/ State	Area (Ha)	Production (ton)	Productivity (tons/ha)
Ernakulam	5375.62	58571.59	10.89
Kerala (total)	9152.55	93007.80	10.16


A view of pineapple cultivationa and marketing in Ernakulam

Technological backstopping

Pine apple production technologies recommended by Pine Apple Research Station (Kerala Agricultural University), Vazhakkulam, Ernakulam are given below:

- Collection, characterization, documentation, conservation and evaluation of germplasm of pineapple.
- Refinement of propagation and management methods of pineapple and passion fruit
- Development of Organic and Good Agricultural practices for pineapple.
- Management of pest and diseases of pineapple.
- Domestication, evaluation and management of exotic varieties of the mandate fruits
- Identification of subtropical fruit varieties for plains, development of agro techniques for subtropical and temperate fruits
- Identification of fruit crops and varieties suitable for homestead cultivation
- High tech fruit culture (high density planting, fertigation, protected cultivation, canopy regulation, precision farming etc.)

- Technological interventions in fruit crops for sustainable livelihood, employment along with food, health and environment security
- Development of pre and post harvest technologies for enhancing shelf life of major fruit crops
- Product diversification, by-product utilisation and waste management of fruit crops
- Mechanisation in fruit cultivation, harvesting, post harvest handling and processing
- Influence of climatic variations in the performance of fruit crops

Scope on PHT

Vazhakulam Agro and Fruit Processing Company Ltd is a Government of Kerala Undertaking established as per the GO (MS) No.263/13/AD dated 31/08/2013. The company was incorporated under the Companies Act, 1956 (No.1 of 1956) on 23 October 2013. Government of Kerala holds 51% share, Vegetable and Fruit Promotion Council Keralam (successor organization of Kerala Horticulture Development Programme (KHDP) holds 19% and registered farmers hold 30%. They have products from pine apple which include

- Jive punch- A mixed fruit drink with pineapple as main ingredient
- Jive Pineapple fruit syrup

The company has the infrastructure facilities for processing activities like juice extraction, Concentration and Aseptic filling of fruit juices like pineapple and mango. There are facilities for production of Tetrapak Drinks and fruit candies. The factory can process 3500 Kg pineapple per hour inputs of pineapple for juice concentrate production to normally 60º Brix using single stage scrap surface evaporator and 2000 Kg mangoes per hour for mango concentrate to normally 28 º Brix. Mango pulp can also be processed at the rate of 500 kg of mangoes per hour.

In the Ready-To-Serve fruit drinks plant, 6000 packets of Tetrapak packages per hour which are automatically packed to a tray and shrink – wrapped.

Marketing opportunities

- More than 95% is marketed through whole sale agents. Agents collect pineapple from different plantations at matured unripe stage and presently 300 truck load of pineapple are being marketed daily in the peak harvesting season of the year.
- During peak harvest season 2850 tons of pineapple is daily marketed in Ernakulam district.
- Whole sale dealers collect only matured unripe fruits which are 118-120 days old. From hormone application to harvest it takes 115-120 days. Synchronous flowering happens at 6-7 months old healthy plants immediately after hormone application.

- International sales also happens through CIAL- Cochin international Airport through the mediation of whole sale dealers and export agents.

Efforts made by KVK for the promotion of Pineapple

- Conducted testing of IFFCO nano N, Zn, Cu in Pineapple in the year 20-21 in association with IFFCO
- KVK has already conducted 3 trainings on pineapple silage production and pineapple silage models were demonstrated in few exhibitions during 2016-21 period.
- KVK supplied pineapple saplings through KVK farm store for homestead growers through sales melas conducted at CMFRI during 2016-21.
- Minimally processed pineapple cut fruits at KVK Ernakulam farmshoppe

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Nano N,Zn,Cu trial conducted by kvk in association with IFFCO
(plot of mr.vincent , vazhakkulam)</td><td>Promotional activity/campaign conducted by KVK ernakulam for promotion of vazhakkulam pineapple</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td colspan="2">Pineapple sailage production</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Sale of pineapple planting materials by KVK at sales mela</td><td>Minimally processed pineapple cut fruits at KVK for sale</td></tr>
</table>

KOTTAYAM – PINEAPPLE

Agricultural profile of the district with special emphasis on Pineapple

If farming means rubber cultivation for Kottayam, it's pineapple for the farmers during the initial three years of raising the plantation. The fruit has changed the financial well-being of the people of the district. Proximity to Vazhakkulam, India's largest pineapple market adds to the advantage of farmers. The brand Vazhakulam pineapple has become so popular over the years and Kottayam supplies a major share of produce to this market. The interior of the district has luxuriant pineapple plantations which are a common sight.

Pineapple is one of the fruits that is being exported from Kerala and the market spreads from Bengaluru, Delhi, Hyderabad and Ahmedabad, to name a few Indian cities. Outside India, the product has developed and sustains a consistent market in the Gulf countries. The Vazhakulam pineapple was given the Geographical Indication (GI) tag under the Agricultural-Horticultural category with GINo.130attheGIRegistry, Chennai on 4th September 2009. GI registration is the process of endorsing brand protection under WTO guidelines to the producer so fany product known for quality and marketed in the label of a geographic area

Statistics on pineapple cultivation: Kerala vs Kottayam

	Kerala	Kottayam
Area (Ha)	10200	1587
Production(tonnes)	85500	15156
Productivity (t/Ha)	8.4	9.55

Specialities of pineapple cultivation in the district:

Vazhakulam pineapple locally known as 'Kannara' is a Mauritius variety coming under the queen group of the species Ananascomosus. The plant is about 85-90 cm height, leaves spiny, gives yield within 12 months. The average fruit weight is 1.2-1.5 kg. The fruit has a pleasant aroma, slightly conical in shape, fruit 'eyes' deeply placed, fruit flesh is crisp and golden yellow in colour, juice is sweet with 14-16° brix and its acidity is 0.50 - 0.70%. The fruit withstands post harvest handling damages and long distance transport. Vazhakulam pineapple is unique in aroma, flavour and sweetness due to its high sugar content and low acidity. The GI registration has boosted the export of pineapple from the state considerably, besides the high reputation fetching premium price in the international market. The need of the hour is a Vazhakulam pineapple locally known as 'Kannara' is

a Mauritius variety coming under the queen group of the species Ananascomosus. The plant is about 85-90 cm height, leaves spiny, gives yield within 12 months.

Details of technological support available for the product:

- Research and development support by KAU, especially through pineapple research station at Vazhakkulam. Kerala Agricultural University has released a new hybrid pineapple Amritha. It is a hybrid between Kew and Ripleyqueen.
- Well established marketing facility at Vazhakkulam and marketing support by Vegetable and fruit promotion council, Kerala. Kerala has exclusive advantage in producing Mauritius variety, which is highly suitable for export market.
- Updated technologies for processed products like squash, dehydrated fruit, fruit candy, jam and hands on training facilities are made available to the farmers of district.

	
Pineapple juice extracting machine: a demonstration at KVK Kottayam	**Pineapple intercropped rubber plantation in Kottayam**

Opportunities for Secondary and Specialty Agriculture:

Pineapple is the third most important tropical fruit in the world. Processed pineapples are consumed worldwide and processing industries are trying out or using new technologies to retain the nutritional quality of the pineapple fruit. Preserved products such as canned pineapple, fruit juices, dehydrated products and frozen fruits are gaining popularity in the foreign market and are good foreign exchange earners. In India only 2.2% of the total produce is processed as compared to 40 to 83% in developed countries. KVK Kottayam has conducted 4 training programmes exclusively for women on processing aspects of pineapple. An exclusive online session on production and value addition in pineapple was also conducted by Dr. Maya T., Head, Pineapple research station Vazhakkulam.

Marketing opportunities for the identified product of the district

Kerala produces more than 3 lakh tonne of pineapples annually and in the peak production season prices tend to drop sharply due to lack of marketing channels. The 900-member All Kerala Pineapple Farmers' Association (AKPFA), one of the largest pineapple farmers' associations in the country, is engaged in marketing of pineapple to North Indian states by rail. Normally, pineapple is being sent to north India, one of the largest markets for the tropical fruit, by road in trucks, which take 5 days to reach Delhi while by rail, it will reach in 50 hours.Thus, it is possible to offer fresher fruits to the market. Kisan Rail, which was launched on August 2020, was used for sending the fruits by rail.

Mandated activities undertaken by the KVK during the past 5 years on Pineapple:

Major activities undertaken on pineapple include:

- Regular trainings to farmers, especially for women who are ready to start small scale processing units based on pineapple products.
- Trainings on production and crop protection aspects of pineapple.
- Field visits with progressive farmers to model farms.

Various trainings on value addition in pineapple at KVK Kottayam.

PATHANAMTHITTA - JACKFRUIT

Jackfruit (*Artocarpus heterophyllus* Lam.) originated in the rainforests of Western Ghats of India is cultivated throughout the lowlands in South and Southeast Asia and is the state fruit of Kerala. Traditionally known as a poor man's fruit and more than 70% of the fruit produced in the district are being wasted due to various factors such as predominance of nuclear families, lack of processing facilities, shortage of jackfruit specific equipment, poor supply chain management, etc. Jack fruit is being grown in the homesteads of the district without any application of fertilizers and pesticides and therefore it can be considered as default organic crop.

Technological back stopping

Name of Variety	Source	Colour
Muttom varikka	Kerala Agricultural University	Yellow
Sindoor	Kerala Agricultural University	Sunset Orange
Then Varikka	Popular variety recommended for Kerala by KAU	Golden yellow
Srilanka Jack	Introduced Variety recommended for Kerala by KAU	Yellow
PLR 1(Palur-1)	Tamil Nadu Agricultural University	Golden yellow
PPI 1	Tamil Nadu Agricultural University	Yellow
PLR (J) 2	Tamil Nadu Agricultural University	Yellow
Burliar 1	Tamil Nadu Agricultural University	Yellow
Velipala	Local Selections from Tamil Nadu by TNAU	Yellow
Singapore	Local Selections from Tamil Nadu by TNAU	Yellow
Hybrid jack	Local Selections from Tamil Nadu by TNAU	Yellow
Thanjavur jack	Local Selections from Tamil Nadu by TNAU	Yellow
Panruti selection	Local Selections from Tamil Nadu by TNAU	Yellow
Swarna	University of Agricultural Sciences , Bengaluru	Golden brown
GKVK-1	University of Agricultural Sciences , Bengaluru	Yellow
Konkan Prolific	Regional Fruit Research Station, Vengurle, Dr. Bala Saheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra	Golden yellow
Siddu	Farmer Variety released by ICAR-IIHR	Coppery Red
Shankara	Farmer Variety released by ICAR-IIHR	Coppery Red

Scope on PHT

Jackfruit has tremendous scope for value addition and processing. Current situation of wastage happening in the jackfruit sector is due to factors like high variability, poor supply chain management and almost nil processing. Opportunities in secondary agriculture related to Jackfruit can be grouped in to RTC (ready to cook), RTE (ready to eat) and value-addition. Many small

processing units have come up in the past three - four years, making a series of Jackfruit products. There is a huge, untapped potential. Minimal Processing of Jackfruit will generate a lot of rural employment and augment the rural economy.

Also in Jackfruit various traditional products are available such as dehydrated tender jackfruit, mature jackfruit flakes, dehydrated jack seed, jackfruit bulb powder, jackfruit seed flour, whole jack fruit powder, preserved jackfruit bulbs, ready-to-serve jackfruit beverages, squash, nectar, vinegar, canned jackfruit products, osmo-air dried ripe jackfruit slice, jackfruit bar, ice-cream, pickles, chips, papad, sweets, jelly, mixture, roasted nuts. Some of the special products of jackfruit were vacuum fried chips, retorted jackfruit products, frozen jackfruit products and extruded products.

Marketing opportunities

The price per fruit varies from market to market. The supply chain management system for jack fruit is poorly developed in the district. However, private players who collect fruits in the immature and mature stages from farmers do exist and the intervention of various agencies for streamlining the activities has resulted in better price realization by the farmers for Jackfruit.

- Promoting Farmers' Co-operative for Jackfruit Marketing
- Exploring Export Markets: The frozen jackfruit, vacuum fried chips, jackfruit pulp, dried jackfruit bulbs, dehydrated canned unripe jackfruit have good potential for export.

Efforts made by KVK for the promotion of Jackfruit

- During 2009 KVK organized the first State Level workshop: Panasam 09.
- During the period 2012-14, established Primary Processing Hub for Jackfruit (PPHJ) with the financial support of Rs. 52.55 lakhs from Department of Agriculture.
- Under the KVK revolving fund a Jackfruit root trainer nursery was established with a production capacity of 2000 grafts per annum. The quality grafts popular varieties are being produced and distributed to farmers.
- KVK provides technical support to the entrepreneur's through guidance in business plan preparation, training and skill development, guidance for establishment of independent production unit.
- Various training, field visits, advisories and other extension activities undertaken by KVK are summarized below

Extension activities organized by KVK

Programmes	No. of programmes	No. of stakeholder
One day training	16	288
Vocational trainings	5	110
Advisory services	426	426
Visitors to processing hub	94	347
Technology Trainings	34	34
Digital Discourse Series	1	865
Support to Institutions • District Industries centre • Krishi Bhavans • State Institute of Rural Development • Industrial Rural Training Centre • Meghalaya Institute of Entrepreneurship • Vegetble and Fruit Promotion Council, Kerala • Kudumbasree Mission	 4 7 2 1 4 2 2	 142 120 50 3 285 25 40
Units set up with KVK‟s support	Commercial units : 16 Small scale units : 22	
New Jack fruit Processing technologies developed	Bakery products from jackfruit flour were jackfruit pasta, frozen burger patties, vegan sausage form jack fruit	

Jackfruit root trainer nursery

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>First state level workshop on Jackfruit</td><td>Home scale processing of Jackfruit</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td colspan="2">Release of Jackfruit pasta technology</td></tr>
</table>

Technological interventions proposed by KVK for ODOP

- Development of production protocols of new Products from Jackfruit -2 No
- Enterprise support for establishment of commercial units – 2 No
- Quality Testing of food products - 100 samples
- Technology training programme – 12
- Internship programme – 5 No.

BALLARI - FIG

Ballari district has historical significance. Some of the events in the great epic Ramayana are related to this historical place. It is said that Rama while searching for Sita met Sugreeva and Hanuman at a place which is very near to Hampi, the celebrated capital of Vijayanagara kingdom. The history speaks volumes about significant role it acquired during Satavahanas, Kadambas, Chalukyas of Kalyana, Kalachuryas, Sevunas and Hoysalas period. There upon the Vijayanagara rulers built the "City of Victory "on the bank of Tungabhadra river at Hampi in Hospet Taluk. This area which had witnessed the prosperity to its peak fell into political turmoil after the fall of Vijayanagara in 1565. This district was transferred to the erstwhile Mysore State on 1st October 1953 from Madras State.

Agro-Climatic Conditions

Ballari district receives an annual average rainfall of 638 mm. Temperature levels in Ballari district vary from 13º C to15º C (during December) to 43º C - 44º C (during April, May,) The relative humidity ranges between 30% (April, May, June) to 70% (July, August, September) High velocity winds are significant character of this district, with a velocity of 6 to 7 kms per hour during October to February, which gradually increases and attains 20 km per hour during June, July and August. From this onwards velocity reduces to 13 km per hour during September.

The district comprises of medium black soils, red loamy soils & red soils. Major portion of Ballari, Sirguppa, parts of HB Halli and Hospet has medium black soils the depth of which ranges from 30-60 cms and clay content of around 50%. These soils originate from granite, genesis, & Dharwad schist and are characterized by water holding capacity of 5 cm per 30 cm soil depth, pH of 7.5 to 9.0 and the availability of micronutrients.

Socio-economical importance of fig fruit:

Irrespective of the size of land holding around 3500 farmers are involved in production of fig in the district. The average cost of production for the produce accounts to g Rs. 1.0 lakhs/ha. The farm gate price for the farmers to the fig fruits varies from Rs.16-24/Kg.

The market has witnessed as low as low a price as Rs.3.0 / Kg during COVID-19 lockdown period and in general it may fetch as low as Rs. 12.00/Kg which discourages the fig growers. This is an opportunity for the Institutes to intervene to reduce the production cost and create a platform to sell the produce at an attractive price. This is possible only when the produce is either exported in a fresh form or processed and value-added form.

Introduction to Fig fruit:

Fig (Ficus carica L.) belongs to the family moraceae. Fig is the native fruit of Asia and Middle East. It has been sought out and cultivated since ancient times and is now widely grown throughout the world, both for its fruit and as an ornamental plant. Now a day demand for fig ingredients is increasing and hence fig plant is cultivated throughout the world. Fig plant is one of the oldest plant cultivated by Humans. In India, fig is considered to be a minor fruit crop and the commercial cultivation of common (edible) fig is mostly confined to Western Parts of Maharashtra, Gujarat, Uttar Pradesh (Lucknow & Saharanpur), Karnataka (Bellary, Chitradurga and Srirangapatna) and Tamilnadu (Coimbatore).

Figs generally are sweet in taste and have a chewy texture. Figs have a great importance in nutrition due to being important source of carbohydrates. They contain essential amino acids and are rich in vitamins B1 , B2, C and minerals. Fresh figs are very sensitive to microbial spoilage, even in cold storage conditions; thus they must be preserved in some novel way. The edible fig is a powerhouse of nutrients and is known since the prehistoric times.

Nutritive value in figs:

Figs are rich in nutrients while being relatively low in calories, making them a great addition to a healthy diet. Figs also contain significant amount of calcium, potassium, phosphorus, iron and small amounts of a wide variety of nutrients, but they are particularly rich in copper and vitamin B6. Figs have many potential health benefits, including promoting digestive and heart health, along with potentially helping manage blood sugar levels. Research also depicted that figs have antioxidant, anticancer, anti-inflammatory, fat-lowering and cell-protective properties.

Need for fig processing:

The fresh fruits have limited shelf life; therefore, it is necessary to process fresh fruits into different value-added products to increase its availability over an extended period and to stabilize the price during the glut season.

The fig fruit is not suitable for transport over long distances. When the fruit is intended for distant markets, then it should be harvested slightly before the full maturity. Fresh fruits that are ripe can be sold in the local markets. The fruits that are picked at optimum maturity stage are cooled within 6 hours of harvest and can be kept for 20 days at 1˚C. Similarly, the fruits can be preserved for 7 days at 10˚C and just for 2 or 3 days at 20˚C. At 40° to 43°F (4.44°-6.11°C) and 75% relative humidity, figs remain in good condition for 8 days but have a shelf life of only 1 to 2 days when removed from storage. They remain in good condition for 30 days when stored at 32° to 35° F (0°-1.67° C). If frozen whole, they can be maintained for several months.

Excess produce can be stored by dehydration of the moisture content to about 10-12%. For storage the fruits are treated with sulphur fumes @ 4 g per 10 kg of fruits and then dried at a temperature of 60˚C until the moisture is reduced to about 12%. Dehydration controls the browning of the fruit, improves fruit texture and reduces infestation. Traditional sun drying is also practiced in some parts of the world, but this method has a high risk of infestation by pests and other pathogens. Processing is the best option to increase the shelf life as well as for high profitability.

Details of technological backstopping available for the product

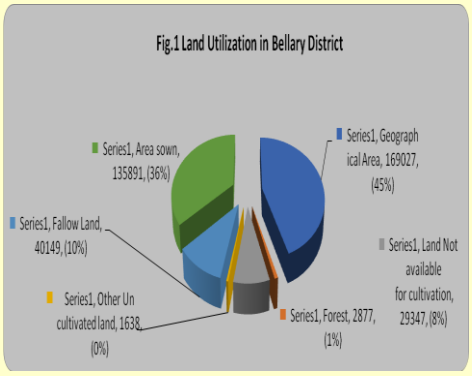
There are limited sustainable fig processing technological options available in India, but there is a huge scope for bringing out the technologies to suit the local and international needs.

Source	Technology
IIFPT Tanjavur	Fortified Fig paste
University of Agricultural Sciences, Raichur	Fig Jam and fig bars
CFTRI Mysore	Fig jam

Opportunities for Secondary and Specialty Agriculture in respect of the identified products

With India's young and urban population growing significantly, the demand pattern for food products is shifting from traditional meals. Consumer preference trends show an increasing focus on nutritious food, and the convenience of long-term storage.

India currently processes less than 10% of its agri output (only around 2% of fruits and vegetables, 6% of poultry, 21% of meat, 23% of marine and 35% of milk) and most of the processing that is done in India can be classified as primary processing – done through rice, sugar, edible oil and flour mills etc. However, primary processing offers lower value-addition compared to secondary processing that includes processing of high value items viz fruits and vegetables, dairy, bakery, chocolates etc. Thus, given the high production levels along with low processing current processing rates, the sector presents huge opportunities.



In the International market, fig value-added product market is segmented into food and cosmetic segments. Fig can go into bakery, confectionary and dairy products. Cosmetic segment is utilized in the form of face wash, face moisturizer and face cream. Among all these segment food segment, is expected to grow enormously in the coming future. On the basis of form the fig ingredient market is mainly segmented into powder and paste. Fig value added products includes fig jam, marmalade, fig paste, fig powder, fig squash, fig toffee, fig jelly, diced/sliced figs, dried figs, fig nuggets etc. Fig can also go into pharmacological

industry as it has good prebiotic property, laxative and also good antioxidant properties.

Marketing opportunities for the identified product of the district – Domestic and International.

The increasing urbanization and income offers huge scope for marketing of fruit based products. Urban organized platforms such as departmental stores, malls, super markets can be attractive platforms to sell well packaged and branded Fig based products.

Metro cities like Chennai, Bangalore, Hyderabad, Mumbai are the biggest markets for fig fruits. Fig value added products can easily be sold in these cities due to increasing consumers awareness on health benefits of figs and fig value added products. Fig powder, fig paste have better demand in cosmetic, bakery and confectionary industries, which can fetch better income to the farmers if pushed in these segments.

The mandated activities undertaken by the KVK during the past 5 years on the produce identified for the district

Before the announcement of One District One Product under PMFME scheme, ICAR-KVK,Ballari has taken up many mandated activities on fig crop over last few years. Arrays of technologies are available for the fig growers to boost the production with desirable quality produce from different institutes. The technologies towards production, macro and micro nutrient management, effective plant protection measures with post-harvest and value additions are supporting the fig growers. In this regard, KVK, Ballari has identified the thrust areas in fig entrepreneurship. To address the identified issues faced by different stakeholders in general and farmers in particular-a series of need based technologies were taken to the farmers as and when situation demanded through the different activities like On Farm Testing, Front Line Demonstrations, Method demonstrations and Capacity building activities like On and off farm trainings, farmer-scientist interactions, entrepreneurship development programmes, field days, publications, TV, Radio programmes, publication of success stories and also research activities.

The list of interventions taken up by the KVK, Ballari in the district since last five years for supporting the fig growers is as follows:

Front Line Demonstrations:

Year	Title
2015-16	Integrated crop management in fig
2016-17	Integrated crop management in fig
2017-18	Integrated crop management in fig
2018-19	Integrated crop management in fig
	Home-Scale enterprise with fig and its products (Under EDP)

Year	Title
2019-20	Integrated crop management in fig
	Integrated crop management in fig
2020-21	Integrated crop management in fig

Capacity building:

- On campus trainings: 08
- Off campus trainings: 05
- Field days: 03
- Farmer-Scientist interaction: 02

Research:

Demand Driven Project under University budget

Scientists of ICAR-KVK,Ballari are also working on a small project entitled "Studies on value addition in fig (Ficus carica)" under the budgetary provision (2020-21) of University of Agricultural Sciences, Raichur. Trials are going on to develop sustainable and consumer acceptable products to be given to the farmers as technologies under this project.

KVK interventions for promoting ODOP (2021-22)

Promoting Fig entrepreneurship through EDP programme

a) EDP on Home-Scale enterprise with fig and its products has been proposed this year for promoting and extending value addition activities in Ballari District.

- ***Selection of beneficiaries***

The awareness programs and need analysis, will be conducted. Preliminary workshop/survey will be conducted and producer's especially Self Help Groups, farm women, fig growers, rural permanent resident of the villages will be selected randomly in the district.

- ***Assessment of entrepreneurial needs***

Assessment of skill development needs and identification of suitable technology for the entrepreneur will be done through workshop/group discussion etc. Workshops would supplement the mentoring process for generating/selecting potential food commodity as well the other entrepreneurial needs and increased value for local producers for further mentoring process.

- ***Capacity Building***

In this phase, the selected beneficiaries will be trained through various capacity building programmes. Besides developing entrepreneurship capabilities, the beneficiaries will be trained on the essential agribusiness skills

as per the requirement of selected enterprises and promoted to start enterprises by linking them to credit sources. Need based demonstration on modern production processes and technologies for prospective entrepreneurs will also be arranged.

The candidates selected will be trained in the KVK. During the course, besides giving hands on training, the candidates will be exposed to other schemes of the Board/State /Central Govt. for extending financial assistance to set up new processing units and also arrange loans through the financial institutions.

Guiding for establishing enterprise/firm by following activities:

1) Hands on experience in the process/manufacture of food products: The hands on training will facilitate the transformation of SHG women, farmers and unemployed youth into budding entrepreneurs within a period ranging from 1 to 12 months .
2) Trouble shooting in setting up of an industrial unit including pollution free process, costing and pricing, marketing and working capital management.
3) Guiding for testing and quality specifications.
4) Bank and scheme linkages, procurement of equipments and raw materials including installation and commissioning, market support etc.

b) Integrated crop management (ICM) in Fig: Soil testing, insect pest management and disease management practices will be taught to the fig growers under ICM programme.
c) Publications in Scientific journals as well as local daily news papers on fig value addition will be done.
d) Success stories of the entrepreneurs will be published to motivate the other farmers in the district.
e) Radio and TV programmes on techniques and importance of value addition as well as success stories of fig entrepreneur will be broadcasted.
f) Youtube videos on fig value addition will be done.
g) Fig mela/ field days along with Horticulture/agriculture departments will be organised.

Background that pushed for entrepreneurship venture in fig processing in Ballari district:

The crisis of COVID-19 lockdown led to a break in supply chain for raw figs as Chennai and Bengaluru witnessed a surge in COVID-19 cases. There was a sudden drop in demand as transport of agricultural produce came to a standstill. As fig has a very short shelf life, it was left un-harvested on the fields as farmers thought that it would burden them further with additional labour cost for picking of fruits. Small holder fig farmers are the most affected among all.

ICAR-KVK, Ballari has responded quickly to this unprecedented situation in a war footing manner. The proven technology developed by Department of Processing and Food Engineering from UAS, Raichur which was refined to suit the local need was disseminated to the farm women of Shrinivas camp of Kurugodu taluk in Ballari district where the figs are grown extensively.

Training and motivational support:

Trainings, online advisories, field visits and demonstrations from ICAR-KVK, Ballari to the farm women amid COVID-19 situations led fruitful results. Self Help Group (SHG) leaders Mrs.Sudha and Mrs.Pooja made efforts to learn the UAS, Raichur recommended post harvesting technology for figs. Enticing fig bar and fig rolls were the outcome of the technology disseminated by KVK.

Once the art of making fig bars and rolls was mastered, the samples were sent to Pesticide Residue and Food Quality Analysis Laboratory (PRFQAL), UAS, Raichur for testing its quality parameters. FSSAI licences were got upon meeting the required quality parameters. Branding and labelling were done to get a bigger market share.

With increased popularity of the technology, most of the fig farmers in and around the Srinivas camp approached KVK, Ballari for similar guidance. With proper scientific guidance the farm women of different SHGs and progressive farmers started their enterprise on value added fig. As unlock of restrictions of COVID-19 lockdown started, solar tunnel dryers and tray dryers were setup to increase the productivity and hygiene in the existing process. One solar tunnel dryer can dry 300 kgs of pulp which yields 100 kg of fig rolls each day, which is three times the outcome that was got earlier by sun drying process practiced during lockdown.

A group of youngsters have installed 14 solar tunnel dryers and other required machinery to increase the productivity and meet the market demand of fig rolls. With the market intelligence that they have gained, they are planning to produce 15-20 quintals of fig rolls each day by employing 60 women labours.

List of entrepreneurs who are running their units under the guidance of KVK, Ballari

Name of the group/brand name	Name of the group leader	Production capacity /Day	FSSAI number	Phone number
Lakshmi sai's Natures products	Pooja	50 kgs	21220025000030	9901374425
MRB fresh anjur bars	Ramesh babu	100 kgs	11220305000178	9448538499
Jaya Shree Fig bars	Shrilakshmi	30 kgs	21220025000138	948089984/ 9980287784
Shri Anjaneya fig bars	Vanipushpa	30 kgs	21220025000145	8762707115/ 9483222444
BMB fig bars	Prasanna	20 kgs	21220025000053	8639039511
GMO fig rolls	Sunil	20kgs	21220025000045	9704466449

Name of the group/brand name	Name of the group leader	Production capacity /Day	FSSAI number	Phone number
LKS fig bars	Lokesh	20 kgs	21220025000049	9902502937
Praveen's fig rolls	Praveen	50 kgs	21219205000318	7032611575
Sri Sai fig Rolls	Gaythri K	20 kgs	2122025000058	9482100485
Sri Ram fig rolls	Akshaya K	20 kgs	2122025000059	9483893700

Enabling factors:

KVK established a link between these farmers and Department Horticulture, Ballari. Now, with the help of the Horticulture department progressive farmers have installed Solar Tunnel Dryers for making the value added products. Director of Horticulture department, Karnataka and District collector of Ballari, CEO of Zilla Panchayt, Joint Director of Small Scale industries have made visits to these value addition units and have given the hope to expand their activities.

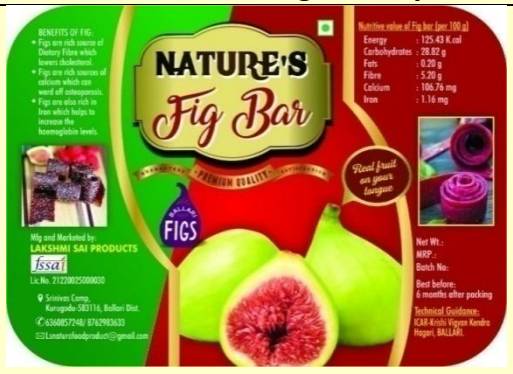
A simple but an effective intervention by KVK, Ballari to convert the artificial glut of fig to its value added product helped farm women of Ballari to script a defining success story that has now caught the eye of many in the state.

Hands-on training to SHG at KVK,Ballari

Off campus training and demonstration of fig value added products at Srinivas camp

SHG women involved in grading and cleaning of fig fruits for value addition

Entrepreneurs at their value addition unit

SHG women with trays filled with fig pulp ready for drying	KVK,Ballari Scientists visit to farmer Ramesh babu's fig drying unit
	
SHG women at Matri square mall Bangalore during NABARD Grameena habba	
	
NABARD DDM with KVK Scientist at fig value addition unit Srinivas camp	**KVK Scientists visit to Vasavi fig value addition unit**
	
Fig entrepreneurs selling their products during Women's day 2021	**Fig entrepreneurs awarded with district level achievers award during women's day 2021**
Branding done by different entrepreneurs in Ballari district	
	


Benefits of Fig :
Figs are rich source of Dietary fibre which lowers cholesterol.
Figs are rich source of calcium which can ward off osteoporosis
Figs are also rich in iron which helps to increase the hemoglobin levels
Technical Guidance:
ICAR-Krishi Vigyan Kendra Hagari, BALLARI.
Srinivas Camp, Ballari-583 113. Karnataka
9480899584
8217561811
REAL FRUIT ON YOUR TONGUE
Nutri Power
FRESH FIG BAR
FIGS
Nutritive value of Fig bar (per 100g)
Energy : 128.30 K.cal
Carbo hydrates : 28.80 g
Fibre : 3.07 g
Calcium : 381.69 g
Iron : 146.48 g
Net Wt. :
MRP. :
Batch No :
Best before 6 months after packing
Mfg and Marketed by:
JAYASREE PRODUCTS
fssai
Lic.No. 21220025000051


INGREDIENTS :
Fig Fruits (80%)
Jaggery (20%)
Citric Acid (E330)
BENEFITS OF FIG :
Figs are rich source of dietary fibre which lowers cholesterol.
Figs are rich sources of calcium which can ward off osteoporosis.
Figs are also rich in iron which helps to increase the hemoglobin levels.
FIGS
MRB
Fresh
ANJUR BAR
Nutritive value of Fig bar (per 100 g)
Energy : 125.40 K.cal
Carbohydrates : 28.82 g
Fats : 0.20 g
Fibre : 2.34 g
Calcium : 277.70 mg
Iron : 45.02 mg
Anjur Dryer
Technical Guidance:
ICAR-Krishi Vigyan Kendra Hagari, BALLARI.
Srinivas Camp, Laxmipuram (Post) Kurugodu-583116, Ballari Dist. Karnataka
9482060288, 9448538499
Net Wt. :
MRP. :
Batch No :
Best before 6 months after packing
Mfg and Marketed by:
SRI VASAVI FARMS
fssai
Lic.No. 11220305000178


Benefits of fig Fruit :
Figs are rich source of dietary fibre
Figs are rich source of Calcium
Figs are also rich Source of Iron
Ingredients
Fig Fruits : 80%
Jaggery : 20%
Citric Acid : E330
Mfg. & Mktd. by
Sri Dobbi Basaveshwara Products
Srinivas Camp, Laxmipura
Ballari-583 113, Karnataka
Ph : 9483893700
8618258278
fssai Lic. No. 21220250000059
REAL FRUIT REAL TASTE
Sri Ram
Fig Roll
FRESH FIG BAR
Ballari FIGS
Nutritive Value of Fig Bar (per 100g.)
Protein : 16.21mg
Fat : 0.0 mg
Energy : 126.8 KCal
Moisture: 11.80 mg
Fiber : 2.8 mg
Calcium : 320 mg
Iron : 96.24 mg
Nt. Wt. : 250gm
Pkd. Dt. :
MRP :
Best before 6 months after packing
Technical Guidance
ICAR-Krishi Vigyan Kendra
Hagari, Ballari.
Benefits of fig :
Figs are rich source of dietary fibre
Figs are rich source of Calcium
Figs are also rich Source of Iron
Ingredients
Fig Fruits : 80%
Jaggery : 20%
Citric Acid : E330
Mfg. & Mktd. by
Sri Venkateshwara Products
Srinivas Camp, Laxmipura
Ballari-583 113, Karnataka
Ph : 9482100485
9480919197
fssai Lic. No. 21220250000058
DELICIOUS IN EVERY BITE
SRI SAI
FIG ROLL
FRESH FIG BAR
Ballari FIGS
Nutritive Value of Fig Bar (per 100g.)
Protein : 17.20 mg
Fat : 0.0 g
Energy : 126.0 KCal
Moisture: 12.00 mg
Fiber : 3.0 mg
Calcium : 354 mg
Iron : 98.64 mg
Nt. Wt. : 250gm
Pkd. Dt. :
MRP :
Best before 6 months after packing
Technical Guidance
ICAR-Krishi Vigyan Kendra
Hagari, Ballari.


GMO
Fresh
Fig Roll
Figs have many potential benefits,including promoting digestive and heart health, along with Potentially helping manage blood sugar levels.
ANJEER
Benefits of Fig :
*Figs are rich source of Dietary fibre which lowers cholesterol.
*Figs are rich source of ward off osteoporosis
*Figs are also rich in Iron which helps to increase the hemoglobin levels
Magnesium : 2% of the DV
Potassium : 2% of the DV
Riboflavin : 2% of the DV
Thiamine : 2% of the DV
Vitamin B6 : 3% of the DV
Vitamin K : 2% of the DV
INGREDIENTS :
Fig Fruits (84%)
Jaggery (16%)
Citric Acid (E330)
Net Weight : 500 gms
Batch No
MFD
MRP.
Nutritive value of Fig bar (per 100g)
Energy : 126.30 K.cal
Carbs : 26.20g
Fibre : 3.45 g
Calcium : 467.70mg
Iron : 82.70mg
Protien : 0.8 grams
Fat : 0 grams
Copper : 3% of the Daily value(DV)
Best before 6 months after packing
Mfg and marked by :
GMO FOODS
fssai
Lic.No.21220025000049
Technical Guidance:
ICAR-Krishi Vigyan Kendra Hagari, BALLARI.
Near Canal,Srinivas Camp, Ballari-583 113, Karnataka

RAICHUR - GREEN CHILLI

Raichur district comes under North-Eastern dry Zone of the agro-climatic zones with varied soil resources comprising 57.6 per cent black and 42.4 per cent red soils. The major cultivated crops of the district are Chilli, Paddy, Redgram, Bengalgram, Sorghum, Cotton and Onion. In Raichur green and red chilli are cultivated in an area of 952 ha and 6370 ha respectively with production of 11424 ton green chilli and 12740 ton red chilli and productivity of 12 ton of green chilli and 2.00 ton of red chilli during 2019-20.

Technology backstopping:

KVK-Raichur under the guidance of University of Agricultural Sciences, Raichur is supporting farmers by giving technical inputs for adoption of good agricultural practices for Integrated Pest Management. The KVK has extended its service to 125 acres each in Raichur and Deodurga taluk. The popular hybrids for cultivation in the district include Syngenta – 5531, 2043, Rudra, Teja, Super-10 and Super-334.

- ***Technologies from IIHR***
  - Improved hybrids and varieties
  - Integrated nutrient management
  - Integrated pest and disease management
  - Solar drying
- ***Technologies from SAU's***
  - Development of hybrids and varieties
  - Integrated pest and disease management practices
  - Post harvest management practices
  - Preparation of value added products
- ***Technologies from Spice board***
  - Good agricultural practices in chilli
  - Sample analysis of chilli and chilli products for export

Scope of PHT:

- ***Technologies from CFTRI***
  - CFTRI has developed a four - tier system of wire - mesh trays or a single tray of perforated Aluminium. It took 14 days in sun to dry fruits having a moisture content of 72 to 74% reducing it to about 6%, the traditional method of sun drying takes about 3 weeks to achieve a moisture level of 15-20%.
  - Quality analysis for export
- ***Sample analysis of chilli and chilli products for export***
- ***Oleoresin extraction***

Opportunities for marketing, secondary and specialty agriculture:

- Dissemination of marketing information
- Adoption of grading equipments
- Adequate cold storage and other facilities
- Financial support through Government sectors
- Providing infrastructure facilities
- Establishment of adequate processing units
- Established market chain from farmer field to Vijaykrishna spices, Hyderabad

	
Introduction of improved varieties	**Demonstration of marigold as trap crop**
	
Spraying of vegetable special at 30, 45 and 65 days intervals	**Installation of pheromone traps for *Spodoptera***
	
Field visits	**Drying of red chillies in solar drier**

Efforts made by KVK for the promotion of Chilli

- Demonstration through On Farm Testing and Front Line Demonstrations (CFLDs)
- Demonstration, Processing and value addition of chilli
- Technical support through GAP and GMP practices during field visits
- Integrated approach for management of pest and diseases
- Integrated nutrient management

- Capacity building training programmes
- Popularization of new hybrids and verities
- Organization of exhibition to create awareness during Krishi Mela and other programmes

Technological interventions proposed by KVK for ODOP

- Laying out of frontline demonstrations on
  - Management of chilli murda complex
  - Popularization of Arka Actino- Plus (a lignite based microbial product) in chilli cultivation in Raichur district
  - Integrated pest management in chilli (murda complex and Spodoptera)
  - Assessment of drying of red chillies in solar drier and sunlight
  - Demonstration of arka microbial consortia in chilli

- Capacity building training programmes

KOLAR – TOMATO

Agricultural profile of the district

Kolar district is a drought prone district and has basically agriculture oriented economy. The district has five taluks namely Bangarapet, Kolar, Malur, Mulbagal and Srinivasapura. Kolar district is land of silk, milk, gold and mango and is located in south eastern part of Karnataka.

All the taluks of the district comes under agro climatic zone-5 i.e., eastern dry zone. It is characterised by low, scanty and uneven distributed rainfall with shallow and poor soils.

Agriculture in Kolar district is mainly rain fed and it has no rivers. Tanks and tube wells are the main sources of irrigation. The district has 2328 tanks irrigating an area of 22795ha and no. of tube wells are 84286 with a net irrigable area of 33469 ha which accounts for 19.61 % of net sown area.

The district being a rain fed district, farmers of Kolar district are using underground water for cultivation of vegetables, mulberry and fodder crops. The allied sectors viz; dairying, sericulture and horticulture is being adopted by large number farmers and the district is known as land of milk and silk. There is a well established hub of milk collection and coccon auction centres in the district which has encouraged the farmers to take up dairying and sericulture

One District One Product (ODOP) is an initiative which is seen as a transformational step forward towards realizing the true potential of a district, fuel economic growth and generates employment and rural entrepreneurship, taking us to the goal of AtmaNirbhar Bharat. One District One Product (ODOP) initiative is operationally merged with 'Districts as Export Hub' initiative being implemented by DGFT, Department of Commerce, with Department for Promotion of Industry and Internal Trade (DPIIT) as a major stakeholder.

Kolar district is approved for tomato under ODOP Scheme. The crop is grown in 46,000 hectares of land in Karnataka where productivity is high. Kolar, the largest producer of tomatoes in the country, houses Asia's second biggest tomato market.The APMC yard in Kolar division that can hold 180-200 tonnes tomatoes per day. The State tops in terms of average yield.Kolar are the vanguard of tomato growing areas in the Karnataka. There are farmers who grow 40 to 50 tonnes of tomato per acre in the district.

At present, Globally around 80% of the tomatoes produced around the world are freshly consumed, whereas the remaining 20% involved in the tomato processing industry for preparing purees, soups, tomato ketchup, pickles, juices,

and sauces.In India, A well known Indian saying is "No tomato, no cooking" but 99% of the tomatoes are currently consumed fresh as it is currently estimated that only about 150,000 tons of tomatoes are processed annually.

Cultivation Scenario of tomato in the district

Year	Area (ha)	Production (Metric tons)	Productivity (t/ha)
2013-14	9,695	5,47,000	56.00
2014-15	9,695	5,47,753	57.13
2015-16	9,695	5,47,753	56.50
2016-17	9,695	5,47,753	56.50
2017-18	9,695	5,47,753	56.50
2018-19	8,712	4,97,145	57.46
2019-20	8,803	5,01,984	57.02
2020-21	19,147	7,97,184	56.76

Technological backstopping

Stage of the crop	Farmers practices	Technology interventions available
Nursery production		
Nursery raising	1. Protray method using cocopeat	1. Arka fermented cocopeat
		2. Usage of MAP (12-61-0)
		3.Application of 19:19:19
		4.Grafting of vegetables
Production Technology		
Land preparation by ploughing	Just ploughing land to fine tilth	1. Summer ploughing 2. Soil solarization
Application of FYM	Application yearly once just before planting	1. Application of FYM (25t/ha) 15 days before to each crop grown in a year on same piece of land Application of enriched FYM with biofertlizers
Application of basal dose of fertilizers	Application of DAP, MOP and NSKE	1. Application of 20% recommended NPK through basal dose 2. Application of SSP, instead of DAP Application of enriched neem cake
Cultivars	Same Private seed company hybrids throught year	1.Selection of varieties according to season
Using polythene mulch	Black colour mulch throught year	1.30 micron bicolored color mulch as insect repellent
Fertigation	1. Injudicious application of water soluble fertilizers	1. Use of urea, MAP, SOP and CN 2.Application of vegetable special

Stage of the crop	Farmers practices	Technology interventions available
Plant protection	Excess usage of PP chemicals	1. FYM enrichment 2. Use of sticky traps 3. Use of pheromone traps 4. Use of biological methods PP chemicals (need based)
	Economically important diseases are Late blight, ToLCV and bacterial wilt	
	Economically important pests are Fruit boarer, Tutaabsoluta, White flies	
Postharvest operations	Only diseased and damaged fruits separated	Grading according to size will fetch higher price

Opportunities

Annual growth rate of over 12% in India's tomato production over the past 5 years indicates strong interest amongst farmers to grow tomato as a major commercial crop. The yields of Indian tomato producers are the lowest amongst major tomato producing countries, signaling inefficiencies in production, depressed farmer incomes and loss of value in the supply side value chain. Kolar alone contributes 28 % percent total share of tomato production in state. Tomato is economically important and widely grown vegetable crop as annual both in rainy and dry seasons in kolar mostly under tube well irrigation. The products of tomato like paste, juice, ketchup, etc. are widely used in kitchens all around the world. Tomato is considered an important fruit vegetable in the region. It has high contents of vitamins A and C and is widely used in various dishes

India is the second largest producer of tomatoes with an 11% global share but processes less than 1% of its produce compared to 26% in other major producing countries and this results in a loss of value to the farmer, consumer and the economy. Key tomato growing districts in Karnataka are principally Kolar (28%) and Belgaum, Haveri and Mandya districts which each have a share of between 8-10%. Of the estimated 41 million tones of tomato processed globally in 2015, only 130,000 tonnes were processed in India which comprises 0.3% of the global tomato processing market. As the world's second largest tomato producer India could potentially process much more of the crop. India's domestic demand for processed tomato products is expanding at an estimated 30% annually. The imposition of a 30% customs duty tariff on imported tomato paste and other tomato value added products has pushed processors to take steps towards sourcing locally. Several processors have reduced the use of imported paste through limited local sourcing as well as through blending imported and locally-produced paste to achieve the necessary input parameters. There are several barriers to sourcing locally including a lack of consistent quality, a lack of available

produce and price volatility. Traditional fresh market tomato cultivars are unsuitable for processing as they do not meet the processing quality parameters of color, total soluble solids and sugar content as well as fruit firmness. India needs "tropical" processing tomato cultivars resistant to key pest and viral risks that are high yielding and demonstrate good fruit quality. A combination of improved crop yields and reduced cost of production can significantly increase the attractiveness of tomato cultivation by Indian farmers to support the processing tomato sector. Processors seek supplies of fresh tomatoes through much of the year and across all three seasons, provided the price point is right. Processors are putting in place strategies to source locally through in-house supply chains or through processing contracts with intermediaries. This creates real opportunity to develop a strong supply chain backbone with farmers. To achieve this, farmers will first need to be convinced through the implementation of a successful demonstration model of a processing tomato supply chain that reflects better and sustainable returns for the farmer as well as the processor.

Although India is one of the major (fourth largest) producer of tomato, the export quantity is negligible to the total production when compared to its export in the world market. It is observed that tomatoes and tomato products in Karnataka reach final consumers through three channels namely Traditional market channel (Channel I), Organised retail/ Supermarket channel (Channel II) and Processor's channel (Channel III). Tomato processing industries procure their raw materials from different sources such as traditional channel/APMCs, through vendors, and through their own group of interested farmers by means of contract called as contract farming and sell tomato processed products through both Channel I and Channel II. The processed tomato products such as tomato paste, ketchup and sauce were sold directly by the manufacturers or through distributors. Majority manufacturers, sell tomato paste directly to the secondary processors like sauce and ketchup manufacturers, while part of it also exported internationally. However, tomato consumers consist of individual households and bulk consumers such as hotels and institutions.

Marketing :

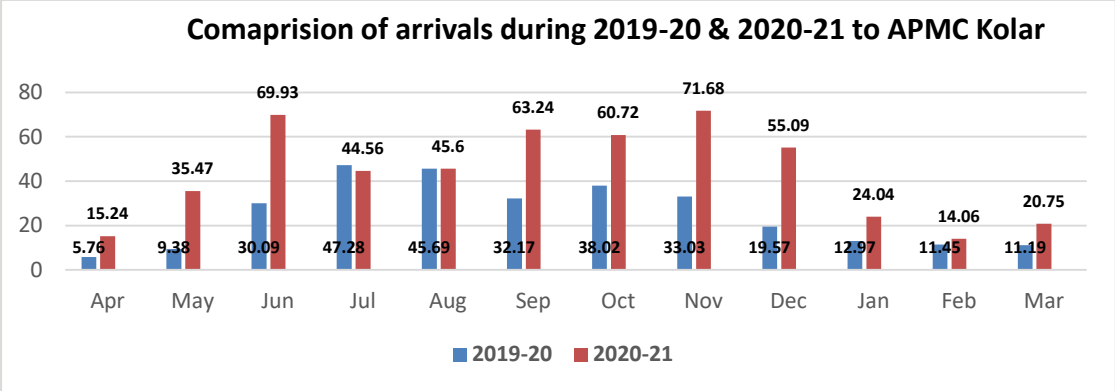
APMC (Agricultural Produce Marketing committee), Kolar is the second largest market in India. A radius of 40-45 km around Kolar is having most suitable soil and environmental conditions to grow fine quality tomatoes. The produce will arrivefrom different district of Karnataka as well as from nearby states. The actual arrivals and average monthly price from April 2019-20 to March 2020-21 is as below.

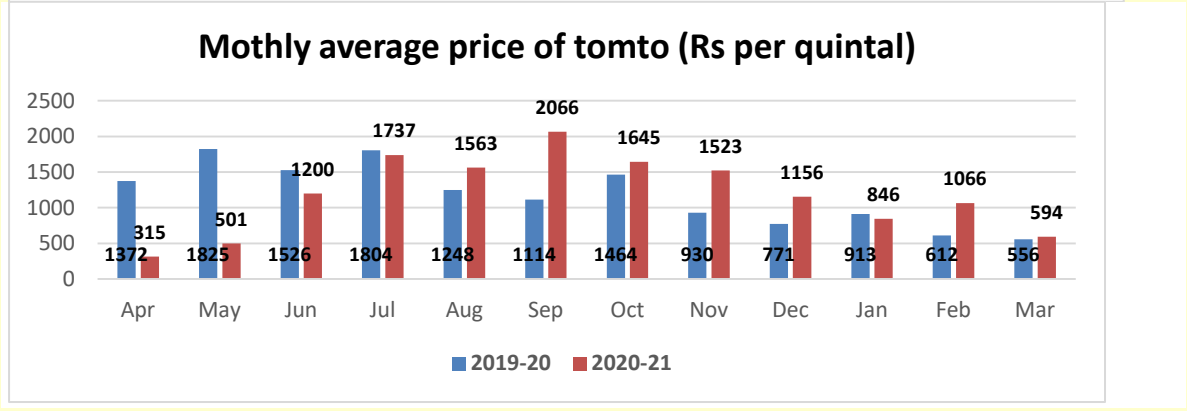
Table 1: Monthly arrivals and average price of tomato during 2019-20

Particulars	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Arrivals (thousand tons)	5.76	9.38	30.09	47.28	45.69	32.17	38.02	33.03	19.57	12.97	11.45	11.19
Average price (Rs.per quintal)	1372	1825	1526	1804	1248	1114	1464	930	771	913	612	556

Table 2.: Monthly arrivals and average price of tomato during 2020-21

Particular	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Arrivals (thousand tons)	15.24	35.47	69.93	44.56	45.60	63.24	60.72	71.68	55.09	24.04	14.06	20.75
Average price (Rs.per quintal)	315	501	1200	1737	1563	2066	1645	1523	1156	846	1066	594





The price of the commodity will vary depending upon the arrivals, cultivar, season, weather, export and produce from adjacent states.

Domestic market

Kolar market mainly concentrate marketing in Sothern states *viz.,*Karnataka, Telangana, Andhra Pradesh, Tamil Nadu and Kerala. Since Kolar Market is well connected by road transport to various metropolitan cities, the produce will be sent through trucks by road transport and within 2-3 days the produce will reach the targeted place.

International market

The produce is mainly sent to Bangladesh and Pakistan especially during April to August. This consignment is also sent through road through NE India.

Interventions of KVK from last five years

Year	OFTs	FLDs
2020	-	1. Integrated insect pest and disease management in Tomato 2. Demonstration of fertigation schedule in tomato for decreasing fertilizer cost and enhance quality yield
2019	-	1. Integrated insect pest and disease management in Tomato 2. Integrated Nutrient Management in Tomato
2018-19	-	1.Integrated crop management in Tomato
2017-18	-	1.Nutrient management in tomato through fertigation
2016-17	1)Evaluation of transplanter for increasing efficiency and reducing drudgery of farm women in tomato	1.Nutrient management in tomato through fertigation management

Timeline of activities

Activities	**2021-22**	**2022-23**	**2023-24**
Technology assessment	√	√	√
Technology dissemination	√	√	√
Capacity development	√	√	-
Production and technological inputs	√	√	-
Frontline extension programmes	√	√	-

CHIKKABALLAPURA – TOMATO

Brief agricultural profile of the district

India is the world's second largest tomato producer after China and currently accounts for 11% of the total global tomato production. Despite this, less than 1% of India's tomato production is processed, way below the average of 26% for the world's top 10 tomato producing countries. The southern and central states constitute much of India's production including the states of Andhra Pradesh, Telangana, Karnataka and Maharashtra. Farmers typically sell to a local aggregator or to a trader in a local market. The processing industry however seeks the agglomeration of a large number of farmers in closely-knit clusters to enable both a sustained supply of larger volumes of tomato to the processing unit and the maintenance of tomato product quality. Generally, tomato crop is produced and processed during the two main seasons across much of India - August to October (kharif) and December to April (Rabi). Where conditions suit, tomato crop is also grown during the off-season (May to July) including under protected cultivation.

Karnataka has total area of 53,538 ha, total production of 8, 67,365 tons and average productivity of 16 tons/ha. Among different districts, Kolar, Mysuru, Davanagere and Chikkaballapur have highest area under tomato crop. Majority of the farmers are growing tomato and marketing it in the local market through traders. Due to price fluctuations the farmers are unable to derive good prices for their produce. Even sometimes, the farmers leave the crop unharvested due to very less price in the market. During this situation processing and value addition in tomato serves as the hand holding factor for tomato growers. Hence, there is a need for development of tomato processing and value addition facilities in the districts having more area under tomato. Chikkaballapura district is a newly created district, separated from the existing Kolar district, located in the southern part of Karnataka, spread across 6 Talukas -Gowribidanur, Gudibande, Begepalli, Chikkaballapur, Shidlagatta and Chintamani. District headquarter is Chikkaballapur (50 km from Bengaluru). It is a major site for grape, grain, and silk cultivation. With recent development, it is widely believed that Chikkaballapura will become part of "Greater Bengaluru".

The project on Establishment of Common Incubation Centre for Processing of Tomato and Other Fruits and Vegetables has been sanctioned and budget break up also has been provided. The required documents like opening of bank account, undertakings, tripartite agreement, surety bond, nomination of CEO and timeline are all settled. The tender documents for civil works, electrification, equipments and laboratory equipments are submitted. Work award of civil works for renovation is starting shortly.

Agro-climatic zone(s) names	Zone V, Eastern dry zone
Normal Rainfall (mm)	747
Actual Rainfall (mm)	806.9
No. of Taluks	6
No. of Villages	1321 Inhabited
No. of Holdings	2,32,333
Gross cropped area (Ha)	1,74,234
Area under irrigation (%)	23.71
Source of irrigation	Bore well
Major Soil Types	Red, Gravel and Sandy loams
Major crops in Kharif	Ragi, Red gram, Groundnut, Maize, Tomato and other vegetables
Major crops in Rabi	Bengal gram, Potato, Onion, Tomato and other vegetables
Major perennial crops	Mango, Pomegranate, Grapes, Cashew, Coconut

2. *Details of technological backstopping available for the product - From NARES (ICAR & SAU Institutes) including international source of technologies*

The three major products of tomato in ODOP project are tomato crush, tomato ketch up and tomato powder. The technological back stopping for tomato crush has been taken from is from IIHR, Bangalore. As our KVK had a Bhoosamrudhi project, in that the tomato crush technology has been transfered which can be used for the ODOP and for tomato ketch up and tomato powder the free technology has been provided by CFTRI, Mysore in their website which can be used by the general public also. Henceforth, the technologies for tomato products are available and can be used for the mass production under ODOP project.

Even the mentor institute Department of Post Harvest Technology, College of Horticulture, Kolar is lending the support for technologies to bring up the product.Being in the midst of the horticulture belt there is a huge potential for the utilization of the common incubation facility by the tomato farmers of the region. Operation and maintenance of the facility would be entrusted to a competent organization selected after extensive scrutiny and in consultation with the mentor institute.

The Common Incubation Centre has been sanctioned under PMFME entitled Establishment of CIC for processing of tomato and other fruits and vegetables at ICAR KVK, Chintamani of worth Rs. 2.08 crore.

APPROVAL LETTER AND BUDGET BREAK UP

No. FM-11/75/2020-ADDITIONALSECRETARY
Government of India
Ministry of Food Processing Industries
Panchsheel Bhawan
August Kranti Marg, New Delhi- 110049

Dated:13 May 2021

To,

Senior Scientist and Head
ICAR – Krishi Vigyan Kendra,
Chintamani, Chikkaballapura district,
Karnataka, PIN-563 125

Email Address: kvkcbpura@gmail.com

Contact Number: 9449866930

Subject: Approval of proposal for establishment of Common Incubation Facility at ICAR – Krishi Vigyan Kendra, Chintamani, Chikkaballapura , Karnataka for processing of Tomato and other fruits & vegetables

Ref:

- Your proposal submitted online on 21.01.2021
- Meeting of Appraisal committee held on 16.02.2021
- Your revised proposal submitted online on 03.03.2021
- Meeting of Project Execution Committee held on 05.03.2021
- Approval of Hon'ble Minister, FPI on 16.03.2021

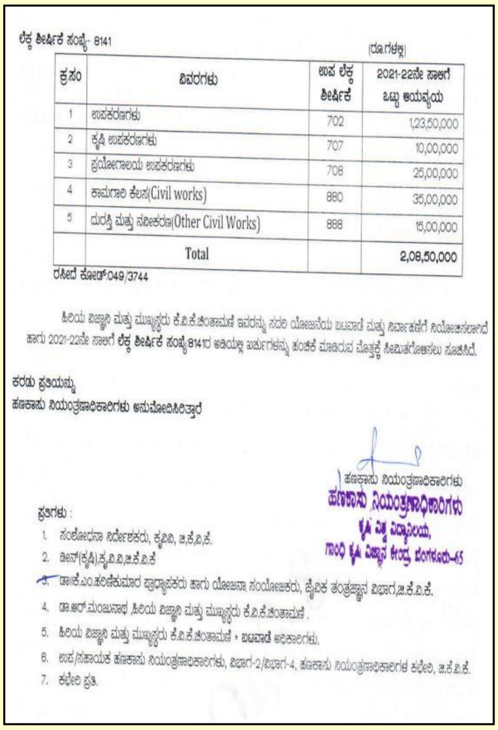
Sir/ Ma'am,

The undersigned is directed to convey the approval of grant by the competent Authority to the proposal of ICAR – Krishi Vigyan Kendra, Chintamani, Chikkaballapura of University of Agricultural Sciences, Bangalore, Karnataka to establish Incubation Centre under the Common Incubation Center component of PMFME scheme.

2. The approved project is for establishing Common Incubation facility for processing of ODOP of the district Chikkaballapura i.e. Tomato and other fruits & vegetables

3. The above approval is accorded to the proposal with total project cost of Rs. 2,08,50,000 (Rupees Two Crore Eight Lakhs Fifty Thousand Only). The total funding support approved is Rs. 2,08,50,000 (Rupees Two Crore Eight Lakhs Fifty Thousand Only).

4. The head wise total cost and approved Grant in Aid cost is as under.



ಲೆಕ್ಕ ಶೀರ್ಷಿಕೆ ಸಂಖ್ಯೆ- 8141

(ರೂ.ಗಳಲ್ಲಿ)

ಕ್ರ.ಸಂ	ವಿವರಗಳು	ಉಪ ಲೆಕ್ಕ ಶೀರ್ಷಿಕೆ	2021-22ನೇ ಸಾಲಿಗೆ ಒಟ್ಟು ಆಯವ್ಯಯ
1	ಉಪಕರಣಗಳು	702	1,23,50,000
2	ಕೃಷಿ ಉಪಕರಣಗಳು	707	10,00,000
3	ಪ್ರಯೋಗಾಲಯ ಉಪಕರಣಗಳು	708	25,00,000
4	ಕಾಮಗಾರಿ ಕೆಲಸ(Civil works)	880	35,00,000
5	ದುರಸ್ತಿ ಮತ್ತು ನವೀಕರಣ(Other Civil Works)	888	15,00,000
	Total		2,08,50,000

ರಸೀದಿ ಕೋಡ್:049/3744

ಹಿರಿಯ ವಿಜ್ಞಾನಿ ಮತ್ತು ಮುಖ್ಯಸ್ಥರು ಕೆ.ವಿ.ಕೆ.ಚಿಂತಾಮಣಿ ಇವರನ್ನು ಸದರಿ ಯೋಜನೆಯ ಬಟವಾಡೆ ಮತ್ತು ನಿರ್ವಹಣೆಗೆ ನಿಯೋಜಿಸಲಾಗಿದೆ ಹಾಗು 2021-22ನೇ ಸಾಲಿಗೆ **ಲೆಕ್ಕ ಶೀರ್ಷಿಕೆ ಸಂಖ್ಯೆ**:8141ರ ಅಡಿಯಲ್ಲಿ ಖರ್ಚುಗಳನ್ನು ಹಂಚಿಕೆ ಮಾಡಿರುವ ಮೊತ್ತಕ್ಕೆ ಸೀಮಿತಗೊಳಿಸಲು ಸೂಚಿಸಿದೆ.

ಕರಡು ಪ್ರತಿಯನ್ನು
ಹಣಕಾಸು ನಿಯಂತ್ರಣಾಧಿಕಾರಿಗಳು ಅನುಮೋದಿಸಿರಿತ್ತಾರೆ

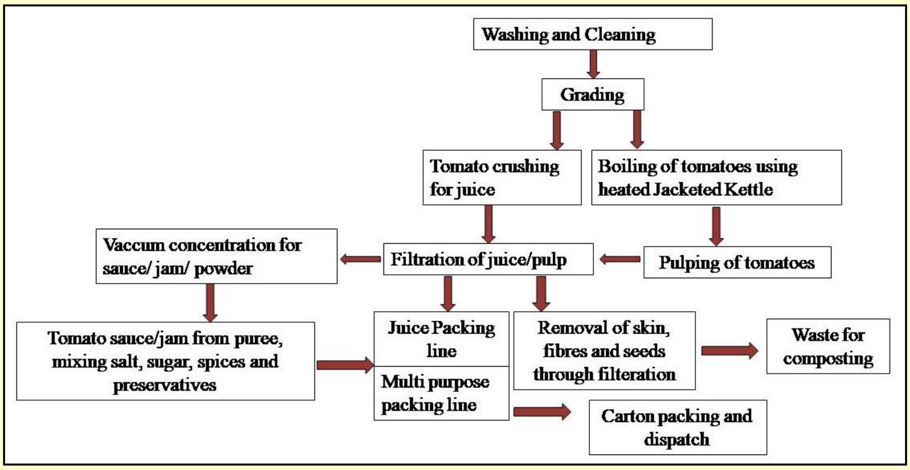
ಹಣಕಾಸು ನಿಯಂತ್ರಣಾಧಿಕಾರಿಗಳು
ಹಣಕಾಸು ನಿಯಂತ್ರಣಾಧಿಕಾರಿಗಳು
ಕೃಷಿ ವಿಶ್ವ ವಿದ್ಯಾನಿಲಯ,
ಗಾಂಧಿ ಕೃಷಿ ವಿಜ್ಞಾನ ಕೇಂದ್ರ, ಬೆಂಗಳೂರು-65

ಪ್ರತಿಗಳು :

1. ಸಂಶೋಧನಾ ನಿರ್ದೇಶಕರು, ಕೃವಿವಿ, ಜಿ.ಕೆ.ವಿ.ಕೆ.
2. ಡೀನ್(ಕೃಷಿ),ಕೃ.ವಿ.ವಿ,ಜಿ.ಕೆ.ವಿ.ಕೆ
3. ಡಾ।ಕೆ.ಎಂ.ಹರಿಣಿಕುಮಾರ ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗು ಯೋಜನಾ ಸಂಯೋಜಕರು, ಜೈವಿಕ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗ,ಜಿ.ಕೆ.ವಿ.ಕೆ.
4. ಡಾ.ಆರ್.ಮಂಜುನಾಥ ,ಹಿರಿಯ ವಿಜ್ಞಾನಿ ಮತ್ತು ಮುಖ್ಯಸ್ಥರು ಕೆ.ವಿ.ಕೆ.ಚಿಂತಾಮಣಿ .
5. ಹಿರಿಯ ವಿಜ್ಞಾನಿ ಮತ್ತು ಮುಖ್ಯಸ್ಥರು ಕೆ.ವಿ.ಕೆ.ಚಿಂತಾಮಣಿ - **ಬಟವಾಡೆ** ಅಧಿಕಾರಿಗಳು.
6. ಉಪ/ಸಹಾಯಕ ಹಣಕಾಸು ನಿಯಂತ್ರಣಾಧಿಕಾರಿಗಳು, ವಿಭಾಗ-2/ವಿಭಾಗ-4, ಹಣಕಾಸು ನಿಯಂತ್ರಣಾಧಿಕಾರಿಗಳ ಕಛೇರಿ, ಜಿ.ಕೆ.ವಿ.ಕೆ.
7. ಕಛೇರಿ ಪ್ರತಿ.

Opportunities for Secondary and Specialty Agriculture in respect of the identified products

Processing lines of Tomato products



More than 50 farmers are expected to make use of incubation centre for manufacture of value added products from tomato. It is also proposed to impart in depth practical training and conduct capacity building to over 300 farmers, entrepreneurs and members of the Self Help Groups from the tomato belt district of Chikkaballapur and Kolar and facilitating them to start their own small and medium scale enterprises.

Tomato crush					
Particulars (Rs. in lakhs)	**1st year (100 ton)**	**2nd year (125 ton)**	**3rd year (150 ton)**	**4th year (175 ton)**	**5th year (200 ton)**
Initial raw material cost	20.00	27.50	35.00	42.50	50.00
Processing cost	10.70	15.87	21.05	26.22	31.40
Gross cost	30.70	43.37	56.05	68.72	81.40
Gross income	41.44	58.55	75.66	92.77	10.98
Net return	**10.74**	**15.18**	**19.61**	**24.05**	**28.49**

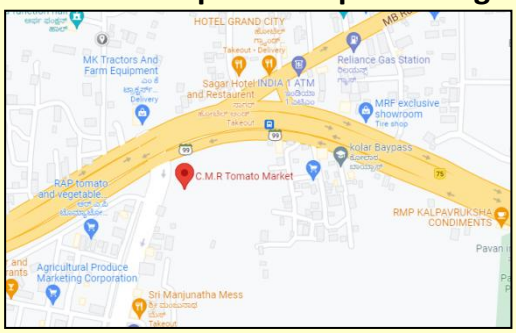
Tomato ketchup					
Particulars (Rs. in lakhs)	**1st year (100 ton)**	**2nd year (125 ton)**	**3rd year (150 ton)**	**4th year (175 ton)**	**5th year (200 ton)**
Initial raw material cost	20.00	27.50	35.00	42.50	50.00
Processing cost	16.80	21.00	25.20	29.40	33.60
Gross cost	36.80	48.50	60.20	71.90	83.60
Gross income	47.84	65.47	81.27	97.06	112.86
Net return	**11.04**	**16.97**	**21.07**	**25.16**	**29.26**

3. Marketing opportunities for the identified product of the district – both domestic and international.

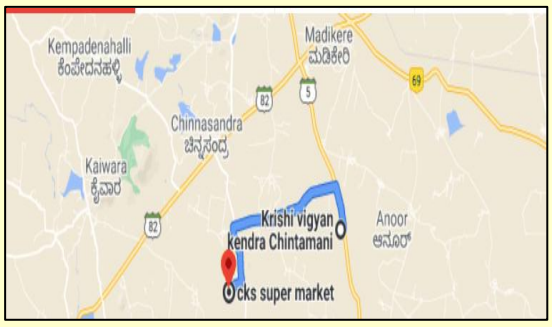
To gain knowledge about production and marketing we visited vast tomato processing units like India Food Park, Tumkur and got an idea of establishing tomato and other fruits and vegetables processing unit. The raw materials procurement and the products developed from CIC both face no problem of transportation and marketing has the ICAR KVK, Chintamani is connected to Bangalore market and Kolar tomato market. There are existing tomato processing units like Sunsip and Innovative Agro Food Products which lend support for marketting facilities and also to transportation of the products too.

Tomato processing and packing unit visit at Food Park, Tumkur

Tomato crush unit visit at Sunsip tomato processing unit, Srinivasapura



Kolar Tomato market



Chikkaballapura Vegetable Market

Brief on the mandated activities undertaken by the KVK during the past 5 years

To create awareness on proper cultivation practices and also for the processing of the tomatoes and manufacture products of it, series of front line demonstrations as integrated crop management in tomato crop and integrated pest management in tomato crop was conducted from last five years. Both ICM and IPM was taken up in our two projects namely Village adoption and Bhoo Samruddhi Project sponsored by IIHR, Bangalore. Later on, the KVK staffs were trained for tomato crush product and TOT was provided on the same.

ICM practice in tomato

IPM Practices in Tomato

IPM Practices in Tomato

Field day organized

Timeline proposed interventions by the KVK in promoting ODOP highlighting on Technology assessment, dissemination, capacity development, production and availability of technological inputs and frontline extension programmes for the identified produce and product.

In many important events we conducted awareness on quality, processing and value addition method demonstrations, off campus and on campus trainings were conducted for the SHGs and FPOs to develop home scale, small scale and medium scale enterprise on tomato based products**.** Many press coverages and radio talks were conducted to spread the information and make effective to reach the mass.

Method demonstration of tomato products to SHGs

Awareness on processing and value addition in tomato For FPOs and SHG

KOLLAM – TAPIOCA AND OTHER TUBER CROPS

Kerala has enormous potential for cultivation of tuber crops such as Cassava (Manihot esculenta), Sweet Potato (Ipomoea batatas), Yams (Dioscorea spp.), Elephant Foot Yam (Amophophallus paeoniifolius) and Taro (Colocasia esculenta). Kollam is an old seaport and

Cassava is considered as crop of future food security having ability to sustain under changing climate conditions especially during drought. Similarly, sweet potato can tolerate saline conditions and it yields considerably well under such condition. Elephant foot yam, tania and arrow root are tolerant to shade conditions and hence they can be grown in different cropping systems. Kollam a old seaport district has immense scope in the production of value added products from tapioca and other tubers.

Technology backstopping

Crop wise improved varieties released by ICAR-CTCRI Trivendrum and KAU, Wayanad are given below;

Tapioca	Sree Vijaya Sree Visakham, Sree Jaya, Sree Pavithra, Vellayani hraswa, M-4
Elephant foot yam	Sree padma
Greater yam	Sree nidhi
Colocasia	Sree rashmi

Scope of PHT

- Great scope for product diversification and value addition in tuber crops
- Opportunity for industry level bio-ethanol production from cassava
- Scope to develop prophylactic and therapeutic functional food from tuber crops.

Value added products of Tapioca

Cassav chips

Potato chips

Sweet potato chips

Marketing opportunity

Cassava and other tuber crops are consumed as baked tubers, fried chips and as a culinary item in the district. Various value added products of Cassava viz., Cassava Pakkavada, Cassava Sweet Fries, Cassava Nutrichips, Cassava crisps, Cassava flour and Sago are widely produced in registered 493 micro enterprises of the district.

No of Micro Enterprises	493
Units received trainings in entrepreneurial skills.	112
received trainings in FSSAI Regulations and other processing rules and regulation	72
No. of units that have received trainings in branding and marketing	65
No. of units that have received trainings in Accounting and management skills	37

Various market functionaries viz., processors, wholesaler (primary and secondary), commission agent, and retailer are functioning between producer and consumer. The established 493 micro enterprises have good forward and backward marketing linkages.

Efforts made by KVK for the promotion of Tapioca and other tubers

KVK Kollam has conducted 2 OFTs and 10 FLDs on Tapioca and other tubers

EDP was organized for three groups

45 number of trainings in tuber crops

Technological interventions proposed by KVK for ODOP

S.No	Activities	Numbers
1.	On Farm trails	2
2	Special programme	1
3.	EDP	1
4.	Trainings	15

THIRUVANANTHAPURAM - CASSAVA

Thiruvananthapuram the Southernmost district of the coastal state of Kerala and agriculture has been the primary occupation of the district. The soil of the district is generally classified as alluvial, peaty and laterite. Cassava also commonly known as Tapioca, continues to be a crop of food security for the millions of people especially in the developing countries of the globe. Thiruvananthapuram and Kollam are the major districts in Kerala cultivating cassava.

Technologies backstopping

- Varieties**:** H-97, H-226, Sree sahya, Sree jaya, Sree harsha, Sree apoorva, Sree Pavithra, Sree Prabha, H-165, Sree Visakham, Sree Prakash, Sree vijaya, Sree Athulya, Sree Swarna, Sree Rekha, Sree padmanabha, Nidhi, Vellayani Hraswa, M-4, Kalpaka

- Fertilizer recommendation:

Particulars	Age (months)	FYM (t/ha)	N	P	K
			(kg ha^{-1})		
High yielding varieties (30-35 t ha^{-1})	10-11	12.5	100	50	100
High yielding varieties (25-30 t ha^{-1})	6-7	12.5	75	50	75
Local varieties (20-25 t ha^{-1})	-	12.5	50	25	50

- Supplementary irrigation at IW:CPE (Irrigation water/ Cumulative pan evaporation) ratio of 0.70 during drought spell was beneficial in maximizing productivity
- Dibbling of short duration legumes like bunchy varieties of groundnut and vegetable cowpea are found ideal. Sequential cropping of rice-cassava may be practiced
- Removing the excess shoots at 30 days after planting along with intercultural operations.
- First intercultural operation at 30-45 days after planting and the second one at one month after the first intercultural operation followed by earthing up.
- Rapid test for Cyanogen determination
- Rapid propagation of tuber planting material
- Organic cassava production technique
- Bio-molecules with pesticidal action: Three formulations Nanma, Shreya and Menma were developed from cassava against borers pests of tree and fruit crops
- Management of spidermites in cassava by spraying of Monocrotophos or dimethoate @ 0.05 % at monthly intervals or spraying water at 10 days interval from January to march.

- Spidermites resistant Cassava genotypes: Ce-2, Ce-4, Ce-14, Ce-38, Ce-139 S-856
- Management of cassava mosaic disease: Remove and destroy infected plants, Plant resistant varieties like H-97, H-165, H-2304, Use meristem tip culture technology to eliminate cassava mosaic virus from infected plants
- Rodent management: Use of traps, poison baiting using 2% zinc phosphide mixed with rava, sugar and oil in 90:5:3 ratio, fumigating the burrows using aluminum phosphide tablet 3-6 g/burrow, smoking the burrows using coconut leaves
- Mechanized harvesting of Cassava
- Extension Technologies
  - Tubertech v1.0: a database system namely TUBERTECH was designed and developed.
  - Tuberhelp: It is software on the agro techniques of tuber crops.
  - SIMCAS: A growth model developed to simulate the growth of Cassava.
  - E-Crop: This device collects various weather parameters from the field at 15 minutes interval and sent to the website of ICAR-CTCRI.

Scope of PHT

The tuber crops snack foods were produced by extrusion cooking to develop direct expanded extradites. Cassava extrudates are totally oil free and hence has much dietetic value. At ICAR-CTCRI, gluten free cookies were prepared by replacing wheat flour up to 50% - 60% along with other ingredients like rice flour, tapioca flour, sweet potato flour, taro flour and sorghum flour. The cookies are available in various shapes and sensory quality is acceptable to the consumers.

- Chipping machine, Hand-operated chipping machine, Pedal operated chipping machine, Motorized chipping machine, Mobile starch extraction units for tuber crops, cassava rasper, Cassava harvesting tool

Hand Operated Chipping Machine

Pedal Operated Chipping Machine

Motorized Chipping Machine

Farmer invented semi manual cassava harvester

Mechanical Cassava Harvester

Cassava Peeler

- Starch Extraction: Starch is extracted from cassava by peeling, chopping, grinding with water for 5 minutes, filtration, decantation and drying at 55^{o} C for one hour. Percentage of starch obtained is 25%.
- Cassava Flour: Flour was prepared from cassava by peeling, grating, drying in hot air oven at 55^{o} C for 24 hrs and then, milling. Percentage of flour obtained is 40% while that of flour after extraction of starch is 12 %.

Extruded products from cassava

Cassava pasta

Starch based adhesives

- Sago: Sago is made by crushing raw tapioca roots in a tank and the juice obtained is stored till it turns into a paste. This paste is then made into small round white balls through a machine. Sago is used to make puddings and bubble tea worldwide.
- Cassava rava: Cassava rava is a pre-gelatinized granular product used as a breakfast recipe
- Cassava chips and fried snacks
- Protien and fibre enriched functional foods viz., pasta, mini-papads and cassava popups,
- Starch based solid adhesives, superabsorbent polymers and super porous hydrogels, animal feed, cassava alcohol etc.,

Marketing opportunities

The market for cassava as a food appears to have great potential for achieving food security in developing countries like India. Also there is a opportunity of using domestically produced cassava flour as a partial replacement for wheat flour. Starch extracted from Cassava has great potential as a raw material for several industries. Cassava, sago and other tropical starches were extensively used for food. Cassava has great scope for the commercial production of caramel.

Activities undertaken by the KVK

- OFTS on Comparative study of different cassava harvesting equipments
- FLDs on improved varieties, management of important pest and diseases, biopesticides, nutrient management,
- EDP activities on Protein and Fiber Enriched Cassava Products

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Demonstration of Cassava variety Sree Pavithra</td><td>ICAR-CTCRI Semi- Manual Cassava Harvester</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Protein and Fiber Enriched pasta Products from cassava</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Popularization of cassava based bio pesticides</td></tr>
</table>

Proposed KVK Intervention

The following are the timeline proposed interventions by KVK in promoting ODOP;

- Varietal introduction & popularization Crop management
- Pest & Disease Management Popularization of Farm machineries
- Value addition (Product Diversification and By-product Utilization)

HASSAN - COCONUT

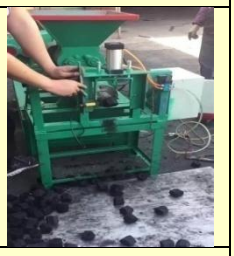
Hassan District noted for its enchanting natural scenic beauty is also a veritable treasure-house of Hoysala architecture and sculpture. Coconut is one of the most useful trees in the world and is often referred to as the "tree of life". It provides food, fuel, cosmetics, folk medicine, building materials and thus often referred as tree of life many other uses. The average rainfall is about 1031 mms annually. Potato, Cabbage, Cucumber, Coconut, Mango, Banana, Coffee, Pepper, Ginger, Sericulture are major commercial crops while Maize, Ragi, Paddy, Sugarcane, Pulses are major field crops. The coconut has cultural and religious significance in the district.

Place/ State	Area (Ha)	Production (ton)
Hassan	106749	333319
Karnataka (total)	610240	4321762

Processing units in the district: Coco peat production unit: 2, Oil extraction unit: 3, crafts making-2, jaggery making unit-1

There are handful of opportunities for secondary agriculture in coconut. Proposing processing lines/secondary products are

i) Virgin coconut oil
ii) Desiccated coconut powder
iii) Coconut water jaggery
iv) Coco peat preparation
v) Char coal preparation
vi) Coconut shell powder

Virgin Coconut Oil			
			
Desiccated coconut Powder	**Coconut water jaggery**	**Coco peat preparation**	**Coal Preparation**

Marketing strategies:

- Pre-harvest contract
- On farm marketing
- Retail marketing
- Wholesale marketing
- Online marketing
- Exports

	
On campus training programme on Preparation of Bakery Products	**Skill training programme on Coconut palm Climbing**
	
Field visit	**Method demonstration**

Mandated activities undertaken by the KVK during last five years

i) During last five years KVK, Hassan has conducted several training programmes on value addition in coconut and bakery product preparation.
ii) Skill development training programme in coconut palm climbing for rural youths
iii) The KVK had taken on farm testing and front-line demonstrations in coconut crop related to crop production, pest and disease management.
iv) The KVK also helped one woman entrepreneur by name smt. Hema Ananth in setting up of small-scale virgin coconut oil unit by providing technical support related to production of virgin coconut oil, bottling, branding and in providing market linkage to the product.
v) Outlet established in KVK for selling the virgin coconut oil for the farmers and other visitors to the KVK.

KOZHIKODE - COCONUT

Area, production, productivity and socio economic importance

Kozhikode district extends over the Malabar and Konkan coasts and is covered by Laterite and Coastal alluvials. This is a humid region with annual rainfall above 200 cm and average temperatures of 26°C-32°C in July and 19°C-28°C in January. Rice, coconut, oilseeds, sugarcane, millets, pulses and cotton are the main crops. The region is also famous for plantation crops and spices which are raised along the hill slopes of the Ghats.

Kozhikode district farmers are practicing mostly homestead based farming system with coconut as the main crop. Coconut crop occupies 1,12,305 hectares land with production of 815 millions nut and productivity of 7221/nuts/ha. Intercrops cultivated are spices, tubers, fruits, vegetables and other plantation crops. Most homesteads also have other enterprises like poultry and dairy in small scales. Many farmers also practice goat rearing, pisciculture, piggery, inland fisheries etc. Coconut based value added products by individuals and societies are the major enterprise activity.

Details of technological backstopping available for the product

The following are the details of Coconut HYVs released by CPCRI, Kasargode, and KAU, Thrissur.

No.	Name of variety	Released by	Suitable for	Nature
1	COD	CPCRI	Tendernut	dwarf
2	Kalpa Jyothi	CPCRI	-do-	-do-
3	Kera madhura	KAU	Copra+nut	Tall
4	Kalpa sree	CPCRI	Oil+Copra+tender coconut	Dwarf
5	Kalpatharu	CPCRI	Ball copra	Tall
6	Kalpa sankara	CPCRI	Nut and copra	Tall
7	Kalpa shreshta	CPCRI	Tender Nut and copra	Tall(DxT)
8	Kera sree	KAU	Nut and copra	Medium tall (TxD)
9	Ananda ganga	KAU	Nut and copra	TxD
10	Laksha ganga	KAU	Nutand copra	TxD

Marketing Opportunities :

Raw materials including coconut inflorescence and coconut palm parts, which is natural resources but are often neglected, are available in abundance in Kerala.

A) Coconut product like virgin coconut oil (VCO) prepared from fresh coconut milk. VCO has considerable potential for therapeutic uses such as antimicrobial, for anti-cancer therapy and for the treatment of Alzhiemer's disease. VCO is the best possible remedy to various skin ailments and it is the best skin care solution for new born babies. The leftover coconut kernel after extracting coconut milk can be made use for the production of desiccated coconut and various types of bakery products, chutney powder and instant curry powders.

B) Kera Bouquet: The use of waste resources of coconut palm to improve lively hood of rural people. A number of beautiful handicrafts made only by coconut inflorescence and coconut palm parts, which is natural resources but are often neglected, are available in abundance in Kerala. So these readily available local resources have a huge potential for international market, which can invariably foster economic growth and can create job.Coconut inflorescence can be used for producing a number of innovative handicrafts and can be stored for a long period as compared to other synthetic material.

Mandated activities undertaken by the KVK during the past 5 years on the product identified for the district

A) Training programmes

- A total of 52 training programmes on Quality planting material production in coconut were conducted benefitting 2734 farmers. As a result, ten commercial plant nurseries were started in Kozhikode district which supplies quality seedling of coconut to the needy farmers. The income of these units ranges fromRs.10,000 to Rs.50 lakhs per year.
- A total of 11 trainings given to 330 farmers on topics such as Scientific cultivation in coconut , planting and care in initial years in coconut, Integrated nutrient management, inter and mixed cropping in coconut, Moisture conservation techniques in coconut garden, and Preparation of coirpith and other composts. Considerable improvement in vigour and productivity of palms are reported by farmers after adopting the technology learned through the above training.
- Fifteen trainings on plant protection aspects in coconut cultivation were conducted benefitting 833 farmers during the period.
- Two ASCI sponsored skill development training programmes under Rashtriya Krishi Vikas Yojanaon 'Friends of Coconut' were conducted for 20 participants per batch
- Under CDB sponsored trainings, total of 313 persons have been trained during 2012 to 2020. Of these, 63 women participated. The training lasts for

six days and includes coconut climbing, coconut nursery management, seed nut selection and pest and disease management.

B) FLD/ OFT programme

The following demonstration programmes with coconut was conducted during the period.

a) Demonstration of a HYV of turmeric viz. IISR Pragati in coconut based cropping system
b) Demonstration of Big Ebanga as an intercrop in coconut gardens
c) Performance evaluation of grafted black pepper in coconut gardens
d) Demonstration on integrated management of Tanjore wilt of coconut

C) Technical support to establish licensed coconut nurseries

KVK has also assisted progressive farmers to establish commercial production units of coconut seedling which has license of either Coconut Development Board or State Agriculture Department. Such five nursery units were established during the last five years.

Timeline proposed interventions by the KVK in promoting ODOP

The following programmes are proposed for the next five years (2022 – 2027)

A) Training programmes

1) Training programmes in Quality planting material production of coconut.
2) Soil testing based INM in coconut
3) IFS in coconut based farming system
4) Coirpith and vermin-composting techniques.
5) Green manuring in situ and moisture conservation techniques in coconut plantations so as to increase productivity of coconut and increase income of holdings.
6) Season based integrated pest and disease management in coconut especially that of Tanjore wilt, bud rot, stem bleeding, rhinoceros and red palm weevils
7) Vocational training on Apiculture in coconut gardens for increased productivity of coconut garden.
8) Post harvest processing and value addition of coconut.
9) Mechanized palm climbing.
10) Capacity building on Integrated fish farming in coconut channels.

B) FLD and Technology assessment programmes

- FLD and OFT programmes on IFS, scientific manuring, drought management, IPDM etc. will be conducted.

- Demonstration of Integrated fish farming in coconut channels.
- Quality evaluation and demonstration programmes on coconut based value added products.

C. Planting material production to produce and supply quality planting materials of coconut.

D. Others

a) Farmers Field School: A Farmers Field School on "Quality seedling production of WCT coconut cultivar Kuttiady Local" for farmers

b) GI tagging of WCT coconut ecotype Kuttiady local: Kuttiady Local is a coconut ecotype with many intrinsic quality parameters. It is proposed to undertake the process of GI tagging of WCT coconut ecotype Kuttiady local involving all stakeholders like CPCRI, Kasargode, Department of Agriculture, KAU, Thrissur etc.

RAMANAGARA – COCONUT PRODUCTS

Ramanagara district is a silk town of Karnataka that falls under Southern Plateau and Hills Region of the Country and classified under Eastern Dry Zone (Zone V) of Karnataka. The average actual rainfall of the district is 874 mm. The pre-monsoon rainfall accounts for 21.9% (190.5 mm) of the annual rainfall, South West Monsoon accounts for 49.4% (428.8 mm) and North East Monsoon 28.7% (249.3 mm). The major crops of the district are Ragi, Redgram, Field bean, Groundnut, Paddy, Coconut, Vegetables and Mango. Sericulture and Dairy farming are the other two major important enterprises being practiced.

India stands 3rd in production in the world after Indonesia and Philippines, although has a potential of much higher production from the existing area. In Ramanagara district, coconut covers an area of 30248 ha with a production of 2232 lakh nuts and productivity of 7397 nuts per hectare per annum.

Technological backstopping

- ***Varieties***

Improved varieties: Chandra kalpa, Kera Chandra, Kalpatharu, Kalpa Pratibha, Kalpa Dhenu, Kalpa mitra, Kalpa haritha, Kera eralam and Kalpa shatabdi

Dwarf/Semi tall varieties: Chowghat orange dwarf, Kalpasree, Kalparaksha, Kalpa surya, and Kalpa jyoti

Hybrids: Chnadra sankara, Kera sankara, Chandra laksha, Kalpa samrudhi and Kalpa sreshta

- ***Polybag nursery***
- ***Irrigation*** *methods*

Based on a study conducted at ICAR-CPCRI, it was concluded that yield of coconut with drip irrigation daily @ 66% of the Eo from December to May was adequate (32 liters/palm/day when the evaporation rate is 4 mm day) and comparable to basin irrigation @ 200 litres per palm once in four days. Thus, there is 34 per cent saving of water in drip irrigation. This is applicable to varieties and hybrids and also in different soil types. The number of dripping points should be six for sandy soils and four for other soil types. The rate of water application should be 2-4 litres per hour per emitter.

- ***Drip fertigation***

If there is drip irrigation facility, then the water soluble fertilizers like urea, DAP, phosphoric acid (Commercial grade) and murate of potash can be applied along with drip irrigation in 6 equal splits. Through fertigation, it is recommended to provide 91 g urea, 33 ml phosphoric acid and 170 g muriate of potash per palm per application. When DAP is used it is recommended to provide 70 g urea, 60 g DAP and 170 g muriate of potash for a single dose per palm.

- ***Basin management through cover crop***
- ***Soil application of bio fertilizer viz., Azospirillum spp, PSB, KeraProbio, KerAM,***
- ***Vermi composting using coconut leaves***

	
Polybag nursery	**Basin management through cover crop**

- **Machineries and gadget from ICAR- CPCRI, Kasaragod, Kerala**

			
Coconut desheller and testa remover		**Manual and Power operated coconut and multi crop slicing machine**	
			
Coconut grater, pulverizer and dryer for making desiccated coconut			
			
Double screw milk expeller		**Snow ball tender coconut machine**	


Process for the production of copra


Tender coconut punch and cutter

Simple 'ice-box technology' to preserve Neera

Coconut climbing machine

Telescope spryers for palm

Coconut chips dryer

Hydro pneumatic milk Extractor

- ***Indian Institute of Food Processing Technology (IIFPT), Thanjavur, Tamilnadu***
  1) The neera tapping machine
  2) Non-dairy coconut ice cream
  3) Neera sugar crystals
  4) Virgin coconut oil crude

Scope on PHT

Coconuts are known for their versatility of uses, ranging from food to cosmetics. Coconut products are used to make everything from clothing to animal feed to beauty creams. Even though India is a major producer of coconut, consumes more than 50% of its coconut production as raw nuts for culinary and religious purposes. 35% of the production is utilized for conversion to copra, 11% for tender nuts, 2% for seed purposes and hardly 2% is utilized for value addition and industrial purposes. Coconut is a food as well as an oil seed crop. It is also a source of fibre, timber, and fuel.

Value added -Secondary agriculture products of coconut

Coconut water: Minimal Processing of Tender coconut, Snow Ball Tender Nut

Mature coconut: Bottled Coconut Water, Coconut water beverages, Coconut water concentrate, Nata-de-coco, Coconut jelly, Coconut Vinegar.

Coconut kernel: Desiccated Coconut, Coconut Chips, Coconut milk, coconut skimmed milk, sweetened condensed skim milk, Pinacolada (coconut milk with pineapple juice), Bottled coconut milk, coconut cheese, Coconut cream, Spray Dried Coconut Milk powder, Coconut jam, Virgin Coconut Oil through Wet Processing of Coconut, Coconut Flour, Dietary fibre from coconut residue, Coconut Honey, Coconut Sap, Toddy.

Unfermented toddy: Jaggery/palm sugar, Refined Sugar, Treacle

Coconut by-products: Coconut shell powder, Coconut Shell Charcoal, Waste Heat Recovery Technology, Activated Carbon

Coconut Oil Based Oleo chemicals: Biofuel/OleoChemicals/FattyAcids, Margarine, coconut mayonnaise, coconut

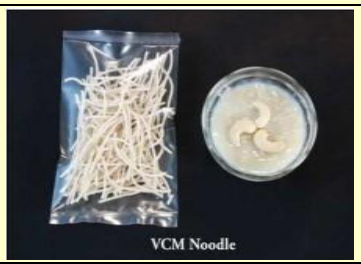
Non-Edible Uses of Coconut Oil: Soap, Surfactants, Lubricants, Coconut oil as alternate automobile lubricant

Coconut waste: Decorative items, handicrafts, brooms, baskets, fish traps, fancy articles, tongue cleaners, husk, coir, coirpith, coir geotextiles

Technologies developed for coconut value addition by different organization

Central Food Technological Research Institute (CFTRI), Mysore, Karnataka	Virgin coconut oil, Coconut beverage from tender coconut, Instant adjunct mix, Instant filling mix, Coconut rice mix, Coconut bites, Spray dried coconut milk powder, Coconut spread based on mature coconut water concentrate and coconut fiber, Neera bottling
Defence Food Research Laboratory (DFRL), Mysore, Karnataka	Technology for preservation of coconut sap (Neera), Tender and mature coconut water with suspended kernels (lemon flavored), Mature coconuts beverage

	blended with lemon juice, Marmalade type coco jam from tender and mature coconuts, Instant coconut chutney, VCO meal based compressed bar, VCO meal based biscuits, VCO meal based noodles, VCO meal based halwa, VCO meal based porridge, VCO meal based ladoo
CPCRI. Kasaragod Kerala	Virgin coconut Oil (VCO), Coconut chips, Snow ball tender coconut, Kalpakrunch, Low fat desiccated coconut, Biscuits, Rusk, Pasta, Muffins, Frozen coconut delicacy, Shelf stable coconut gratings, Foam mat dried coconut milk powder, Paneer/Cottage cheese, Minimally processed tender coconut, Coconut sugar, Kalpa drinking chocolate, Bean to bite Chocolate, Nutribar, Coconut water jelly, Coconut water sqush, Mature coconut water based vinegar, Coconut-based ice-cream product, Coconut pickle, Coconut chutney powder
KAU	Minimal Processing of Tender coconut

		
Coconut beverage from tender coconut	**Blends of coconut oil with other edible oils**	**Coconut spread**
		
Neera bottling	**Instant coconut chutney**	**VCO meal based compressed bar**
		
VCO meal based biscuits	**VCO meal based noodles**	**VCO meal based halwa**

		
VCO meal based porridge	**VCO meal based ladoo**	**Kalpakrunch**
		
Snow ball tender coconut	**Foam mat dried coconut milk powder**	**Kalpa drinking chocolate**
		
Coconut based ice cream	**Coconut water jelly**	**Coconut chutney**
			
Coconut cake	Coconut rusk	Masala biscuits	Ladoo
			
Cookies	Salt biscuit	Coconut sweet and salt biscuits	Coconut stripes
Ready to use products from UAS Bangalore			

Marketing Opportunities

The coconut and its value added products are sold through APMC, direct marketing, online marketing and through FPOs. In Ramanagara, the regulated market for coconut is placed at Channapatna, Ramanagara and Kanakapura talukas.

Online purchase of vegetable and fruits are also increasing day by day. coconuts are also available through online shopping sites like *www.ebay.in*, *www.shopclues.com*, *www.flipkart.com*, *www.bigbasket.com*, *www.amazon.in*. The minimally processed tender coconut supplied by Farm Fresh India Agrotech Pvt. Ltd. in Bengaluru. Manufacturers of various branded value added products of coconut are having their own online shopping websites for marketing their products.

The marketing information on coconut can be collected through different sources such as NAFED, AGMARKNET, Kerafed, Karnataka State Coir Development Corporation Limited, Karnataka State Agricultural Marketing Board, APEDA and MARKETFED. The FPOs can play a major role here by directly marketing dehusked coconut in the retail outlets in the city and the husk can also be marketed which provides an additional income to the farmers. The husk chips are marketed online priced between Rs. 65 and 500/ kg which is ideal for Orchid and Anthurium gardening and for use in flower beds and in gardens.

Thengu Mane (house of coconuts) at Rajajinagar, Bangalore sells various products made from coconut like ice-cool tender coconut, sweet lassi and souffle, jelly, barfi, holige, ice creams made of coconut milk in basic, cardamom and vanilla flavors.

Efforts made by KVK for the promotion of Coconut

Different extension activities undertaken by KVK are briefed below

OFT	Performance of flower crops as inter crop in coconut
FLD	➢ Integrated approaches in coconut orchard management ➢ Demonstration of shade loving guinea grass var. DGG-1 in coconut garden ➢ Demonstration of shade loving guinea grass var. BG-2 in coconut garden ➢ Demonstration of marigold as intercrop in coconut orchard ➢ Integrated pest and disease management in coconut
Field days	Two with 82 participants
Sponsored programmes	10 with 442 participants
Traning	15 with 458 participants
Group discussion	13 with 267 participants
Survey	4 survey in four villages of four different taluk with participation of 100 farmers
Skill and vocational trainings	Friends of Coconut Tree- FOCT training programmes were conducted for 120 rural youths

	
Application of fertilizer	**Field day**
	
Friends of Coconut tree	**Group discussion**

In the above programmes awareness on soil test based fertilizer application, mechanization, intercrops and multistoreyed cropping in coconut and demonstration on fertilizer application, use of rhinoceros beetle traps, rats management, importance of bees for pollination, skill development on of coconut climber, use of coconut dehusker and value addition were created.

Proposed Interventions by KVK in promoting coconut products:

Technology assessment	4 OFTs focusing on green manure cum cover crops, inter crops and management of white fly
FLD	16 FLDs focusing on water management, insitu moisture conservation, management of eriophid mites, stem bleeding, mechanization, coir pith composting, INM, IPDM and ICM practices.
Capacity development	25 courses
Supply technology inputs	Cococnut seedling, enriched vermicompost, production of earthworm, tricoderma, microbial consortium, tender coconut opener, coconut climber, RB Traps, Yellow sticky cards

TUMAKURU 1 – COCONUT PRODUCTS

Brief agricultural profile of the district with special emphasis on the product identified

Tumakuru District is an administrative district in the state of Karnataka in India. Tumakuru District is the fourth largest district in the state of Karnataka after Belagavi with an area of 10,598 km². Tumkur is located located between north latitudes 12° 45’ to 14° 20’ and east longitudes 76° 20’ to 77° 31’. It is also called ***Kalpatharu Nadu*** **(land of coconut trees), due to the abundance of coconut trees in the area**. The District has 10 taluks 50 hoblies & 2715 villages. The average rainfall is about 540.7 mms annually.

DISTRICT FEATURES	
Agro-climatic zone(s) names	Eastern dry zone Central dry zone Southern dry zone
Gross cropped area (ha)	5,75,961
Area under irrigation (ha)	1,59,802
Net cropped area(ha)	5,09,542
Sources of irrigation	Canal, Tank, Borewell, Open well
Soil Types	Sandy loam, shallow black soils and red loamy soil
Major crops	Ragi, Groundnut, Redgram, Paddy, Coconut, Arecanut, Fruits and Vegetables
Livestock details	Dairy, Piggery, Poultry, Sheep , Goat and Fishery

The government of India allotted the Coconut crop for Tumakuru district under “One District One Product (ODOP)” Since Tumakuru district has large area and higher production capability in Coconut crop.

Coconut crop

Coconut is a versatile product and has multiple uses. Almost all the parts of a freshly grown coconut, eatable or otherwise, are used in some or the other manner. Coconut everything can be found in the natural food market. Coconut oil, coconut sugar, coconut water. Each of the different pieces of the coconut are used for different, and sometimes multiple, products. Therefore, oil competes with all of the other coconut products for the simple availability of the coconut plant. The coconut is a very useful plant with a wide range of products being sourced from it. Coconut products are used to make everything from clothing to animal feed to beauty creams. Its kernel is harvested for its edible flesh and delicious water, while its husk is used for its strong fibers. Most important, however, are its oils, which are extracted, processed, and marketed for culinary, medicinal, and cosmetic uses

alike. Such trendy products come from young green coconuts, fresh coconut and the trees' flowers.

India leads the Asian countries in productivity of coconut with 8303 nuts per hectare per annum while in production we are at the second position behind Indonesia. India is one of the largest producers of coconut in the world. Coconut in India is predominately a small holders crop contributing to about Rs. 83000 million annually which is about 2% of the contribution of agriculture and allied sectors.More than 10 million farming families dependent on this crop for this livelihood.

Without value addition and by product utilization farmers can't get a fair and steady price for their products. The price of product can't be controlled until and unless there is a procurement mechanism for surplus products and opportunities for value addition.

Coconut has the advantage of having hundreds of uses which no other oil seed or horticultural crop can claim coconut products and by-products can be commercially utilized for multiple purposes. Coconut is a food as well as an oilseed crop. It is also a source of fiber, timber and fuel. Coconut palm is also a beverage crop in many states in the country. The kernel is an integral part of the diet of the people of the west coast of India.

Coconut is grown in an area of 3,88,408 ha with a production of 26507 lakh nuts in Karnataka where as in Tumkur district is grown in area of 1,32,587ha with a production of 9945.66 lakh nuts. At present there is hardly any infrastructural facility for processing and value addition apart from inefficient supply chain due to large number of intermediaries. Rising income levels and changing consumption patterns and favourable demographic profile and changing lifestyles is a challenge for converting raw materials to value added products as per the local demands of consumers/ Market. The functional infrastructure if established in the vicinity which is accessible to the farmers could be of great help.

The identified products

There are handful of opportunities for secondary agriculture in identified product of Tumakuru district *i.e.* one district one product as coconut. Proposing processing lines/secondary products are

1) Virgin coconut oil
2) Desiccated coconut powder
3) Coconut chips
4) Coconut oil
5) Coco peat preparation

		
Virgin coconut oil	**Desiccated coconut powder**	**Coconut chips**

Marketing opportunities for identified product of the district

- ✓ Area under coconut (India): 1.63 m ha
- ✓ Coconut production: 12355 m nuts
- ✓ Productivity- 7572 nuts/ha
- ✓ No. of farmers to be trained: 500
- ✓ There are 2500 coconut by products units in country with 2000 crores investment with the export value of 20617.7 million rupees and import value of 2706 million rupees.
- ✓ In Karnataka there are 439 coconut processing units with 25 coconut water processing and packing units, 103 desiccated coconut oil units and 54 virgin coconut oil units.

Marketing strategies:

- Pre-harvest contract
- On farm marketing
- Retail marketing
- Wholesale marketing
- Online marketing
- Exports

Mandated activities undertaken by the KVK during last five years

i. During last five years KVK, Tumakuru has conducted the several training programmes on value addition in coconut and also training programmes on bakery product preparation.
ii. Skill development training programme in coconut palm climbing for rural youths was conducted in the KVK.
iii. The KVK had taken on farm testing and front-line demonstrations in coconut crop related to crop production, pest and disease management.
iv. The KVK also selling the coconut products for the farmers and other visitors to the KVK through KVK outlet in last five years.

Timeline proposed interventions by the KVK in promoting ODOP

Technology assessment	June, 2022
Technology dissemination	July to August, 2022
capacity development	August to September, 2022
Production and availability of technological inputs	September to December, 2022
frontline extension programmes	January to March, 2023

TUMAKURU 2 - COCONUT PRODUCTS

Coconut plays a significant role in the agrarian economy of Tumakuru district. Coconut is a crop of small and marginal farmers. 1.45 lakhs coconut area holdings in the Tumakuru district with are less than one hectare. The palm is an essential component in the commercial farming system. Apart from the importance of copra and coconut oil which is widely used in the manufacture of soaps, hair oil, cosmetics and other value-added & industrial products, its husk is a source of fibre which supports a sizable coir industry. The tender nut supplies coconut water and mature nuts for copra, a popular thirst quencher of health and hygienic value.

Details of technological backstopping available for the product

Details of Technology	Source of technology
Establishment of Model nursery for coconut seedlings for production and distribution of quality planting material	CPCRI, Kasargod
Demonstration on Integrated Nutrient management on Coconut	CPCRI, Kasargod
Demonstration on intercropping system in Coconut orchard	CPCRI, Kasargod, TNAU Coimbatore, UHS, Bagalkot
Demonstration on Mixed cropping system in Coconut orchard	CPCRI, Kasargod, TNAU Coimbatore, UHS, Bagalkot
Demonstration on Multistored cropping system in Coconut orchard	CPCRI, Kasargod, TNAU Coimbatore
Demonstration on Integrated Pest and Disease management on Coconut	CPCRI Kasargod
Mass multiplication of Predators and Parasites for management of Coconut pest	NBIAR Bengaluru
Bioresources management in coconut eco system	CPCRI Kasargod
Friends of Coconut (FOCT) Safety device for coconut climbing machine	CPCRI Kasargod and Coconut Development Board, Kochi
Coconut Value added products (Coconut chips, Snow Ball Tender Nut, Virgin Coconut Oil , Coconut honey, Desiccated Coconut, Coconut milk powder, Coconut Vinegar, Coconut milk, Coconut Crisps, Coconut cream, Coconut flour, Toddy, Coconut jiggery, condiments & cookies)	CPCRI Kasargod, TNAU, Coimbatore and Coconut Development Board, Kochi
Coconut By products (Coconut coir pith,	CPCRI Kasargod, TNAU,

Details of Technology	Source of technology
Coconut Broom stick, Coconut shell charcoal, Activated Carbon, Ornaments by coconut by products)	Coimbatore

Opportunities for Secondary and Specialty Agriculture in respect of the identified products

The price of coconut and coconut products are influenced by many factors viz. production, global demand, policy decisions of the government formulated from time to time, price of other vegetable products etc. The marketability and price realization of coconut and coconut products determine the financial security of the coconut farmers. The price behaviour of coconut and its products has a profound influence on the rural economy of district. Coconut is purely an elastic commodity as every movement in its production and consumption are reflected in the price. Post-harvest processing of coconut is now being changed from the edible and inedible traditional products to several other value added products. ICAR and SAU has developed new technologies for several coconut products and by-products. Presently several food products are developed from coconut kernel like desiccated coconut, coconut milk powder, coconut milk and virgin coconut oil which are having high demand and prospects for commercial production and marketing.

The following Edible, Non edible and Value added products are selected and to be implemented in the district.

A. Edible Products:

- Coconut Kernels/ Coconut Milk
- Coconut oil
- Virgin coconut oil
- Candy, Desiccated coconut
- Coconut Powder
- Cookies, Laddu etc.,
- Tender Coconut (Snow ball, Minimally processed, Tender Nut juice)
- Coconut water and
- Neera (Neera Drink, coconut honey, coconut jiggery, coconut sugar)

B. Non Edible products:

- Coconut Palm: Furniture's and other kitchen utilities
- Coconut Leaf
- Coconut Husk
- Coconut Shell
- Coconut Testa oil: High fibre biscuit, dried to extract oil.

The Details of the products are as follows:

I. Food products from coconut water

- Tender Coconut Water
- Packaged Tender Coconut Water

- Minimal Processing of Tender coconut
- Snow Ball Tender Nut
- Fruit juice blended tender coconut water

II. Products from Mature coconut

- Water Bottled Coconut Water
- Coconut water beverages
- Coconut water concentrate
- Frozen coconut water
- Nata-de-coco
- Coconut jelly
- Coconut Vinegar

III. Products from coconut kernel

- Desiccated Coconut
- Coconut Chips
- Coconut milk
- Coconut Skimmed Milk
- Sweetened condensed skim milk
- Bottled coconut milk
- Coconut cream
- Spray Dried Coconut Milk powder
- Coconut syrup
- Coconut jam
- Pinacolada (coconut milk with pineapple juice)
- Yoghurt
- Virgin Coconut Oil through Wet Processing of Coconut
- Margarine
- Coconut Mayonnaise
- Coconut Flour
- Dietary fibre from coconut residue
- Coconut Honey
- Coconut Cheese
- Fermented beverage concentrate
- Toddy

IV. Products derived from unfermented

- Toddy Jaggery / palm sugar
- Refined Sugar
- Treacle

1. Coconut bites and others

V. Products from coconut by- products

- Coconut shell powder
- Coconut Shell Charcoal
- Activated Carbon

VI. Coconut based handicrafts

- Handicrafts
- Coconut Leaf
- Leaf Midrib
- Husk and coir
- Coir geotextiles
- Coirpith

Productivity Enhancement :

India stands in the forefront in productivity among all other coconut producing countries.While it has been demonstrated that a productivity as high as 18,000 nuts/ha could be obtained from some pockets, there are areas where productivity is as low as 5,000 nuts/ha. With the increasing cost of production, productivity has to be increased in order to make Indian coconut products competitive in the global as well as domestic market.

Local arrangements for marketing of coconut products.

KVK is encouraging the coconut growers as well as by product / Value added product producers through capacity building and linking the same with potential buyers like Dealers, Whole salers and market promoting activities.

Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Interventions under taken	Impact created	Photographs
OFT- Assessment of commercial flower crops in coconut based cropping system	The additional income obtained was Rs.9,70,00/- from adoption of Chrysanthemum and Marigold as intercrop in Coconut orchard.	
ICM in Coconut	The additional income of Rs.5,54,00/- was obtained from intercropping in coconut orchard and increased the soil fertility by growing the legumes as intercrop	
Entrepreneurial development of farmers/youths (FOCT) – 04	80 Coconut tree climbers were trained and Task force created in the district. They are earing Rs. 15,000 /month	

Interventions under taken	Impact created	Photographs
Trainings on Improved production practices in coconut and Soil fertility improvement and IPDM - 16	27 % yield increased due to implementation of the production practices and management of Stem bleeding and wilt	
Diagnostic and problematic field visit - 45 Nos	70 percent of the coconut farms recovered from stem bleeding and *Ganoderma* wilt	

Timeline proposed interventions by the KVK in promoting ODOP

Name of the interventions and number of Programmes	June 2021	July 2021	August 2021	Sept 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022
Technology assessment-**1**										
Front Line demonstrations-**1**										
Capacity building-**10**										
Other Extension activities-**15**										
Planting Material Production-**5000**										
Value added products-**05**										
Marketing interventions -10										

LAKSHADWEEP - COCONUT PRODUCTS

Introduction

Lakshadweep is not only the tiniest union territory of India but is the most remote and geographically isolated territory because of its peculiar nature of isolation in the Arabian Sea. It comprises 28 small Islands which 10 are inhabited and 18 uninhabited. The islands themselves are far away from each other making accessibility between each island which is constrained for performing any developmental activity. All together these Islands have a geographical land area of 3200 ha with a population of about 70,000.

For the purpose of ODOP selection, State Nodal Agency, UTL (Department of Agriculture) and KVK-Lakshadweep conducted a survey during 2020. The livelihood activities in Lakshadweep are mainly coconut and fish based processing and value addition. Coconut is processed and value added which is marketed within the islands and to the mainland. The main products of coconut from the island are coconut oil, virgin coconut oil, vinegar, neera, jaggary, coconut sugar and others. There are few expeller units in the islands to extract oil and supply within the islands. Most of the units extracting oil are of low efficient and depend on mainland for packaging and other requirements for marketing. In fish processing, the fish is converted to a traditional product called “Mas” which is cooked, smoked and sun dried fillets of Tuna fish which is sold internally and to mainland to a smaller extent.

Agriculture in Lakshadweep

The major agricultural crop in Lakshadweep is Coconut. Few vegetables are grown in the terraces and in traces on land based. The common vegetables grown are Tomato, Chilles, Brinjal, Okara, Amaranthus and others. Coconut is cultivated in 2650 hectors with very high density. The palm density in Lakshadweep is 420/ha comprising of 1.1. million bearing coconut palms. The annual coconut production is estimated to be around 10 crore nuts every year. After domestic consumption there is a surplus of eight crore nuts which are available to the food processing industries for value addition. At present most of these nuts are processed to copra (Dried kernels) in summer months except that a part of fresh nuts are procured from farmers for processing by individual establishment involved in oil expeller industry and self help groups active with traditional method of coconut oil production. The industry is as follows:

1) Quantity of fresh coconut marketed - 1 crore nuts
2) Quantity of nuts converted to copra (Dry kernels) - 6 crore nuts
3) Quantity of nuts converted to HPVCO and CPVCO - 1 crore nuts
4) Quantity of copra processed to oil - 1200 MT

Table 1: Island wise Area & Production of Coconut

Sl. No	Island	Area (Ha)	Number of coconut palms	Coconut production/ annum
1	Agatti	338.10	131859	13524000
2	Amini	306.10	119379	12244000
3	Androth	452.70	176553	18108000
4	Bitra	7.70	3003	308000
5	Chetlat	100.10	39039	4004000
6	Kadmath	243.50	94965	9740000
7	Kalpeni	258.50	100815	10340000
8	Kavaratti	392.00	152880	15680000
9	Kiltan	149.20	58188	5968000
10	Minicoy	426.10	166179	17044000
	Total	**2674.00**	**1042860**	**106960000**

It is an accepted fact that though tremendous opportunities exist in the Lakshadweep islands for enhancing income from coconut farming through production and marketing of value added products, there are only very few coconut based processing units functioning in the islands. The opportunity to market value added coconut products from the islands with a tag of organic is also yet to be properly utilised.

Inadequacy of entrepreneurship among the islanders for exploring the potential for income generation through coconut based value addition enterprises is quite evident. Few entrepreneurs who have ventured to market organic coconut oil are encountered with many problems especially those related to marketing. Copra, coconut oil, coir and coir products, neera (coconut inflorescence sap) and coconut jaggery are the major traditional coconut based enterprises available in the islands.

It is understood that the enterprises for value addition using advanced processing machineries and infrastructure are yet to be established. Problems due to limited transportation and marketing facilities, lack of difficulty in repair and maintenance of the existing old machinery in the coconut processing units functioning under government agencies, lack of efforts for facilitating farmer collectives to take up value addition enterprises, lack of proper guidance for individual private entrepreneurs in the islands for the production and marketing of coconut value added products, lack of labour and high wage rate etc. adversely affect the sector.

Table 2: Production of coconut and its by products in Lakshadweep

Sl. No	Island	Coconut Production/ Annum	Husk @ 300g/ nut in MT	Dehusked nuts @ 290g/ nut in MT	Shell @ 50g/ nut in MT	Coconut water @ 50ml/nut in MT	Kernel@ 190g/ nut in MT	Copra @95g/ nut in MT
1	Agatti	13524000	4057.2	3921.96	676.2	676.2	2569.56	1284.78
2	Amini	12244000	3673.2	3550.76	612.2	612.2	2326.36	1163.18
3	Androth	18108000	5432.4	5251.32	905.4	905.4	3440.52	1720.26
4	Bitra	308000	92.4	89.32	15.4	15.4	58.52	29.26
5	Chetlat	4004000	1201.2	1161.16	200.2	200.2	760.76	380.38
6	Kadmath	9740000	2922	2824.6	487	487	1850.6	925.3
7	Kalpeni	10340000	3102	2998.6	517	517	1964.6	982.3
8	Kavaratti	15680000	4704	4547.2	784	784	2979.2	1489.6
9	Kiltan	5968000	1790.4	1730.72	298.4	298.4	1133.92	566.96
10	Minicoy	17044000	5113.2	4942.76	852.2	852.2	3238.36	1619.18
	Total	**106960000**	**32088**	**31018.4**	**5348**	**5348**	**20322.4**	**10161.2**

Food product (chosen as ODOP)

The finalized ODOP products of Lakshadweep is coconut based food products and main products are detailed below:

- Coconut expeller oil
- Virgin coconut oil
- Coconut water vinegar
- Desiccated coconut powder
- Defatted coconut powder
- Coconut based snackes

Time line proposed interventions by the KVK:

Technology assessment	Frontline Demonstration	Capacity development
• Value addition and processing of technologies (3 years)	• Demonstrating best practices (2-6 years) • Scaling up of best practices	• Quality neera production • Efficient methods in producing jaggary from neera • Skill demonstration in coconut sugar production, Virgin coconut oil, Desiccated coconut powder, Defatted coconut powder, Coconut based snakes
Extension literature & other knowledge materials	Exposure visits	Method demonstration

Technology assessment	Frontline Demonstration	Capacity development
• Production of extension literature on best practices identified in local language • Awareness progammes on ODOP programme • Establishment of micro processing units • Success story of value addition unit in the district(Three months once)	• Visit to value addition and processing units of coconut • Visit to R&D institutes on value addition and processing in coconut • (Six months once)	• Demonstrating best practices in production of value added and processed coconut products

MALAPPURAM - COCONUT PRODUCTS

Malappuram has tropical humid climate with an oppressive summer and plentiful seasonal rainfall. Major crops cultivated in the district are coconut, arecanut, paddy, banana, vegetables, tapioca, pepper, sesame etc. of which coconut is the most important rainfed crop of the district. Area, production and productivity of coconut in Malappuram and Kerala as a whole is presented below;

Place/ State	Area (ha)	Production (m nuts)	Productivity (Nuts/ha)
Malappuram	105090	1063	10117
Kerala (total)	760250	7684	10097

Technological backstopping

The technologies for preparation of varied products from different parts of coconut are available with ICAR-CPCRI and Coconut development board are briefed below

- **Coconut kernel:** Virgin coconut oil, desiccated coconut, coconut milk, coconut cream, dried coconut milk powder, coconut flour, coconut chips, coconut chunks, flavored coconut milk
- **Inflorescence:** Neera, palm jaggery,
- **Coconut water:** Coconut water concentrate, coconut vinegar, nata-de-coco
- **Coconut trunk:** Timber
- **Coconut leaf:** Thatching houses, decoration, midribs of leaves are used to make brooms, fancy products like fruit baskets, caps etc.
- **Coconut husk:** Soil conditioner and rooting medium
- **Coconut fibre:** Handicrafts
- **Coconut shell:** Activated carbon, charcoal, ice cream cups, buttons for garments, handicrafts

Schematic representation of different coconut products

	
Neera – Unfermented coconut inflorescence sap	**Palm jaggery (*Kerachakkara*)**
	
Handicrafts from coconut shell	**Handicraft from coconut fibre**

Marketing opportunities

Globally, out of 12.5 million ha of area under coconut, close to nine million hectares (about 75% of the total area) is contributed only by Indonesia, Philippines and India.

- Continuous demand for coconut nuts in domestic market
- Huge demand for coconut oil
- Desiccated coconut is a well-established exported product of coconut
- Activated carbon market is growing faster chiefly because of its use in mitigating environmental pollution, especially removing heavy metal residues in industrial pollutants.
- Virgin coconut oil, a high value cosmetic and medicinal product has a niche market
- Coir and Coir-Based Products: China is the major buyer of coir fiber (90%) and its requirement is expected to increase 10-20% every year. At present, there is deficit of nearly 20% in supply of coir fiber in the world

Efforts made by KVK for the promotion of coconut products

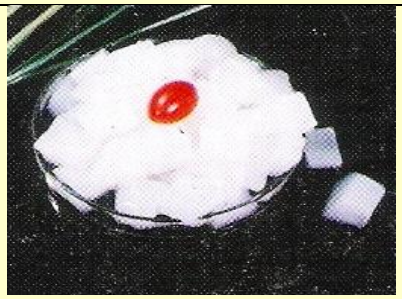
- Small scale production of coconut water vinegar and clarification of vinegar using fining agents
- Production of Nata De Coco
- Management of stem bleeding in coconut
- Crop intensification through introduction of Gliricidia, Guinea Grass, turmeric, bush pepper and hybrid napier as intercrop
- Area wide management of red palm weevil through CPS
- Mini set planting of Amorphophallus variety *Gajendra*

- CPS level management of bud rot using mancozeb
- Rhinoceros beetle management through *Metarhizhium*
- KAU coconut climbing machine *Kerasuraksha*
- Insitu moisture conservation



Small scale production of coconut water vinegar





Production of Nata De Coco


Clarification of coconut water vinegar using fining agents

KANNUR – COCONUT OIL

Brief agricultural profile of the district

District:	Kannur
Gross cropped area:	219901 ha
Net cropped area:	186766 ha
Cropping intensity:	118
Coconut Area:	83663 ha
Coconut Production:	501 million nuts
Productivity of coconut:	5988 nuts /ha

(Source: Dept. of Economics and Statistics, Kerala,18-19)

Technological backstopping available for the product

Kerala Agricultural University and Central Plantation Crop Research Institute, Kasargod

Opportunities for Secondary and Specialty Agriculture in respect of the identified product

Processed and Value added products of coconut- Coconut oil., Virgin Coconut Oil, VCO Meal peda, Vinegar, Tender coconut water RTS etc., Coirpith compost, Cocopeat

Marketing opportunities for the identified product of the district – both domestic and international.

Ecoshops of Department of Agriculture, FPO outlets

Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

- On Farm Tests, Front line Demonstrations ,
- EDPs on Coconut and Coconut based produce
- Capacity building trainings on Coconut Production Technology
- Skill based training on Processing and Value addition of coconut
- Training for coconut technicians
- Convergence with FPOs
- Coconut Nursery Management Techniques
- Sponsored trainings in convergence with Coconut Development Board

Training for Coconut FPO

Skill based training on Processing and Value addition of

	coconut	
		
Coconut seedling nursery in convergence with Thejaswini Coconut Farmer Producer Company		

- Skill training for selected youths through FPOs during the past 5 years

- **VFFS on Coconut:** On world Coconut Day, KVK Kannur in collaboration with CPCRI Kasargode has initiated a Virtual Farmer Field School (VFFS) on Integrated Crop Management in Coconut, where the discussion and interaction among farmers and between farmers and experts about the field problems was in online mode on 02-09-2021


Inauguration of VFFS on Coconut

VFFS was conducted through Thejaswini Coconut Farmer Producer Company at Thirumeni Cherupuzha, Coconut Farmer Producer Company at Pariyaram and Coconut Farmer Producer Company at Iritty as monthly sessions on various aspects including microclimate management, mother palm identification, nursery management, integrated nutrient management, integrated pest and disease management, processing and value addition, creation of coconut service providers etc.

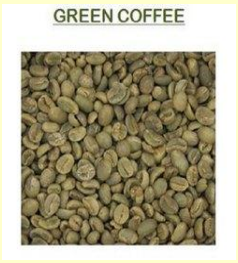
Timeline proposed interventions by the KVK in promoting ODOP

- On Farm Tests
- Front line Demonstration on e-Kalpa, mobile application developed by CPCRI on Coconut Cultivation
- Training and capacity building programmes on coconut cultivation
- FFS and VFFS on Scientific Coconut cultivation
- EDPs on Coconut and Coconut based produce for farmers and youth
- Sponsored trainings in Convergence with CDB programmes on rejuvenation of coconut cultivation
- Leaflets and e-Leaflets on integrated nutrient management and integrated pests and diseases in coconut

KODAGU - COFFEE

Brief agricultural profile of the district

Coffee based mixed farming system (Coffee, Black pepper, paddy, fishery, piggery, back yard poultry and fruit crops) is the unique feature of the district and backbone of the economy of the district. High elevation and shaded coffee with diversified forest flora and fauna is the uniqueness of coffee in this district. Coffee is growing in an area of 1,05,670 ha (70% Robusta coffee, 30% Arabica coffee) with a production of 107,175 MT (90,075 MT Robusta, 17,100 MT Arabica) of clean coffee by about 40,000 growers and productivity is between 500-600 kg clean coffee per ha. The socio economic condition of the district mainly depends on the coffee yield, but the increasing cost of cultivation, erratic and high rainfall and low price prevailing are pushing the farmers into stress period from last three years.



Details of technological backstopping in the district

The coffee board apart from KVK is the main technology backstopping agency both for research and extension activities including subsidy programmes for scientific management of coffee estate. Marketing support was withdrawn in the year 1993, now the farmers are at liberty to sell their produce in the open market. Supply of quality seed and planting material, soil test based lime and fertilizer application, subsidy programmes for rejuvenation of senile estates, water resource augmentation, mechanization, training programmes, field visits are undertaken every year. Kaapi shastra is the unique paid training programme from Coffee Board, concentrating mainly on Post harvest practices and value addition in coffee.

Opportunities for Secondary and Speciality agriculture

The secondary agriculture encompasses processing, value addition and marketing. Majority of the farmers sell their produce to the local traders. There are frequent complaints by the farmers on the moisture and outturn percentages being exploited by the middlemen to cheat them. Aggregation of produce by the cooperatives or Farmers producer organizations with the aid of Block chain system of Coffee Board can assist the farmers in this area. Qualitative and quantitative production system at farm level is the first step, followed by best practices at harvesting can help in augmenting quality issue at curing. The clean coffee production and traceability are the two mantras for competitiveness and realization of price. Once the clean coffee done can be

stored in the infrastructure developed ware houses can auction by individually or organizations through coffee board promoted ICT platform. Value addition is the process of roasting, blending, powdering, packing, labelling, branding and marketing. Speciality coffee covers flavoured and specialized methods to collect the raw coffee (civet coffee, birds coffee, elephants coffee), processed similar to other coffee powder.

Marketing opportunities at domestic and international level

Coffee is an export commodity; our major importers are European countries, Russia and Arab countries. Indian Coffee Trade Auctioning is very strong network with other countries helping in domestic and foreign trade. Indian coffee with a tag of GI and shade grown with diversified forest based ecosystem favours build up of various branded filtered, hot and speciality coffee from Kodagu district.

Mandated activities undertaken by the KVK

From KVK we are extending the facility of soil test based lime and fertilizer application for consistent yield and quality. An average 750 to 1000 soil sample analysed every year. Diagnostic field visit or field visits are regularly taken up by KVK for pest and disease management at farmers fields. Nurturing of FPO was the highlight and impact created among the planter's community for input management. FPO (Puthari Farmers producer company ltd) is having a membership base of 1100 members with an area of 15,550 acre of coffee. In the year 2020, for the first time pooled 1500 bags (50kg each) aggregated from shareholders, processed and marketed in the domestic market and shared the profits among the shareholders(12-15% higher). Also, FPO processed part of the coffee beans as roasted, blended, powdered filtered coffee and marketing with the brand "Jamma and Jest".

Time line proposed interventions by the KVK:

Technology assessment	Frontline Demonstration	Capacity development
• Scientific Treatment of parchment effluent for composting and its enrichment • Scientific composting of coffee husk and its enrichment(3 years)	• Blending of coffee for filter coffee production • Packaging specifications for coffee products promotion • Improved scientific cultivation practices in coffee • Improving soil quality and reducing the cost of cultivation by Soil test based fertiliser application. (2-6 years)	• Pre & Post harvest practices for quality production of coffee • Value addition in Coffee • Formalities for getting FSSAI licence for products marketing • Packaging requirements for various products • Blending techniques in Coffee Powder production • Speciality coffee production (Monthly one training)
Popular articles	**Exposure visits**	**Method demonstration**
• Awareness on ODOP programme • Establishment of micro processing units • Success story of value addition unit in the district • (Three months once)	• Visit to curing and processing establishments • Visit to value addition units in and out the district • (Six months once) •	• Preparation of good coffee • Preparation of filter coffee blends • (monthly once) •

Extension activities

EDP: Establishment of model value addition (coffee powder) unit at KVK (First year)

- KVK being the important technology backstopping agency in the District for farmers

- Coffee is the bread and butter of farmers in the district
- The socio-economic condition of the district depends on the coffee production.
- The benefits of primary production getting stagnated with a net income of Rs 80,000 per ha causing the farmers in stress condition
- High time and scope to showcase the processing and value addition of Coffee
- ODOP pave a way in utility of KVK farm coffee demonstration unit (2ha) by use of existing resources(crop, space, water, labour, governmental support)
- The unit both acts as revolving fund activity and common facility centre for farmers for clean coffee production, grading, roasting, blending, powdering, packing, labeling, branding
- Regular capacity building activities for farmers, farm women, rural youths, SHG members, FPOs for entrepreneurship and higher income

Model value addition unit at KVK

Machine Type	Approx. Budget required	Capacity
Pulper cum huller	2,50,000	50kg/hr
Roasting machine	4,75,000	25 kg/hr
Grinding machine	1,50,000	25 kg/hr
Blending machine	2,50,000	25 kg/hr
Packing machine	1,00,000	25 kg /hr
Misc.	50,000	

The above machineries are for end to end solutions of value addition.



Production and availability of technological inputs

- Scientific recycling of Farm waste
- Production of quality planting material
- Soil testing

VIJAYAPURA 1 & 2 - LIME

Brief agricultural profile of the district

Vijayapur is one of the largest district in Karnataka and has an area of 10541 sq.km., covering 5.49 per cent of the area of the State. It falls under the agro-climatic zone of Northern dry zone-3 of Karnataka state which receives average annual rainfall of 632 mm. Vijayapur district has five taluks namely Muddebihal, Basavana Bagewadi, Vijayapur, Sindgi and Indi. Due to the untimely and inadequate nature of rainfall, Bijapur district has frequently suffered from famines and droughts. Though the district is being drained by five rivers, the area under irrigation is very small. The total area sown is 842,586 hectares, out of which only 1,98,614 (23.5%) hectares is irrigated.

Lime is a unique crop that it is harvested around the year and that they are sold in terms of number of limes rather than kilograms of lime. A unit of limes sold in Vijayapur market is referred to as a “dag” and they are sold in batches of 1,100 limes per dag. During the summer season between February to May, the demand for limes is very high from juice vendors because of the hot temperature, therefore the price of limes is very high at around Rs. 700-1,400 per dag. In the rainy and winter season, June – September and November – December, there is a huge supply of limes because of the monsoon rains and limited demand because of the wet and cold weather. The price of 1,100 limes during the rainy and winter seasons falls to between 10-200 rupees. Because the cost of harvesting, transporting, and purchasing bags is higher than the price of limes in the market-place, farmers end up letting their limes fall on the ground and use the limes as fertilizer. By adding value to and preserving limes during the rainy and winter seasons, farmers can increase their incomes and reduce the unnecessary wastage that is so prevalent in agriculture in India today.

Crop	Area (ha)	Production (Mt)	Productivity (t /ha)	Potential Yield (t/ha)	Yield Gap (t/ha)
Lime	6815	170375	25	25	5

Details of technological backstopping available for the product

1) Lime Board , Indi Vijayapur district
2) Krishi Vigyan Kendra, Vijayapur
3) Central Citrus Research Institute(CCRI), Nagpur
4) College of Food technology , UAS,Dharwad
5) College of Agriculture, Vijayapur
6) Central Food Technological Research Institute (CFTRI), Mysore

7) Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana,Punjab
8) Indian Institute of Food Processing Technology, Thanjavur, Tamil Nadu
9) Dept. of Agriculture food processing and engineering, UAS, Raichur
10) Indian Institute of Horticulture Research, Bengaluru
11) University of Horticultural Sciences, Bagalkot

Secondary and Specialty Agriculture in respect of the identified products

The lemon is a small evergreen tree (Citrus limon) originally native to Asia and is also the name of the tree's oval yellow fruit. The fruit is used for culinary and non-culinary purposes throughout the world primarily for its juice, though the pulp and rind (zest) are also used, mainly in cooking and baking. Lemon is about 5% (approximately 0.3 mole per litre) citric acid, which gives lemons a sour taste, and a pH of 2 to 3. This makes lemon juice an inexpensive, readily available acid for use in educational science experiments. Because of the sour flavor, many lemon-flavored drinks and candies are available, including lemonade and sour heads. Lemons are used to make lemonade, and as a garnish for drinks. Lemon zest has many uses. Many mixed, soft drinks, iced tea, and water is often served with a wedge or slice of lemon in the glass or on the rim. The average lemon contains approximately 3 tablespoons of juice. Fish are marinated in lemon juice to neutralize the odor. Lemon juice, alone or in combination with other ingredients, is used to marinate meat before cooking. Lemons, alone or with oranges, are used to make marmalade. The grated rind of the lemon, called lemon zest, is used to add flavor to baked goods, puddings, rice and other dishes. Pickled lemons are a Moroccan delicacy. Numerous lemon liqueurs are made from lemon rind. Apart from the juice, the essential oil extracted by steam distillation is an important product from the fruit. Lemon oil is highly beneficial for medicinal purposes. The main chemical components of lemon oil are a-pinene, camphene, b-pinene, sabinene, myrcene, a-terpinene, linalool, b-bisabolene, limonene, trans-a- bergamotene, nerol and neral. India tops the production list with ~16% of the world's overall lemon and lime output followed by Mexico (~14.5%), Argentina (~10%), Brazil (~8%) and Spain (~7%). The Indian market for processed foods is growing at over 12 per cent a year, propelling demand for flavours in savoury foods and beverages as the large food makers make inroads into the region. Globally, the flavours and fragrances industry is estimated at about â‚¬14.8 billion, of which the top five players account for 40 per cent of the market. These top five companies have a substantial presence in the â‚¬187 million Indian flavours and fragrance market - flavours make up 45 per cent of the market, and fragrances 55 per cent. Fragrances will continue to play an important role in product differentiation, aiding demand growth. Environmental fragrance goods will also experience healthy gains through 2012, driven by advances in aromatherapy and household applications, as well as consumer desires for more sophisticated and blended fragrances. Food will remain the largest market for flavors and fragrances, based

on the widespread application of flavor materials in processed food, dairy and bakery products, candy and confectioneries, and other items such as breakfast cereals and bars, meat and seafood products, snack food and meal supplements/replacements. The further expansion of fortified food as well as beverages -- will provide opportunities, since flavors are often used to cover up the off-tastes of vitamins, minerals, antioxidants and other additives. There is a good scope for new entrants and entrepreneurs should venture into this field.

Food products	Cosmetic products
Lime salt pickle	Hair oil
Lime sweet pickle	Soap
Lime spicy paste pickle	Toothpaste
Lime juice	Mouthwash
Lime squash	Hand sanitizers
Lime candy	Floor cleaners
Lime Jam	
Lime Jelly	
Lime zest(Rind)	
Citric acid	
Lime powder	

Marketing opportunities for the identified product of the district – Domestic and International.

Domestic : Local mandis , HOPCOMS , APMC, Malls , Retail market, Online marketing , Kisan Bandi

International: Foreign countries

Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Year	2016-17	2017-18	2018-19	2019-20	2020-21	2016- 2020
OFT	-	-	-	-	-	**-**
FLD	01	01	01	01	01	**05**
Trainings	02	01	02	03	03	**11**
EDP	-	-	-	01	-	**01**

Technology details

Sl No	FLD	Technology demonstrated	Impact
1	ICM in Lime	Citrus canker: Removal of dead parts and Spraying with Bacterinashak@0.05g/l + COC@2g/l (3 sprays)	• 8.95% increase in yield • net income of Rs. 96800/ha • B:C ratio of 3.27

Sl No	FLD	Technology demonstrated	Impact
2	ICM in Lime	Wilt complex management in lime Sanitation, drenching with Metalaxyl MZ @ 3 g/lit, Soil application with Pseudomonas floroscence @ 2 kg /acre with 100 kg FYM.	• 20.85 % increase in yield • Net income of Rs. 139050/ha • B:C ratio of 4.63
3	IPM in Lime	Gummosis and canker management in Lime: Spraying with Bacterinashak@0.05g/l + COC@2g/l(3sprays), Pseudomonas fluroscence @ 10 g/litre, removal of dead parts, Stem smearing with Bordeux mixture paste	• 15.69% increase in yield • net income of Rs. 89150/ha • B:C ratio of 3.09

1. 2016-17	FLD- Integrated crop management in Lime	
Technology demonstrated: For Citrus canker: Removal of dead parts and Spraying with Bacterinashak@0.05g/l + COC@2g/l (3 sprays)	**Impact created:** Percent increase in yield over farmers practice was 8.95% with net income of Rs. 96800/ha and B:C ratio of 3.27	
2. 2017-18	**FLD- Integrated Pest management in Lime**	
Technology demonstrated: For Gumosis and canker management in Lime: Spraying with Bacterinashak@0.05g/l + COC@2g/l (3 sprays), *Pseudomonas fluroscence* @ 10 g/litre, removal of dead parts, Stem smearing with Bordeux mixture paste.	**Impact created:** Percent increase in yield over farmers practice was 15.69% with net income of Rs. 89150/ha and B:C ratio of 3.09	
3. 2018-19	**FLD - Integrated Pest management in Lime**	
Technology demonstrated: For Gumosis and canker management in Lime: Sanitation, Pruning of dead branches during May end, Spraying with *Pseudomonas floroscence* @ 5 g per litre (3 sprays), Spraying of COC + antibiotics 3 g +0.5 g per litre (3 sprays), Drenching with Matelayxl MZ (Ridomil gold) @ 3 g per litre. 3litres per plant and Arka Lime special @ 2kg/ac.	**Impact created:** Percent increase in yield over farmers practice was 09.09% with net income of Rs. 199200/ha	

	and B:C ratio of 3.62.	
4. 2019-20	**FLD- Wilt management in Lime**	
Technology demonstrated: Sanitation, drenching with Metalaxyl MZ @ 3 g/lit, Soil application with Pseudomonas *floroscence* @ 2 kg /acre with 100 kg FYM.	**Impact created:** Percent increase in yield over farmers practice was 20.85% with net income of Rs. 139050/ha and B:C ratio of 4.63.	
5. 2020-21	**FLD- Wilt complex management in Lime**	
Technology demonstrated: Sanitation, drenching with Metalaxyl MZ @ 3 g/lit, Soil application with *Pseudomonas floroscence* @ 2 kg /acre with 100 kg FYM.	**Impact created:** Percent increase in yield over farmers practice was 18.22% with net income of Rs. 127925/ha and B:C ratio of 4.26.	

Timeline proposed interventions by the KVK in promoting ODOP

Sl. No.	Particulars	Title of Technology	No. of Demos	Area (ha) / Units/No's	Team members involved
1	FLD	Wilt complex management in Lime	10	4	Plant Pathology & Horticulture
2	EDP	Processing of lime	1 SHG	-	Plant Pathology & Home science
3	Capacity development	Cultivation and processing of Lime	250 Nos	-	Plant Pathology & Home science
4	FFS	Cultivation and processing of Lime	01	-	Plant Pathology & Home science
5	Planting materials	Kagzi variety	-	3000	Farm manager

GADAG – BYADAGI RED CHILLI

Agro-ecologically, Gadag district lies in the hot semi-arid region of the Deccan Plateau and Agro-Climatically, Northern Dry Zone-3 and Region-2 of Karnataka State. Northern Dry Zone-3 comprises Gadag, Ron, Gajendragad, Mundargi and Naragund talukas (5 Blocks) and Northern Semi-Transitional Zone-8 comprises Shirahatti and Laxmeshwar taluka (2 Blocks). The district has semi undulating to undulating table land within the watershed of Krishna River. Malaprabha river and Tungabhadra river both tributaries of Krishna passes through the outer edges of the district i.e. Ron and Mundargi talukas respectively. The district receives average rainfall of 640 mm with history of occurrence of agricultural droughts with a probability of 70 per cent of years. Long dry spells in Kharif season and receding soil moisture in Rabi season are the main characteristics of agricultural droughts. About 46.1 per cent of soil type is medium black soil followed by 40.7 per cent deep black soil. Rest of the soil type is red sandy soils and red & black mixed soil. The district has a total cropped area of 552809 hectares (84.24 per cent of total geographical area). Net sown area is 404457 hectares. About 1.65 lakh hectare is sown more than once with a cropping intensity of 143.6 per cent. The district has an irrigation area of 99353 hectares (24.56 per cent) and it is mainly confined to Naragund and Ron taluks which get protective irrigation from Malaprabha Reservoir. Important crops cultivated are Greengram, Bengalgram, Redgram, Groundnut, Sunflower, Maize, Rabi Sorghum, Bt.Cotton, Onion and Chilli.

<u>"Byadagi Chilli" : Importance, uniqueness and utility value</u> :

Byadgi chilli is a famous variety of chilli mainly grown in the Gadag district of Karnataka State. It is named after the town of Byadgi which is located in the Haveri district of Karnataka. The business involving Byadagi chillis has the second largest turnover among all chilli varieties of India. An oil, oleoresin extracted from these chillies is used in the preparation of nail polish and lipsticks. Byadagi chilli is also known for its deep red colour and is less spicy and is used in many food preparations of South India. Byadagi chilli has been accorded Geographical Indication (GI) in February 2011. **Its GI tag is 129.**

Byadagi chillies come in two types: dabbi and kaddi. Byadagi dabbi, which is small and plump, is more popular for its colour, flavour and taste. Though it has more seeds, it is less spicy compared to the kaddi variety. This variety is best suited for masala preparation and oleoresin extraction. Many established food companies prefer this variety for their products. Among cosmetic products, it is mainly used in nail polish and lipstick. The kaddi type is gnarled, thin, long and has fewer seeds.

Cuisine :

Byadagi chilli is an important ingredient in spicy preparations like Bisi bele bath, sambar, chutneys and other food items of South India and is widely used in the Udupi cuisine. It is also used in meat preparations because of the bright red colour that it imparts to the meat. 25 industries in and around Byadagi are involved in grinding these chillies into powder and selling them to masala manufacturers like MTR Food Products and other companies

Oleoresin :

Earlier Byadagi Chilli was grown mainly for the purpose of using it in food items as a spicy ingredient but recently, it has also been grown for the extraction of oleoresin, a red oil from the pods. Oleoresin is used in the preparation of nail polish and lipsticks. The extraction of oleoresin has also led to the creation of cold storage units in Byadagi since the chilli pods have to be maintained at a low temperature of 4 to 6-degree Celsius to maintain the colour and purity. Storing in cold storage units also increases the amount of oleoresin extracted from chilli by about 30–40%. About 50 litres of oleoresin can be extracted from about 1 tonne of Byadagi chillies. Companies have been set up in and around Byadagi town that are involved in the extraction of oleoresin. This oleoresin is then sent to Kerala where it is further refined before being exported to USA, Japan and European countries.

Business :

Byadagi Chillies are primarily sold at the Byadagi Chilli market; annual sales are about Rs.3 billion ($75 million). This market attracts traders from all over Karnataka and from neighbouring Andhra Pradesh because of favourable conditions for the business like a fair price, immediate payment and accurate measurement of the Chillis. The recent increase in sales of low-priced, more-pungent chilli varieties into the market has caused a decrease in the price of Byadagi chillies as well. Because of this, the farmers involved in its cultivation may not be able to make the required profits on their yield.

Uniqueness of Byadagi Chilli :

- Bydagi Chilli have got the highest colour values of 150000 to 250000 CU and red in colour (156.9 ASTA colour units) and negligible (0.03%) in capsaicin.
- Fruits stand out by their deep red colour on maturity and wrinkles on the surface.
- Fruits are 12-15 cm long and thin but not too pungent and not spicy.
- The plant grows to a height of 1m. with a spread of 1m. Leaves are thin and light green in colour.

Byadagi Chilli : Gadag district Scenario :

Byadagi Kaddi

Red Chilli is the important commercial spice crop cultivated in Gadag district. It is mainly grown in rainfed situation in deep to medium black soil in Kharif season. The sowing window is June – July and is mostly seed drill sown. Either it is sown as a sole crop or intercropped with Onion. Farmers mainly use "Byadagi Dabbi" or "Byadagi Kaddi" varieties. Normally farmers use their own selection seeds or buy it from other Chilli Growers. During 2019-20, area under dry chilli was 20729 hectares with annual production of 31407 quintals. The productivity of Chilli per hectare, area sown and production depend on the ideal climatic situation i.e. timely onset of monsoon, sufficient rainfall during growing period from July to September. Further, ideal management practices contribute to higher productivity. However, there are major productivity constraints and market related issues confronting the Chilli Growers.

Byadagi Dabbi

Details of Technological Backstopping available for the Product -

There are several research institutes, Universities and Organisations involved in research on productivity enhancement, quality enhancement and preparation of various value added products. The details of Institutes are given below

1) University for Horticultural Sciences, Bagalkot
2) College of Engineering, University of Agricultural Sciences, Raichur
3) ICAR-Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana
4) Central Food and Technology Research Institute, Mysore
5) Indian Institute of Horticulture Research, Bengaluru
6) Spices Board, Cochin
7) Private Agencies and Firms
8) Indian Institute of Food Processing, Tanjavur

Opportunities for Secondary and Specialty Agriculture in respect to the identified product:

The Byadagi Chilli grown in Gadag district is known for colour, pungency, taste, aroma and is used daily in almost all dishes. After harvest of crop, the chillies are sun dried and are marketed without processing which fetches low price in the market. In addition, the drying of Red Chillies on the mud floor leads to adherence of mud sand and dust particles which affect the colour and keeping quality of chilli powder. The sun dried chillies as well as the chilli powder may fail to meet the standards for export. In this direction, it is very important to produce the good quality product to meet the domestic and international market. There are ample opportunities for processing of red chillies into various products, because pure Byadagee red chilli powder is in great demand. In addition, many traditional and ethnic chilli based processed products are forgotten by the younger generation. To rejuvenate and to give new instinct to the traditional product and to make availability of fresh products, the processing and value addition of red chilli products is very important. For many traditional products like dry chutneys and pickles, red chilli powder is the main ingredient used. The chilli based products like methi chillies, masala chilli powder, green chilli pickle, etc., are more popular in Northern part of Karnataka. In this backdrop, it is very important to promote secondary agriculture through processing, value addition and marketing of red chilli products.

The following are the chilli based value added products to be promoted under speciality agriculture.

1) Red chilli powder
2) Masala chilli powder
3) Methi chillies
4) Green cut and dried chillies
5) Green chilli pickle
6) Ripened red chilli chutney
7) Green chilli powder
8) Red chilli flakes
9) All types of pickles
10) Chutney powders – All types




Marketing Opportunities for Products of Byadagi Chilli :

Chilli powder is consumed daily in our food system for its flavour, taste and nutrition. Chilli is also used in the medicine because of its stimulative and digestive properties. Hence, there is huge demand for “Byadagi type Chilli” at domestic and international market. Several value added products viz., masala powder, chilli flakes, methi chilli, sambar powder, chilli pickle can be prepared. The Self Help

Groups Forum can be effectively used for preparation of these products and KVK can play a role of marketing facilitation through its network of partners.

There are two Horticulture FPOs in Gadag district and majority of members are Chilli Gorwers and these FPOs can establish Chilli processing units and develop a brand of "Byadagi Chilli Powder" and various value added products. These FPOs, can tie up with National and International Traders.

Details of plant and machineries required for chilli processing and value addition Model Unit at KVK, Gadag:

Sl. No	Name of the	Cost of machinery (Rs. in lakhs)	Capacity	Purpose
1	Destemming	90	-	Remove the stems & enhance the keeping quality of chilli powder
2	Pre-cleaner and destoner	5	500 Kg./hr	Removes the dust, mud and stones
3	Pulveriser	5	1 Qtl./hr	For making chilli powder
4	Vibrator sieve	1	1 Qtl./hr	Removing big size particles and seeds
5	Solar drier Roaster cabinet drier	5	50-100 Kgs	For drying of methi chillies, drying of green chillies and cut chillies
6	Chilli pounding machinery	0.8	10 Kg./hr	For making chilli based chutneys
7	Blending machine/ homogenizer	2.0	50 Kg./hr	Homogenisation of masala powders
8	Pedal sealer, band sealer and FFS machine	2.0	200 bags/hr	Packing and sealing of masala powders
8	Fruit pulper, fruit washer	3.0	50 Kg./hr	For the preparation of Ethnic ripened red chilli chutney
9	Mango cutting machine	2.0	1 Qtl./hr	For the preparation of mango pickle
10	Amla cutting machine	1.0	0.5 Qtl./hr	For the preparation of Amla pickle
11	Pasteurizer	1.0	50 Kg./hr	Pasteurization of red chilli chutney

Brief on the mandated activities undertaken by the kvk during the past 5 years on in the identified product:

During the past 5 years, KVK has carried out the following mandated activities on Byadagi Chilli

Particulars	No. of trainings	No. of participants
1. TRAINING PROGRAMMES :		
a) Training on Integrated Crop Management in Chilli	19	532
b) Training on Post Harvest Management	7	189
c) Training on Sucking Pest Management	23	700
d) Training on Value addition in Chilli	7	185
TOTAL	**56**	**1606**
2. FRONT LINE DEMONSTRATIONS :		
Particulars	**Area (ha.)**	**No. of farmers**
a) Integrated Crop Management in Chilli	6	15
b) Method demonstration on Vaccum packaging of Chilli	-	150
TOTAL	**6**	**165**
3. EXTENSION ACTIVITIES :		
Particulars	**No. of activities**	**No. of participants**
a) Organisation of Seminar on Red Chilli	2	150
b) Organisation Exhibitions	5	1500
c) Celebration of field days	1	75
d) Field visits	45	130
TOTAL	**53**	**1855**
4. SALE OF TECHNOLOGICAL PRODUCTS :		
Particulars	**Quantity**	
a) Sale of Byadagi Chilli seeds	0.9 quintals	
b) Sale of HDPE polythene sheets for drying of Chilli pods		

Timeline proposed interventions by the KVK in promoting ODOP

a) Technology Assessment: Assessment of drying of Byadagi Chilli in solar drier December, 2021 to January, 2022

b) Front Line Demonstrations:

- IPM in Byadagi Chilli - July to November,2021 and 2022

c) Entrepreneurship Development: It involves preparation of following chilli products along with packing, labelling and marketing skills - January to March, 2022 and 2023

- Chilli powder
- Masala chilli powder
- Methi chilli
- Chilli pickle

d) Seed Production programmes of Byadagi dabbi and kaddi varieties – July to November, 2021 and 2022

e) Training programmes :

i) To Farmers / farm women:

- Good Agricultural Practices in Byadagi Chilli cultivation - June, 2021 & 22
- Integrated Pest Management in Byadagi Chilli - July to September, 2021 & 22
- Integrated Disease Management in Chilli - July to September, 2021 & 22
- Nutrient Management in Chilli - July to August, 2021 & 22
- Post Harvest Management in Chilli - November, 21 to January, 22
- Seed production of Byadagi varieties - June to October, 2021 & 22

ii) To Rural Youths :

- Value addition in Chilli - October to November, 2021 & 22
- EDP on Chilli based micro enterprises - November to December, 2021 & 22
- Seed production - June to October, 2021 & 22

f) Extension Programmes:

- Organisation of Buyers – Sellers Meet - December, 22 to January, 2023
- Seminar on Byadagi chilli crop - July, 2022
- Farm advisories services - July to November, 2021 & 22
- Facilitation of marketing linkages - January to February, 2022 & 23

BIDAR -GINGER

Bidar is a district of Karnataka state in southern India. The historic city Bidar is the administrative centre of the district. Bidar is popularly known as pulse bowl of Karnataka. Historically this place has been a bone of contention for centuries among several kingdoms.

Agro-Climatic Conditions :

Bidar district climate is moderate almost throughout the year dry. The average rainfall of the district is 847 mm with 50 rainy days spread across the district. Medium and minor irrigation facility is available in the district. The soil types of bidar district comprising of black soil and laterite soil. The district soils are deficit in nitrogen,phosphorous,sulphur,zinc and boron and high in potassium,Laterite soils are deficit in potassium.

Agriculture :

Agriculture is the main occupation in rural parts of the district and plays a vital role in the economy of the district. About 65 per cent of the working population depends mainly on agriculture.. Among the diversified crops ginger has its own place for quality and quantity of production. It occupies in an area about 4000ha with 7lakhs MT production with 175 t/ha production. In the district ginger is grown both in black and red soil. Majority of the growers adopt advanced production technologies like selection of disease free seeds, effective land preparation. Adoption of drip irrigation system with raised bed, rhizome seed treatment, fertigation practices with effective plant protection measures. These good horticulture practices creates avenue to achieve a record yield ranging from 170-220t/ha. In the district **Humnabad local, Mahim** and **Maran** are the major ruling varieties. Some other varieties like **Himachal** and **Reo-de-janerio** are found in small quantity. The favourable climatic conditions with supported with good soil and water properties enables to harvest quality ginger rhizomes.

Socio-economical importance of ginger:

The cost of quality seeds is the major investment for the producers. The farm gate price for the farmers to the ginger ranges from Rs.2000-15,000/qt.

The average price about Rs.50000/t to the produce about 7200tonne will accounts Rs.36croresyear revenue to the district only from fresh produce. In some situation market price will come down as low as Rs.20, 000/t which discourages to the ginger growers. This creates an opportunity to intervene the Institutes to reduce the production cost and create a platform to sell the produce to an attractive price. This is possible only when the produce is either exported in a fresh form or processing and value-added form.

Technological backstopping available for the product

Sl. No.	Institutes	Technology
1.	ICAR - INDIAN INSTITUTE OF SPICES RESEARCH Kozhikode-673012, Kerala, India	**Zero Energy Chamber:** -Dimension for a chamber to keep 200 kg of fresh ginger: -Double brick structure- outside wall: Length- 180 cm: -width- 130; Height- 82 cm Inside wall: Length – 120cm; width- 90 cm; Height- 75 cm Gap between walls – 20 cm -During storage the sand can be moistened with water every alternate day which will keep the temperature inside the chamber about 5-7 degree lower than ambient. It can store healthy ginger up to 4-5 months without damage.
		Micronutrient mix for spice crops: 1) These are the micronutrient compositions for supplying essential nutrients and promoting growth in spices. 40-55% of soils are moderately deficient in micronutrients like Zinc, while 25-30% is deficient in Boron. Deficiency of other micronutrients occurs in 15% of soils. The novelty of this technology augments the uptake of essential nutrient by the plants 2) IISR have developed crop/soil specific i.e. ginger and turmeric (for soils with pH below and above 7), black pepper and cardamom micro nutrient mixtures for foliar application. 3) Guarantees 15-25% increase in yield and quality. 4) Commercialization is underway, selection of entrepreneurs done. Four Indian patents filed and two are in draft stage. 5) Improves health, quality and yield of the crops. 6) Water soluble and compatible with simple or complex standard fertilizers. 7) Easy transportation and long shelf life upto one year. 8) Environment friendly. 9) Low cost investment cost of production -Rs 70/kg with cost benefit 1:2.5. 10) Advanced package of practices for commercial utility.
		PGPR Talc formulation – Ginger: 1) GRB 35 - Bacillus amyloliquefaciensNCBI (FJ493538). 2) Suspend 100g of PGPR talc formulation (109CFU/g) in 10 liters of water. Soak 5Kg of ginger rhizome bits(30g)in PGPR suspension for 1 hr prior to planting. 3) The soaked rhizome can be planted on prepared beds. Drench the remaining suspension on ginger beds as a booster dose (1liter/bed). 4) A second booster dose of PGPR can be given as a soil

Sl. No.	Institutes	Technology
		application at the rate of 1kg of talc formulation / ha as soil drench. 5) This PGPR formulation is applied to rhizomes prior to planting. Booster doses of the same PGPR is given as soil drench either alone or with FYM. It enhances nutrient mobilization and use efficiency, growth and yield and provides protection against diseases at an eligible cost.
		Ginger Varieties Developed: IISR-Rejatha IISR-Mahima IISR-Varada
	University of Horticultural Sciences, Bagalkot	Complete Package of Practices for ginger crop
	Central Food Technological Research Institute, Mysore	**Ginger Tea:** The technology for the manufacture of Ginger Tea has been developed at CFTRI, Mysore, using appropriate equipment for optimal product recovery of right quality. The CFTRI has the necessary expertise to provide technical assistance and guidance for setting up the project. The CFTRI can offer further technical assistance for project implementation under technical consultancy arrangements.

Processing, Value Addition and Marketing

Ginger is a spice of commercial and medicinal importance. Sun drying of ginger rhizome retains its colour and aroma than mechanical drying of ginger rhizome using hot air dryer, but hot air dryer dries ginger rhizome faster than sun drying of ginger rhizome. Peeled or scraped rhizome reduces drying time, thus minimizing mold growth and fermentation. However, while this process decreases the fiber content by removing the outside corky skin, it also tends to remove some of the oils constituents, as they are more concentrated in the peel, and therefore reduces some of the pungency. Splited or sliced ginger rhizome dries faster than peeled ginger rhizome under the same conditions. Mechanical drying of ginger gives a more homogenous and cleaner product than sun drying of ginger. Traditional methods of ginger processing gives low capacity output while modern/mechanized methods give high capacity output.

Processing Methods:

Green (Fresh) Ginger A substantial quantity of green (fresh) ginger is consumed worldwide as vegetable. Ginger for vegetable use should be fleshy with low fiber content and, therefore, harvesting is done from the sixth month onwards. Fresh rhizomes should be washed, and cleaned from debris, shoots and roots. When available, pressure washing is preferred as it is more efficient and tends to reduce

the microbial load. Traditionally, rhizomes are killed by a 10 min. immersion in boiling water, which also inactivates enzymatic processes, then, sun-dried.

Slicing/Splitting:

Improved a motorized reciprocating ginger slicer. The machine consisted of the feeding unit, slicing mechanism, driving mechanism and housing. The ginger rhizomes fed manually into the hopper falls by gravity into the cylinder at the bottom dead center of the piston. It is pushed horizontally to the stationary knife blade as the piston moves towards the top dead center. The pushing of the rhizomes forces the ginger through the blade, which are collected at the outlet.

A ginger splitting machine unit consisted of a splitting chamber, stationary cutting blade and two revolving impellers. The splitting blade is stationary and is concentrically located across the circle of the splitting chamber. Ginger rhizomes slide on their larger surface areas into the hopper longitudinally. Constant rotation of the impellers created a synchronized flow of ginger rhizomes inside the splitting chamber.

Ginger Powder:

Ginger powder is made by pulverizing the dry ginger to a mesh size of 50 to 60. Ginger powder forms an important component in curry powder. It also finds direct application in a variety of food products. Pulverization is generally a limiting unit operation in ginger processing. Pulverization is a physical unit operation whose phenomenon involves size reduction or crushing of the cells and separation of granules from other insoluble matter, so as to aid the extraction of constituents from a composite structure. There are two major methods of crushing namely: traditional and modern methods. Traditional method (mortar and pestle) employed in ginger crushing is gives low capacity output and susceptible to increase in microbial load on the crushed ginger, while modern method offers higher capacity output though it requires skilled manpower to operate and maintain.

Ginger Products: Ginger has various forms which includes fresh, dried, pickled, preserved, crystallised (or candied) and powdered or ground.

Fresh ginger: Fresh ginger in young form has mild flavour and a pale, thin skin that does not require peeling. The fresh mature ginger on the other hand is tough, which requires peeling to get to the fibrous flesh. It is either chopped or grated before use.

Dried ginger: Ginger processed into dried form is available in both whole fingers and slices. Dried gingers are sold either with the root skin left on or with the skin peeled off. Split- dry or African ginger is prepared thus the rhizomes are split longitudinally, usually with a sharp table knife, spread on a mat-covered platform, and turned intermittently until it is properly dry. In certain cases, the cleared

whole or split ginger is scalded in water for a couple of minutes before the drying process. Dried skinless ginger is prepared thus, the roots are boiled in water, killing the rhizomes. Peeling, scraping or slicing is also done to remove the skin. Before use it is soaked in recipe liquid. Dried ginger may be further processed to produce oil. The appearance, the contents of volatile oil, pungent principles, fibre and the aroma and flavor character are important in the quality evaluation of dried ginger.

Bleached Ginger:

Bleached ginger is produced by dipping scraped fresh ginger in a slurry of slaked lime, Ca(OH)2, followed by sun drying. As the water adhering to the rhizomes dries off, they are again dipped in the slurry. This process is repeated until the rhizomes become uniformly white in colour. Dry ginger can also be bleached by this method. Liming gives ginger a better appearance and less susceptibility to the attack of insect pests during storage and shipping.

Essential Oil and Oleoresin:

Ginger oil is obtained by steam distillation of the ground spice. The oil possesses an aroma and flavor that are cultivar specific. Cultivars with intrinsically high volatile oil and a good aroma and flavor are the best choice. It is used for its antiseptic, aphrodisiac, laxative, stimulant and tonic properties and is often blended with other essential oils to produce many different mixtures for many different ailments. Ginger oil has a spicy and peppery aroma. Oils and oleoresins are preferred to dried spices as flavoring by the food industry, because they are more stable, cleaner, free from contaminations, and can be standardized by blending oils from different sources. Ginger oleoresin is a semisolid mass obtained by solvent extraction of ginger powder followed by removal of the solvent. It contains variable amounts of volatile oil, pungent principles, fatty oil, and other extractives of the spice soluble in the solvent. The oleoresin contains the full complement of organoleptics of the natural spice.

Marketing opportunities for the identified product of the district - Domestic and International.

In the district the ginger is sold in the markets of Bidar: Mannakalli and Humnabad. Majority of the produce is marketed in the Nanded market of Maharashtra and Hyderabad market of Telangana. This indicates the need of establishment of well-pledged market yard in the district. As the Indian ginger is having demand in the International market, hence, there is a demand and scope for export of ginger from Bidar.

KVKs activities during the past 5 years

Arrays of technologies are available for the ginger growers to boost the production with desirable quality produce from different International, National and State Institutes. The technologies towards production with potential elite

varieties, macro and micro nutrient management, effective plant protection practices with post-harvest and value additions are supporting the ginger growers. In this regard, KVK, Bidar has identified the thrust areas in ginger entrepreneurship. To address the identified issues faced different stakeholders in general and farmers in particular-a series of need based technologies were taken to the farmers as and when situation demanded through the different activities like On Farm Testing, Front Line Demonstrations, Method demonstrations and Capacity building activities like On farm training and Off farm trainings, farmers-scientists interactions and field days.

The list of interventions taken up by the KVK, Bidar in the district since last five years for supporting the ginger growers is as follows:

On Farm Test during last five years (2016-17 to 2020-21)

- Transplanting technique in ginger
- Improved Pit Storage technology for Ginger
- Assessment of Planting method and Rhizome size in Ginger
- Assessment of Ginger varieties
- Integrated Nutrient Management in ginger
- Integrated Disease Management
- Assessment of Planting method and Rhizome size in Ginger

Front Line Demonstration during last five years (2016-17 to 2020-21)

- Assessment of IISR Powder mixture for Ginger
- Management of iron deficiency through soil and foliar application in Ginger
- Management of Phyllosticta leafspot in Ginger

Capacity building:

- Oncampus trainings: 05
- Offcampus trainings: 03
- Field days: 03
- Farmers-Scientist interaction: 02

KVK interventions for 2021-22 in promoting ODOP

Sl . No.	Activity	Title of the Intervention	No.	Month of Implementation
1.	OFT	Assessment Of method for peeling of Ginger rhizomes	03	May, 2021
2.	EDP (Entrepreneurship Development Programme)	Home scale enterprise for economic empowerment of SHGs: Ginger candy cubes	01	May-June, 2021
3.	Trainings	Production technology for high yield and quality in ginger	01	May, 2021

Sl . No.	Activity	Title of the Intervention	No.	Month of Implementation
		Processing and value addition in ginger	02	May, 2021 February, 2022
		Crop management in ginger	01	August, 2021
4.	Vocational training	Storage and Home scale processing of ginger for SHGs	01	January, 2022
		Entrepreneurship development in ginger for rural youths	01	February, 2022




Assessment of Planting Method And Rhizome Size in Ginger

Assessment Of Ginger Varieties



Assessment of Ginger Varieties

CHAMARAJANAGAR – TURMERIC

Turmeric (*Curcuma longa* L) is one of the ancient spice, popularly known as "*Indian saffron*" belongs to family Zingiberaceae. India is the largest producer, consumer and exporter of turmeric in the world, which accounts for more than 50 percent of the world trade. The area under turmeric cultivation in India is 1,85,000 hectares with an annual production of 9,57,000 metric tons and productivity is 5.17 metric tons per hectare. Andhra Pradesh is the foremost state in turmeric production, followed by Tamil Nadu, Orissa, Karnataka and West Bengal (Anonymous, 2016).

In Karnataka, Chamarajanagar district is known for its varied agro-climatic conditions and diverse cropping situations. Turmeric, Ginger, Chilli, Coriander and Garlic are the major spices grown. Among spices crops Turmeric is commercially grown in an area of >12,200 ha. The productivity is around 3.75 metric tonnes per hectare, low as compared to national and other states (Department of Horticulture, GOK, and annual reports 2017-18).

Major reasons for the lower productivity of Turmeric is majority of the farmers are using local varieties (>90%) whose identification / name is not known. Characteristics of local varieties are long duration (270 – 280 days), low yielding (15 – 20 t/ha fresh rhizome), and low in quality *viz*., curcumin content (2 – 3%) and curing (16 – 17%).

Scenario in the district for processing, value addition and marketing:

Even though turmeric is grown in large scale, few identified constraints are;

a) Majority of the farmers are using cow dung slurry while processing (boiling) and then sundried in the open / ground, which results in poor quality and unhygienic final produce, further leading to reduction in market demand and price.
b) Non availability of the regulated markets in the district, farmers are dependent on Erode market (Tamil Nadu) or middleman for marketing, resulting lower profit.
c) No knowledge on value addition of turmeric leaves as well as rhizomes *viz*. powder making, curcumin & oleoresin extraction, oil extraction, dye extraction and aromatherapy etc.
d) Non availability of Lab facility to assess quality of the turmeric *viz. Curcumin, essential oil* locally.
e) No agency/Institutes/ Line Department working on post harvest process of turmeric- which is crucial in enhancing the income of farmers. Inspite of above constraints and price fluctuations, the area under turmeric crop is in increasing trend because of assured income and non-perishableness of the final product. Even the farmers can store it for years together during price fluctuation.

Technological backstopping

1) Improved high yielding good quality varieties – IISR Alleppey supreme, IISR Pratibha, IISR Pragathi, CIMAP- Pitambari, Rajendra Sonia.
2) Turmeric harvester to reduce the skilled labour shortage and drudgery in harvesting, can save up to 16000/- per acre by adopting mechanized harvesting.
3) CFTRI technology of turmeric processing - preparation of turmeric powder- The process consists of grading/ separation of fingers from mother rhizomes (2000kg) followed by thorough washing with running tap water to remove the soil, stones, dirt and other foreign materials. Washed rhizomes (1900kg) were subjected to a slicing machine to obtain a slice thickness of 1-3mm. slices (1800kg) were dried by a mechanical drier @ 80^0 C for about 02 hours to obtain slices moisture content about less than 50%, later the drying temperature was reduced to 55^0 C and slices were dried for another 04 hours to obtain dried turmeric slices (400kg) which has a moisture content of 8-10%. Dried slices were packed in gunny bags, subjected to hammer mill for size reduction/ powdering and pass through 42-48 mesh (Tyler series) to get fine hygienic turmeric powder. Powder (395kg) was packed in pp lined gunny bags and stored.
4) Rapid multiplication of turmeric to reduce the seed requirement per unit area. Only 200 kg seed rhizome is sufficient to produce seedlings required for 01 acre. We can save approximately 600 kgs of seed rhizomes per acre. With in 45 days uniform healthy seedlings are available for transplanting.
5) Turmeric booster (micro nutrient mixture) @ 5 gm/lt. 2 foliar sprays at the interval of 40 days and 60 days of the crop to enhance the yield (up to 12%) and quality of rhizome.

Opportunities for Secondary and Specialty Agriculture

Secondary Agriculture-

1) Production of double polished turmeric fingers
2) Production of turmeric powder

Speciality Agriculture -

1) Extraction of Curcumin and oleoresin
2) Extraction edible dye /pigment - The most valued constituent of turmeric is its yellow pigment; curcumin. The most acceptable edible pigment in present days.
3) Preparation of by product “Kum-kum”
4) Extraction of turmeric leaf oil - major constituent for aroma therapy

Marketing opportunities

Turmeric powder is an essential ingredient of curry powders and is extensively used in traditional medicines. Value added produce *kum-kum have huge demand*, leaf *essential oil is a major constituent of* aroma therapy etc.

Activities undertaken by the KVK during the past 5 years

In view of these factors, the KVK, Chamarajanagar has intervened by taking On Farm Testings (5 Nos.), Front Line Demonstrations (5 Nos.), Method Demonstrations (10 Nos.), Training Programmes (50 Nos.) and Seed production of Improved varieties.Which has created awareness among farming community of the district with regard to the Good Agricultural Practices (GAP) in turmeric production. The details of interventions are as follows:

On Farm Testings (5 Nos.)

- Assessment of suitable propagation methods in turmeric (2016-17).
- Assessment of suitable weedicides in turmeric for effective weed management (2016-17).
- Assessment of suitable turmeric varieties for high yield and quality (2016-17 to 2020-21).

Front Line Demonstrations (4 Nos.)

- Quality management and hygienic processing in turmeric (2014-15)
- Popularization of improved turmeric variety IISR Alleppy Supreme for higher yield (2016-17)
- Integrated crop management in turmeric (2017-18)
- Introduction of turmeric improved variety IISR Pratibha for higher yield and quality (2018-19 to 2020-21)

Method Demonstrations (12 Nos.)

- Use of tractor drawn turmeric harvester at farmers field (2016-17 to 2020-21)
- Seed rhizome treatment in turmeric (2016 to 2021)
- Different propagation methods in turmeric (2016 to 2021)

Training Programmes (56 Nos.)

Training on improved cultivation aspects, maturity indices, harvesting and post harvesting management (processing) and marketing were covered, nearly 1650 turmeric growers are benefitted from the training programmes.

Popularization of micro nutrient formulation to enhance yield and quality:

Introduction of Turmeric special, micro nutrient formulation to farmers and input dealers of Chamarajanagara district. Three input dealers are commercialized these technology.

ICAR KVK, Chamarajanagara has sold approximately 600 kg. of Turmeric booster to the needy farmers.

Seed Production of improved varieties:

Since last 5 years an estimated 6,85,300 kg. seed rhizomes of improved turmeric varieties were produced under PPP mode in collaboration with different agencies and farmers.

Seed production by Farmers and Organizers	2016-17	2017-18	2018-19	2019-20	2020-21	TOTAL (kgs.)
Kamadhenu Arishina Belagarara Sangha, Hardanahalli	2,000	8,000	12,000	20,000	18,000	60,000
Souharda horticulture FPO, Ankanashettypura	-	-	-	65,000	1,50,000	2,15,000
Seed production at KVK Farm	2,500	3,600	2,800	4,500	4,000	17,400
FLD /OFT farmers	-	1,600	2,100	4,200	3,000	7,900
Farmers-Scientist participatory mode	-	-	85,000	1,30,000	1,70,000	3,85,000
					TOTAL	**6,85,300**

Note: Out of 685.3 tonnes of seed rhizomes 270 tons of Alleppy Supreme and 415.3 tons of IISR Pratibha.

Based on the findings of On Farm Testings, it was observed that, the varieties IISR Alleppy Supreme and IISR Pratibha were found superior with respect to fresh rhizome yield (32-40 t/ha), curcumin content (5.65-6.00%), curing percentage (20.00 - 22.35 %) and medium duration (232.8 days) as compared to local varieties. Since last 5 years, the area under the variety Alleppy Supreme and Pratibha has increased to 125 and 735 acres respectively.

Large scale method demonstrations were carried out for harvesting turmeric using tractor drawn turmeric harvester, it was found that 3–4 acres of turmeric crop can be harvested in a single day, which costs about 6000 Rs/day, while manually to harvest the same area it requires 75 men labourers and costs Rs. 25,500/- thereby saving Rs. 19,500/day. Using tractor drawn harvester it saved time, labour, money and drudgery involved in the harvesting process. Hence farmers were convinced that by using turmeric harvester, they can save up to 73% of labour cost in harvesting. KVK is providing the turmeric harvester on rental basis (Rs. 2,000-00 per day) under Custom Hiring Centre. Farmers are showing interest towards mechanical harvesting and during the current year an area of 82 acres is harvested through turmeric harvester. This year farmers have placed an indent for the machine well in advance at KVK.

Under IFSD project, commodity based association (CBA: Kamadhenu Arisina Belegarara Sangha) on turmeric was established during 2013-14 at Haradanahalli village involving 20 farmers. These CBA was linked to CFTRI, Mysore to gain knowledge on hygienic and improved processing technology on turmeric. This technology is being adopted by the CBA. The CBA has taken this as a challenging task in introducing this technology and marketing of turmeric powder in brand name of its association. To establish the processing industry they have approached NABARD and District authorities for financial assistance with a project outlay of rupees one crore. Further a land of one acre has been purchased for the industry.

During the last 5 years the KVK interventions has made the turmeric growers to adopt improved productions practices in turmeric viz., improved varieties, INM, IPDM and post harvest technologies. The farmers are obtaining 33% higher seed rhizome yield and reducing the harvesting cost by 73% through adoption of mechanical harvesting. Similarly adoptions of portray method of raising seedlings has reduced the seed rate by 75% per unit area. The marketing problem is being addressed jointly by CBA and KVK and this is spreading to neighboring farmers and other villages in the district. However, it is in the initial stage and looking forward for large scale adoption in the coming years.

Interventions proposed by the KVK in promoting ODOP

Implemented large scale demonstration of short duration improved turmeric variety IISR Pragathi for enhances the yield and quality. – 50 acre area- funded by NABARD, Bangalore. (2021-2022)

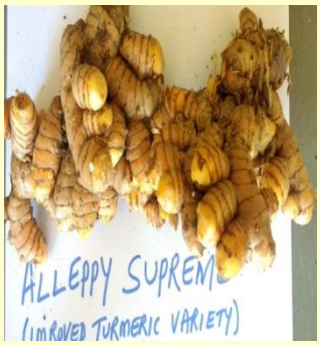
- ✓ Proposed for "Establishment of Turmeric processing and value addition-incubation centre at ICAR, KVK Chamarajanagar under PMFME Scheme"
- ✓ Proposed for establishment of Biochemical laboratory at ICAR, KVK Chamarajanagar under PMFME scheme for analysis of Curcumin content.

Front Line demonstration of Improved Turmeric varieties Alleppy Supreme and Prathiba

Method demonstration on Turmeric Harvester

Demonstration of rapid multiplication of Turmeric

Sowing operations



CHIKKAMANGALURU – SPICE CROPS

Brief agricultural profile:

Black pepper, *Piper nigrum* L. belongs to family Piperaceae, is a perennial vine grown for its berries extensively used as spice and in medicine. India is one of the major producer, consumer and exporter of black pepper in the world. During 2017-18, 21250 tonnes of black pepper products worth Rs. 94,002 lakhs were exported to various countries. Black pepper is cultivated to a large extent in Kerala, Karnataka and Tamil Nadu and to a limited extent in Maharashtra, North eastern states and Andaman & Nicobar Islands. The crop is grown in about 2 lakh hectares with a production of 55000 tonnes annually (2017–18). Kerala and Karnataka account for a major portion of production of black pepper in the country. Black Pepper is cultivated in 9556 ha. area and production is 4742 tonns.

Climate and Soil: Pepper can be grown in a wide range of soils with P^H 4.5 to 6.0. in its natural habitat, it thrives well in red lateritic soils. Black Pepper is a plant of humid tropics requiring adequate rainfall and humidity. It grows successfully between 20^0 north and south latitude and from the sea level up to 1500 metres. The crop tolerates temperatures between 10^0 and 40^0 c. A well distributed annual rainfall of 125 – 200cm is considered ideal for pepper.

Varieties: Majority of the cultivated types of pepper are monocious though variation is found from complete male to complete female spike. Over 75 cultivars of Black Pepper are being cultivated in India. Black Pepper have been released for cultivation from Pepper Research Station, Panniyur, Kerala and Indian Institute of Spices Research, Calicut such as Panniyur -1 to 7, Sreekara, Subhakara, Panchami, Pournami, PLD-2, IISR Sakthi, IISR Thevam, Girimunda and IISR Malabar Excel.

Details of technological backstopping available for the product-From NARES (ICAR and SAU Institutes) including international source of technologies

Sl.No.	Product	Stage maturity at harvest	Source
1.	Canned pepper	4-5 months	CPCRI, Kasaragodu CFTRI
2.	Dehydrated green pepper		
3.	Oleoresin and essential oil	15-20 days before maturity	
4	Black pepper	Fully mature and 1-2 berries start turning from yellow to red in each spike	
5	Pepper powder	Fully mature with maximum starch	
6.	White pepper	Fully ripe	

Sl.No.	Name of the technology	Source
7.	Black pepper sauce Extracted from white pepper	Pepper research station, Panniyur
8.	Black pepper candy Extracted from white pepper	
9	Serpentine method Serpentine layering technique can be used for production of rooted cuttings of black pepper in a cheap and effective manner.	IISR, Calicut
10	Hand operated cleaner cum grader Suitable for cleaning and grading operation	TNAU
11	Vertical column method A novel method of intensifying quality planting material production has been standardized using vertical cloums with soil-less media.	IISR, Calicut
8.	Spike shedding Spike shedding especially in varieties like Panniyur-1 at higher elevations like Kodagu and Idukki is one of the emerging problem. It is seen in serious condition when the pre-monsoon showers are delayed and flowering and spiking occur during June-July. These spikes predominantly produce female flowers instead of bisexual flowers. Heavy spike shedding may occur due to lack of pollination and anthracnose infection. Irrigation of vines from second fortnight of March (50-60 litres/ vine at fortnightly intervals) coupled with prophylactic spraying with bordeaux mixture (1%) or carbendazim + mancozeb (0.1%) reduces the intensity of spike shedding.	IISR, Calicut

Opportunities for Secondary and Specialty Agriculture in respect to the identified products

Farmers were regularly selling their black pepper @ 350 Rs per kg and white pepper @ 700 Rs per kg to the traders of Mudigere and Chikkamagaluru. Value added products like Pepper powder and Black pepper oleroresin are also fetching good market price of Rs.8500/- and Rs.15000/- per kg respectively

Marketing opportunities for the identified product of the district-both domestic and international for Black pepper products

Domestic selling

- Black pepper ready to sale Black pepper , White pepper , Pepper powder and Black pepper oleoresin is to be sold through Malls, whole sale dealers, Bazaars, Retail shops, exclusively black pepper oriented shops at taluk levels, linkage with FPOs, products marketed though ICT viz., whatsapp , Face book and other medias

International selling

- Black pepper products (Labeling and branding) patent has to be taken and sell it to international market through tie up with some MNC companies.

Important different grades based on size are Pin head, Light pepper, Malabar Garbled, Tellichery Garbled, Malabar ungarbled

Mandated activities undertaken by the KVK during the past 5 years on the product identified for the district

FLD.01: Yield maximization of Black Pepper through Foliar nutrition

Prioritized Problem: Poor yield, Immature berry and spike drop and poor fruit set

Technology demonstrated: Spraying of Pepper special 5 gm/lit. @ pre and post blossom stage

Sl. No.	Extension activity	Numbers
1	Training programmes	2
2	Field visits	5
3	Field day	1

Source: IISR,Calicut
Cluster: Daradahalli
Village: Mudigere
No. of farmers: 15 (450 vines)
Total Area: 8344 ha
Parameters: Spike length, No. of berries per spike, Fresh and Dry Yield (Q/ha)
Results:

Sl. No.	Parameters	Demo plot	Control Plot
1	Spike length (cm)	21.95	19.24
2	No. of berries/spike	98.33	71.32
3	Fresh Yield (kg/20 vines)	400.4	336.6
4	Dry Yield (kg/20 vines)	**120.6**	**101.1**
5	Gross returns(Rs/20vines)	60233.3	50500
6	Cost of cultivation (Rs/20vines)	12000	11400
7	Net returns (Rs/20vines)	48233.3	37620
8	B:C	**5.01**	**4.42**
9	**Percentage yield increase over control**		**19.28**

Conclusion: Foliar nutrition of micronutrients at pre and post blossom stage helped in retaining of maximum berries and increase in spike length

FLD 2: Processing for quality black pepper
Prioritized problem: Lack of awareness on improved method of drying of pepper, poor and low quality produce
Technology demonstrated: 200 gauge UV resistant polythene sheet
Source: UAS (D)
Cluster: Mudigere
Village: Dhardahalli
Area: 450 (30vines each)
Demos: 15

Total Area: 8344 ha

Results:

Sl. No.	Parameters	Demo	Control
1	Colour of pepper seed	Black	Gray
2	Yield (kg/20vines)	101	101
3	Cost of cultivation (Rs./ 20vines)	12082	11400
4	Gross returns(Rs/20vines)	63630	55550
5	Net returns (Rs/20vines)	51547	44150
6	B:C	5.2	4.87

Conclusion: Use of polythene sheet for drying leads to uniform drying, colour and increased weight of seed.

FLD. 03: Integrated crop management in pepper

Prioritized problem: Spike drop, poor fruit set, Higher Incidence of wilt, lack of processing

Source: IISR,Calicut., UAS(B), IIHR, CFTRI & UAS (D)

Sl. No.	Technology to be Demonstrated	Critical inputs	Quantity per demo
1	Spraying of Pepper special 5 gm/lit. at pre and post blossom stage	Pepper special	2 kg
2	Application of Arka Microbial Consortium(25gm/lit)(azatobacter,bacillus and pseudomonas) + 1 kg neem cake / FYM	Arka Microbial Consortium	6 kg
3	Blanching of pepper berries in hot water (80^0 C) for 1 min and drying in UV- stabilized LDPE Polythene covers	LDPE Polythene covers	3kg (12ft × 10ft)

Observations recorded:

- Spike length, No. of berries per spike, Fresh and Dry Yield (Q/ha), PDI, B:C ratio, Time taken for drying , Colour of berries

  Area:1000 vines (50 vines each) (20.0ac)

  No. of Demo: 20

  Cluster: Nidnahalli & Bettagere

Results:

Sl. No.	Parameters	Demo	Control
1	Spike length (cm)	12.63	8.00
2	No. of berries / spike	63.30	40.00
3	No. of spike of / m^2	18.70	13.00
4	Fresh Yield (Q/ha)	18.70	12.00
5	Dry Yield (Q/ha)	5.61	3.60
6	Dry Yield (Q/ha) Coffee based system-100 vines/ha	2.75	1.25
	Disease incidence (%)		
7	Before imposition	5.25	6.00
8	After imposition	2.50	14.50

9	Time taken for drying (Days)	2.50	5.00
10	Colour of berries	Jet Black	Dull Black
11	Returns	2,80,500	1,62,000
12	Cost of cultivation	94,869	89,786
13	Net returns	185631	72214
14	BC ratio	1.94	0.85

Sl. No.	Extension activity	Numbers
1	Training programmes	4
2	Field visits	5
3	Field day	01

FLD 04: Management of Foot rot disease in Black Pepper

Prioritized problem: Foot rot disease, decrease in yield and income

Technology demonstrated:

- Drenching of *Arka Microbial Consortium* (25gm/l) (azatobacter, bacillus and pseudomonas)
- Spraying of Potassium Phosphonate(3 ml/lit) at pre and post monsoon

Cluster: Mudigere
Village : Daradahalli
Area: 250 vines
Demos: 10
Total Area (ha): 8334 ha

Source: IIHR,Bengaluru & IISR, Calicut

Results:

Sl.No.	Parameters	Demo	Control
1	Disease incidence (pre)(%)	38.66	41.97
2	Disease incidence (post)(%)	27.99	40.41
3	Yield (kg/20 vines)	432.00	357.30
4	Gross returns (Rs/20 vines)	216000	178660
5	Cost of cultivation (Rs/ 20 vines)	64900	63350
6	Net returns(Rs/20 vines)	151100	115310
7	B:C ratio	3.32	2.81
8	Per cent increase over control	20.90	-

Conclusion:

- Application of microbial agents had less incidence of diseases when compared to chemical treatment.
- Time of application of bioagents is very much important in disease management *i.e.* in may month after good shower had good result.

FLD – 05 Wilt (quick) management in black pepper

Crop : Black pepper

Problem : quick wilt & stress leading to yellowing of vines, incidence upto 40% infestation

Crop	Technology demonstrated	Variety	No. of farmers	Area (ha)
Black pepper	• Soil application of Arka microbial consortium 25g/litre • Spraying 1% Bordeaux mixture (Cuso4 2 kg + lime 2 kg in 200 liters water)	Panniyur 1	10	4

Cluster village: G. Hosahalli

Area : 10 acre

No. of demos: 10

Season : Kharif

Source: IIHR, Bangalore

Observations - Per cent plant death (%), Disease severity (%), Yield (q/ha), B: C ratio

Results:

Sl. No.	Parameters	Control	Demo
	Per cent yellowing (quick wilt) of vines (%)		
1	Before spray	8.8	9.4
2	After spray	11.24	2.8
3	Yield (kg/ vines)	2.87	4.15
4	Gross income (Rs/ha)	88375	120350
5	Cost of cultivation (Rs/ha)	83230	89350
6	Net income (Rs)	5145	31000
7	B:C ratio	1.06	1.34

Demo. Yield (Kg/ha)			Yield of local check (Kg/ha)	Increase in yield (%)	Increased income (Rs./ha)
High	Low	Average			
520	300	415	287	44.59	25855

Economics of Demo (Rs/ha)			Economics of Check (Rs/ha)		
Gross cost	Gross returns	Net returns	Gross cost	Gross returns	Net returns
89350	120350	31000	83230	88375	5145

FLD-06 Management of Termite in black pepper

Prioritized problem: Incidence of termite on standards use for pepper vine cultivation leading to death of vines

Season: Summer

Source: NBAIR

Cluster village: Mudigere

Crop	Technology demonstrated	Variety	No. of farmers	Area (ha)
Pepper	Use of raptor as repellent for termites @15g/l (drenching 3 litres/tree)	Panniyur	25	10

Observations recorded: Per cent pest incidence, Yield (Q/ ha), B:C Ratio

Results:

Sl. No.	Parameters	Demo	Control
	No. of infested trees (%)		
1	Before treatment After treatment	10.24 1.12	9.86 13.48
2	Yield (kg/vine)	4.64	3.8
3	B C ratio	1.10	0.72

Demo. Yield (kg/vine)			Yield of local check (t/ha)	Increase in yield (%)	Increased income (Rs.)
High	Low	Average			
6.0	3.0	4.64	3.8	18.10	37630

Economics of Demo (Rs/ha)			Economics of Check (Rs/ha)		
Gross cost	Gross returns	Net returns	Gross cost	Gross returns	Net returns
99350	208980	109630	99000	171000	72000

OFT-1 - Assessment for Effective management of wilt (slow & quick) in black pepper

Crop : Black pepper

Problem : slow wilt, quick wilt, root mealy bugs, stress leading to yellowing of vines, incidence up to 40% infestation

Treatment	Technology to be assessed	Source	
TO : 1	Farmers practice Drenching of COC and 1% bordeux spray	-	-
TO : 2	Soil application of Carbosulfan 25 EC– 2ml/litre Spraying of carbendazim - 2g per litre @ post monsoon	UAS (B)	Carbosulfan Carbendazim
TO : 3	Spraying 1% pseudomonas 10 ml/litre Soil application of FYM enriched Arka microbial consortium 25g/litre and Arka actinoplus	IIHR, Bangalore	Pseudomonas Arka microbial consortium Arka actinoplus

Season : Kharif

Cluster village: Bidarahalli

Area : 2.5 acre

No. of trials: 5

Observations - Per cent plant death (%), Disease severity (%), Yield (q/ha), B:C ratio

Results:

Sl. No.	Parameters	TO 1	TO 2	TO 3
	Per cent yellowing (quick & slow wilt) of vines (%)			
1	Before spray	20.91	32.34	44.11
2	After spray	37.40	35.93	24.68
3	Yield (kg/30 vines)	475	600	650
4	Dry yield (kg/30 vines)	142.5	180	195
5	Gross income (Rs)	47025	59400	64350
6	Cost of cultivation (Rs)	15000	15600	16200
7	Net income (Rs)	32025	43800	48150
8	B:C ratio	2.13	2.80	2.97

Results of assessment	Technology option 3 with Soil application of Arka microbial consortium 25g/litre and Arka actinoplus recorded lowest death of vines which recorded per cent yellowing of vines (24.68) followed by treatment 2 with Soil application of Carbosulfan & Spraying of carbendazim (35.93) compared to farmer practice (37.40)
Feedback from the farmer	Soil application of microbial agents reduced the yellowing of vines with less mortality and gaining good yield
Conclusions	The technology has been continued for second season for confirmation of results

Trainings : 9 on campus trainings 26 off-campus training on major spice crops were conducted to 1129 farmers. Improved cultivation practise and plant cultivation measures were covered during training programmes.

Seminars : 2 Seminars on Improved cultivation practices in Pepper cultivation and workshop on cultivation practices on pepper were organised for 382 farmers.

Proposed interventions by the KVK in promoting ODOP for the identified produce
FLD-01: Management of quick wilt in Black pepper (Source of technology: IIHR, Bengaluru)

Technology to be demonstrated

- Soil application - Arka microbial consortium 20g/litre and Arka actinoplus 10g/litre
  (Drenching solution 3litres per vine)
- Cluster: G. Hosahalli, Mudigere
- No. of demo :20

OFT.1: Assessment of Black pepper varieties under hill zone of chikkamagaluru district against wilt

Technology	Pepper varieties	Source
TO1	Panniyur -1	Farmers practice
TO2	IISR Thevam Tolerant to foot rot diseases. Suited to high altitude areas and planes (5.17kg/vine).	IISR, Calicut
TO3	IISR Shakthi Tolerant to Phytophthora foot rot 5.21kg/vine	IISR, Calicut
TO4	Paniyoor-8 High yielding, field tolerant to Phytophthora foot rot and drought.1365 kg/ha (dry)	KAU- Kerala

TO5	Arka coorg excel Regular bearer 5.3 kg/vine, weight of berries (5.45g/100) and percent recovery (37.22 %)	IIHR, Bengaluru

Cluster: G. Hosahalli, Mudigere
No. of Demo: 20

CHILLI AS SPICE CROP

Details of technological backstopping

Sl.No.	Name of the technology	Source
1	Dehydrated chilli, pickle, powder, paste, sauce,	IIFPT, Thanjavur
2	**Sun - drying:** four - tier system of wire - mesh trays or a single tray of perforated Aluminium. It took 14 days in sun to dry fruits having a moisture content of 72 to 74% reducing it to about 6%, the traditional method of sun drying takes about 3 weeks to achieve a moisture level of 15-20%.	CFTRI
3	**Process Flow chart for Production of Red chilli Powder** Harvesting Drying Shorting/ Grading Crushing/ Milling Sieving Dry Cleaning Vacuum Conveyor Stem Cutting Packing Powdered Red Chilli	IIFPT, Thanjavur

Point No: 3 Opportunities for Secondary and specialty Agriculture in respect of the identified products

Farmers were regularly selling their Dry chilli 200 Rs per kg to the traders of Chikkamagaluru

Value added products: Dehydrated Chilli, pickle, powder, paste, sauce,

Sl.No.	Products	Rs /kg
1	Dehydrated chilli	350
2	Pickle	700
3	Chilli powder	850
4	Paste	1000
5	Sauce	700

Point No: 4 Marketing opportunities for the identified product of the district-both domestic and international for Dry chilli products

Domestic selling

- Dry chilli ready to sale Dehydrated chilli, pickle, powder, paste, sauce, is to be selled through Malls, whole sale dealers, Bazaars, Retail shops, exclusively dry chilli oriented shops at taluk levels, linkage with FPOs

International selling

- Dry chilli (Labeling and branding) patent has to be taken and sell it to international market through tie up with some MNC companies

Point No.5: Brief on the mandated activities undertaken by the KVK

FLD 1: Integrated Crop Management in Chilli

Technology demonstrated:

Problem	Source	Critical inputs
Thrips and mites incidence	UAS Dharwad & IIHR Hessarghatta	B. Dabbi seeds Vegetable special (5 g/l) Yellow sticky trap (8 No./ac) Dimethoate @ 1.7ml/l (Thrips) Dicofol @ 2.5ml/l (Mites)

Cluster : Tarikere
Village : Bagguvalli
Area: 2 ha
Demos: 10
Total Area (ha): 3023 ha

Results:

Sl. No.	Parameters	Demo	Control
1	Avg. No. of thrips/plant	0.53	2.65
2	Avg. No. of mite/plant	0.06	0.46
3	Yield (q/ ha)	**7.76**	**7.09**
4	Cost of cultivation (Rs./ ha)	39800	41592
5	Gross returns(Rs/ha)	93156	85080
6	Net returns (Rs/ha)	53356	43488
7	B:C	**2.53**	**2.04**
8	Per cent increase over control	9.44	-

Conclusion:

- Use of true to type seeds had good plant population.
- Use of Micronutrient resulted in higher yield over control by 9.44%
- Need base use of effective chemical had better pest control

FLD -02: Intercropping of Chilli in onion field for higher income

Prioritized problem : Lack of awareness about new hybrid and low yield**,** Low income returns, monocropping

Season : Kharif

a) **Cluster village :Bagguvalli, Tarikere**

Crop	Technology demonstrated	Variety	No. of farmers	Area (ha)
Chilli - onion	• RDF (100:50:50 NPK kg/ha) + FYM 25 t/ha • Introduction of Hybrid chilli Arka kyathi in onion field • Vegetable special Spray at 45 DAP	Arka kyathi	20	8.00

Results:

Data on parameter in relation to technology demonstrated		
Parameter with unit	**Demo**	**Check**
• Plant height (cm)	82.38	-
• Number of branches	22.73	-
• Fruit length (cm)	9.8	-
• Number of green fruit/plant	30.4	-
• Fruit yield of chilli/ plant (kg)	0.72	-
• Fruit yield of chilli/ha (t/ha)	8.56	-
• Onion bulb yield/m^2 (kg)	1.84	1.95
• Onion bulb yield/ha (t/ha)	18.4	19.5
• BC ratio	1.53	0.20

Demo. Yield t/ha						Yield of local check t/ha
High		Low		Average		
Onion	Chilli	Onion	Chilli	Onion	Chilli	Onion
19.4	11.5	17.0	7.0	18.4	8.56	19.5

Economics of Demo (Rs/ha)			Economics of Check (Rs/ha)			Increased Income
Gross cost	Gross return	Net return	Gross cost	Gross return	Net return	
68950	174577.5	105623	40000	48315	8315	97308

b) **Cluster village :** Muguli, Ajjampura

Crop	Technology demonstrated	Variety	No. of farmers	Area (ha)
Chilli - onion	• RDF (100:50:50 NPK kg/ha)+ FYM 25 t/ha • Introduction of Hybrid chilli Arka kyathi in onion field • Vegetable special Spray at 45 DAP	Arka kyathi	10	2.00

Demo. Yield t/ha						Yield of local check t/ha	Increased income (Rs.)	Additional income gained (Rs.)
High		Low		Average				
Onion	Chilli	Onion	Chilli	Onion	Chilli	Onion	52500	52500
7	0.9	6.5	0.7	6.1	0.75	6.9		

Economics of Demo (Rs/ha)			Economics of Check (Rs/ha)		
Gross cost	Gross return	Net return	Gross cost	Gross return	Net return
120000	222500	102500	100000	150000	50000

Trainings :

Sl No	Title of the programme	Location	No. of participants
1	Integrated crop management in chilli	Baggavalli, Tarikere	25
2	Integrated nutrient management in chilli	Daradahalli, Mudigere	10
3	Integrated nutrient management in grount nut and chilly intercropping in onion	Bagguvalli Tarikere	36
4	Integrated crop management in chilli	Mugli, Tarikere	22
5	Micro nutrient management in onion and chilli	Muguli, Ajjampura	21

Other spice crops in Chikkamagaluru district

Brief agricultural profile of the district with special emphasis on the product identified for their district (Area, production, productivity, and socio-economic importance

Area, Production and Productivity of Spice crops			
Spice crop	**Area (ha)**	**Production (Tons)**	**Yield (t/ha)**
Cardamom	2563	461.64	0.18
Tamarind	104.48	481.92	4.61
Ginger	1313.9	16364.2	12.45
Turmeric	104.48	481.92	4.61
Coriander	414.29	221.66	0.54
Fenugreek	47	52.77	1.12
Clove	106.47	44.252	0.42
Nutmeg	208.4	96.58	0.46
Cinnamon	7	1.70	0.24
Vanilla	34	36.25	1.07

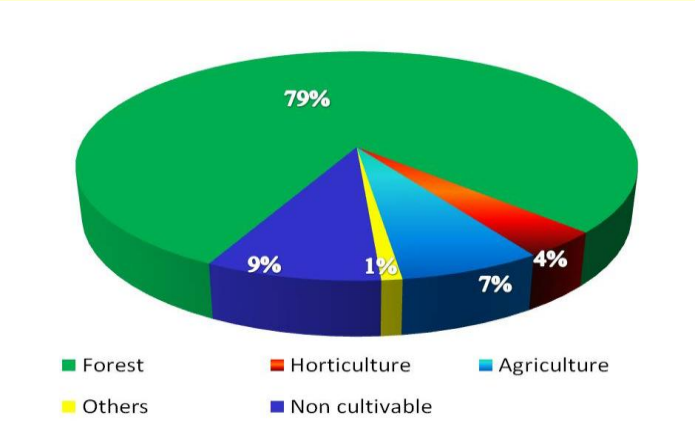
Opportunities for Secondary and Specialty Agriculture in respect of the identified products

Sl. No.	Products/crop	Value added products
1	Pepper	White pepper, Pepper powder
2	Cardamom	Garland, Cardamom powder
3	Ginger	Dry ginger, Ginger paste, Ginger pickle
4	Chilli	Dry chilli, Chilli powder
5	Turmeric	Turmeric powder
6	Coriander seeds	Coriander powder
7	Nutmeg	Dry nutmeg,
8	Cinnamon	Dry leaves, Dry Bark
9	Clove	Unopened dry flower bud
10	Tamarind	Tamarind pickle, Tamarind paste

UTTARA KANNADA – SPICE CROPS

DISTRICT PROFILE:

Total geographical area of the district is 10.24 lakh ha, out of which 1.22 lakh ha (11.91%) is under cultivation and major portion i.e., 8.13 lakh ha (79.41%) is covered with hills and forest. Horticulture crops comprise about 3.84 per cent area i.e., 0.62 lakh ha of cultivable area, whereas, 0.72 lakh ha (7.05%) is under agriculture crops. Totally in 0.75 lakh ha (0.73% area) commercial crops are grown and nearly 0.03 lakh ha (0.30% area) is occupied with other crops whereas 0.89 lakh ha (8.68%) area is non-cultivable land (fallow).



Uttara Kannada has three types of agro-climatic zones hill, coastal and transitional zone.

Hilly Zone: Rainfall ranges from 2500 to 3500 mm with valleys and low hills. Major area covered is forest and dominated by laterite soils.

Coastal Zone : High to very high rainfall of about 3500 mm hot and humid climate with highly leached sandy alkaline soils.

Transitional Zone : Rainfall ranges from 800-1200 mmdominated by plains and rolling hills. Soils vary from red loam to medium black soils.

In the total geographical area of the district, Horticulture crops being cultivated in 62360.66 ha (2019-20 reconciliation report, Dept. Hort. uttar kannada). Details given below

Sl. No.	Particulars	Area/ha
1	Plantation crops	45146.22
2	Fruits crops	10544.70
3	Spices crops	5946.87
4	Vegetable crops	636.12
5	Flower crops	55.95
6	Medicinal and aromatic	30.81
Total		**62360.66**

Cropping pattern in different Taluks:

Taluk	Cropping Pattern
Karwar, Ankola, Kumata, Honnavar, Bhatkal	Coconut, Cashew, Arecanut and Banana
Sirsi and Yellapur	Arecanut + Black pepper + Banana+ Coconut + Cocoa, Pineapple, Ginger
Siddapur and Joida	Arecanut + Black pepper + Banana+ Coconut
Haliyal and Mundgod	Coconut, Arecanut, Banana, Cashew and Mango, Ginger

Major Spice crops cultivated in the district

Sl. No.	Crop	Area (ha)	Production (Metric tons)	Productivity (t /ha)	Value (Rs. in Lakhs)
1	Black pepper	4109.58	2051.89	0.50	9746.48
2	Ginger	333.00	10229.11	30.72	3068.73
3	Nutmeg	164.40	351.80	2.14	738.78
4	Cardamom	156.17	40.18	0.26	341.54
5	Turmeric	16.52	298.95	18.10	448.43
6	Clove	13.11	1.973	0.15	21.703
7	Cinnamon	6.19	1.0488	0.17	1.57
8	Vanilla	10.13	4.653	0.46	139.59

Technological backstopping *:*

- Indian Institute of Spice Research, Kozhikode, Kerala
- Krishi Vigyan Kendra, Santhanpara, Idukki, Kerala
- University of Horticultural Sciences, Bagalkot
- Tamilnadu Agricultural University, Coimbatore
- College of Food Technology, UAS, Dharwad
- Indian Institute of Horticulture Research, Bangalore
- CCS National Institute of Agricultural Marketing, Jaipur
- Krishi Vigyan Kendra,Gonikoppal, Kodagu District.
- Krishi Vigyan Kendra, Kottayam
- Orissa University of Agricultural and Technology, Bhubaneswar, Odhisa
- Kerala Agricultural University, Vellanikkara, Thrissur
- Krishi Vigyan Kendra, Sirsi, Uttarkannada
- Central Food Technological Research Institute

Opportunities for secondary and specialty Agriculture

Sl. No.	Spice crop	secondary and specialty Agriculture in respect of the identified products	Source
1	Black pepper	**Processed products** Black pepper White pepper **Value added products** De hydrated green pepper Green pepper in brine Freeze dried green pepper	CFTRI KAU IIHR IISR

Sl. No.	Spice crop	secondary and specialty Agriculture in respect of the identified products	Source
		Dehydrated salted green pepper Canned green pepper Bottled green pepper Cured green pepper Sterilized black pepper Pepper oil Pepper oleoresin	
2	Turmeric	**Processed products** Dried rhizome Turmeric powder **Value added products** Turmeric oil Oleoresin Turmeric root chips Turmeric curing and polishing	CFTRI KAU IIHR IISR
3	Nut mug	**Processed products** Drying De rinding **Value added products** Oleoresin Nutmeg butter Nutmeg oil Mace oil nutmeg rind jam, squash, candy, pickle, dehydrated rind	CFTRI KAU IIHR IISR
4	Cardamom	**Processing** Green ginger Dry zinger **Value addition** Ginger dehydration and bleaching ginger oil, oleoresin, ginger candy, ginger preserve, ginger puree, ginger powder, ginger beer and ginger paste	CFTRI KAU IIHR IISR
5	Zinger	**Processing** Green ginger Dry zinger **Value addition** Ginger dehydration and bleaching ginger oil, oleoresin, ginger candy, ginger preserve, ginger puree, ginger powder, ginger beer and ginger paste	CFTRI KAU IIHR IISR

Marketing Opportunities

- Local Mandis
- APMC
- Malls
- HOPCOMS

- Retail market
- Co-operative societies

Brief on the mandated activities undertaken by the KVK during the past 5 years

2015-16	2016-17	2017-18	2018-19	2019-20	2015-20
1	1	3	2	2	**09**
1	1	1	1	2	**06**
3	7	3	4	10	27
--	--	--	--	--	--
--	--	--	--	--	42

Particulars	Technology Demostrated	Impact
OFT	Management of Shoot Borer in Ginger	Shoot borer incidence were reduced to 4.98 %, 25.24% increase in yield and high B:C ratio 2.57
OFT	Management of berry drop in Black pepper	94.20% reduction in Berry Drop ,0.80% increase yield and high B:C ratio 9.78 were observed
OFT	Management of berry drop in black pepper	94.20% reduction in Berry Drop ,0.80% increase yield and high B:C ratio 9.78 were observed
OFT	Evaluation of Multi Purpose Trees (MPT) as pepper standards	Pepper with Silver oak performed better and 84% of survival rate were observed with this technology
OFT	Eco friendly management of sucking insects in blackpepper	Sucking Insects incidence reduced to0.96%with Dimethoate & 1.86 % with neem oil ,Coccinellid Population reduced to 0.04 % with dimethoate and 0.56% with neem soap with respect to yield dimethoate recorded higher yield of 19.8 q/ha and b:c ratio 3.62 followed by neem oil
FLD	Foot rot Management in Black Pepper	Foot rot Incidence was reduced to 3.63% , 20.55% of Increase in yield and high B:C ratio 5.71 were observed
FLD	Foot rot Management in Black Pepper	Foot rot Incidence was reduced to 3.12 % , 7.26% of Increase in yield and high B:C ratio 9.78 were observed
FLD	Enhancing productivity of Ginger through scientific production technologies	17.99 % of Increase in yield and high B:C ratio 3.22 were observed and rhizome rot Incidence was reduced to 10.67 %
FLD	ICM in Black pepper	23.52 % of Increase in yield and high B:C ratio 3.34 were observed and percent reduction of was reduced to 13.80%.
FLD	Rhizome rot management in Ginger	26.11 % of Increase in yield and high B:C ratio 3.38 were observed and percent reduction of wilt incidence reduced to 1.80 %.
FLD	Foot rot management in	43.75 % of Increase in yield and high B:C

	Black pepper	ratio 3.00 were observed and percent reduction of rhizome rot incidence reduced to 12.86 %.

Time line proposed interventions by the KVK in promoting ODOP 2021-22

Sl No	Particulars	Title of technology	No of demos	Area (ha) Units (no)	Team members involved
1	OFT	Assessment of cardamom verities for yield potential, disease & pest resistance	05	1.0 ha	Horticulture, Plant protection, Animal Science and SSH
2	FLD	ICM in Black pepper	05	1.0 ha	Horticulture, Plant protection, Animal Science and SSH
3	FLD	ICM in Ginger	05	1.2 ha	Horticulture Scientist –Animal science, SSH
4	Planting material	Black pepper	-	30000	Horticulture and SSH
5	Planting material	Cardamom	-	5000	Horticulture and SSH
6	Planting material	Nut meg	-	2000	Horticulture and SSH
7	Capacity development Training	Processing and value addition spice crops	-	200	Horticulture ,Animal Science and SSH

IDUKKI – SPICES

Area, Production, Productivity and Socio Economic Importance.

Crop	Cardamom	Pepper
Area(ha)	31165	43790
Production (Mt)	16505	18726
Productivity (Kg/ha)	530	428
Socio – Economic importance	• Cardamom is a valuable spice that is obtained from seeds of a perennial plant [*Elettaria cardamomum*]. Cardamom must be dried before it is stored and sold. The cardamom plant produces flowers after it is 2-3 years old. The first crop of seed capsules is harvested in the third year after planting. Cardamom plant flowers in April-May and continues until July-August. The seed capsules are harvested at 30–40-day intervals. Small cardamom is a valuable source of income to farmers inhabiting in Idukki district of Kerala. • Cardamom is used internally for indigestion, nausea, vomiting and pulmonary disease with copious phlegm. It can be used with a laxative to prevent stomach pain, griping, as well as flatulence. Cardamom Seeds are used as a spice in cooking and as a flavoring in other medicines. The cardamom oil is an essential item in the processed foods, tonics, liquors, and perfumes. The fruit also finds significant usage in Ayurvedic medicines for dental infections, digestive disorders, etc. It also works to warm the stomach and helps with heart burn. Green cardamom is extensively used to treat infections in teeth and gums. It is also used to prevent throat troubles, congestion of the lungs, pulmonary tuberculosis and inflammation of eyelids.	• Black pepper is one of the most valued and widely used spices in the world and dominates multi-billion dollar global spices trade. The Idukki district is well known for its spices and majority of the farming community is depending on pepper cultivation as a source of income. • Black pepper (Piper nigrum) is one of the most popular and oldest spices in the world, with culinary uses and more recently as a food preservative Due its medicinal properties, it is used in traditional medicine for its antioxidant, anti-inflammatory and anticancer properties

Technological backstopping available for the product

Sl. No.	Technology for Spices	Source
1.	Small Cardamom root grub management with EPN	ICAR-NBAIR-2015
2.	Small Cardamom Thrips management with *Lecanicillium psalliotae*	ICAR-IISR-2019
3.	Small cardamom stem borer management with *Bacillus thuringiensis*	ICAR-NBAIR-2016
4.	Pink Pigmented Facultative Methylotrophs (PPFMs) for drought management	TNAU-2014
5.	Innovative technologies for deterring crop raiding wild elephants	Kerala Forest Department -2019
6	Bee keeping in Small cardamom	KAU
7.	Arka Microbial Consortium	ICAR-IIHR-2011
8	Arka Decomposer	ICAR-IIHR-2012
9.	Paecilomyces for Nematode management	ICAR-IIHR-2014
10	cardamom special	IISR
11	Cardamom Washing machine	NIF
12	Cardamom grader	Spices Board
13	Improved Cardamom Curing Devices	Spices Board
14	Supply of Bee-keeping boxes	Spices Board
13	Pepper Special	IISR
15	Encapsulated formulation for Black Pepper	IISR
16	PGPR Consortium for black pepper	IISR
17	Black Pepper Thresher	NIF
18	Low input nutrient technology for black pepper- For the predominantly small and marginal black pepper growers in Kerala- Application of ½ POP (recommended package of fertilizers) + zinc (6kg/ha as basal) is a risk free rational technology for better returns. However, large and medium farmers with enough resource to spare, application of FYM+ ½ recommended P (25 kg/ha) +Azospirillum (20g vine -1) or FYM + ½ recommended N (70 kg/ha) + Phosphobacteria (20g vine -1) is recommended for better returns.	IISR
19	Drip irrigation schedule for brush Pepper- @ 8 lit./plant/day during October-may is ideal for 5 year old bush pepper	IISR
20	Pepper ladder	Spices board
21	White pepper Making Machine	UAS Bangalore

Secondary and Specialty Agriculture in respect of the identified products

Harvesting at the correct stage of maturity is essential to produce high quality cardamom capsules. The fruits should only be harvested once they are fully ripe and mature. If the crop is thick when it is mature the higher yields and higher value of the final product may offset the losses due theft. A ripe capsule has black seeds inside whereas an immature capsule has white seeds. When a cardamom capsule is ripe it can be easily removed from the stem. The harvester should start harvesting

at the base of each stem and move up the stem taking of any capsules that easily fall off without pulling. Cleaning, washing, drying, winnowing, sewing and grading are the common methods used for processing. Secondary and speciality agricultural opportunities in small cardamom and black pepper are numerous. It mainly includes diversified products like tender cardamom pickle, pepper in brine, tender pepper pickle, black pepper powder, crushed black pepper, pepper in honey and specialty agricultural opportunities include crushed cardamom, white pepper, white pepper powder, pepper oil, cardamom oil.

Marketing opportunities for the identified product of the district

Opportunities for the Marketing spices of Idukki district is through licensed cardamom auctionaries at Vandenmedu and Bodinaikannur. Spice park, Puttady does the grading and sorting of cardamom and Pepper. Mainly International marketing facilities are available for graded black pepper in USA, UK and Indonesia and Cardamom at UAE. Grading cardamom is graded by colour and size. The deeper the green colour and the larger the capsule size, the higher the grade. Grinding cardamom capsules are usually sold whole. Grinding can be a method of adding value to a product. However, it is not advisable to grind spices. After grinding, spices are more vulnerable to spoilage. The flavour and aroma compounds are not stable and will quickly disappear from ground products. The storage life of ground spices is much less than of the whole spices.it is very difficult for the consumer to judge the quality of a ground spice. It is very easy for unscrupulous processors to contaminate the ground spice by adding other material. Therefore, most costumers, from wholesalers to individual customers prefer to buy whole spices.

The Indian grading system for cardamom capsules separates them into different types:

- Alleppey Green Cardamom
- Coorg Green Cardamom
- Bleached or Half-bleached Cardamom
- Bleached White Cardamom
- Mixed Cardamom

Packaging:

Cardamom are packed separately according to colour: deep green , green, light green and pale brownish. If 95% of the cardamom corresponds to one of the colour groups, the relevant colour if the cardamom should be indicated on the Agmark labels. When the cardamoms are not of any one of the uniform colour, the colour is not indicated on the label. Cardamom capsules can be packaged in polyethene bags of various sizes according to the market demands. The bags should be sealed to prevent moisture entering. Sealing machines can be used to seal the bags. Attractive labels should be applied to the products. The label needs to contain all relevant product and legal information – the name of the product,

brand name, details of manufacturer [name and address], date of manufacture, expiry date, and weight of the content.

Activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Year	Crop	Undertaken Activity	Title of the KVK Intervention	Number of trials/ demo	Impact created
2016-17	Small cardamom	OFT	Assessment of different bio-pesticides and parasites against cardamom stem and capsule borer, *Conogethes punctiferalis*	5	*Bacillus thuringiensis var Kurstaki* sprays in combination with the releases of parasites *Apanteles sp* and *Friona sp* gave effective control of stem and capsule borer.
		FLD	Integrated Management for fusarium disease in small cardamom plantations	5	bio-control agents such as 1 per cent *Trichoderma harzianum* (109 cfu/ml) as basal application and 1 per cent and *Pseudomonas fluorescens* (109 cfu/ ml) as spray and soil drenching was effective control methods for Fusarium in small cardamom

Year	Crop	Undertaken Activity	Title of the KVK Intervention	Number of trials/ demo	Impact created
			Integrated Nutrient Management in Cardamom	10	INM reduced the indiscriminate use of chemical fertilizers thus reduced soil acidity, nutrient deficiencies. Spike length, Number of berries per spike increased as compared to check.
	Black Pepper	OFT	Assessment of suitable Black Pepper Foot rot (Quick wilt) resistant variety for Idukki District	5	IISR-Thevam was showed least percentage of quick wilt disease incidence compared to farmer developed varieties and check.
		FLD	Column Method for production of quality planting materials in Black Pepper	1	Column method enhanced the production of health planting materials than other methods. The disease and pest attacks were found reduced
2017-18	Small cardamom, Black Pepper	FLD	Popularization of Pink Pigmented Facultative Methylotrophs (PPFMs), to protect crops Small cardamom, Black pepper and vegetables from heat and drought condition	10	Spraying of Pink Pigmented Facultative Methylotroph (PPFM) bacteria on the fields to mitigate drought and protect the crop and the bacteria, found on plant phyllosphere, secrete variety of growth hormones which could be used by the plants leading to an

Year	Crop	Undertaken Activity	Title of the KVK Intervention	Number of trials/ demo	Impact created
					increased growth and yield.
2018-19	Small cardamom	FLD	Bio-intensive intervention of pest and drought management in small cardamom	2	Effective balance of pests and beneficial organisms in Small cardamom plantation
	Black Pepper	FLD	Integrated Nutrient Management in Black Pepper	1	INM reduced the indiscriminate use of chemical fertilizers thus reduced soil acidity, nutrient deficiencies. Spike length, Number of berries per spike increased as compared to check.
2019-20	Small cardamom	OFT	• Assessment of different innovative technologies for deterring crop raiding wild elephants • Assessment of different biological control agents for the management of thrips in small cardamom	2 2	Solar based LED light fixed field was not visited wild elephants as compared to different treatments and crop standing good. *Lecacillium psalliotae* treated field up to 62.5 % mortality was recorded in the test population, ten days post inoculation.
	Black Pepper	OFT	Assessment of different potting mixture to produce healthy planting material of black pepper	1	The trial with coirpith compost +trichoderrma +Soil reduced the fungal incidence in plants and Percentage recovery of plants were more.

Year	Crop	Undertaken Activity	Title of the KVK Intervention	Number of trials/ demo	Impact created
2020-21	Small cardamom	FLD	Bio-intensive intervention of pest, drought management and deterring crop raiding wild elephant in small cardamom	1	Solar based LED light fixed field was not visited wild elephants as compared to different treatments and crop standing good. *Lecacillium psalliotae* treated field up to 62.5 % mortality was recorded in the test population, ten days post inoculation.
	Black Pepper	OFT	Assessment of different potting mixture to produce healthy planting material of black pepper	5	The trial with coirpith compost +trichoderrma +Soil reduced the fungal incidence in plants and Percentage recovery of plants were more.
		FLD	Demonstration of IISR PGPR consortium for growth promotion in Black pepper	3	IISR-PGPR consortium increased the yield in terms of spike length, number of berries, also nutrient deficiencies were reduced which in turn reduced the fungal diseases

Interventions by the KVK in promoting ODOP for the identified produce and product

1. **EDP on diversified spice products preparation**

Products include

- Tender cardamom pickle
- Pepper in brine
- Tender pepper pickle
- Crushed black pepper

- Black pepper powder
  - Pepper in honey
  - Crushed cardamom
  - White pepper
  - White pepper powder

Timeline:

June-July 2021: Implementation and SHG Formation

August- September 2021: Capacity building

October 2021: Product preparation

November– December 2021: Packaging, Branding and marketing

January 2022 onwards: Marketing in progress + Horizontal spread+ Monthly meetings

2. Capacity Development programmes:

Title of training	No. of Courses	Expected participants
Introduction and orientation of the programme, Pre-evaluation, Importance of spices processing	10	100
Practical sessions on cardamom and pepper-based products Capacity trainings will be provided on ▪ Tender cardamom pickle ▪ Cardamom oil extraction ▪ Pepper oil extraction ▪ Pepper in brine ▪ Tender pepper pickle ▪ Crushed black pepper ▪ Black pepper powder ▪ Pepper in honey ▪ Crushed cardamom ▪ White pepper ▪ White pepper powder	10	100
Capacity building programme on spice processing through diversified products	10	100
Product preparation with special emphasis on spice recipes	5	60
Nutrient management in ensuring the nutrient deficiencies in spices	5	60
Best Management Practices in ensuring the increased productivity in spices	5	60
Pest- disease management in ensuring the increased productivity in spices	5	60

3. Formation of a community interest group groups for EDP generation through small cardamom and black pepper oil extraction

Timeline:

June- July 2021: Sensitization, Ice breaking and Selection of members

August – September 2021: Distillation unit installation and capacity building

October- November 2021: sensitization of diversified product preparation of spices

December 2021: Registration of CIG group
January 2022: Trainings and practical session on product development
February 2022: Self-sufficient employment generating group
March 2022 onwards: follow up and monthly meetings

4. EDP generation through Cardamom dry flower preparing SHG unit establishment

Different plant parts of Cardamom like pods, sheath and by-products of peppers spikes are the major wastes found in agricultural spice cluster of Idukki district. The wastes will be converted to Dry flower bouquets and other wastes to wealth generating products. An SHG with 10-15 members will be formed, trained and will be molded as a Self-sufficient employment generating group

Timeline:

August- September 2021: Implementation and selection of members
October 2021: Registration of SHG group

November 2021: Trainings and practical session on dry flower preparation

December 2021: Capacity building

January onwards: Product preparation, Packaging, Branding and marketing

February 2022: follow up and monthly meetings

WAYANAD – MILK AND MILK PRODUCTS

Brief agricultural profile of the district

Milk is the largest agricultural commodity in India both in quantitative and value terms. India ranks first in milk production, accounting for 20 per cent of world production. Milk production in India has been increasing steadily over the years from 55.6 million tonnes in 1991-92 to 176.3 million tonnes in 2017-18, at an average annual growth rate of 4.5 percent. Indian dairy industry with an estimated size of 70 billion US$ contributes to about 17% of global milk production. Last few years have witnessed the growth rate of around 5%. .In 2019 the milk production in Kerala reached a volume of 2.5 Billion Litres. The state currently represents the twelfth largest dairy market in India. Despite the floods Kerala faced in 2018 and '19 monsoons, followed by a crisis owing to Covid -19 this year, the state's milk cooperatives have clocked an impressive turnover. The milk production in Kerala mainly consists of cow milk and buffalo milk. Currently, liquid milk represents the biggest product segment in Kerala, accounting for majority of the total market share. The cow milk dominates the total milk production, accounting for majority of the total share. Wayanad stands second in milk production in the state. The State has highest crossbred to indigenous cattle ratio and highest AI performed per 1,000 breedable population.

Wayanad is a hilly backward district of Kerala. The climate and tropical features of Wayanad are congenial for the growth of dairy industry. Dairying is an important source of subsidiary income to small/marginal farmers and agricultural labourers in the district. There are more than 50 milk societies in Wayanad and the milk production is more than 5 crore litres annually.

Opportunities for Secondary and Specialty Agriculture in respect of the identified products

Owing to highest literacy rate in Kerala, farmers can be easily prompted to acquire more knowledge and awareness about the scientific dairy farming practices and are further likely to adopt new technology in milk processing. The government policies are quite favorable to dairy development. In India the level of milk processing is around 34% which is highest among all food categories. With expected rise in milk production, more new processing units will come into operation. It is, therefore, estimated that the processed dairy segment will grow at around 15% during the next five years. There has been consistent rise in demand for value added products such as ghee, curd, dairy beverages, Sambaram /buttermilk, kattimoru, paneer, paladamix, peda, sipup, ice cream, milky jack, coconut burfi, buttercookies, gulabjamun, butter, Cream etc. thereby encouraging the organized dairy industry to go for diversification of product profile.

Marketing opportunities for the identified product of the district - Domestic and International.

Dairying in Kerala has now gained the status of a profitable enterprise where there is ample scope for marketing milk and milk products. More number of young entrepreneurs are venturing into the sector in the wake of the sharp decline in price of cash crops, especially pepper, coffee and tea. Value added products from milk can be sold through eco-shops and marketing channels of FPOs. If common packing facility like pouch filling/canning line etc is made available n KVK dairy farmers can utilize the facility for improved packing and get more avenues for marketing.

Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Year	Sl. No.	Activities undertaken by the KVK
2020-21	1	Resource person/Master Trainer - for PM FME -training programme for District Level Trainers on topics a. Dairy processing Equipment: Selection Specifications & Installations b. Packaging of Dairy Products c. Hands on experience/ skill training of Milk products

a) Method demonstration of equipment used for processing products from milk and product development in collaboration with Kudumbasree and FPO for developing course content for training.




Timeline proposed interventions by the KVK in promoting ODOP

Sl. No	Proposed interventions	Objective
1.	Capacity Building Programme	To develop trained manpower with entrepreneurial skill required to establish, manage and direct small and medium dairy processing enterprise
2.	Common facilitation centre	To provide facilities for value addition technologies in milk for different enterprises by FPOs /SHG/Diary farmers and other entrepreneurs.
3.	Field Level demonstration.	Technology dissemination through skill training programmes on production of different value added products from milk.

DAKSHINA KANNADA – MARINE PRODUCTS

Fisheries Profile of the District

Karnataka with its three coastal districts is one of the eight maritime states in India and stands fifth with regard to marine fish landings.The coastline of the three districts amount to 300 km with a continental shelf of 27,000 sq. km and an EEZ of 87,000 sq. km. Further there are 8000 ha of brackish water area also in the state. India occupies fifth position amongst the major shrimp farming countries in the world. Brackishwater aquaculture includes culture of shrimp varieties mainly, the native giant tiger prawn (*Penaeus monodon*) and exotic white leg shrimp (*Penaeusvannamei*). In addition to these, culture of seabass (*Latescalcarifer*) and milkfish are largely practised in brackish water aquaculture.

About 90% of the shrimp farmers in India are small scale farmers which own less than 2 ha of land. Marine fisheries contribute to 3% of total exports of the country and in domestic market the fish utilization is 81% fresh; 5% frozen, 6% dry and 5% for fish meal. Karnataka emerged as a maritime state in 1956. Traditionally Karnataka coast is known as “mackerel coast”. The marine fisheries resource potential of the state has been estimated at 4.25 lakh metric tons, of which 2.25 lakh metric tons come from inshore areas up to a depth of 70 m and the remaining 2.0 lakh metric tons hail from off shore/deep sea zone. The state has 6 major fishery harbors such as Mangalore fishing harbor in Dakshina Kannada (D.K), Malpe and Gangolli fishing harbors in Udupi and Honavar, Tadri, and Karwar in Uttara Kannada (U.K) districts. About 90% of the marine fish production in the state comes from these major ports.

Marine fish production of the state is 3.93 lakh metric tonnes whereas inland production is 1.7 metric tonne. The total fish production in the state is 5.90 metric tonnes. Dakshina Kannada is having the coastal length of 42 Km with major Mangalore as prime fish landing centre.The district has marine capture fish production of 1.51 lakh metric tonne. Dakshina Kannada harbours around 1,337 trawl boats, 57 purse seiners, 1,420 motorized boats and around 534 traditional boats. In the district, around 1.5 lakh people are engaged in fishing and fisheries related activities that are directly or indirectly connected to marine fisheries. Some of the people are engaged in direct fishing, while some are engaged in postharvest process such as cleaning, washing, icing, ice making, pickling, fish drying, marketing etc.

The pelagics found in Karnataka are Indian oil sardine, Indian mackerel, ribbon fish, anchovies, Thryssa sp., carangids, seer fishes, tunnies, etc. The demersal fishes found are bulleyes, threadfin breams, croakers, lizard fishes, pomfrets, triggerfish, elasmobranchs and catfishes. High valued crustacean forms the third largest resources which include shrimps, crabs, lobsters and

stomatopods. Mollusks resources like squids, cuttlefish, octopus, bivalves and gastropods stands at fourth position.

Technological Backstopping Available for Marine Products

- ICAR-Central Institute of Fisheries Technology(CIFT)-Kochi, Kerala
- National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT)-Ernakulam, Kerala.
- Marine Products Export Development Authority (MPEDA)-Kochi, Kerala
- ICAR-Central Institute of Brackishwater Aquaculture(CIBA)-Chennai, Tamil Nadu
- CSIR-Central Food Technological Research Institute (CFTRI) -Mysuru, Karnataka
- KVAFSU, Bidar, Karnataka
    - CIFTEQ™ FISHMAID® - Battered and Breaded Products
    - CIFTEQ™ FISHPOUCH - Ready-to-serve Fish curry in
    - CIFTEQ™ DRISH®- Cured and dried fish products
    - CIFTEQ™ FIFERS® Fish wafers
    - CIFTEQ™ FISH KURE – Protein enriched extruded Product from Fish
    - CIFTEQ™ Fish Pickle
    - CIFTEQ™ FERTIFISH® Foliar spray from fish waste
    - CIFTEQ™ MATSYA - Fish feed from processing discards
    - CIFTEQ™Ciftdry SHD-60 -Solar dryer with LPG backup -60 kg
    - CIFTEQ™ChillFish-RFVK - Refrigerated mobile fish vending kiosk
    - CIFTEQ™Ciftdry SHD-20 -Solar dryer with electrical backup - 20 kg
    - CIFTEQ™Ciftdry STD-50 -Solar tunnel dryer - 50 kg
    - CIFTEQ™Hand operated fish descaling machine – 5 kg
    - CIFTEQ™ PURESMART: Succinyl Chitosan based hydro-alcohol hand sanitizer, for personal hygiene
    - CIFTEQ™Fish Smoking Kiln (COFISKI) etc.

Value added marine fish products

Fish and Prawn chutney by RR foods, Mangaluru, Dakshina Kannada

Specialty Products Fish balls

Specialty Products Fish fingers

Fish Chakli

Fish Shev

Fish Papad

Fish Sausage

Specialty Products Skewered

Specialty Products Fish cutlets

Fish wafers

Fish Pickle

Fish Soup Powder

Fish Kure

Fish Pickle

Ready-to-serve fish curry in retortable pouches

Solar dried fish at KVK, Dakshina Kannada

Hybrid solar drier

Opportunities:

Fish is a rich source of easily digestible protein that also provides polyunsaturated fatty acid, vitamins and minerals for human nutrition. A large proportion of total landed fish remains unused due to inherent problems related to unattractive colour, flavor, texture, small size and high fat content. Most of these fishes belong to pelagic species and some are unconventional species. A need for their conservation and utilization for human consumption has been recognized in order to prevent post-harvest fishery losses. Recovery of flesh by mechanical deboning and development of value-added products are probably the most promising approaches. These include surimi and surimi-based products. Surimi is a washed fish mince and used as a base material for making different types of value added products like fish cutlet, fish sev and fish wada, fish Kheema, etc.

Value addition is the key word in the Indian context of industrial fish processing to ensure maximum returns through diversification. Development of indigenous processing machinery is a felt need for cost effective value addition in fisheries sector value addition has opened a new field for the profitable utilization of by-catch and low value fish catches. In India even now majority prefer fresh fish. However, there is an increasing trend in utilization of value added fish products as evidence of their availability in modern super markets as well as malls which are becoming popular.

Value added products primarily fall under 8 categories

1) Speciality products
2) Mince based products
3) Battered and breaded products
4) Surimi based products
5) Extruded products
6) Intermediate moisture products
7) Pickled products.
8) Ready to serve products in retortable pouch

The concept of value addition in seafood sector covers the range of products from live fish and shellfish to ready to eat/serve convenience products. Being the largest producer of several agri-commodoties, there are ample opportunities for value addition and product development, especially ready to eat/ ready to cook products for the domestic as well as export market.

Curing and drying, even though an age old practice, open up new dimensions and possibilities towards value addition in domestic as well as overseas markets. In India as per the estimates about 17-20% of the catch is converted to dried products and dry fish export contributes to about 7.86% of total fish exports. The major importing countries are Sri Lanka, Malaysia, Indonesia, Singapore and UAE. However there are several factors hindering the addition of dried fishery products to the product profile. The major one being, drying is still considered a traditional method of processing and hence standard operating procedures are

seldom followed. Improving the handling practices right from the point of raw material harvesting till marketing, popularisation of improved packaging practices, use of hygienic energy efficient mechanical driers and adequate extension services can facilitate better adoption of during practices in marine sector.

Marketing opportunities

Marketing of value added products is completely different from the traditional seafood trade.It is dynamic, sensitive, complex and very expensive market surveys,packaging and advertising are a few of the very important areas, which ultimately determine the successful movement of a new product. Most of the market channels currently used is not suitable to trade value added products. A new appropriate channel would be the supermarket chains which want to procure directly from the source of supply. Appearance, packaging and display are all important factors leading to successful marketing of any new marine product. The retail pack must be clean, crisp and clear and make all the contents appear to the customer. The consumer must be given confidence to experiment with a new product launched in the market. Packaging requirements change with product form, target group, market area, species used and so on. The latest packaging must also keep abreast with the latest technology.

Activities Undertaken by the KVK during the past 5 years:

Training programmes:

Year	Details	Total participants
2015-16	Value addition	100
	Women empowerment	62
2016-17	Fish processing and Value addition	55
2017-18	Shrimp farming	20
	Formation and Management of SHGs	16
2018-19	Fish processing and value addition	11
2020-21	Entrepreneurial development of farmers/youths	60

Hygienic fish drying using solar drier demonstration to the farming community of Dakshina Kannada

		
Solar dried sole fish at KVK Dakshina Kannada	**Traditionally open dried and solar dried mackerel fish**	

Proposed Interventions by the KVK

-Technology assessment:

- Under Action plan 2021-22
  1) Hygienic and quality fish drying using solar driers- CIFTEQ^{TM} Ciftdry SHD-20 -Solar dryer with electrical backup - 20 kg and CIFTEQ^{TM} Ciftdry STD-50 -Solar tunnel dryer - 50 kg with traditional drying method.
  2) CIFTEQFish Pickle and chutney powder.

Technology Dissemination:

- A mini fish processing plant funded by Central Institute of FisheriesTechnology, Kochi, Kerala under World Fish Centre project is being established at KVK, Dakshina Kannada which will be effectively used for the product identified for the district.
- SHGs of various talukas of the Dakshina Kannada will be trained and the facilities for product preparation at KVK will be provided.
- Awareness programmes on effective use of bycatch and hygienic by products preparation with zero waste production and effective utilization of low valued marine fishes for various products development will be carried out across the coastal villages.
- District produced marine products and CIFT developed value added products will be displayed and a sale unit will be established at KVK, Dakshina Kannada to create awareness to the people visiting KVK

Salient Features of marine products development:

- Utilization of low cost fish as a raw material for making different types of value added products which are equally good from nutritional point of view can be a potential option for fisherwomen, women self-help groups and unemployed youth.
- Low cost technologies for setting up small scale units with minimal investment.
- Women self-help groups are the potential users of the value added fish product technologies.
- The various fish products have a very good acceptability among the people; however popularization of these products throughout India by means of using different methods of advertisement is need of hour.

Training on fish drying using solar drier to women at KVK, Dakshina Kannada

Capacity development programmes:

Details	Batch Size	Date
Value added fish products preparation	20	3rd week of June
Fish byproducts preparation	20	3rd week of July
Improved techniques of production of value added fish products	20	3rd week of August
Small scale business setup models	20	3rd week of September
Packaging technologies in marine fish products export	20	3rd week of October
Quality management in fish processing and export	20	3rd week of November
Fish drying and chilling technology	20	3rd week of January
Marine fish segregation and refrigeration technologies	20	3rd week of February
Marketing of marine products	20	3rd week of March
Exposure visit to central institutes and successful entrepreneurs units.	20	-

Note: The duration of the programme varies from 1 day to 3 days.

UDUPI - MARINE

Area, production, productivity, and socio-economic importance

Coastal length	98 KM
Fisheries Villages	64
Fishermen Population	198759
Fishermen in to fisheries	107192
Ice Plant	91
Cold Storages	17
Freezing Plant unit	10
Frozen storage Unit	4
Boat building yard	15
Fisheries Cooperative Societies	52
Federation	1
Women Cooperative societies	17
Fishing Harbours	2
Fisheries Landing centre	6
Fisheries Link Roads – 87	154.06 KM

Resources and Potential- Marine Fisheries

- Traditionally, Karnataka coast is known as “Mackerel Coast”
- The marine Fisheries resource potential of the State is estimated at 6.02 lakh metric tons
- The pelagic Fishery wealth of the district, mainly comprising mackerel and oil sardine, used to be traditionally harvested by operating shore seine known as "Rampani". But this method has now become almost obsolete.
- The mechanization of fishing operation was initiated with the introduction of 30 - 46 ft. trawlers in 1957 for exploiting inshore demersal resources including shrimps.
- Introduction of purse seines in 1970s extended the area of fishing operation for shoaling pelagic resources.
- Motorization of traditional crafts like gill- netters and long- liners and encouragement of offshore Fishing beyond 50 meters depth using bigger vessels for a duration of 7-8 days, have effectively increased the range and efforts of fishing operations.
- Financial institutions have extended the required loan facilities for owning bigger Fishing boats, which has helped in increasing the feet strength.
- In recent years, fishermen are being trained in operation of sophisticated electronic equipment both for Fishing and navigation.

Fishing Nets/Gears marine Fisheries			
Net	**Total nets in the State**	**District**	**Production (MT)**
Trawl Nets	4420	2025	93962
Gill net	9033	4297	13153
Ring Seiners	76	71	
Cast Net	830	13	
Traditional Nets	7360	696	
Purse Seine Net	274	102	10270
Shore Seine Net	6	2	510
Total	21999	7206	117895

	Fish production (MT)		**Marine**		**Inland**	
	Quantity (MT)	**Value (Lakhs)**	**Quantity (MT)**	**Value (Lakhs)**	**Quantity (MT)**	**Value (Lakhs)**
State	587412	551491	389491	373362	197921	178129
District	1,20,972	1,17,028	1,17,895	114259	3077	2769

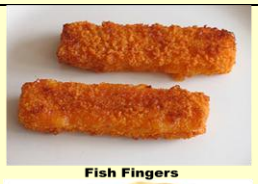
- Fish production 5.88 lakh metric tons
- contribution of Marine sector being 66 %
- Inland sector 34 %.
- The Fish production from the state contributed about **4.27% of India's total Fish production** and ranks **6th position**. The current level of per-capita Fish availability in the state is around 6.8 kg.

Brackish water Aquaculture - Major Spp. Cultured in the district

Culture System	**Numbers/Area**	**Production (tons)**
Shrimp Farming – Penaeus vannamei and P. monodon	350 (465 ha)	2790
Cage culture – Asian Seabass and Red snapper	1723	2584.5
Other (Bivalves, Mussels, groupers, etc)	200 (150ha)	2123

Details of technological backstopping available for the product

Sl. No.	Name of the technology	Source of the technology
1.	CIFTEQTM FISHPOUCH - Ready-to-serve Fish curry in	ICAR-Central Institute of Fisheries Technology(CIFT)-Kochi, Kerala
2.	CIFTEQTM DRISH®- Cured and dried fish products	KVAFSU, Bidar, Karnataka
3.	CIFTEQTM Fish Pickle	CSIR-Central Food Technological Research Institute (CFTRI) -Mysuru, Karnataka
4.	CIFTEQTM MATSYA - Fish feed from processing discards	
5.	CIFTEQTMCiftdry SHD-20 -Solar dryer with electrical backup - 20 kg	
6.	CIFTEQTMCiftdry STD-50 -Solar tunnel dryer - 50 kg	
7.	CIFTEQTMFish Smoking Kiln (COFISKI)	
8.	Prawn Pickle	
9.	Prawn chutney	
10.	Fish cutlets	
11.	Sausage etc	
12.	Pappad	
14.	Wafers	
15.	Fish balls	
16.	Fish Fingers	
17.	Salt dried fish	
18.	Smoked fish etc	


Fish Fingers


Fish chakkuli


Fish Balls


Coated Squid rings


Fish shev


Fish wafers


Fish Sausage

Opportunities for Marine products through processing, value addition and marketing

Fish is a rich source of easily digestible protein that also provides polyunsaturated fatty acid, vitamins and minerals for human nutrition. A large proportion of total landed fish remains unused/moving to fishmeal and manure industry due to inherent problems related to unattractive colour, flavor, texture, small size and high fat content. Most of these fishes belong to pelagic species and some are unconventional species. A need for their conservation

and utilization for human consumption has been recognized in order to prevent post-harvest fishery losses.

Recovery of flesh by mechanical deboning and development of value-added products are probably the most promising approaches.These include surimi and surimi-based products. Surimi is a washed fish mince and used as a base material for making different types of value added products like fish cutlet, fish sev and fish wada, fish Kheema, etc.

Value added products primarily fall under 8 categories

1) Specialty products
2) Mince based products
3) Battered and breaded products
4) Surimi based products
5) Extruded products
6) Intermediate moisture products
7) Pickled products.
8) Ready to serve products in retortable pouch

Marketing opportunities in both domestic and international for Marine products

- Domestic Market: 75% of total catch for fresh as well as frozen fish consumption and 19.57% is being used for other industries like Fishmeal, Manure and oil industry
- Low value and small sized fish portion of bycatch can be used for value addition through production of Pickle, Fryums, papad and other products.
- A new appropriate marketing channel would be the supermarket chains which want to procure directly from the source of supply.
- International Market: Earning 7563.52 Lakh by exporting 5681.96 MT (5.43 %) through processed products like Squid rings, Frozen fish and shell fish. Major contribution is from Shrimp.

Mandated activities undertaken by the KVK during the past 5 years on the produce and product identified for the district

Sl.No.	Particulars	Numbers
1	OFT	3
2	FLD	10
3	Farmers scientist interaction	17
4	Field day	07
5	Training	38
6	Method demonstrations	7
7	In collaboration with DOF	15 - trainings 5 - field days 3 - Krishi Abhiyan

Proposed intervention by the KVK in promoting ODOP identified Marine product

Problem identified and Proposed EDP on Marine Prodcuts: small sized commercial fishes, some low value fish and shellfishes do not fetch a good price

in the market hence are diverted to fish meal and manure industry. This diversion leads to improper utilization of the cheapest but rich protein source. Value addition is the only solution for better utilization and employment generation/doubling the income

EDP on Marine Products – Value addition of Low value fish and shellfish product preparation and marketing




Technology demonstrated: Product Preparation of Pickle, Papad, Chakkuli, wafers, Chutney powder, cutletes, Fish fingers, Fish balls etc.

Village : 1 group of 10 members from Bengre, Santhekatte

EDP – Value addition of Low value fish and shellfish product preparation and marketing

- Group formation
- Training on product preparation
- Branding
- Labelling
- Market Linkage

Capacity development programmes

Sl No	Details	Batch
1	Value added fish products preparation	20
2	Fish byproducts preparation	20
3	Quality management in fish processing & export	20
4	Fish drying and chilling technology	20
5	Marketing of marine products	20
6	Exposure visit to central institutes and successful entrepreneurs units	20

Expected outcome:

Better utilization of protein rich food resources

- Resource conservation
- Employment generation and doubling of farmers income
- Skill up-gradation
- Women empowerment
- Increase in per capita consumption rate
- Socio economic upliftment
- Development of village level home industries

KASARAGOD – MUSSELS

India has risen to one among the top 10 mussel producing nations in Asia with an annual production of 10,060 tonnes, worth $ US 1.79million, In India, the mussel culture is gaining momentum due to its commercial importance as most preferred seafood with a wider distribution of green mussel (Perna viridis) culture along the coast of Kerala, Karnataka, Goa, Maharashtra and Andaman & Nicobar Islands and brown mussel (Perna indica) has got limited distribution in south west coast of India stretching from Varkala to Kanyakumari. It is pertinent to mention that Malabar Coast of Kerala, commonly referred as 'Mussel fishery zone' of India that contributes more than 80 % of total annual mussel production of the coun18432 tonnes) is mostly dominated by green mussel. Kerala stands first, contributing 95 % of th try (e total mussel production. In recent years, the increasing demand for mussel has enabled farmers in north and central Kerala to adopt commercial scale for mussels farming.

In Kasaragod district in Kerala, Mussel culture is increasingly getting popular in Padanna and Cheruvattur Panchayats in Hosdurg Taluk, The Cheruvattur panchayat has an area of 18.37 Sq.km with a population of 24,504. The number of families with fishing as the main occupation is 144 and about 300 families depend upon fishing as a source of subsidiary income. At Padanna panchayat, the population is 17,961 with an area of 13.08 Sp. km. The number of families for whom fishing is the main occupation is above 200 and the number of families doing fishing as a source of subsidiary income is about 400.

Mussels are considered as one of the most nutritive food rich in vitamin A, B12, vitamin C, thiamine, riboflavin; high in mineral contents like Iron, Zinc, manganese, phosphorus and selenium. It is good source of Omega -3 fatty acids enriched with easily digestible protein and essential amino acids and has low calorific value.A daily intake of mussels stimulates brain functions, improves heart health, promotes cellular functions, facilitates blood circulation, reduce arthritis, prevents anaemia and asthma. A balanced proportion of essential to nonessential amino acid ratio (0.7:1.1) along with the optimum and balanced quantities of vitamins, mineral nutrients, and low cholesterol contents are the special characteristics of P. viridis. The potential health benefits related to marine mussel consumption are due to the presence of inexpensive source of protein with high biological value and polyunsaturated fatty acids (PUFAs).Value added products from Mussels are exported to different countries in frozen/ dried condition.

Technological backstopping available for the product

A variety of products have been developed by R&D activities by CIFT and IFP, Kochi. KAU Thrissur has conducted training, seminars on mussels. Various value added products of mussels like seafood cocktails, iced and frozen meat, canned, smoked and dried mussel, ready-to-eat fried mussel meat in vacuum packs

marinated, chutneys powder and pickles and traditional value added products are prepared and marketed by seafood are developed by CIFT, Kochi.

Processing, Value Addition and Marketing

Secondary Agriculture: Training programme on value addition can be done, the technologies developed by KAU, CMFRI and CIFT can be utilised and transferred to the farmers, Self help groups. Farmers may be mobilised to start Small scale industry to manufacture different types of products. The mussel products can be sold through various markets as they having very good demand

Speciality Agriculture*:* Value to the products can be done by creative innovations like functional and nutraceutical products. Indigenous storage and packaging technologies and traditional technology can be enhanced for increasing value and income.

Marketing opportunities for the identified product of the district - Domestic and International.

Value added products from Mussels are exported to different countries in frozen/ dried condition. They are also air lifted in iced condition to the Middle East countries where mussels are in great demand. Indian mussels have great demand in global markets especially in United Arab Emirates, Germany and Republic of South Africa.

In Kasaragod district the farmers have to harvest the fully-grown mussels in May itself and sell before the onset of monsoon to avoid mortality due to low salinity. At present only a few companies are purchasing mussels from the farmers and the bargaining from the farmer's side is limited. Further processing and production of value-added products are required to get maximum return. Better marketing facilities are to be made available for obtaining better price. Mussel culture is a recent initiative in the Padanna and Cheruvattur area. As mussel do not form the cuisine of this area, the expertise in meat shucking is low compared to their counterpart in Calicut area.

Activities undertaken by the KVK during the past 5 years on the product identified for the district

KVK has visited various fisheries Department and farmers and studied about it. Mussel culture was initiated by the CMFRI and DWCRA (Development of Women and Children in Rural Areas) in Kasaragod. KVK has given training on value added products from shellfish and other fishes locally available, classes were taken importance of marine products in our diets.

Demonstrated the traditional products made from Mussels like Kallamakai, Adda, and Marinated products. Storage and packaging technologies of these products were also demonstrated to farmers. For farming the average cost estimates of mussel culture at Padanna Panchayath showed that the major cost was that of nylon rope (34%), bamboo (20%) and seed (20%). The other expenditures involved

cloth (7%), construction cost (5%), harvesting (4%), seeding (4%) and coir rope (3%).

Depuration of mussel is required to maintain the quality of the product and in coming years this will become mandatory for internal and export market. The cold storage facility of the boiled and shucked mussel meat is lacking as the mussel culture harvesting is done in a limited period.

KVK interventions in promoting ODOP

Sl. No.	Activity proposed	Timeline
1	Front line demonstration on production and post harvest storage of mussels and demonstration of value added products.	2021-22
2	Capacity building of extension functionaries and farmers groups (SHGs) on processing and value addition in collaboration with Kerala Agricultural University, Thrissur by organising one week duration training programme during the first week of December 2021.in harvest and post- harvest fisheries to develop technology based business ideas and establish sustainable enterprises.	December 2021
3	Demonstration of value chain approach in mussel farming with the financial assistance of NABARD including the cost of raft, seeds, anchoring, depuration cost etc.(Project under preparation)	2021-23
4	Demonstration of Scientific processing technique to enhance the shelf life of the product at room temperature will be provided to farmers groups.	2021-23
5	ICAR – KVK, CPCRI Kasaragod will support the start-ups or prospective entrepreneurs by providing technical guidance and value-added business support.	2021-22
6	Technical consultancy, project planning, market linkage, packaging, with the assistance of CIFT Kochi, KVK, CMFRI Ernakulam and KAU, Thrissur to entrepreneurs.	2022-23.

Epilogue

- One District One Product (ODOP) is an initiative of Government of India towards realizing the true potential of a district, fuel economic growth and generate employment and rural entrepreneurship, taking us to the goal of AtmaNirbhar Bharat. The Department of Commerce is engaging with State and Central government agencies to promote ODOP.

- The objective is to convert each district of the country into an Export Hub by identifying products with export potential in the district, addressing bottlenecks for exporting these products, supporting local exporters/manufacturers to scale up manufacturing, and find potential buyers outside India with the aim of promoting exports, promoting manufacturing & services industry in the district and generate employment in the district.

- To fulfill above objective, KVKs of Zone-XI comprising of Karnataka, Kerala and Lakshadweep are carrying out different activities such as OFTs, FLDs, capacity building programmes, extension activities etc. to promote ODOP products specified for their respective district.

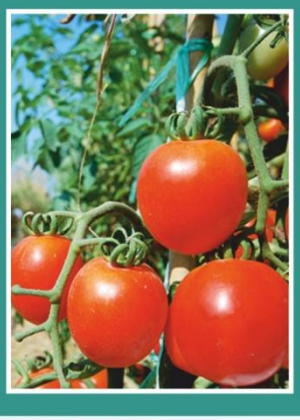
- KVKs under ICAR-ATARI, Bengaluru have prepared a strategic plan for the product specified for their respective district in the form of this publication entitled 'One District One Product-Karnataka, Kerala and Lakshadweep: A strategic document by KVKs'in order to encourage agri-based micro-enterprises among Agripreneures, FPOs, SHGs, CIGs etc., as well as serve as reckoner to researchers, extension personnel, administrators, policy makers and other stake holders.

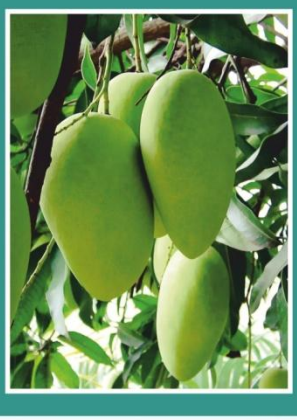
भाकृअनुप
ICAR

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch








एक जिला One District
एक उत्पाद One Product

Karnataka, Kerala and Lakshadweep